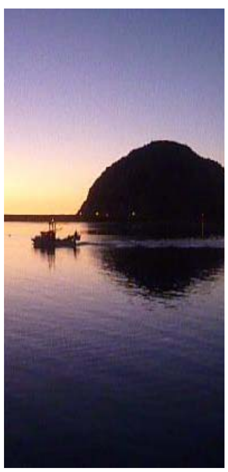
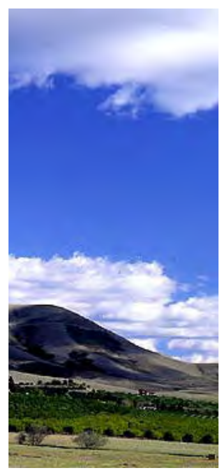
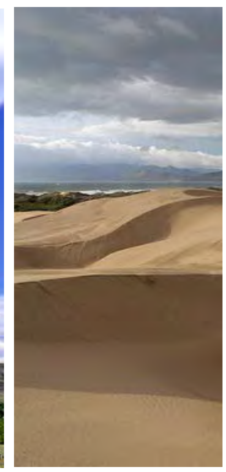
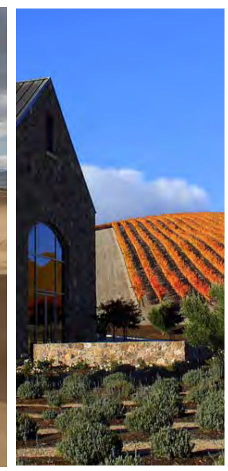
San Luis Obispo County
Regional Recycled Water Strategic Plan









Participating Agencies:

City of Arroyo Grande
City of Grover Beach
City of Morro Bay
City of Pismo Beach
County of San Luis Obispo
Nipomo Community Services District
Oceano Community Services District
South San Luis Obispo County Sanitation District
Templeton Community Services District

FINAL

November 2014

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San Luis Obispo, CA 93401
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San Luis Obispo County
Regional Recycled Water Strategic Plan

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EXECUTIVE SUMMARY

Introduction

The County of San Luis Obispo (County) is investigating opportunities for the use of treated wastewater (recycled water) across the County as part of the San Luis Obispo Region Integrated Regional Water Management (IRWM) Plan (SLO IRWMP). The Regional Recycled Water Strategic Plan (RRWSP) is one component of an update to the SLO IRWMP, and is funded by a Round 2 IRWM Regional Planning Grant from the California Department of Water Resources (DWR).

Increased interest in recycled water use has been expressed across the County through individual agency water and wastewater planning efforts, and through County-wide efforts such as SLO IRWMP and the County Master Water Report. The interest in recycled water is driven by several factors, particularly the acknowledgement of limited existing water sources and the desire to maximize the benefit of local resources. In addition, the 2014 drought conditions have increased interest in the beneficial use of a local, reliable water supply. In particular, overdraft of groundwater basins across the region is limiting available supplies and increasing the likelihood of seawater intrusion in coastal communities.

Historically, the primary obstacles to recycled water implementation were cost competiveness with existing water supplies and some future water supplies, as well as, in some cases, public or customer acceptance of reuse. Some of these obstacles still exist and are explored in the RRWSP.

RRWSP Purpose, Objectives, and Approach

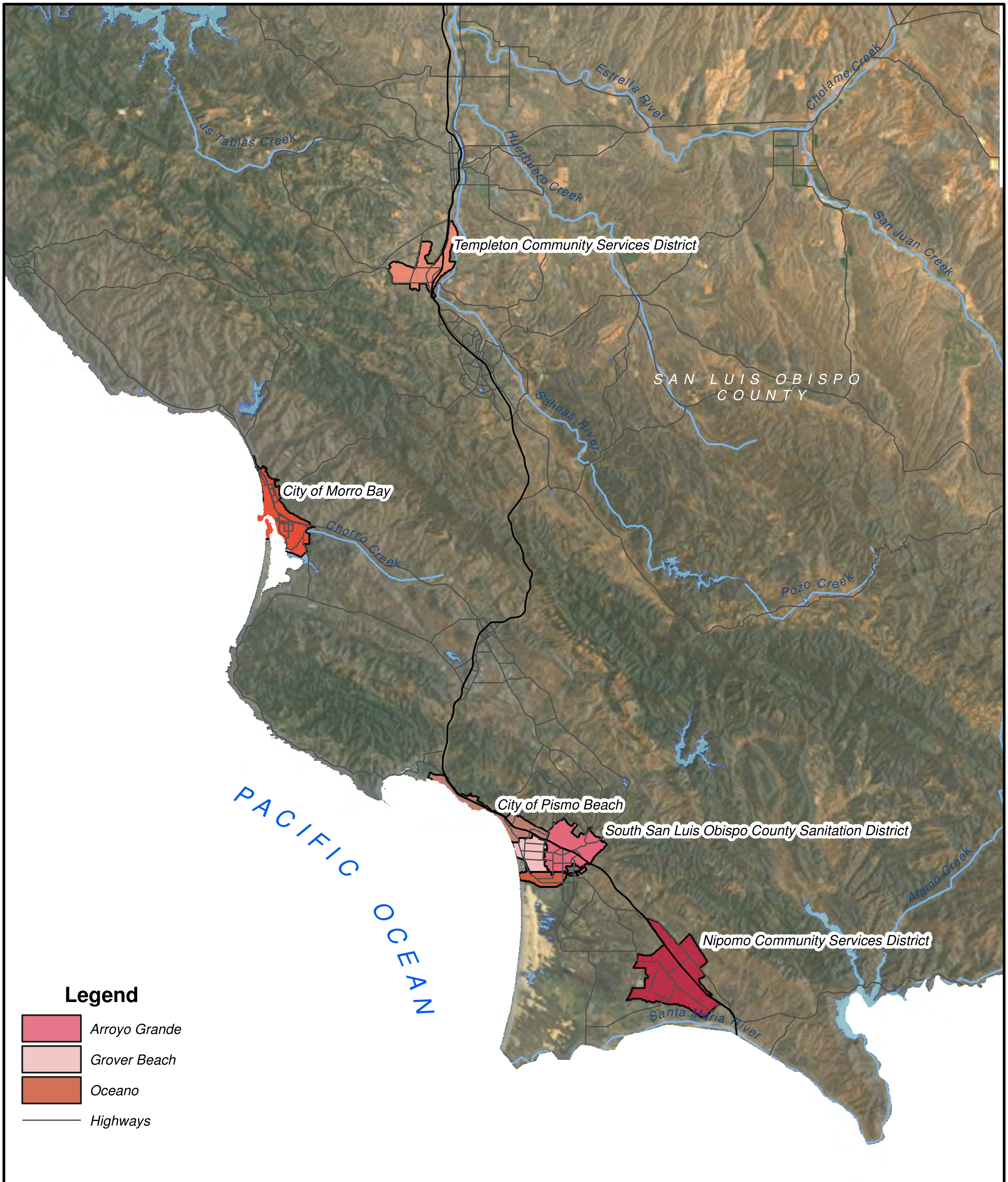
The purpose of the RRWSP is to identify and prioritize potentially viable next steps in successfully implementing water reclamation across the County in a safe and cost-effective manner. The RRWSP objectives are to:

- Update previously defined recycled water projects, identify new projects, and identify opportunities for inter-regional cooperation.
- Apply a similar cost and benefit basis to all projects to identify higher regional priorities.
- Advance existing recycled water planning efforts for each study area based on the progress and needs of each area.
- Define the critical next steps for individual agencies and regional entities to move priority projects forward.
- Identify one or more projects for the final round of Proposition 84 implementation grant funding, which is scheduled for 2015.

The RRWSP's approach builds upon the technical information developed by each agency. This work also updated relevant information for previously identified projects, and identified potential modifications to those projects to lower cost while maintaining potential benefits. The RRWSP identifies high-priority projects based on costs and benefits, and defines critical next steps for each project. The RRWSP also addresses policy, regulatory, permitting, legal, and funding / financing considerations for different types of recycled water projects.

The RRWSP covers region wide recycled water opportunities, and has focused evaluations within four study areas (refer to the figure on the following page):

1. Morro Bay
2. Nipomo (Nipomo Community Services District (NCSD))
3. Northern Cities (Arroyo Grande, Grover Beach, Pismo Beach, Oceano CSD, and South San Luis Obispo County Sanitation District (SSLOCSD))
4. Templeton (Templeton CSD)



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RRWSP Study Areas

San Luis Obispo County
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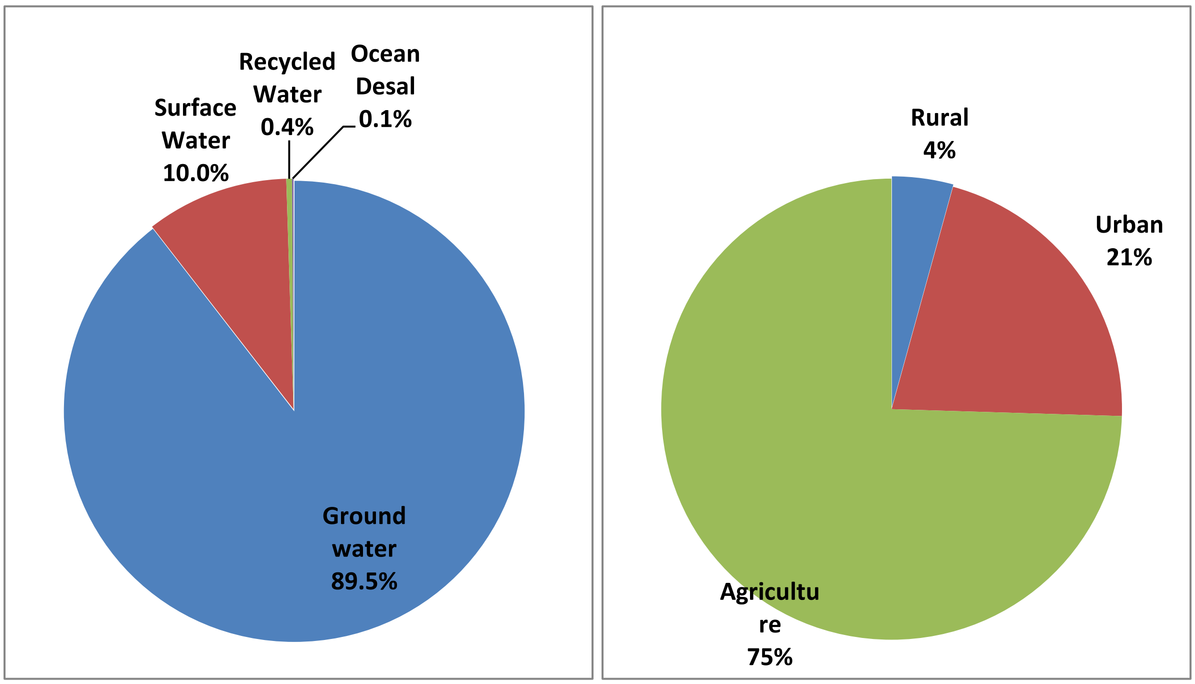
Regional Overview

The County's water supplies consist of groundwater, local and imported surface water, recycled water, and ocean desalination. The specific water supply portfolio for each water purveyor varies according to its location and previous investments in water supply infrastructure. For example, many purveyors are entirely dependent on groundwater, while a limited number use groundwater only to meet peak season demand. As reflected in the following figure, most water purveyors have a heavy reliance on groundwater. In fact, the Central Coast has the highest reliance on groundwater of any region in the State.

County Water Supply Portfolio & Types of Water Use

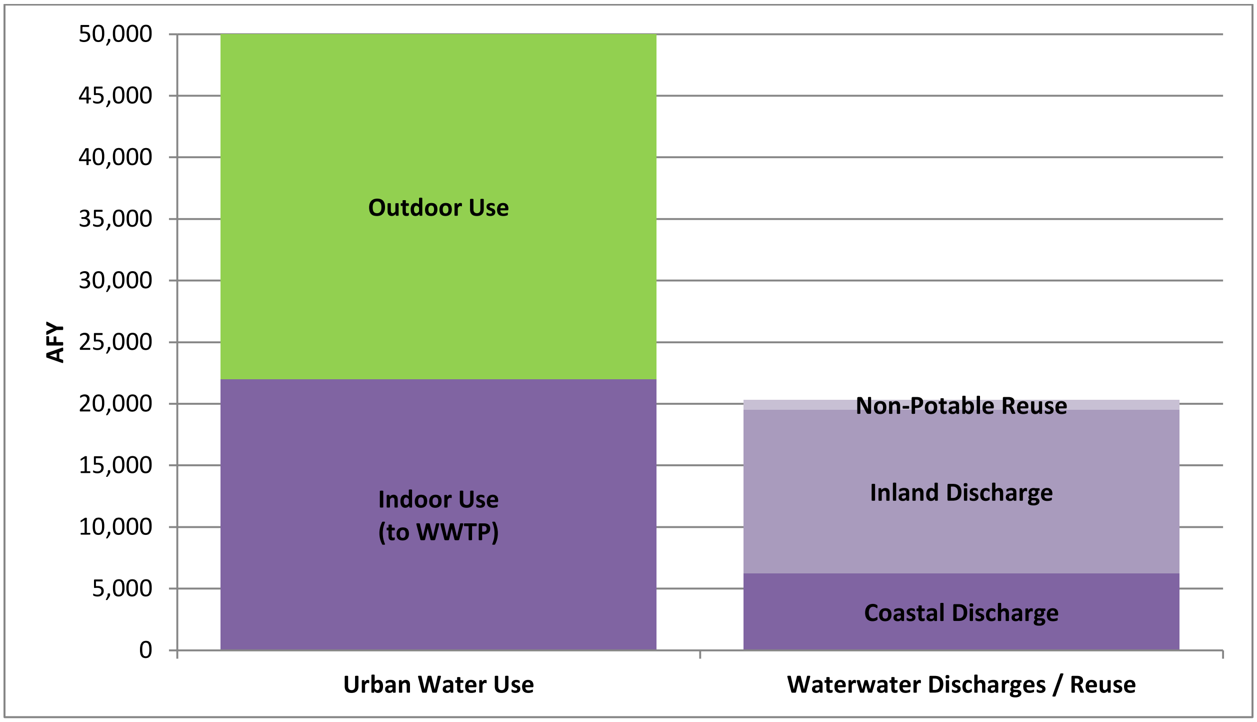


Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

In general, there are limited untapped groundwater supplies for municipal drinking water use. As a result, many purveyors have invested in surface water supplies over the past two decades, such as the State Water Project and Nacimiento Water Project. These new surface supplies have eased the stress on many groundwater basins. In addition, some historical supplies may be reduced in the future – whether from unsustainable pumping of groundwater, groundwater quality issues, or reductions in surface water availability. Climate change also has the potential to impact availability and reliability of the County's water supplies. These conditions, among others, have spurred interest in recycled water, particularly in locations where treated wastewater is discharged to the ocean and no associated water supply benefit is realized.

Urban water use accounts for approximately 21% of total water use across the County, which equates to approximately 50,000 acre-feet per year (afy). As shown in the following figure, approximately half of this volume is used outdoors and the other half is used indoors. Most indoor urban water use is conveyed to municipal wastewater treatment plants (WWTPs) and has the potential for reuse. After accounting for water losses and reuse within the WWTPs, approximately 20,000 afy (or roughly 10% of total water use across the County) has the potential for reuse. Finding the highest and best beneficial reuse for this volume of water is the focus of the RRWSP.

Estimated Municipal Water Use and Wastewater Production



Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

Recycled Water Background

Currently there are seven operational non-potable reuse (NPR) projects across the region primarily consisting of golf course irrigation. The City of San Luis Obispo operates the only recycled water distribution system in the region, serving primarily City parks for landscape irrigation. Also, the County Department of Public Works is currently constructing a recycled water treatment and distribution system for the community of Los Osos, which will be operational in 2016. In total, approximately 830 afy of effluent is currently reused across the region by the following existing non-potable reuse projects:

- Atascadero (300 afy to Chalk Mountain Golf Course)
- California Men's Colony (200 afy to Dairy Creek Golf Course)
- Nipomo CSD, Blacklake WWTP (50 afy to Blacklake Golf Course)
- Rural Water Company WWTP (50 afy to Cypress Ridge Golf Course)
- City of San Luis Obispo (180 afy to nearby golf courses, schools, and commercial establishments and minimum of 1,800 afy to San Luis Obispo Creek for streamflow augmentation)
- San Simeon CSD (Trucking of recycled water for irrigation started in 2014)
- Woodlands MWC WWTP (50 afy to Monarch Dunes Golf Course)

In addition, approximately 790 afy of discharges are counted toward pumping rights:

- Nipomo CSD Southland WWTP (640 afy percolated to Nipomo Mesa groundwater)
- Templeton CSD Meadowbrook WWTP (150 afy infiltrated to Salinas River underflow)

Unplanned or incidental reuse occurs in the County via discharge of disinfected secondary effluent to percolation ponds from WWTPs without an ocean outfall. The ponds discharge to the underlying groundwater or an adjacent river and may eventually be used for potable or non-potable use, such as agriculture.

Unlike inland discharges, effluent discharge via ocean outfalls has no existing water supply benefit. Therefore, reuse of effluent from WWTPs with ocean outfalls would provide the largest water supply benefit. Approximately 5,700 afy of effluent is currently discharged to the ocean and the volume will rise as growth occurs in these areas. These discharges offer the highest opportunity for water supply benefit through reuse since the effluent does not provide any water supply benefit at this time. The following table summarizes effluent discharges and reuse across the region and the following figure shows the locations of each of these WWTPs.

Summary of Existing Effluent Discharges

Agency / WWTP	Existing Effluent		Existing Reuse	Inland Discharge	Ocean / Coastal Discharge
North County Sub-Region					
City of Atascadero	1.0 mgd	1,100 afy	300 afy	800 afy	--
Heritage Ranch CSD	0.2 mgd	230 afy	--	230 afy	--
City of Paso Robles	3.0 mgd	3,300 afy	--	3,300 afy	--
San Miguel CSD	0.1 mgd	130 afy	--	130 afy	--
TCSD Meadowbrook WWTP[1]	0.15 mgd	170 afy	--	170 afy[2]	--
North Coast Sub-Region					
California Men's Colony	1.2 mgd	1,340 afy	200 afy[3]	1,140 afy[3]	--
Cambria CSD	0.5 mgd	540 afy	--[4]	540 afy	--
Cayucos CSD	0.25 mgd	275 afy	--	--	275 afy
Los Osos WWTP[5]	1.2 mgd	1,340 afy	--	1,340 afy	--
Morro Bay	0.87 mgd	975 afy	--	--	975 afy
San Simeon CSD	0.07 mgd	80 afy	--[6]	--	80 afy
South County Sub-Region					
Avila Beach CSD	0.05 mgd	50 afy	--	--	50 afy
NCSD Blacklake WWTP	0.05 mgd	50 afy	50 afy	--	--
NCSD Southland WWTF	0.6 mgd	640 afy	--	640 afy[7]	--
Pismo Beach	1.1 mgd	1,230 afy	--	--	1,230 afy
Rural Water Company	0.05 mgd	50 afy	50 afy	--	--
City of San Luis Obispo[8]	3.2 mgd	3,600 afy	180 afy	3,420 afy[8]	--
San Miguelito MWC	0.15 mgd	170 afy	--	--	170 afy
SSLOCSD WWTP	2.6 mgd	2,910 afy	--	--	2,910 afy
Woodland MWC	0.05 mgd	50 afy	50 afy	--	--
Total	**16.4 mgd**	**18,230 afy**	**830 afy**	**11,710 afy**	**5,690 afy**

Notes:

1. Templeton CSD is considering diverting existing sewer flows that go to the Paso Robles WWTP (approximately 0.22 mgd) and conveying the flow for treatment at the TCSD Meadowbrook WWTP.
2. Templeton CSD retrieves the percolated water at downstream wells.
3. Must maintain a minimum discharge of 0.75 cfs (0.5 mgd; 540 afy) to Chorro Creek.
4. Percolated effluent serves as a barrier to slow the seaward migration of subterranean fresh water.
5. Currently under construction and start of operations planned for 2016.
6. Trucking of recycled water for irrigation started in 2014.
7. Percolated water is accounted for in the Nipomo Mesa Management Area groundwater balance.
8. Must maintain a minimum discharge of 2.5 cfs (1.6 mgd; 1,800 afy) to San Luis Obispo Creek.

Municipal Wastewater Treatment Plants within San Luis Obispo County

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Common Types of Reuse

Common types of water reuse can be divided into the following categories:

- **Urban Reuse - Landscape Irrigation:** Common locations of use include parks, golf courses, cemeteries, school yards, freeway landscaping, sod farms, nurseries, and residential landscaping.
- **Urban Reuse - Other Uses:** Dual plumbing (flushing toilets and urinals), priming drain traps, structural and nonstructural fire fighting, decorative fountains, commercial laundries, consolidation of backfill around pipelines, artificial snow making for commercial outdoor use, commercial car washes (no public contact with washing), fish hatcheries with public access, soil compaction, mixing concrete, dust control on roads and streets, and cleaning roads, sidewalks and outdoor work areas, sanitary sewer flushing.
- **Agricultural Irrigation:**
    - Orchards and vineyards (edible portion); food crops, including root crops, where the edible portion contacts recycled water.
    - Food crops (where the edible portion is above ground and not contacted by recycled water); pasture for animals producing milk for human consumption; any nonedible vegetation (controlled access).
- **Environmental Reuse:** The use of recycled water to create, enhance, sustain, or augment water bodies, including wetlands, aquatic habitats, or stream flow.
- **Industrial Reuse:** Use of recycled water in industrial applications and facilities, power production, and extraction of fossil fuels. Common industrial uses include for cooling tower makeup water, boiler feed water, and industrial processes.
- **Potable Reuse**
    - **Indirect Potable Reuse:** Augmentation of a drinking water source (surface water or groundwater) with recycled water followed by an environmental buffer. Groundwater may receive additional treatment prior to use (for example disinfection); surface water would receive conventional surface water treatment.
    - **Direct Potable Reuse:** The introduction of recycled water into a public water system (e.g., distribution system) or into a raw water supply upstream of a water treatment plant.
- **Impoundments:**
    - Unrestricted Recreational: No limitations are imposed on body-contact water recreation activities.
    - Restricted Recreational: Activities limited to fishing, boating, and other non-body contact activities.

All of the types of reuse listed above are examined in the RRWSP with the exception of:

- Impoundments: Restricted impoundments are common recycled water storage methods for golf courses and agricultural fields but are not an end use. Use of recycled water for unrestricted impoundments is not considered in the RRWSP.
- Direct Potable Reuse: This option has recently emerged as a viable recycled water alternative being considered across the United States. While direct potable reuse can legally be implemented in California, several years of study and development of specific regulations await before a feasible project could be initiated in the County.

Opportunities, Constraints, and Recommendations by Study Area

This section presents the recycled water evaluation conducted for each of the study areas and summarizes opportunities across the region.

City of Morro Bay

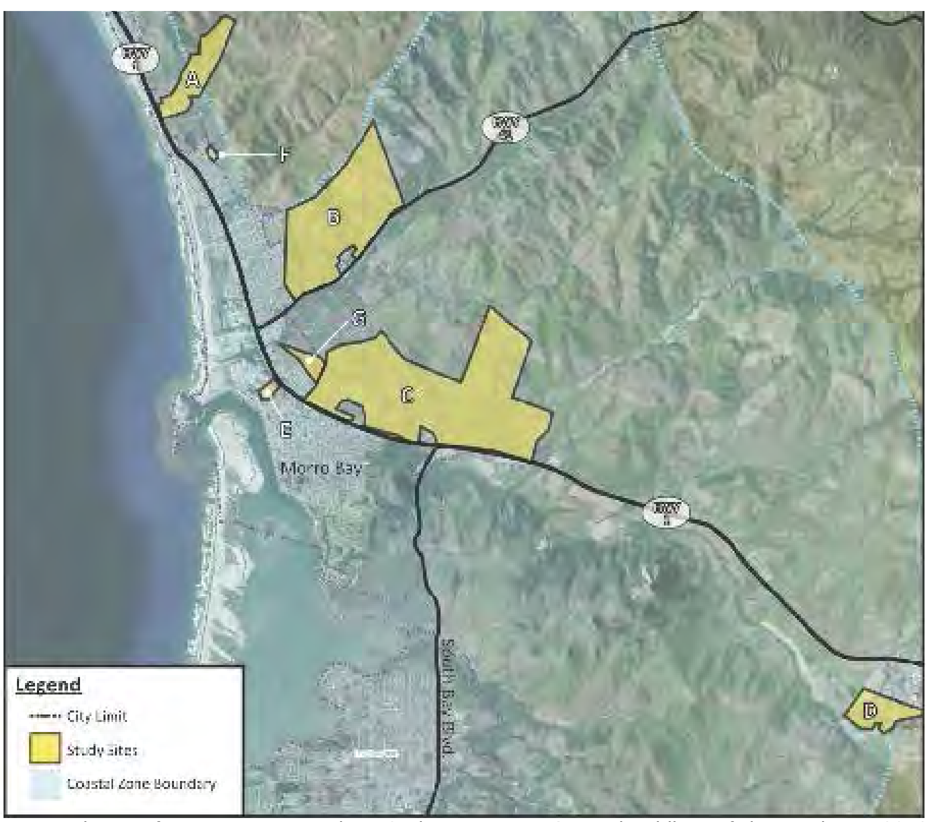
The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility (WRF). One key goal of the new facility is to produce disinfected tertiary effluent for reuse. In February 2014, the City set a goal to have the new WRF online in five years from issuance of the final NPDES permit (anticipated for late 2014/early 2015). The City Council is scheduled to decide on a site in late 2014.

There are a range of recycled water opportunities in and around the city, including landscape irrigation, agricultural irrigation, and groundwater recharge / streamflow augmentation. The city wants to maximize reuse from the new WRF. However, implementation of each type of potential reuse is subject to constraints, and feasible recycled water options are ultimately dependent on the site selected for the new WRF.

Next Steps

- Decide on a location for the new water reclamation facility
- Refine recycled water study completed in 2011
- Pursue reuse opportunities specific to the WRF location
- Work cooperatively with the agricultural community and other potential customers to develop a recycled water distribution system
- Incorporate recycled water planning into salt and nutrient management planning

New WRF Sites Evaluated by Morro Bay



Source: Figure 1 from New WRF Project: Options Report – Second Public Draft (December 5, 2013)

Nipomo CSD

NCSD has two WWTPs (Southland WWTF and Blacklake WWTP) and both currently maximize reuse. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. Southland WWTF is percolated into the underlying groundwater basin, and these flows are included in the Nipomo Mesa Management Area (NMMA) water balance. Reuse of Southland WWTF effluent for landscape irrigation in strategic locations, such as offsetting pumping in groundwater depressions, could provide benefits to NCSD but would not necessarily provide new water. Also, Southland WWTF would need a tertiary treatment upgrade or an equivalent soil aquifer treatment and pumping system for potential uses identified in the report.

Potential landscape irrigation, agricultural irrigation, and groundwater recharge projects from Southland WWTF were explored in the RRWSP. However, the projects were not cost effective ($10,000+/af) primarily because NCSD would only receive a 10% water supply benefit for every unit of recycled water use since percolated Southland WWTF effluent is already part of the NMMA water balance. (The water balance assumes 10% of percolated water is lost during transport to the groundwater table and reuse of the effluent for irrigation would avoid these losses). In summary, NCSD beneficially reuses 90% of treated effluent from Southland WWTF and would only be able to receive a maximum new water supply benefit of 90 afy if all 900 afy of existing effluent is reused for irrigation.

NCSD Recycled Water Project Concepts

Alternative		Average Annual Demand	Unit Cost Based on	
ID	Description		Annual Demand	Water Supply Benefit
N1a	Nipomo Regional Park Project	51 afy	$4,790 / AF	$47,900 / AF
N1b	N1a & Blacklake Golf Course Extension	551 afy	$1,730 / AF	$17,300 / AF
N1c	N1a & Monarch Dunes Golf Course Extension	951 afy	$1,310 / AF	$13,100 / AF

Note: All proposed projects are from Southland WWTF. Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

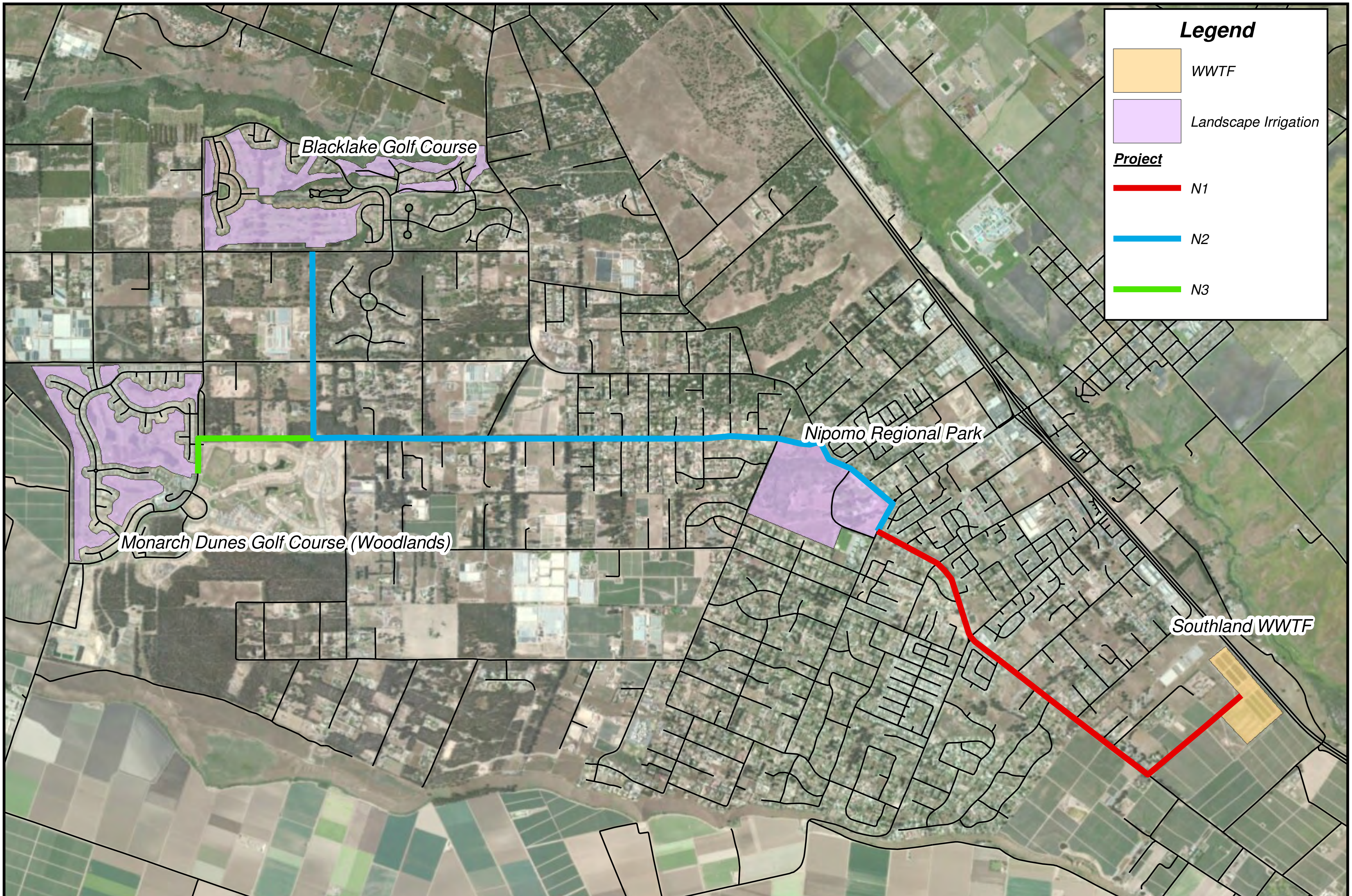
In addition, NCSD recycled water opportunities and constraints include:

- Southland WWTF will require an upgrade to tertiary filtration or pumping after percolation to implement a recycled water project
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) resulting in additional costs for treatment and concentrate management
- Substantial agricultural demand exists in proximity to the Southland WWTF. Approximately 600 acres of irrigated agricultural acreage are located within 1.5 miles south and west of Southland WWTF.

Based on this assessment, a water supply benefit will not drive a NCSD recycled water project. However, recycled water projects could be driven by the need for alternative disposal methods in the future based on potentially stricter waste discharge requirements from the RWQCB.

Next Steps

- Continue to monitor potential mounding of effluent recharge at the Southland WWTF and, if mounding is realized, pursue reuse opportunities
- Work with SSLOCSD representatives on potential cross-basin reuse projects
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



Nipomo CSD Landscape Irrigation Project Concepts

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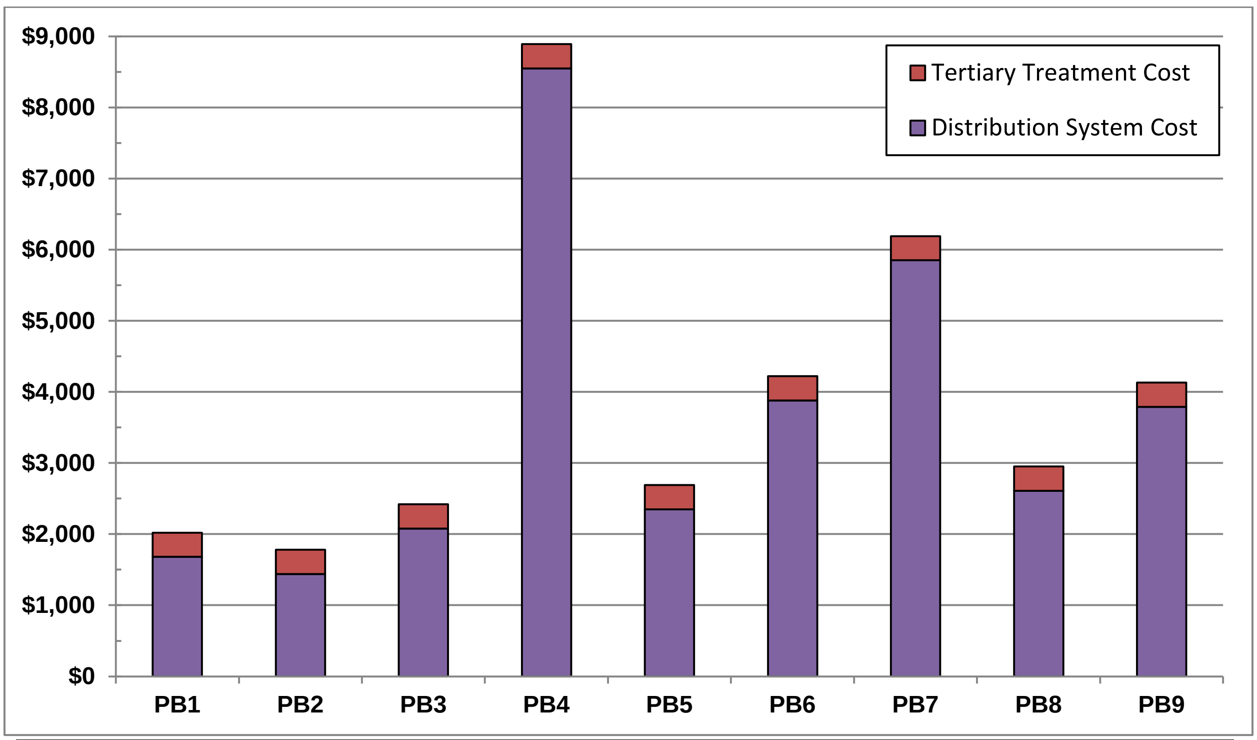
City of Pismo Beach

The Pismo Beach WWTP currently discharges approximately 1.1 mgd (1,230 afy) of disinfected secondary effluent through the joint Pismo Beach / SSLOCSD ocean outfall. Nine landscape irrigation project concepts from the Pismo Beach WWTP were defined. In addition, use of Pismo Beach WWTP effluent in combination with SSLOCSD effluent for larger, regional projects, such as agricultural reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation are discussed under SSLOCSD in the following section.

Pismo Beach Recycled Water Project Concepts	
<u>Landscape Irrigation Project Concepts</u> PB1: Pismo Beach Sports Complex PB2: Caltrans and Middle School PB3: Price House Historic Park PB4: South to Arroyo Grande PB5: Pismo State Beach Golf Course	PB6: Dinosaur Caves Park PB7: Palisades Park <u>Projects using the existing effluent outfall</u> PB8: Pismo State Beach Golf Course PB9: Western Grover Beach

Unit Costs of Pismo Beach Project Concepts ($/AF)



AFY	16	89	28	26	86	47	62	77	84

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Opportunities and Constraints

Based on findings from the project concepts development process, preliminary recycled water opportunities and constraints for Pismo Beach include:

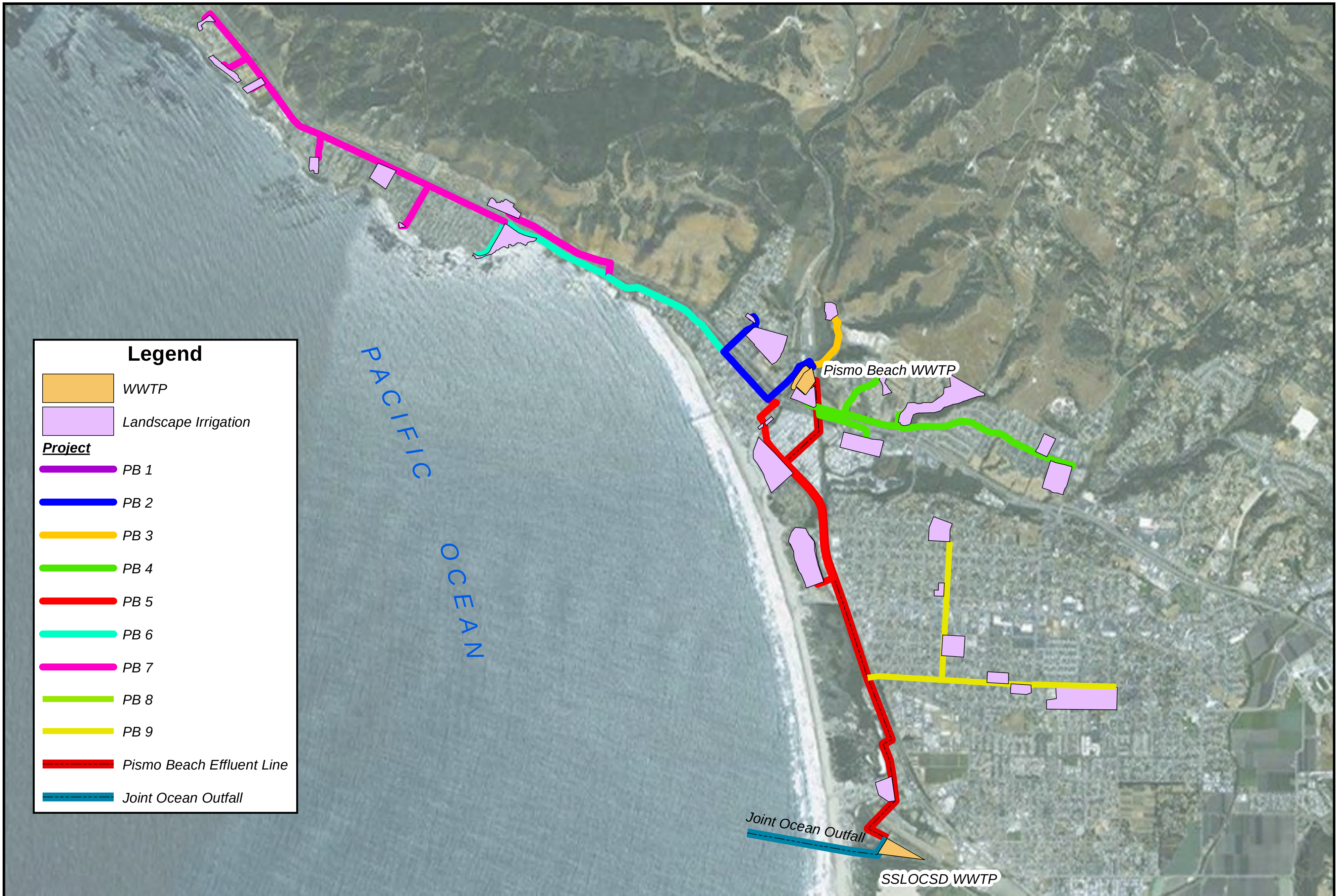
- Maximizing reuse will require more types of uses than just existing landscape irrigation.
- Approximately 130 afy of landscape irrigation demand is located within 0.5 mile of the WWTP, which offers promising reuse opportunities. However, demand estimates for several key potential customers must be confirmed before proceeding much further with planning.

- Tertiary treatment upgrades for small treatment plant commonly have high unit costs due to the lack of scale and could result in high project unit costs for service to customers close to the WWTP.
- There is potential for large recycled water use from new development if approved by the City.
- Pismo State Beach Golf Course is not a Pismo Beach potable water customer so their water supply benefit must be achieved through groundwater exchange.
- Most landscape irrigation customers have relatively low demands and are spread across the city, which causes service to these customers have high unit costs.
- Use of Pismo Beach effluent for agricultural irrigation is potentially the most cost-effective reuse project as long as the Pismo Beach receives a water supply benefit. Agricultural irrigation is included in the SSLOCSD section.
- Use of Pismo Beach effluent for groundwater recharge is a viable option and is included in the SSLOCSD section.

The City is in the process of obtaining abandoned oil pipelines with the intent to consider their use for conveyance of recycled water. This option could potentially reduce distribution infrastructure costs and make more landscape irrigation projects cost effective. This concept will be evaluated as part of the City's Recycled Water Facilities Plan, which is currently being prepared and is expected to be completed in early 2015.

Next Steps

- Complete Recycled Water Facilities Plan that is in progress in consultation with regional stakeholders and the SWRCB.
- Complete investigation that is in progress into the ability to use abandoned oil lines for recycled water conveyance. The RRWSP did not consider this option and its application could make non-potable reuse cost effective for the City.
- Confirm demand estimates for cost effective projects
- Explore alternative tertiary treatment method geared toward relatively small flows (i.e. 0.1 to 0.3 mgd)
- Evaluate the cost to retrofit Pismo Beach State Golf Course and the ability for the city to receive groundwater benefits
- Refine potential projects to develop a phased recycled water program
- Continue discussions with new development (if approved by the City) regarding recycled water demand and funding
- Consider use of the existing outfall as a recycled water conveyance facility (but only if 100% tertiary treatment conversion is planned)
- Compare costs of viable projects with alternative water supplies
- Continue to participate in discussions with regional SSLOCSD projects that could put Pismo Beach effluent to beneficial use and confirm the ability of the City to receive a water supply benefit
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



Potential Landscape Irrigation Projects - Pismo Beach

San Luis Obispo County

Regional Recycled Water Strategic Plan

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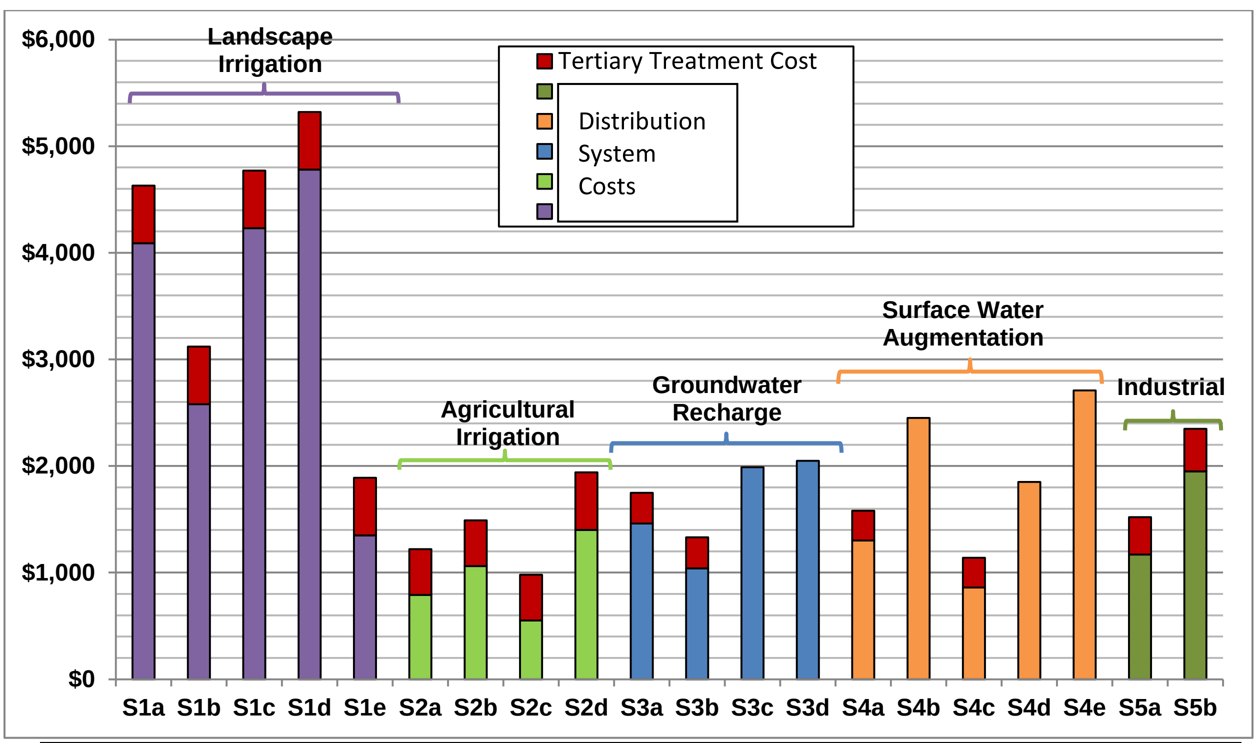
Northern Cities – SSLOCSD

The SSLOCSD WWTP currently discharges approximately 2.6 mgd of disinfected secondary effluent through a joint ocean outfall (shared with Pismo Beach). Approximately 1.1 mgd of disinfected secondary effluent from Pismo Beach WWTP is discharged through the same ocean outfall. SSLOCSD has the largest volume of effluent considered in the RRWSP and the largest opportunities for large-scale reuse; however, landscape irrigation projects are expensive ($3,000+/af) and the more cost effective reuse opportunities – agricultural irrigation, industrial reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation – will require institutional, legal, outreach, and financial planning to be feasible.

SSLOCSD Recycled Water Project Concepts	
Landscape Irrigation Project Concepts	Groundwater Recharge Project Concepts
S1a. Small Landscape Irrigation Project	S3a. GWR via surface spreading @ existing basins (60% RO)
S1b. Core Landscape Irrigation Project	S3b. GWR via surface spreading @ new basins (60% RO)
S1c. Extension to Grover Beach Project	S3c. GWR via surface spreading @ new basins (Full AWT)
S1d. Extension North of Highway 101 Project	S3d. GWR via injection (Full AWT)
S1e. Nipomo Mesa Golf Courses	Surface Water Augmentation Project Concepts
Agricultural Irrigation Project Concepts	S4a. Arroyo Grande Creek Augmentation (80% RO)
S2a. Direct delivery over 12 hours / day (Tertiary)	S4b. Arroyo Grande Creek Augmentation (Full AWT)
S2b. S2a with 40% RO	S4c. Los Berros Creek Augmentation (80% RO)
S2c. Direct delivery over 24 hours / day (Tertiary)	S4d. Los Berros Creek Augmentation (Full AWT)
S2d. S2a; Serving 50% of estimated demand	S4e. Lopez Reservoir Augmentation (Full AWT)
	Industrial Reuse Project Concepts
	S5a. Tertiary Treatment
	S5b. Full RO

Unit Costs of SSLOCSD Project Concepts ($/AF)



AFY	12	162	44	52	1500	1890	1810	1890	1200	300	2760	2390	2390	2670	2390	2670	2390	2390	1100	1100

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Overall, the amount of reuse for landscape irrigation is limited by the demand, while supply limits the amount of agricultural irrigation during the peak demand season (summer). Groundwater recharge and reservoir augmentation are limited by supply. Stream augmentation could be limited by supply or demand depending on future regulatory scenarios related to the volume of flow required at different points in the creek in the Habitat Conservation Plan.

Opportunities and Constraints

Based on the project concepts development process, SSLOCSD recycled water opportunities and constraints include the following:

- Reuse from SSLOCSD WWTP will require upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or discharge regulations for specific types of reuse (e.g., stream augmentation or indirect potable reuse).
- Landscape irrigation projects have the highest unit costs due to limited demand in proximity to the SSLOCSD WWTP.
- Agricultural irrigation projects have the lowest unit costs due to substantial agricultural demand in proximity to the SSLOCSD WWTP.
- GWR and stream augmentation projects offer the highest volume of reuse, have moderate unit costs, and include a range of costs primarily due to the level of treatment assumed for each project.
- Industrial reuse has moderate unit costs and could be combined with the Nipomo golf courses or agricultural reuse alternatives since they have similar pipeline alignments.

Next Steps

General

- Complete planned treatment plant improvements and re-evaluate facilities needed to implement tertiary treatment upgrade.
- Track regulatory drivers and their impacts on reuse opportunities, including:
    - RWQCB Waste Discharge Requirements (NPDES Permit)
    - NOAA Habitat Conservation Plan
    - California Coastal Commission Coastal Development Permit
    - Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003
- Address institutional issues and potential funding mechanisms for regional projects
    - Discuss cost sharing of projects between water and wastewater agencies or water/sewer funds.
    - Discuss operations and management of the project
    - Discuss the logistics and legal basis for groundwater exchanges.
    - Coordinate with Pismo Beach reuse plans to identify the most cost effective reuse projects for the NCMA.
    - Develop project concepts sufficiently to position for grant funding opportunities
    - Initiate discussions with member agencies about project funding between the water supply entities (Arroyo Grande, Grover Beach, and Oceano CSD) and SSLOCSD.
    - Investigate funding mechanisms for regional projects that benefit NCMA pumpers in addition to SSLOCSD and its member agencies.

- Discuss support for use of SSLOCSD recycled water in the NMMA and the related ability to receive water supply benefits in the NCMA.

- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

Landscape Irrigation

- Except for the Nipomo Mesa Golf Courses option, the landscape irrigation alternatives have unit costs exceeding $3,000/af. However, unit costs can be reduced if some non-potable projects can be reduced to less than $2,000/af when are combined with groundwater recharge at the Soto Sports Complex Stormwater basins.

Nipomo Mesa Golf Courses

- Confirm demand estimates that account for future growth
- Address issues associated with use of NCMA effluent in the NMMA.

Agricultural Irrigation

- Initiate planning for agricultural reuse program to enable a project to be developed within 10 years.
- Conduct outreach to agricultural operations in the area determine willingness to use recycled water in the future and obstacles to implementation.
- Set up a pilot study potentially in conjunction with Cal Poly[1] similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source for a pilot project.
- In conjunction with GWR hydrogeological characterization, attempt to define locations of agricultural pumping compared with municipal pumping.

Industrial Reuse

- Discuss reuse options with Phillips 66 refinery.
- Address issues associated with use of NCMA effluent in the NMMA.

Groundwater Recharge / Seawater Intrusion Barrier

- Further investigate the water supply benefits of implementing a small groundwater recharge project at the Soto Sports Complex Stormwater basins. Considering combining this project with a non-potable project. Determine if the close proximity of potable water wells to the recharge basins is a fatal flaw.
- Further investigate the NCMA groundwater basin, potentially with a groundwater model, to identify surface recharge locations, inland injection locations, and coastal injection locations. Define the benefits of these projects to the basin, particularly the prevention of seawater intrusion.
- Determine benefits of and need for a seawater intrusion barrier (via direct injection or in-lieu reuse) and groundwater levels that would necessitate its use. Determine the value of groundwater protected from seawater intrusion.

Streamflow Augmentation

- Continue to track developments in Arroyo Grande Creek flow requirements / restrictions.
- Track new and potential surface water discharge regulations.

[1] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org

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SSLOCSD Recycled Water Project Concepts

San Luis Obispo County

Regional Recycled Water Strategic Plan

Executive Summary

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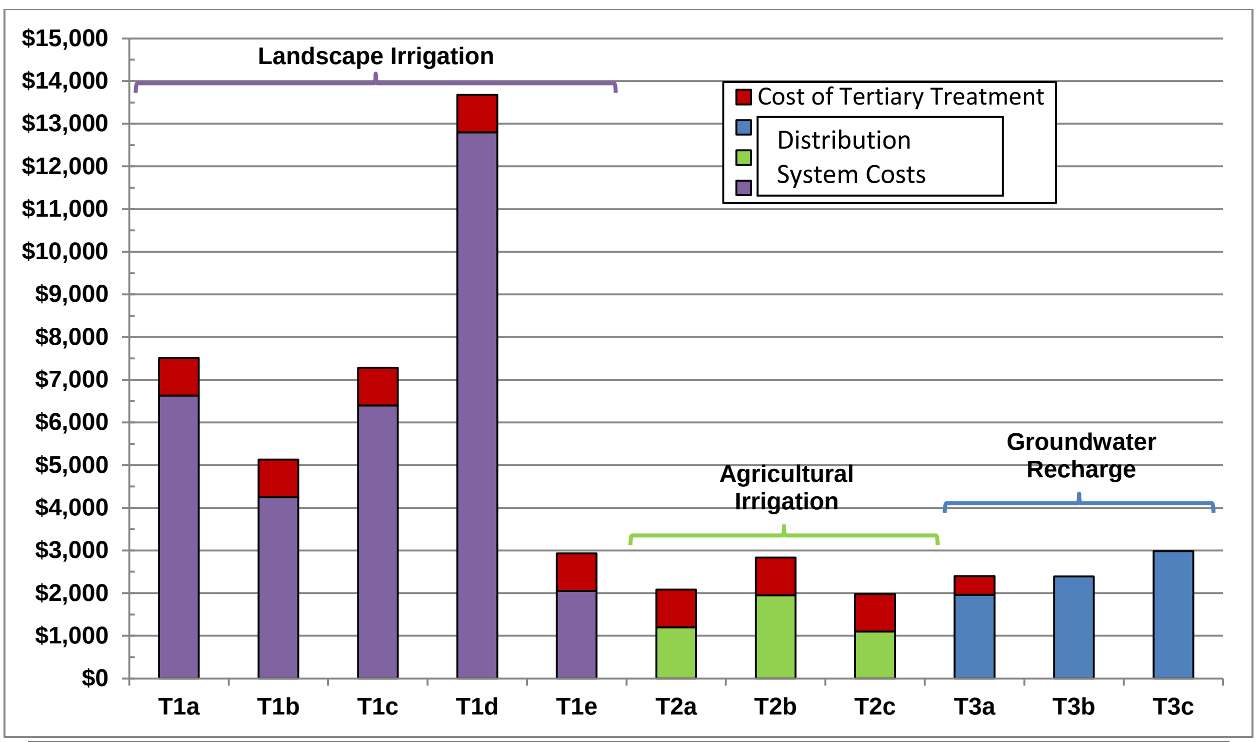
Templeton CSD

Templeton CSD is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges through augmentation of Salinas River underflow. The district plans to implement a project to increase discharges from the Meadowbrook WWTP by diverting district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the sewer diversion as well as untreated Nacimiento water. In addition, recycled water opportunities are being explored. Eleven recycled water project concepts were defined for Templeton CSD. Most reuse options will require an upgrade to tertiary treatment.

Templeton CSD Recycled Water Project Concepts	
<u>Landscape Irrigation Project Concepts</u>	<u>Agricultural Irrigation Project Concepts</u>
T1a. Downtown Core Landscape Irrigation Project	T2a. Direct delivery over 12 hours each day (Tertiary)
T1b. Evers Sports Park Extension Project	T2b. T2b with 40% RO
T1c. Vineyard Elementary School Extension Project	T2c. Direct delivery over 24 hours each day (Tertiary)
T1d. Jermin Park Extension Project	<u>Groundwater Recharge Project Concepts</u>
T1e. Commercial Landscape Irrigation (Equestrian Center) Project	T3a. GWR via surface spreading (60% RO)
	T3b. GWR via surface spreading (Full AWT)
	T3c. GWR via injection (Full AWT)

Unit Costs of TCSD Project Concepts ($/AF)



AFY	27	16	20	5	160	260	260	260	530	500	500

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Opportunities and Constraints

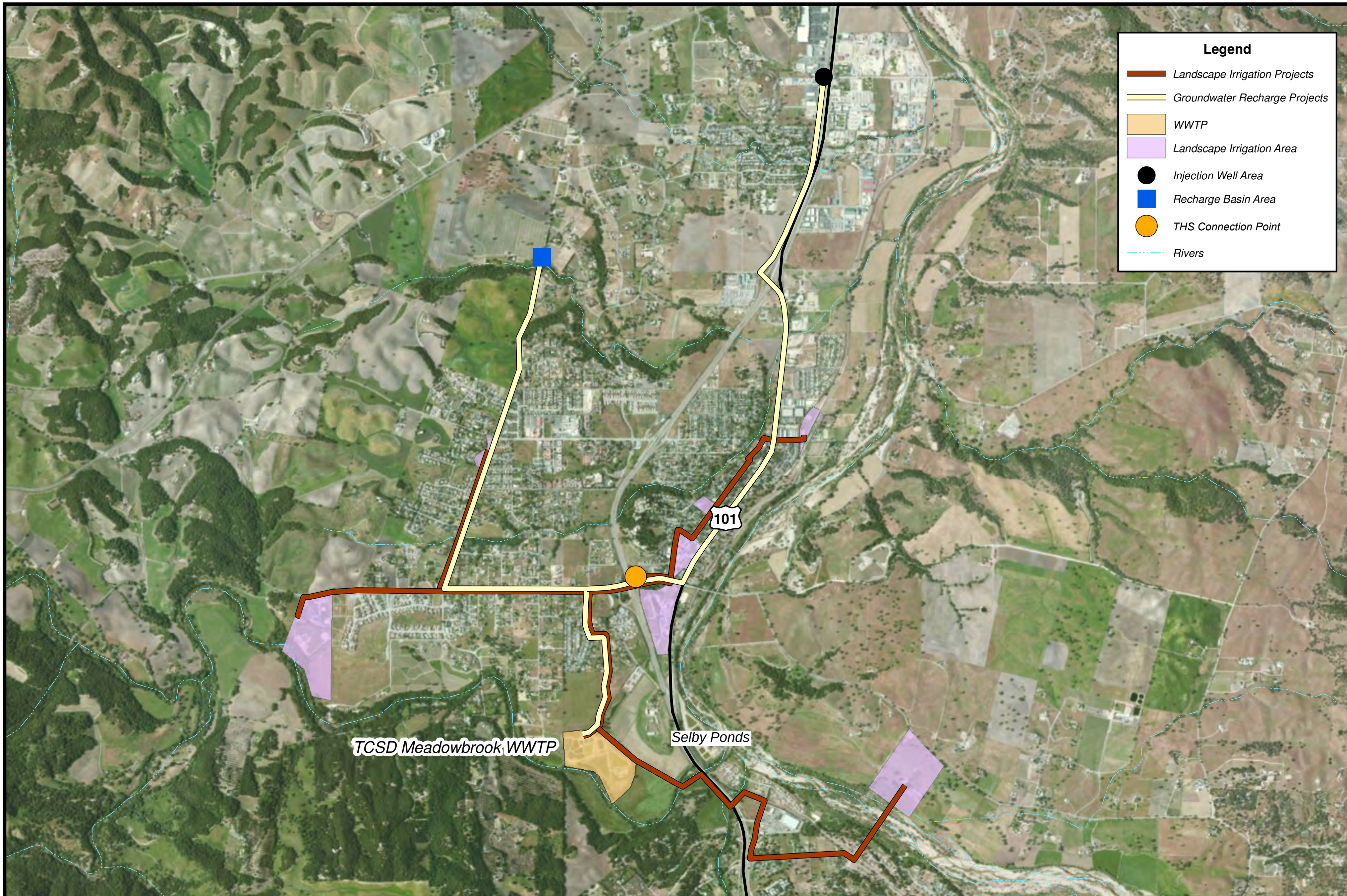
Based on the project concepts development process, TCSD recycled water opportunities and constraints include the following:

- Maximizing percolation at the Selby Ponds is the favored use of Meadowbrook WWTP effluent.
- Significant increases to effluent flows are dependent on a combination of septic tank conversions, build-out growth, and diversions from the East Side Force Main and Lift Station Project.
- Potential for reuse of up to 0.2 mgd of effluent without treatment upgrades for feed and fodder irrigation but the reuse would not offset potable water demand.
- Most reuse opportunities from Meadowbrook WWTP will require at least an upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or regulations for specific types of reuse (e.g., groundwater recharge).
- Landscape irrigation projects have high unit costs due to limited demand in proximity to the WWTP.
- Commercial landscape irrigation (i.e., equestrian farm) has moderate unit costs due to moderate demand.
- Agricultural irrigation has moderate unit costs due to moderate demand in proximity to the Meadowbrook WWTP but a proper market assessment was not conducted.

Next Steps

TCSD plans to incorporate feasible projects into the District's planned Integrated Water Resources Strategic Plan and must be able to adjust reuse needs based on future percolation performance of the Selby Ponds and actual increases to future flows. Therefore, TCSD should:

- Incorporate commercial irrigation, agricultural irrigation, and groundwater recharge.
- Incorporate commercial and agricultural irrigation into the forthcoming Integrated Water Resources Strategic Plan.
- Continue investigation into improving recharge capacity at Selby Ponds through WWTP improvements as well as upgrades and improvements to the ponds.
- Considers water supply benefits and impacts to discharge capacity of continued recharge of Nacimiento water in the Selby Ponds.
- Refine feed and fodder disposal option as a temporary disposal alternative until Selby Pond recharge capacity is better known.
- If Selby Ponds cannot recharge all effluent, refine agricultural irrigation and commercial irrigation options.
- Survey private agricultural and large turfgrass operations in the vicinity of the WWTP for their interest in recycled water use and water quality requirements combined with the ability for TCSD to use a similar amount of groundwater currently being used by the entity.
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



Templeton CSD Recycled Water Project Concepts

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Other Potential Recycled Water Projects

The RRWSP focused on defining projects in five areas across the region but many more relevant opportunities exist.

North County

- **City of Atascadero:** The City currently reuses non-potable discharges at Chalk Mountain Golf Course and is currently preparing a Wastewater Collection System and Treatment Plant Master Plan update that is evaluating reuse at local parks and Atascadero Lake but no projects were defined at the time the RRWSP was prepared.
- **Heritage Ranch CSD:** HRCSD currently discharges effluent that eventually enters an unnamed tributary to the Nacimiento River. The District is considering construction of a spray irrigation site for effluent disposal management.
- **City of Paso Robles:** The City is currently upgrading its WWTP to an advanced secondary (nutrient removal) process and has begun preliminary design of filtration and disinfection processes that are necessary to produce tertiary quality recycled water. The City recently adopted a Recycled Water Master Plan that identifies areas in east Paso Robles where recycled water may be used to offset pumping from the Paso Robles Groundwater Basin. Also, a major vineyard owner has expressed interest in purchasing recycled water for in-lieu recharge of the Paso Robles Groundwater Basin.

North Coast

- **California Men's Colony:** CMC currently reuses tertiary effluent at Dairy Creek Golf Course and helps to maintain a continuous flow rate of 0.75 cfs in Chorro Creek. CMC is also a regional site considered by the City of Morro Bay and Cayucos CSD for treatment of their wastewater.
- **Cambria CSD:** CCSD's effluent discharges serve as a barrier to seawater intrusion. CCSD is currently pursuing an indirect reuse project involving extraction and treatment brackish groundwater near the effluent percolation ponds and is considering future non-potable reuse options.
- **Los Osos WWTP:** The new water reclamation plant started construction in 2014 and startup is planned for 2016. Reuse will occur via agricultural irrigation, landscape irrigation, and discharge to leach fields. The volume to each type of use is currently being defined through potential customer outreach.
- **San Simeon CSD:** The district installed a 36,000 gpd tertiary filtration system in 2013. Current reuse is via hauling by truck for irrigation of commercial properties. The district has plans to construct a distribution system in phases as funds become available.

South County

- **Rural Water Company:** All effluent is currently reused at the Cypress Ridge Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.
- **City of San Luis Obispo:** The City is currently updating its Recycled Water Master Plan to develop plans to expand the system from existing use of 180 afy. There is also a possibility of recycled water sales to agricultural customers on the edge of the city limits.
- **Woodlands Mutual Water Company:** All effluent is currently reused at the Monarch Dunes Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.

Regional Opportunities, Constraints, and Recommendations

Ultimately, recycled water is one of many water resources options for the region. As presented in the RRWSP, there are several potential recycled water projects across the region that can provide cost effective benefits. A number of factors must be present to successfully implement a cost effective recycled water project, including water supply needs, recycled water supply and demand, acceptable economics, and protection of public health. Local conditions across the region result in a range of recycled water project opportunities and constraints. There are also opportunities and constraints that apply across the region. This section discusses these opportunities and constraints and outlines potential recommendations to move recycled water projects forward on a regional level.

Regional Opportunities and Constraints

The project concepts considered in the RRSWP revealed several recycled water opportunities across the region as well as substantial obstacles to implementation of successful projects. All the reuse projects considered in the RRWSP are technically feasible and some are cost effective but barriers remain to successful project implementation. The most common drivers for recycled water projects across the State are:

- Need for new large water supply
- Occurrence of significant seawater intrusion
- Wastewater discharge restrictions

Portions of these drivers are present across the region but not to the degree to support significant recycled water investments. These drivers may increase in the future and would improve the opportunity for reuse projects. Each driver is discussed further here.

Large Water Supply Need

The need for a new, local, and reliable water supply is the primary driver for recycled water projects in the region. The need is present when considered across multiple water suppliers, particularly when considering the 2014 drought conditions; however, the individual agencies currently lack the need for a new, *large* water supply.

Recycled water projects typically have strong economies of scale since the two largest components – treatment and pipelines – have economies of scale. Several potentially viable large (1,000+ afy) recycled water projects were identified but the need for this volume of new water by the individual sponsoring agency has not been demonstrated. A few small, cost effective (< 100 afy) recycled water projects were defined and showed some viability until the cost of small-scale treatment is included. This is the region-wide dilemma for recycled water and requires municipal, agricultural, and other large water users to coordinate efforts.

On the other hand, desalination is the other primary potential large, new source of water for the county and studies of potential desalination plants in the County[2] resulted in water supply unit costs ranging from $3,000/af to $3,900/af. In addition, desalination raises non-monetary concerns, such as impact to the marine setting and energy intensity. Most recycled water project concepts in the RRWSP are more cost effective and potentially have less environmental impacts than desalination.

[2] South San Luis Obispo County Desalination Funding Study (Wallace, October 2008); Evaluation of Desalination as a Source of Supplemental Water, Administrative Draft, Technical Memorandum 2 (Boyle, September 2007)

Also, the maximum recycled water rate for willing agricultural customers is the cost of current water supplies, which is roughly the avoided cost of groundwater pumping. Agricultural reuse project concepts are some of the most cost effective projects in the region but the full cost of recycled water is significantly higher than groundwater. As a result, successful agricultural reuse projects require creative funding and financing plans.

Occurrence of Significant Seawater Intrusion

The NCMA and NMMA have reduced pumping in recent years to avoid seawater intrusion and, on a smaller scale, Morro Bay, San Simeon, and Cambria have managed pumping to avoid seawater intrusion. To date, their efforts appear to be effective and there does not appear to be a need for a new seawater intrusion barrier. However, seawater intrusion conditions may change that could necessitate the need for a new barrier. Recycled water could be recharged via percolation or injection to create a barrier or could provide in-lieu supplies to groundwater pumpers overlying the coastal area threatened by seawater intrusion.

Wastewater Discharge Restrictions

Treatment plant upgrades can be a significant project cost, especially the initial phases, and most plants to date have not been required to upgrade to tertiary effluent. Placing the full cost of tertiary treatment plant upgrades with the benefitting recycled water project reduces the potential for a cost effective recycled water project in most cases. However, the future direction of wastewater discharge requirements is likely towards more stringent discharge limits and may require WWTP upgrades that would benefit reuse.

Regional Obstacles and Recommendations

The following table summarizes recycled water obstacles from a regional perspective and recommendations to address these obstacles. The table is followed by a review of regional opportunities, constraints, and recommendations for specific types of reuse projects.

Regional Recycled Water Obstacles and Recommendations

Obstacle	Recommendation
Leadership / Advocate	
Water supply projects can take many years (and election cycles) to implement from concept to operations and, as a result, many are put on hold from political and/or staff turnover. Recycled water projects can also take just as long and can cause additional political or staff concerns due to public misunderstanding or misleading information. Therefore, most successful large recycled water projects include respected scientific, public health, environmental, and political advocates to move the project forward by being able to champion the project benefits, help gain the public's trust, and assist to mitigate opposition.	- Identify recycled water champions in multiple fields - scientific, public health, environmental, and political - to support projects. - Support and facilitate regional projects with costs and benefits spread across diverse entities. - Advocate for highest and best use of existing potable water.
Cost	
Recycled water projects costs may be too high in comparison to existing and alternative water supplies to gain support.	- Identify new water supply needs based on existing water quantity, quality, or reliability. - Establish specific need for reuse (if appropriate) as part of an integrated water resources plan. - Complete advance project planning and/or preliminary design for future funding for pilot projects, WWTP upgrades, and delivery systems. - In the future, reconsider feasible projects that may not be cost effective at this time, as the value of recycled water to municipalities grows as limits and reliability of existing sources are strained further.
Cost of treatment plant upgrades to tertiary treatment is an obstacle. Further tightening of discharge requirements will help support reuse as funds are committed to treatment plant upgrades.	- Plan for tertiary treatment upgrades in WWTP facility plans. - Identify funding sources other than recycled water projects for WWTP upgrades.
Brine disposal in the inland setting is a major hurdle for reuse (and any other salt management efforts).	- Incorporate recycled water planning into salt and nutrient management planning to identify the best management measures.
Benefits	
Reuse has clear benefits but many of the benefits are distributed across all water users. Most cost effective opportunities provide water supply benefits beyond the municipalities producing the recycled water.	- Grant funding can help address the contradiction between the lead agency / primary funding source and project beneficiaries. - Advocate for grant funding of recycled water projects in areas attempting to reduce dependence on local groundwater to improve project economic viability.
Legal	
Existing groundwater users do not have a mechanism to transfer their groundwater rights in exchange for use of alternative water supplies as is the case in most adjudicated groundwater basins.	- Start discussions with all groundwater basin pumpers to develop a mechanism to exchange groundwater rights for use of alternatives water supplies.

Obstacle	Recommendation
Financing	
Reliance on a single or low number of customers can cause payback issues if the demand is overestimated or the customer may not exist in the future.	- Confirm recycled water demand estimates and costs to convert each potential recycled water customer. - Get customer commitments prior to start of design and construction to properly design facilities and ensure revenue for loan payments.
Institutional	
Recycled water projects are often times positioned to provide regional benefits that face the challenges of bringing multiple sub-regional political entities together with diverse goals.	- Leverage existing sub-regional water planning groups, such as NCMA and NMMA, to identify key stakeholders and gain support.
Water and wastewater are handled by separate agencies in some areas, causing cost sharing / allocation issues.	- Define water and wastewater benefits of recycled water projects to support cost allocation.
Public Acceptance	
Recycled water projects, particularly involving potable reuse, require thorough, planned public outreach efforts; however, these efforts tend to be underfunded and reactionary instead of proactive, all-embracing, and well-timed.	- Make sure to include funding for initial and ongoing public outreach specific to the targeted groups.
Regulatory	
Recycled water project implementation is tied to compliance with regulations and policies to protect surface water and groundwater that may present obstacles in terms such as requiring treatment upgrades or making certain types of reuse projects infeasible.	- Evaluate project feasibility based on applicable regulations and policies. - Move forward with salt and nutrient planning in all basins where reuse is being considered and incorporate recycled water plans into the effort. - Track new regulations and policies for impacts on water recycling.
Policies	
Mandatory use and other similar policies are not in place in most jurisdictions.	- Any jurisdiction implementing a recycled water project should adopt a mandatory use ordinance to demonstrate political support and to be eligible for most grant funds or low-interest loans. - Have developers include 'purple pipe' in new developments within a reasonable distance from the WWTP or planned distribution system. If the development is large enough and recycled water demand high enough, have developers include water reclamation plants in the development. - Consider applying California Water Code (CWC) 13551[3] provisions if necessary.

[3] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

Landscape Irrigation

Urban landscape irrigation represents the second most common type of reuse across California followed after agricultural irrigation. It tends to be the first use for recycled water considered for most urban areas since opportunities for agriculture irrigation are limited in these settings. As a result of decades of project operations, implementation of landscape irrigation projects is generally straightforward and involves the least obstacles – with the exception of cost.

There is limited opportunity for cost effective landscape irrigation in the region for a combination of reasons:

- There is a limited amount of large landscape areas due to long-standing water conservation measures taken.
- Most of the existing large landscape areas are golf courses and most of these use at least some recycled water or non-potable groundwater. (Although significant volumes of potable water are used at these courses too to meet irrigation demand and flush salts).
- Potential large landscape areas identified in the RRWSP are too far from existing WWTPs and/or demands are too small for cost effective distribution to the sites.
- The small opportunities that exist require WWTP upgrades to tertiary treatment, which generally have high unit costs on a small scale.

Several potential landscape irrigation projects are identified in the RRWSP. The cost effective projects are closest to the WWTP and/or include a golf course that uses large volumes of potable water. Implementation of the smaller projects is probably more feasible due to the total cost as long as the tertiary treatment portion of the cost can be managed. In addition, successful implementation of small recycled water projects could spur support for expansion in the future.

Agricultural Irrigation

Of the types of recycled water projects evaluated in the RRWSP, agricultural reuse has the most potential across the region. Agricultural water use represents approximately 75% of total water use across the region. Agricultural reuse is advantageous because of the relatively high demand in concentrated areas combined with proximity to the existing WWTPs. Also, agricultural reuse represents matching water quality to use thus freeing potable water for potable uses. Finally, agricultural reuse in coastal locations can serve as a seawater intrusion barrier.

There are many hurdles to successful agricultural reuse projects in the region:

- Recycled water producers realizing a water supply benefit. The benefit can be realized if the agricultural customer agrees to reduce pumping from potable groundwater aquifer(s) by the amount of recycled water used.
- Providing recycled water at a competitive price to existing agricultural water supplies. Recycled water can be sold to agricultural customers at or below their current cost of water supply (primarily groundwater at up to $300/af), but the revenue from recycled water sales would most likely not cover the cost of the recycled water project on its own. To economically justify such a project, the avoided cost of new water supply acquisition must be considered as well as the potable water revenue received from the new potable supply.
- Gaining willing agricultural customers of recycled water due to real and perceived issues.

- Identifying or creating a lead agency with the capability and authority to develop, construct, and operate a regional project.

Agricultural reuse offers one of the best opportunities for recycled water use in the region while also having several obstacles to overcome. Considering this, the region can start to take efforts to address the obstacles by starting discussions on governance, water supply benefits, and recycled water pricing. In addition, steps can be taken to address grower concerns over recycled water use so that these issues can be resolved while the other non-customer issues are addressed. Recommended next steps include:

- Reach out to agricultural interests to determine steps necessary to gain willing customers.
- Conduct educational tours of existing agricultural reuse projects in Northern, Central, and Southern California.
- Conduct technical studies considering specific recycled water quality, soil conditions, and crops.
- If deemed beneficial, follow technical studies with pilot studies, potentially set in conjunction with Cal Poly[4], similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source(s) for a pilot project.
- Leverage the agricultural resources of the local Resource and Conservation Districts during outreach and implementation.
- Consider application of CWC Section 13551[5] to gain agricultural customers based on the availability of recycled water of adequate quality and at a reasonable cost. (Refer to Section 13.2.1 for further discussion).

Groundwater Recharge

Groundwater recharge with recycled water has some potential opportunities across the region, but geological constraints and treatment requirements may cause projects to be too expensive. The two primary areas considered for recharge – Northern Cities Management Area and Paso Robles Groundwater Basin – have limited areas where water recharged from the surface can reach the potable water aquifers. Injection would be needed where surface recharge locations are lacking and injection requires the additional costs of injection wells and advanced treatment (beyond tertiary) of recycled water.

Use of recycled water to prevent seawater intrusion of groundwater along the coast is an option worthy of further consideration. Several key steps were identified for successful implementation of a potential seawater intrusion barrier projects for SSLOCSD. Other than cost, the primary obstacles to GWR with recycled water are:

- Better understanding of potential groundwater basin recharge locations and storage potential.
- Definition of benefits other than a new water supply, such as preventing seawater intrusion and/or subsidence.
- Receipt of water supply benefits by project sponsors or sharing of costs across all basin beneficiaries.

[4] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org
[5] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

- For use of tertiary recycled water, significant volumes of dilution water would be required for a GWR project to meet regulations.
- Basins may not have sufficient assimilative capacity to apply recycled water unless additional treatment is provided.

Streamflow Augmentation

Streamflow augmentation is an attractive reuse option since many streams now have minimum flow requirements for habitat and/or wildlife preservation. For example, offsetting Lopez Dam releases to Arroyo Grande Creek or increasing stream flow in other portions of the region to allow for pumping would create new water supplies.

However, the largest obstacles to implementation of these projects are surface water discharge regulations. Existing surface water discharge regulations add significant treatment costs and anticipated future regulations would require even higher levels of treatment with associated costs.

To assess streamflow augmentation options in the future:

- Fully assess flow and water quality requirements and restrictions in in Arroyo Grande Creek and other potential sites across the region.
- Track surface water discharge regulations and their implications for streamflow augmentation.

Concluding Remarks

The best opportunities for reuse – agriculture and groundwater recharge – align with the region's water resources profile: agriculture comprises approximately 75% of total water use and groundwater represents approximately 90% of water supplies. However, institutional and other implementation issues arise when attempting to allocate costs and realize benefits for agriculture and GWR projects because recycled water is produced by public agencies but beneficiaries extend beyond the municipalities.

Recycled water offers one of the region's best options for new water supplies, especially when compared with the cost and environmental impacts of desalination. However, many recycled water projects are more expensive than additional conservation or fully realizing the relatively recent investments in surface water projects. Additionally, water supply conditions and the associated need for recycled water vary by individual agency while recycled water projects require regional scale to achieve significant water supply benefits and acceptable costs due to economies of scale.

The 2014 drought conditions have highlighted the benefits of developing a local, reliable water supply for municipalities as well as agricultural and industrial water users. In particular, the sustainability of and long-term impacts from groundwater overdraft have increased interest in recycled water. For example, some growers in the Morro Valley have expressed the desire to the City of Morro Bay to develop recycled water for agricultural reuse. The full cost of recycled water appears to be too high for many areas at this time, but will become more competitive in the future as other options become more expensive, the value of local supplies increases, and successful grant funding helps to subsidize local costs. In the meantime, the region should take the initial steps outlined in the RRWSP to address hurdles to implementation of feasible recycled water projects and provide minimal initial investment in projects to position them for grant funding.

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San Luis Obispo County
Regional Recycled Water Strategic Plan

Participating Agencies:

City of Arroyo Grande
City of Grover Beach
City of Morro Bay
City of Pismo Beach
County of San Luis Obispo
Nipomo Community Services District
Oceano Community Services District
South San Luis Obispo County Sanitation District
Templeton Community Services District

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South San Luis Obispo County Sanitation District
Templeton Community Services District

November 2014

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Acronyms and Abbreviations

AACE	Association for Advancement of Cost Estimating International
Afy	Acre-feet per year
AOP	Advanced oxidation process
AWT	Advanced water treatment
Basin Plan	Water Quality Control Plan
BDOC	Biodegradable Organic Carbon
BWRO	Brackish Water Reverse Osmosis
CCI	Construction Cost Index
CCR	California Code of Regulations
CDPH	California Department of Public Health
CECs	Constituents of emerging concern
cfs	Cubic feet per second
CSD	Community Services District
CWA	Clean Water Act
CWC	California Water Code
DDW	(SWRCB) Division of Drinking Water (formerly CDPH)
DWP	Drinking Water Program
DWR	(California) Department of Water Resources
EIR	Environmental Impact Report
ENR	Engineering News Record
ER	Engineering Report
fps	Feet Per Second
gpd	Gallons Per Day
gpm	Gallons Per Minute
GSWC	Golden State Water Company
GWR	Groundwater recharge
hp	Horsepower
hr	Hour
in	Inches
IRWM	Integrated Regional Water Management
IWRSP	Integrated Water Resources Strategic Plan
kw	Kilowatt
LF	Linear Feet
MG	Million Gallons
mg/L	Milligram Per Liter (aka “Part Per Million”)
mgd	Million Gallons Per Day
MPN	Most Probable Number
MUN	Municipal and Domestic Supply
N	Nitrogen
NCSD	Nipomo Community Services District
NCMA	Northern Cities Management Area
NDMA	N-Nitrosodimethylamine

NMMA	Nipomo Mesa Management Area
NPDES	National Pollution Discharge Elimination System
NPR	Non-Potable Reuse
NTU	Nephelometric Turbidity Unit
OCSD	Oceano Community Services District
ppm	Part Per Million (aka Milligram Per Liter)
PVC	Polyvinyl Chloride
RO	Reverse osmosis
RMS	Resource Management Strategy
RRWSP	Regional Recycled Water Strategic Plan
RW	Recycled Water
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SIP	SWRCB Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
SLO	San Luis Obispo
SNMP	Salt Nutrient Management Plan
SRF	State Revolving Fund
SSLOCSD	South San Luis Obispo County Sanitation District
SWP	State Water Project
SWRCB	(California) State Water Resources Control Board
TCSD	Templeton Community Services District
TDS	Total Dissolved Solids
Title 22	Title 22 of California Code of Regulations
TM	Technical Memorandum
µg/L	Microgram per liter
USEPA	U.S. Environmental Protection Agency
UWMP	Urban Water Management Plan
WDR	Waste Discharge Requirements
WPA	Water Planning Area
WRFP	Water Recycling Funding Program
WRR	Water Recycling Requirements
WWTF	Wastewater Treatment Facilities
WWTP	Wastewater Treatment Plant

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EXECUTIVE SUMMARY

Introduction

The County of San Luis Obispo (County) is investigating opportunities for the use of treated wastewater (recycled water) across the County as part of the San Luis Obispo Region Integrated Regional Water Management (IRWM) Plan (SLO IRWMP). The Regional Recycled Water Strategic Plan (RRWSP) is one component of an update to the SLO IRWMP, and is funded by a Round 2 IRWM Regional Planning Grant from the California Department of Water Resources (DWR).

Increased interest in recycled water use has been expressed across the County through individual agency water and wastewater planning efforts, and through County-wide efforts such as SLO IRWMP and the County Master Water Report. The interest in recycled water is driven by several factors, particularly the acknowledgement of limited existing water sources and the desire to maximize the benefit of local resources. In addition, the 2014 drought conditions have increased interest in the beneficial use of a local, reliable water supply. In particular, overdraft of groundwater basins across the region is limiting available supplies and increasing the likelihood of seawater intrusion in coastal communities.

Historically, the primary obstacles to recycled water implementation were cost competiveness with existing water supplies and some future water supplies, as well as, in some cases, public or customer acceptance of reuse. Some of these obstacles still exist and are explored in the RRWSP.

RRWSP Purpose, Objectives, and Approach

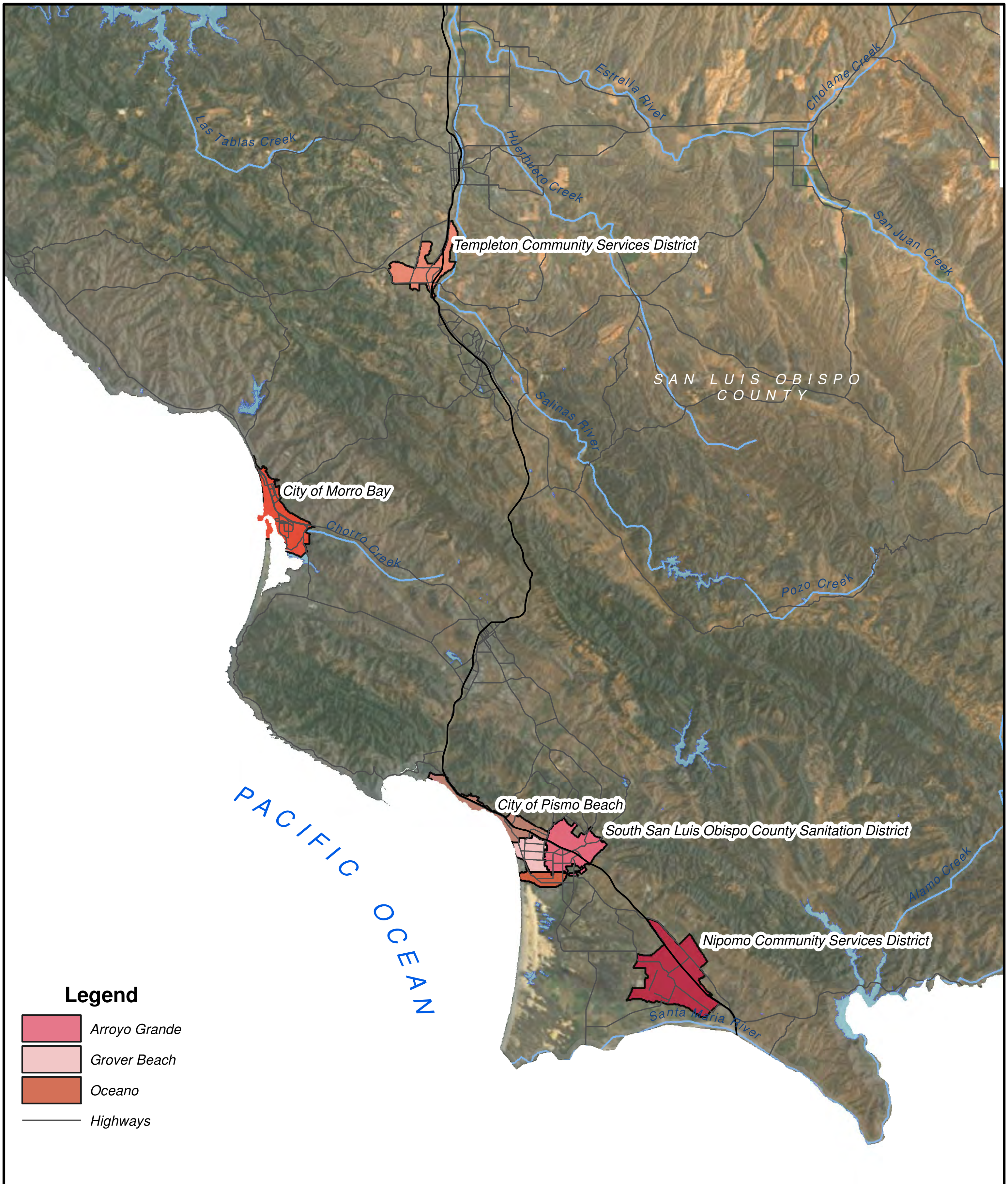
The purpose of the RRWSP is to identify and prioritize potentially viable next steps in successfully implementing water reclamation across the County in a safe and cost-effective manner. The RRWSP objectives are to:

- Update previously defined recycled water projects, identify new projects, and identify opportunities for inter-regional cooperation.
- Apply a similar cost and benefit basis to all projects to identify higher regional priorities.
- Advance existing recycled water planning efforts for each study area based on the progress and needs of each area.
- Define the critical next steps for individual agencies and regional entities to move priority projects forward.
- Identify one or more projects for the final round of Proposition 84 implementation grant funding, which is scheduled for 2015.

The RRWSP's approach builds upon the technical information developed by each agency. This work also updated relevant information for previously identified projects, and identified potential modifications to those projects to lower cost while maintaining potential benefits. The RRWSP identifies high-priority projects based on costs and benefits, and defines critical next steps for each project. The RRWSP also addresses policy, regulatory, permitting, legal, and funding / financing considerations for different types of recycled water projects.

The RRWSP covers region wide recycled water opportunities, and has focused evaluations within four study areas (refer to the figure on the following page):

1. Morro Bay
2. Nipomo (Nipomo Community Services District (NCSD))
3. Northern Cities (Arroyo Grande, Grover Beach, Pismo Beach, Oceano CSD, and South San Luis Obispo County Sanitation District (SSLOCSD))
4. Templeton (Templeton CSD)



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RRWSP Study Areas

San Luis Obispo County
Regional Recycled Water Strategic Plan
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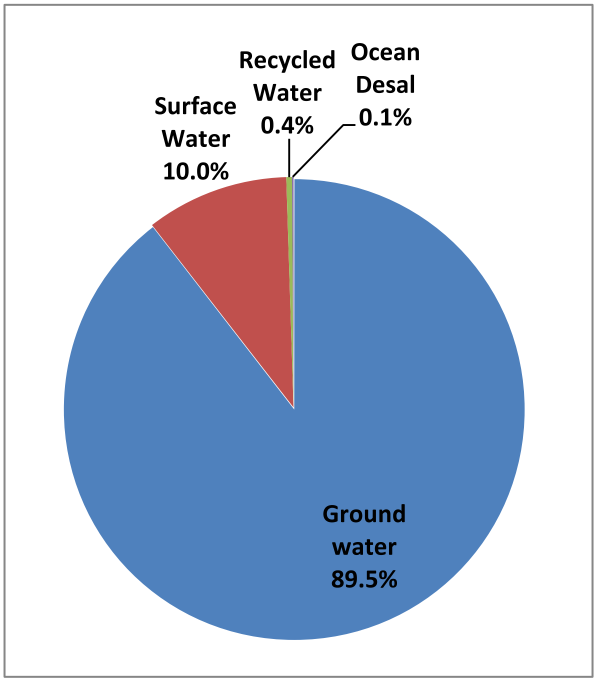
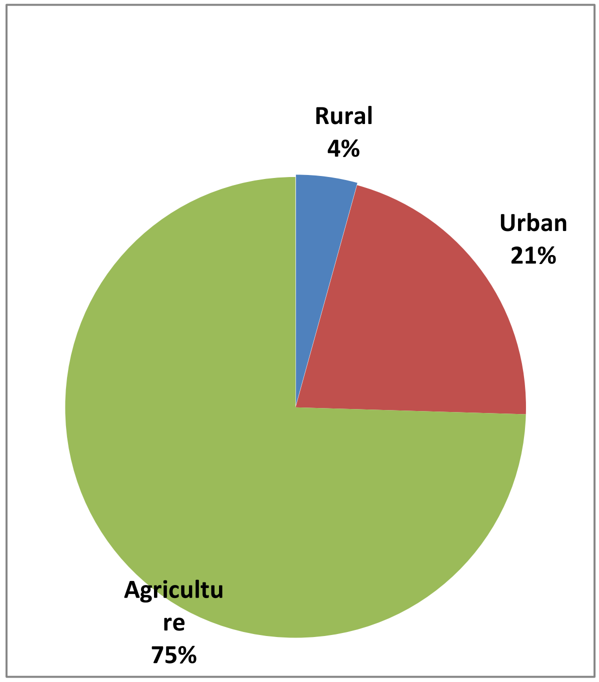
Regional Overview

The County's water supplies consist of groundwater, local and imported surface water, recycled water, and ocean desalination. The specific water supply portfolio for each water purveyor varies according to its location and previous investments in water supply infrastructure. For example, many purveyors are entirely dependent on groundwater, while a limited number use groundwater only to meet peak season demand. As reflected in the following figure, most water purveyors have a heavy reliance on groundwater. In fact, the Central Coast has the highest reliance on groundwater of any region in the State.

County Water Supply Portfolio & Types of Water Use

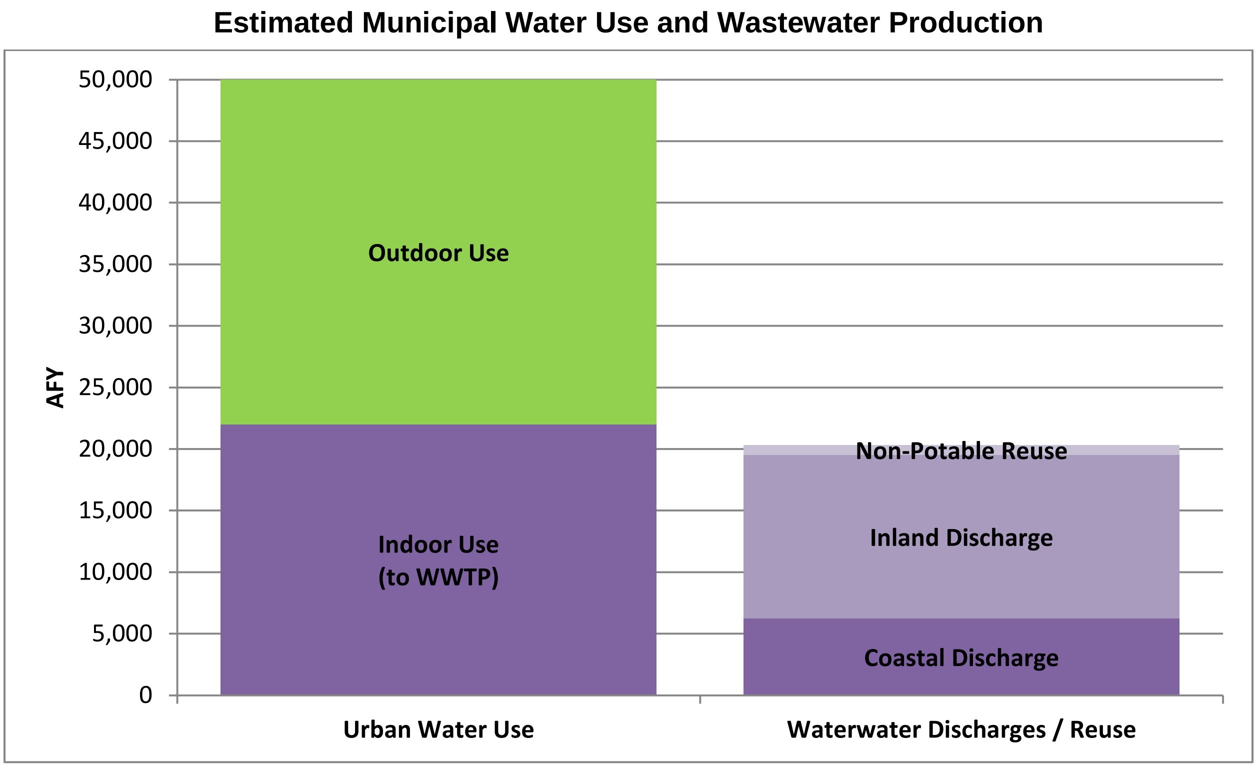




Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

In general, there are limited untapped groundwater supplies for municipal drinking water use. As a result, many purveyors have invested in surface water supplies over the past two decades, such as the State Water Project and Nacimiento Water Project. These new surface supplies have eased the stress on many groundwater basins. In addition, some historical supplies may be reduced in the future – whether from unsustainable pumping of groundwater, groundwater quality issues, or reductions in surface water availability. Climate change also has the potential to impact availability and reliability of the County's water supplies. These conditions, among others, have spurred interest in recycled water, particularly in locations where treated wastewater is discharged to the ocean and no associated water supply benefit is realized.

Urban water use accounts for approximately 21% of total water use across the County, which equates to approximately 50,000 acre-feet per year (afy). As shown in the following figure, approximately half of this volume is used outdoors and the other half is used indoors. Most indoor urban water use is conveyed to municipal wastewater treatment plants (WWTPs) and has the potential for reuse. After accounting for water losses and reuse within the WWTPs, approximately 20,000 afy (or roughly 10% of total water use across the County) has the potential for reuse. Finding the highest and best beneficial reuse for this volume of water is the focus of the RRWSP.



Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

Recycled Water Background

Currently there are seven operational non-potable reuse (NPR) projects across the region primarily consisting of golf course irrigation. The City of San Luis Obispo operates the only recycled water distribution system in the region, serving primarily City parks for landscape irrigation. Also, the County Department of Public Works is currently constructing a recycled water treatment and distribution system for the community of Los Osos, which will be operational in 2016. In total, approximately 830 afy of effluent is currently reused across the region by the following existing non-potable reuse projects:

- Atascadero (300 afy to Chalk Mountain Golf Course)
- California Men's Colony (200 afy to Dairy Creek Golf Course)
- Nipomo CSD, Blacklake WWTP (50 afy to Blacklake Golf Course)
- Rural Water Company WWTP (50 afy to Cypress Ridge Golf Course)
- City of San Luis Obispo (180 afy to nearby golf courses, schools, and commercial establishments and minimum of 1,800 afy to San Luis Obispo Creek for streamflow augmentation)
- San Simeon CSD (Trucking of recycled water for irrigation started in 2014)
- Woodlands MWC WWTP (50 afy to Monarch Dunes Golf Course)

In addition, approximately 790 afy of discharges are counted toward pumping rights:

- Nipomo CSD Southland WWTP (640 afy percolated to Nipomo Mesa groundwater)
- Templeton CSD Meadowbrook WWTP (150 afy infiltrated to Salinas River underflow)

Unplanned or incidental reuse occurs in the County via discharge of disinfected secondary effluent to percolation ponds from WWTPs without an ocean outfall. The ponds discharge to the underlying groundwater or an adjacent river and may eventually be used for potable or non-potable use, such as agriculture.

Unlike inland discharges, effluent discharge via ocean outfalls has no existing water supply benefit. Therefore, reuse of effluent from WWTPs with ocean outfalls would provide the largest water supply benefit. Approximately 5,700 afy of effluent is currently discharged to the ocean and the volume will rise as growth occurs in these areas. These discharges offer the highest opportunity for water supply benefit through reuse since the effluent does not provide any water supply benefit at this time. The following table summarizes effluent discharges and reuse across the region and the following figure shows the locations of each of these WWTPs.

Summary of Existing Effluent Discharges

Agency / WWTP	Existing Effluent		Existing Reuse	Inland Discharge	Ocean / Coastal Discharge
North County Sub-Region					
City of Atascadero	1.0 mgd	1,100 afy	300 afy	800 afy	--
Heritage Ranch CSD	0.2 mgd	230 afy	--	230 afy	--
City of Paso Robles	3.0 mgd	3,300 afy	--	3,300 afy	--
San Miguel CSD	0.1 mgd	130 afy	--	130 afy	--
TCSD Meadowbrook WWTP[1]	0.15 mgd	170 afy	--	170 afy[2]	--
North Coast Sub-Region					
California Men's Colony	1.2 mgd	1,340 afy	200 afy[3]	1,140 afy[3]	--
Cambria CSD	0.5 mgd	540 afy	--[4]	540 afy	--
Cayucos CSD	0.25 mgd	275 afy	--	--	275 afy
Los Osos WWTP[5]	1.2 mgd	1,340 afy	--	1,340 afy	--
Morro Bay	0.87 mgd	975 afy	--	--	975 afy
San Simeon CSD	0.07 mgd	80 afy	--[6]	--	80 afy
South County Sub-Region					
Avila Beach CSD	0.05 mgd	50 afy	--	--	50 afy
NCSD Blacklake WWTP	0.05 mgd	50 afy	50 afy	--	--
NCSD Southland WWTF	0.6 mgd	640 afy	--	640 afy[7]	--
Pismo Beach	1.1 mgd	1,230 afy	--	--	1,230 afy
Rural Water Company	0.05 mgd	50 afy	50 afy	--	--
City of San Luis Obispo[8]	3.2 mgd	3,600 afy	180 afy	3,420 afy[8]	--
San Miguelito MWC	0.15 mgd	170 afy	--	--	170 afy
SSLOCSD WWTP	2.6 mgd	2,910 afy	--	--	2,910 afy
Woodland MWC	0.05 mgd	50 afy	50 afy	--	--
Total	**16.4 mgd**	**18,230 afy**	**830 afy**	**11,710 afy**	**5,690 afy**

Notes:

1. Templeton CSD is considering diverting existing sewer flows that go to the Paso Robles WWTP (approximately 0.22 mgd) and conveying the flow for treatment at the TCSD Meadowbrook WWTP.
2. Templeton CSD retrieves the percolated water at downstream wells.
3. Must maintain a minimum discharge of 0.75 cfs (0.5 mgd; 540 afy) to Chorro Creek.
4. Percolated effluent serves as a barrier to slow the seaward migration of subterranean fresh water.
5. Currently under construction and start of operations planned for 2016.
6. Trucking of recycled water for irrigation started in 2014.
7. Percolated water is accounted for in the Nipomo Mesa Management Area groundwater balance.
8. Must maintain a minimum discharge of 2.5 cfs (1.6 mgd; 1,800 afy) to San Luis Obispo Creek.

Municipal Wastewater Treatment Plants within San Luis Obispo County

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Common Types of Reuse

Common types of water reuse can be divided into the following categories:

- **Urban Reuse - Landscape Irrigation:** Common locations of use include parks, golf courses, cemeteries, school yards, freeway landscaping, sod farms, nurseries, and residential landscaping.
- **Urban Reuse - Other Uses:** Dual plumbing (flushing toilets and urinals), priming drain traps, structural and nonstructural fire fighting, decorative fountains, commercial laundries, consolidation of backfill around pipelines, artificial snow making for commercial outdoor use, commercial car washes (no public contact with washing), fish hatcheries with public access, soil compaction, mixing concrete, dust control on roads and streets, and cleaning roads, sidewalks and outdoor work areas, sanitary sewer flushing.
- **Agricultural Irrigation:**
    - Orchards and vineyards (edible portion); food crops, including root crops, where the edible portion contacts recycled water.
    - Food crops (where the edible portion is above ground and not contacted by recycled water); pasture for animals producing milk for human consumption; any nonedible vegetation (controlled access).
- **Environmental Reuse:** The use of recycled water to create, enhance, sustain, or augment water bodies, including wetlands, aquatic habitats, or stream flow.
- **Industrial Reuse:** Use of recycled water in industrial applications and facilities, power production, and extraction of fossil fuels. Common industrial uses include for cooling tower makeup water, boiler feed water, and industrial processes.
- **Potable Reuse**
    - **Indirect Potable Reuse:** Augmentation of a drinking water source (surface water or groundwater) with recycled water followed by an environmental buffer. Groundwater may receive additional treatment prior to use (for example disinfection); surface water would receive conventional surface water treatment.
    - **Direct Potable Reuse:** The introduction of recycled water into a public water system (e.g., distribution system) or into a raw water supply upstream of a water treatment plant.
- **Impoundments:**
    - Unrestricted Recreational: No limitations are imposed on body-contact water recreation activities.
    - Restricted Recreational: Activities limited to fishing, boating, and other non-body contact activities.

All of the types of reuse listed above are examined in the RRWSP with the exception of:

- Impoundments: Restricted impoundments are common recycled water storage methods for golf courses and agricultural fields but are not an end use. Use of recycled water for unrestricted impoundments is not considered in the RRWSP.
- Direct Potable Reuse: This option has recently emerged as a viable recycled water alternative being considered across the United States. While direct potable reuse can legally be implemented in California, several years of study and development of specific regulations await before a feasible project could be initiated in the County.

Opportunities, Constraints, and Recommendations by Study Area

This section presents the recycled water evaluation conducted for each of the study areas and summarizes opportunities across the region.

City of Morro Bay

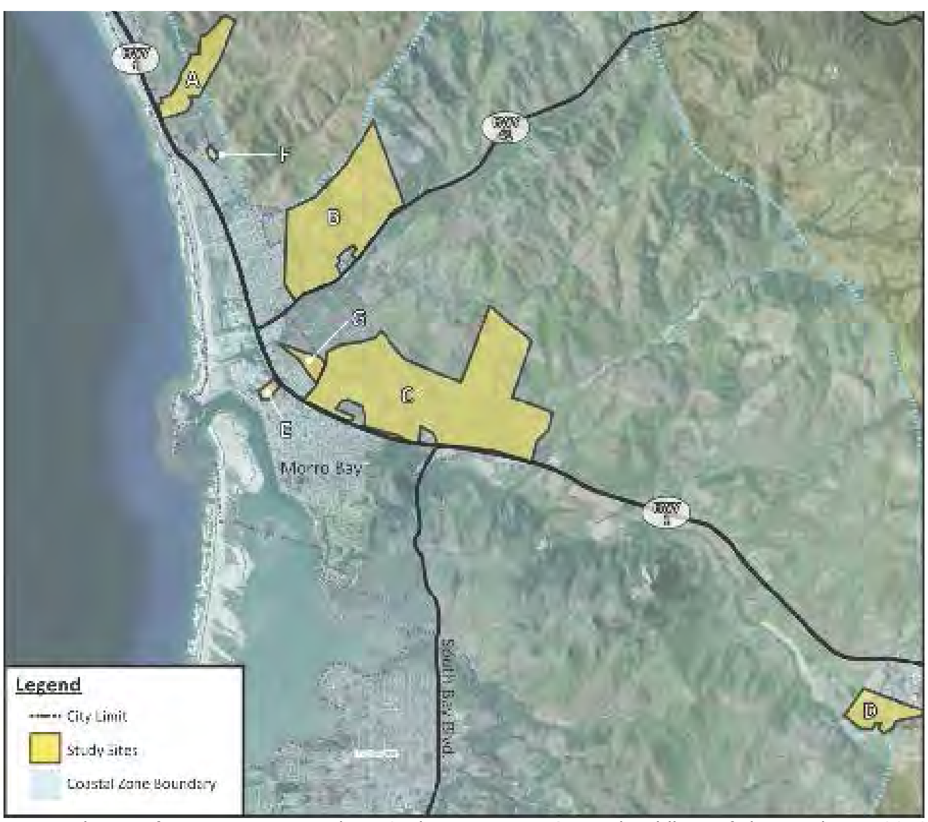
The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility (WRF). One key goal of the new facility is to produce disinfected tertiary effluent for reuse. In February 2014, the City set a goal to have the new WRF online in five years from issuance of the final NPDES permit (anticipated for late 2014/early 2015). The City Council is scheduled to decide on a site in late 2014.

There are a range of recycled water opportunities in and around the city, including landscape irrigation, agricultural irrigation, and groundwater recharge / streamflow augmentation. The city wants to maximize reuse from the new WRF. However, implementation of each type of potential reuse is subject to constraints, and feasible recycled water options are ultimately dependent on the site selected for the new WRF.

Next Steps

- Decide on a location for the new water reclamation facility
- Refine recycled water study completed in 2011
- Pursue reuse opportunities specific to the WRF location
- Work cooperatively with the agricultural community and other potential customers to develop a recycled water distribution system
- Incorporate recycled water planning into salt and nutrient management planning

New WRF Sites Evaluated by Morro Bay



Source: Figure 1 from New WRF Project: Options Report – Second Public Draft (December 5, 2013)

Nipomo CSD

NCSD has two WWTPs (Southland WWTF and Blacklake WWTP) and both currently maximize reuse. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. Southland WWTF is percolated into the underlying groundwater basin, and these flows are included in the Nipomo Mesa Management Area (NMMA) water balance. Reuse of Southland WWTF effluent for landscape irrigation in strategic locations, such as offsetting pumping in groundwater depressions, could provide benefits to NCSD but would not necessarily provide new water. Also, Southland WWTF would need a tertiary treatment upgrade or an equivalent soil aquifer treatment and pumping system for potential uses identified in the report.

Potential landscape irrigation, agricultural irrigation, and groundwater recharge projects from Southland WWTF were explored in the RRWSP. However, the projects were not cost effective ($10,000+/af) primarily because NCSD would only receive a 10% water supply benefit for every unit of recycled water use since percolated Southland WWTF effluent is already part of the NMMA water balance. (The water balance assumes 10% of percolated water is lost during transport to the groundwater table and reuse of the effluent for irrigation would avoid these losses). In summary, NCSD beneficially reuses 90% of treated effluent from Southland WWTF and would only be able to receive a maximum new water supply benefit of 90 afy if all 900 afy of existing effluent is reused for irrigation.

NCSD Recycled Water Project Concepts

Alternative		Average Annual Demand	Unit Cost Based on	
ID	Description		Annual Demand	Water Supply Benefit
N1a	Nipomo Regional Park Project	51 afy	$4,790 / AF	$47,900 / AF
N1b	N1a & Blacklake Golf Course Extension	551 afy	$1,730 / AF	$17,300 / AF
N1c	N1a & Monarch Dunes Golf Course Extension	951 afy	$1,310 / AF	$13,100 / AF

Note: All proposed projects are from Southland WWTF. Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

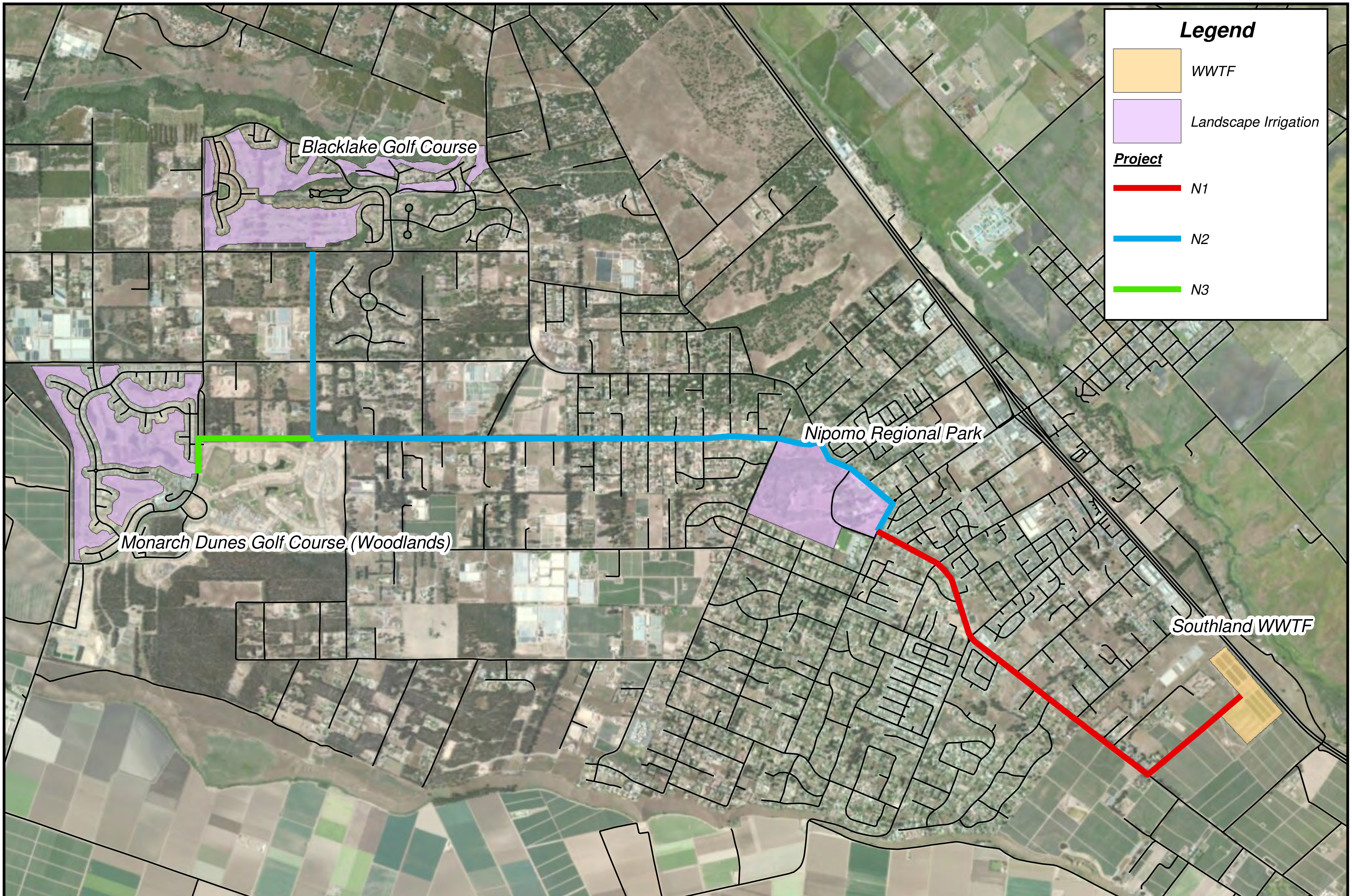
In addition, NCSD recycled water opportunities and constraints include:

- Southland WWTF will require an upgrade to tertiary filtration or pumping after percolation to implement a recycled water project
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) resulting in additional costs for treatment and concentrate management
- Substantial agricultural demand exists in proximity to the Southland WWTF. Approximately 600 acres of irrigated agricultural acreage are located within 1.5 miles south and west of Southland WWTF.

Based on this assessment, a water supply benefit will not drive a NCSD recycled water project. However, recycled water projects could be driven by the need for alternative disposal methods in the future based on potentially stricter waste discharge requirements from the RWQCB.

Next Steps

- Continue to monitor potential mounding of effluent recharge at the Southland WWTF and, if mounding is realized, pursue reuse opportunities
- Work with SSLOCSD representatives on potential cross-basin reuse projects
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



Nipomo CSD Landscape Irrigation Project Concepts

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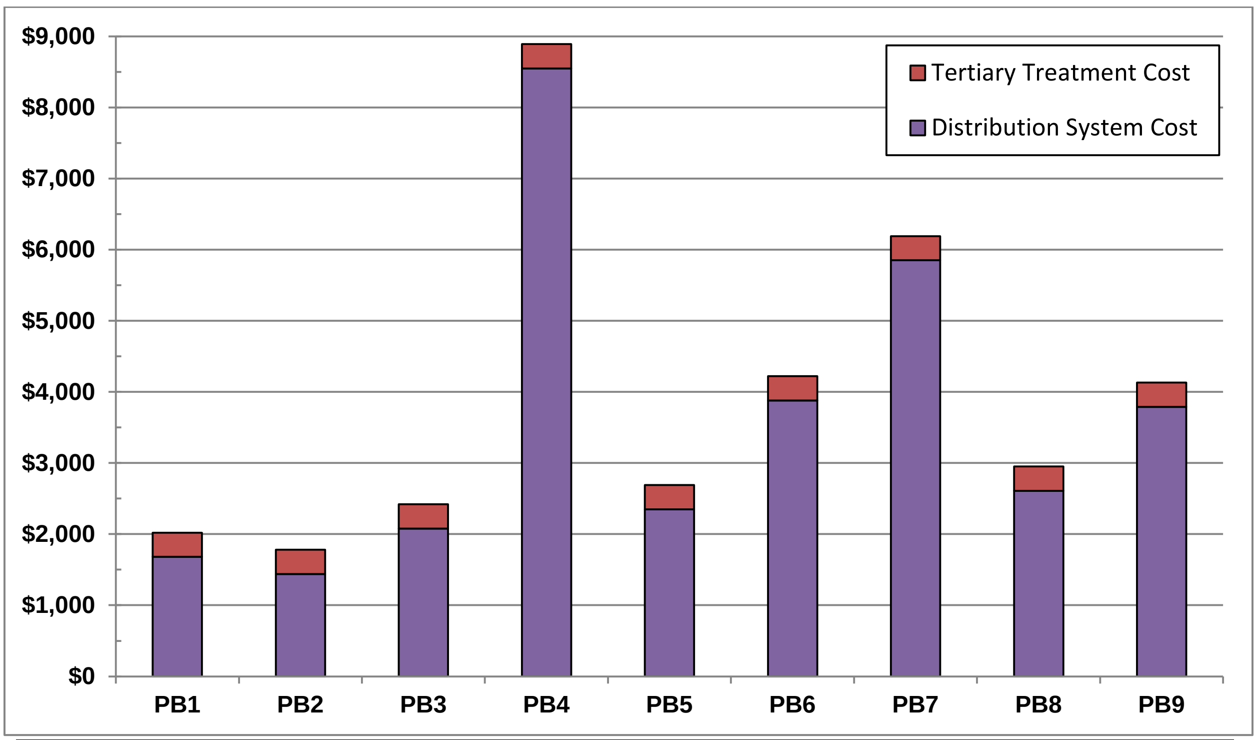
City of Pismo Beach

The Pismo Beach WWTP currently discharges approximately 1.1 mgd (1,230 afy) of disinfected secondary effluent through the joint Pismo Beach / SSLOCSD ocean outfall. Nine landscape irrigation project concepts from the Pismo Beach WWTP were defined. In addition, use of Pismo Beach WWTP effluent in combination with SSLOCSD effluent for larger, regional projects, such as agricultural reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation are discussed under SSLOCSD in the following section.

Pismo Beach Recycled Water Project Concepts	
<u>Landscape Irrigation Project Concepts</u> PB1: Pismo Beach Sports Complex PB2: Caltrans and Middle School PB3: Price House Historic Park PB4: South to Arroyo Grande PB5: Pismo State Beach Golf Course	PB6: Dinosaur Caves Park PB7: Palisades Park <u>Projects using the existing effluent outfall</u> PB8: Pismo State Beach Golf Course PB9: Western Grover Beach

Unit Costs of Pismo Beach Project Concepts ($/AF)



AFY	16	89	28	26	86	47	62	77	84

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Opportunities and Constraints

Based on findings from the project concepts development process, preliminary recycled water opportunities and constraints for Pismo Beach include:

- Maximizing reuse will require more types of uses than just existing landscape irrigation.
- Approximately 130 afy of landscape irrigation demand is located within 0.5 mile of the WWTP, which offers promising reuse opportunities. However, demand estimates for several key potential customers must be confirmed before proceeding much further with planning.

- Tertiary treatment upgrades for small treatment plant commonly have high unit costs due to the lack of scale and could result in high project unit costs for service to customers close to the WWTP.
- There is potential for large recycled water use from new development if approved by the City.
- Pismo State Beach Golf Course is not a Pismo Beach potable water customer so their water supply benefit must be achieved through groundwater exchange.
- Most landscape irrigation customers have relatively low demands and are spread across the city, which causes service to these customers have high unit costs.
- Use of Pismo Beach effluent for agricultural irrigation is potentially the most cost-effective reuse project as long as the Pismo Beach receives a water supply benefit. Agricultural irrigation is included in the SSLOCSD section.
- Use of Pismo Beach effluent for groundwater recharge is a viable option and is included in the SSLOCSD section.

The City is in the process of obtaining abandoned oil pipelines with the intent to consider their use for conveyance of recycled water. This option could potentially reduce distribution infrastructure costs and make more landscape irrigation projects cost effective. This concept will be evaluated as part of the City's Recycled Water Facilities Plan, which is currently being prepared and is expected to be completed in early 2015.

Next Steps

- Complete Recycled Water Facilities Plan that is in progress in consultation with regional stakeholders and the SWRCB.
- Complete investigation that is in progress into the ability to use abandoned oil lines for recycled water conveyance. The RRWSP did not consider this option and its application could make non-potable reuse cost effective for the City.
- Confirm demand estimates for cost effective projects
- Explore alternative tertiary treatment method geared toward relatively small flows (i.e. 0.1 to 0.3 mgd)
- Evaluate the cost to retrofit Pismo Beach State Golf Course and the ability for the city to receive groundwater benefits
- Refine potential projects to develop a phased recycled water program
- Continue discussions with new development (if approved by the City) regarding recycled water demand and funding
- Consider use of the existing outfall as a recycled water conveyance facility (but only if 100% tertiary treatment conversion is planned)
- Compare costs of viable projects with alternative water supplies
- Continue to participate in discussions with regional SSLOCSD projects that could put Pismo Beach effluent to beneficial use and confirm the ability of the City to receive a water supply benefit
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

Potential Landscape Irrigation Projects - Pismo Beach

San Luis Obispo County

Regional Recycled Water Strategic Plan

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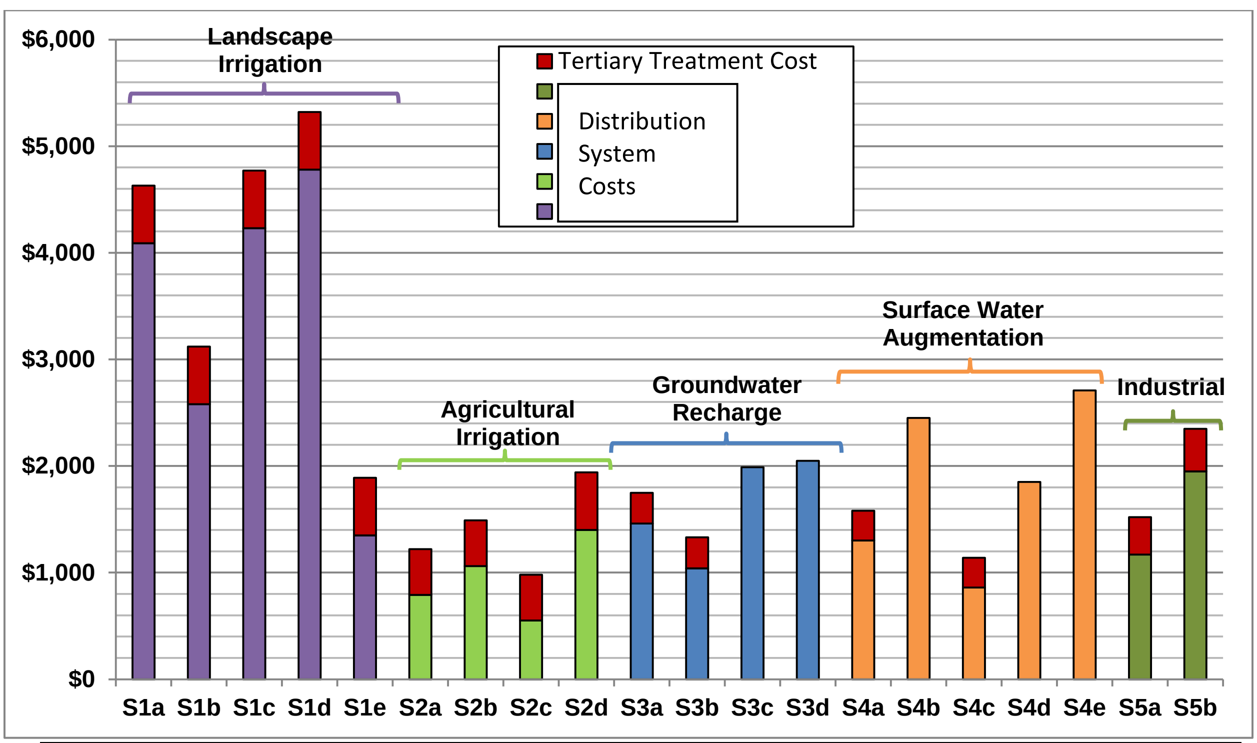
Northern Cities – SSLOCSD

The SSLOCSD WWTP currently discharges approximately 2.6 mgd of disinfected secondary effluent through a joint ocean outfall (shared with Pismo Beach). Approximately 1.1 mgd of disinfected secondary effluent from Pismo Beach WWTP is discharged through the same ocean outfall. SSLOCSD has the largest volume of effluent considered in the RRWSP and the largest opportunities for large-scale reuse; however, landscape irrigation projects are expensive ($3,000+/af) and the more cost effective reuse opportunities – agricultural irrigation, industrial reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation – will require institutional, legal, outreach, and financial planning to be feasible.

SSLOCSD Recycled Water Project Concepts	
Landscape Irrigation Project Concepts S1a. Small Landscape Irrigation Project S1b. Core Landscape Irrigation Project S1c. Extension to Grover Beach Project S1d. Extension North of Highway 101 Project S1e. Nipomo Mesa Golf Courses Agricultural Irrigation Project Concepts S2a. Direct delivery over 12 hours / day (Tertiary) S2b. S2a with 40% RO S2c. Direct delivery over 24 hours / day (Tertiary) S2d. S2a; Serving 50% of estimated demand	Groundwater Recharge Project Concepts S3a. GWR via surface spreading @ existing basins (60% RO) S3b. GWR via surface spreading @ new basins (60% RO) S3c. GWR via surface spreading @ new basins (Full AWT) S3d. GWR via injection (Full AWT) Surface Water Augmentation Project Concepts S4a. Arroyo Grande Creek Augmentation (80% RO) S4b. Arroyo Grande Creek Augmentation (Full AWT) S4c. Los Berros Creek Augmentation (80% RO) S4d. Los Berros Creek Augmentation (Full AWT) S4e. Lopez Reservoir Augmentation (Full AWT) Industrial Reuse Project Concepts S5a. Tertiary Treatment S5b. Full RO

Unit Costs of SSLOCSD Project Concepts ($/AF)



AFY	12	162	44	52	1500	1890	1810	1890	1200	300	2760	2390	2390	2670	2390	2670	2390	2390	1100	1100

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Overall, the amount of reuse for landscape irrigation is limited by the demand, while supply limits the amount of agricultural irrigation during the peak demand season (summer). Groundwater recharge and reservoir augmentation are limited by supply. Stream augmentation could be limited by supply or demand depending on future regulatory scenarios related to the volume of flow required at different points in the creek in the Habitat Conservation Plan.

Opportunities and Constraints

Based on the project concepts development process, SSLOCSD recycled water opportunities and constraints include the following:

- Reuse from SSLOCSD WWTP will require upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or discharge regulations for specific types of reuse (e.g., stream augmentation or indirect potable reuse).
- Landscape irrigation projects have the highest unit costs due to limited demand in proximity to the SSLOCSD WWTP.
- Agricultural irrigation projects have the lowest unit costs due to substantial agricultural demand in proximity to the SSLOCSD WWTP.
- GWR and stream augmentation projects offer the highest volume of reuse, have moderate unit costs, and include a range of costs primarily due to the level of treatment assumed for each project.
- Industrial reuse has moderate unit costs and could be combined with the Nipomo golf courses or agricultural reuse alternatives since they have similar pipeline alignments.

Next Steps

<u>General</u>

- Complete planned treatment plant improvements and re-evaluate facilities needed to implement tertiary treatment upgrade.
- Track regulatory drivers and their impacts on reuse opportunities, including:
  - RWQCB Waste Discharge Requirements (NPDES Permit)
  - NOAA Habitat Conservation Plan
  - California Coastal Commission Coastal Development Permit
  - Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003
- Address institutional issues and potential funding mechanisms for regional projects
  - Discuss cost sharing of projects between water and wastewater agencies or water/sewer funds.
  - Discuss operations and management of the project
  - Discuss the logistics and legal basis for groundwater exchanges.
  - Coordinate with Pismo Beach reuse plans to identify the most cost effective reuse projects for the NCMA.
  - Develop project concepts sufficiently to position for grant funding opportunities
  - Initiate discussions with member agencies about project funding between the water supply entities (Arroyo Grande, Grover Beach, and Oceano CSD) and SSLOCSD.
  - Investigate funding mechanisms for regional projects that benefit NCMA pumpers in addition to SSLOCSD and its member agencies.

- Discuss support for use of SSLOCSD recycled water in the NMMA and the related ability to receive water supply benefits in the NCMA.

- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

Landscape Irrigation

- Except for the Nipomo Mesa Golf Courses option, the landscape irrigation alternatives have unit costs exceeding $3,000/af. However, unit costs can be reduced if some non-potable projects can be reduced to less than $2,000/af when are combined with groundwater recharge at the Soto Sports Complex Stormwater basins.

Nipomo Mesa Golf Courses

- Confirm demand estimates that account for future growth
- Address issues associated with use of NCMA effluent in the NMMA.

Agricultural Irrigation

- Initiate planning for agricultural reuse program to enable a project to be developed within 10 years.
- Conduct outreach to agricultural operations in the area determine willingness to use recycled water in the future and obstacles to implementation.
- Set up a pilot study potentially in conjunction with Cal Poly[1] similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source for a pilot project.
- In conjunction with GWR hydrogeological characterization, attempt to define locations of agricultural pumping compared with municipal pumping.

Industrial Reuse

- Discuss reuse options with Phillips 66 refinery.
- Address issues associated with use of NCMA effluent in the NMMA.

Groundwater Recharge / Seawater Intrusion Barrier

- Further investigate the water supply benefits of implementing a small groundwater recharge project at the Soto Sports Complex Stormwater basins. Considering combining this project with a non-potable project. Determine if the close proximity of potable water wells to the recharge basins is a fatal flaw.
- Further investigate the NCMA groundwater basin, potentially with a groundwater model, to identify surface recharge locations, inland injection locations, and coastal injection locations. Define the benefits of these projects to the basin, particularly the prevention of seawater intrusion.
- Determine benefits of and need for a seawater intrusion barrier (via direct injection or in-lieu reuse) and groundwater levels that would necessitate its use. Determine the value of groundwater protected from seawater intrusion.

Streamflow Augmentation

- Continue to track developments in Arroyo Grande Creek flow requirements / restrictions.
- Track new and potential surface water discharge regulations.

[1] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org

SSLOCSD Recycled Water Project Concepts

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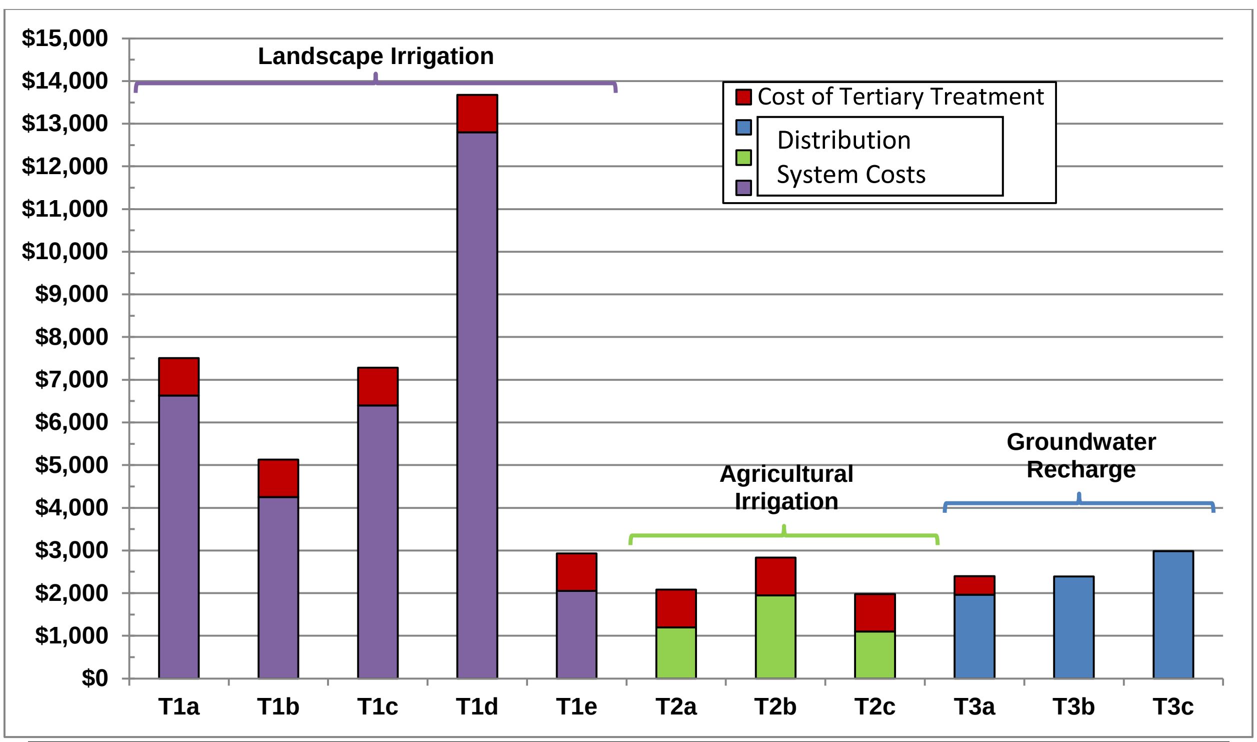
Templeton CSD

Templeton CSD is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges through augmentation of Salinas River underflow. The district plans to implement a project to increase discharges from the Meadowbrook WWTP by diverting district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the sewer diversion as well as untreated Nacimiento water. In addition, recycled water opportunities are being explored. Eleven recycled water project concepts were defined for Templeton CSD. Most reuse options will require an upgrade to tertiary treatment.

Templeton CSD Recycled Water Project Concepts	
Landscape Irrigation Project Concepts	Agricultural Irrigation Project Concepts
T1a. Downtown Core Landscape Irrigation Project	T2a. Direct delivery over 12 hours each day (Tertiary)
T1b. Evers Sports Park Extension Project	T2b. T2b with 40% RO
T1c. Vineyard Elementary School Extension Project	T2c. Direct delivery over 24 hours each day (Tertiary)
T1d. Jermin Park Extension Project	Groundwater Recharge Project Concepts
T1e. Commercial Landscape Irrigation (Equestrian Center) Project	T3a. GWR via surface spreading (60% RO)
	T3b. GWR via surface spreading (Full AWT)
	T3c. GWR via injection (Full AWT)

Unit Costs of TCSD Project Concepts ($/AF)



AFY	27	16	20	5	160	260	260	260	530	500	500

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

Opportunities and Constraints

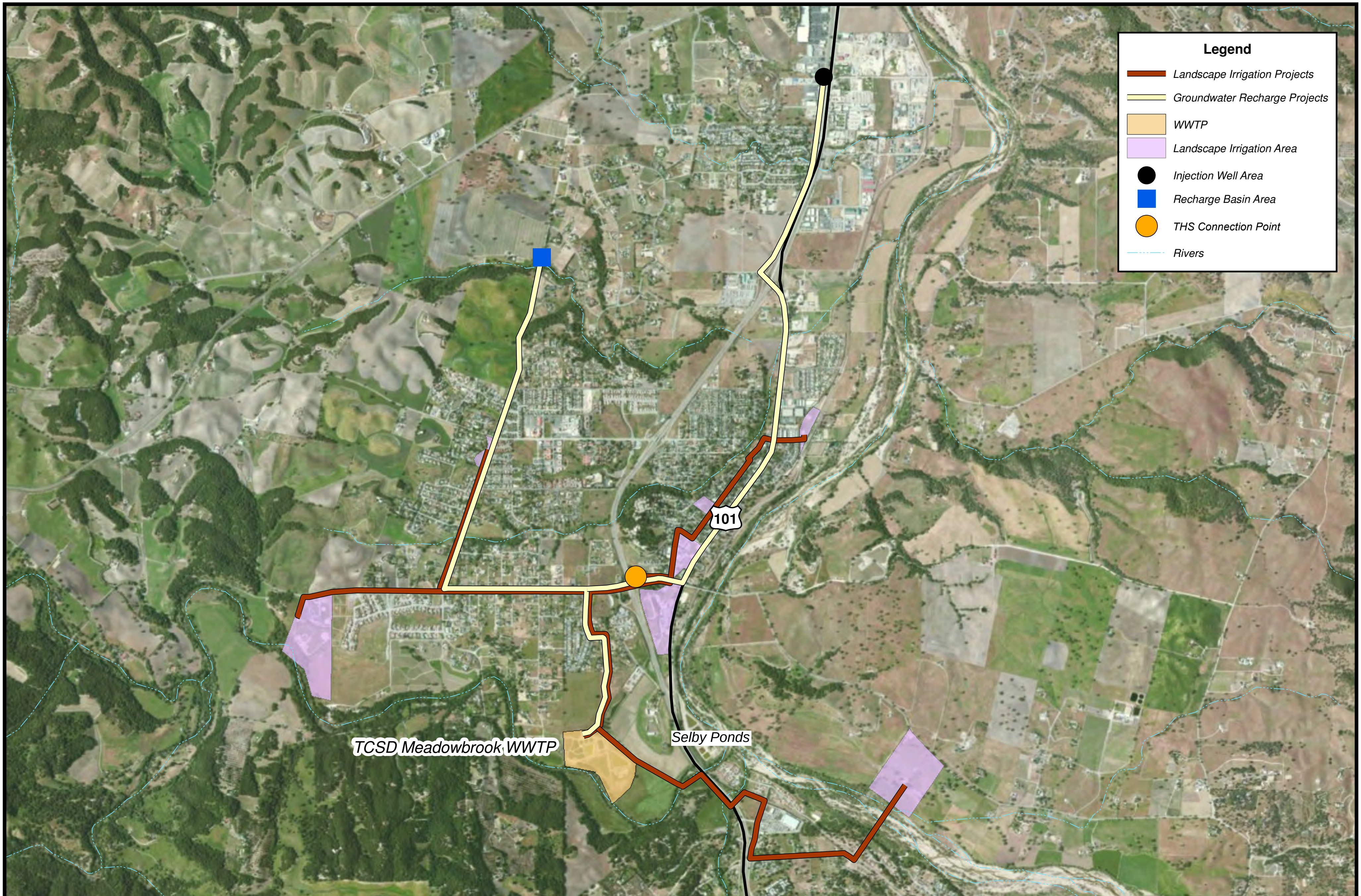
Based on the project concepts development process, TCSD recycled water opportunities and constraints include the following:

- Maximizing percolation at the Selby Ponds is the favored use of Meadowbrook WWTP effluent.
- Significant increases to effluent flows are dependent on a combination of septic tank conversions, build-out growth, and diversions from the East Side Force Main and Lift Station Project.
- Potential for reuse of up to 0.2 mgd of effluent without treatment upgrades for feed and fodder irrigation but the reuse would not offset potable water demand.
- Most reuse opportunities from Meadowbrook WWTP will require at least an upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or regulations for specific types of reuse (e.g., groundwater recharge).
- Landscape irrigation projects have high unit costs due to limited demand in proximity to the WWTP.
- Commercial landscape irrigation (i.e., equestrian farm) has moderate unit costs due to moderate demand.
- Agricultural irrigation has moderate unit costs due to moderate demand in proximity to the Meadowbrook WWTP but a proper market assessment was not conducted.

Next Steps

TCSD plans to incorporate feasible projects into the District's planned Integrated Water Resources Strategic Plan and must be able to adjust reuse needs based on future percolation performance of the Selby Ponds and actual increases to future flows. Therefore, TCSD should:

- Incorporate commercial irrigation, agricultural irrigation, and groundwater recharge.
- Incorporate commercial and agricultural irrigation into the forthcoming Integrated Water Resources Strategic Plan.
- Continue investigation into improving recharge capacity at Selby Ponds through WWTP improvements as well as upgrades and improvements to the ponds.
- Considers water supply benefits and impacts to discharge capacity of continued recharge of Nacimiento water in the Selby Ponds.
- Refine feed and fodder disposal option as a temporary disposal alternative until Selby Pond recharge capacity is better known.
- If Selby Ponds cannot recharge all effluent, refine agricultural irrigation and commercial irrigation options.
- Survey private agricultural and large turfgrass operations in the vicinity of the WWTP for their interest in recycled water use and water quality requirements combined with the ability for TCSD to use a similar amount of groundwater currently being used by the entity.
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



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Templeton CSD Recycled Water Project Concepts

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Other Potential Recycled Water Projects

The RRWSP focused on defining projects in five areas across the region but many more relevant opportunities exist.

North County

- **City of Atascadero:** The City currently reuses non-potable discharges at Chalk Mountain Golf Course and is currently preparing a Wastewater Collection System and Treatment Plant Master Plan update that is evaluating reuse at local parks and Atascadero Lake but no projects were defined at the time the RRWSP was prepared.
- **Heritage Ranch CSD:** HRCSD currently discharges effluent that eventually enters an unnamed tributary to the Nacimiento River. The District is considering construction of a spray irrigation site for effluent disposal management.
- **City of Paso Robles:** The City is currently upgrading its WWTP to an advanced secondary (nutrient removal) process and has begun preliminary design of filtration and disinfection processes that are necessary to produce tertiary quality recycled water. The City recently adopted a Recycled Water Master Plan that identifies areas in east Paso Robles where recycled water may be used to offset pumping from the Paso Robles Groundwater Basin. Also, a major vineyard owner has expressed interest in purchasing recycled water for in-lieu recharge of the Paso Robles Groundwater Basin.

North Coast

- **California Men's Colony:** CMC currently reuses tertiary effluent at Dairy Creek Golf Course and helps to maintain a continuous flow rate of 0.75 cfs in Chorro Creek. CMC is also a regional site considered by the City of Morro Bay and Cayucos CSD for treatment of their wastewater.
- **Cambria CSD:** CCSD's effluent discharges serve as a barrier to seawater intrusion. CCSD is currently pursuing an indirect reuse project involving extraction and treatment brackish groundwater near the effluent percolation ponds and is considering future non-potable reuse options.
- **Los Osos WWTP:** The new water reclamation plant started construction in 2014 and startup is planned for 2016. Reuse will occur via agricultural irrigation, landscape irrigation, and discharge to leach fields. The volume to each type of use is currently being defined through potential customer outreach.
- **San Simeon CSD:** The district installed a 36,000 gpd tertiary filtration system in 2013. Current reuse is via hauling by truck for irrigation of commercial properties. The district has plans to construct a distribution system in phases as funds become available.

South County

- **Rural Water Company:** All effluent is currently reused at the Cypress Ridge Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.
- **City of San Luis Obispo:** The City is currently updating its Recycled Water Master Plan to develop plans to expand the system from existing use of 180 afy. There is also a possibility of recycled water sales to agricultural customers on the edge of the city limits.
- **Woodlands Mutual Water Company:** All effluent is currently reused at the Monarch Dunes Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.

Regional Opportunities, Constraints, and Recommendations

Ultimately, recycled water is one of many water resources options for the region. As presented in the RRWSP, there are several potential recycled water projects across the region that can provide cost effective benefits. A number of factors must be present to successfully implement a cost effective recycled water project, including water supply needs, recycled water supply and demand, acceptable economics, and protection of public health. Local conditions across the region result in a range of recycled water project opportunities and constraints. There are also opportunities and constraints that apply across the region. This section discusses these opportunities and constraints and outlines potential recommendations to move recycled water projects forward on a regional level.

Regional Opportunities and Constraints

The project concepts considered in the RRSWP revealed several recycled water opportunities across the region as well as substantial obstacles to implementation of successful projects. All the reuse projects considered in the RRWSP are technically feasible and some are cost effective but barriers remain to successful project implementation. The most common drivers for recycled water projects across the State are:

- Need for new large water supply
- Occurrence of significant seawater intrusion
- Wastewater discharge restrictions

Portions of these drivers are present across the region but not to the degree to support significant recycled water investments. These drivers may increase in the future and would improve the opportunity for reuse projects. Each driver is discussed further here.

Large Water Supply Need

The need for a new, local, and reliable water supply is the primary driver for recycled water projects in the region. The need is present when considered across multiple water suppliers, particularly when considering the 2014 drought conditions; however, the individual agencies currently lack the need for a new, *large* water supply.

Recycled water projects typically have strong economies of scale since the two largest components – treatment and pipelines – have economies of scale. Several potentially viable large (1,000+ afy) recycled water projects were identified but the need for this volume of new water by the individual sponsoring agency has not been demonstrated. A few small, cost effective (< 100 afy) recycled water projects were defined and showed some viability until the cost of small-scale treatment is included. This is the region-wide dilemma for recycled water and requires municipal, agricultural, and other large water users to coordinate efforts.

On the other hand, desalination is the other primary potential large, new source of water for the county and studies of potential desalination plants in the County[2] resulted in water supply unit costs ranging from $3,000/af to $3,900/af. In addition, desalination raises non-monetary concerns, such as impact to the marine setting and energy intensity. Most recycled water project concepts in the RRWSP are more cost effective and potentially have less environmental impacts than desalination.

[2] South San Luis Obispo County Desalination Funding Study (Wallace, October 2008); Evaluation of Desalination as a Source of Supplemental Water, Administrative Draft, Technical Memorandum 2 (Boyle, September 2007)

Also, the maximum recycled water rate for willing agricultural customers is the cost of current water supplies, which is roughly the avoided cost of groundwater pumping. Agricultural reuse project concepts are some of the most cost effective projects in the region but the full cost of recycled water is significantly higher than groundwater. As a result, successful agricultural reuse projects require creative funding and financing plans.

Occurrence of Significant Seawater Intrusion

The NCMA and NMMA have reduced pumping in recent years to avoid seawater intrusion and, on a smaller scale, Morro Bay, San Simeon, and Cambria have managed pumping to avoid seawater intrusion. To date, their efforts appear to be effective and there does not appear to be a need for a new seawater intrusion barrier. However, seawater intrusion conditions may change that could necessitate the need for a new barrier. Recycled water could be recharged via percolation or injection to create a barrier or could provide in-lieu supplies to groundwater pumpers overlying the coastal area threatened by seawater intrusion.

Wastewater Discharge Restrictions

Treatment plant upgrades can be a significant project cost, especially the initial phases, and most plants to date have not been required to upgrade to tertiary effluent. Placing the full cost of tertiary treatment plant upgrades with the benefitting recycled water project reduces the potential for a cost effective recycled water project in most cases. However, the future direction of wastewater discharge requirements is likely towards more stringent discharge limits and may require WWTP upgrades that would benefit reuse.

Regional Obstacles and Recommendations

The following table summarizes recycled water obstacles from a regional perspective and recommendations to address these obstacles. The table is followed by a review of regional opportunities, constraints, and recommendations for specific types of reuse projects.

Regional Recycled Water Obstacles and Recommendations

Obstacle	Recommendation
Leadership / Advocate	
Water supply projects can take many years (and election cycles) to implement from concept to operations and, as a result, many are put on hold from political and/or staff turnover. Recycled water projects can also take just as long and can cause additional political or staff concerns due to public misunderstanding or misleading information. Therefore, most successful large recycled water projects include respected scientific, public health, environmental, and political advocates to move the project forward by being able to champion the project benefits, help gain the public's trust, and assist to mitigate opposition.	- Identify recycled water champions in multiple fields - scientific, public health, environmental, and political - to support projects. - Support and facilitate regional projects with costs and benefits spread across diverse entities. - Advocate for highest and best use of existing potable water.
Cost	
Recycled water projects costs may be too high in comparison to existing and alternative water supplies to gain support.	- Identify new water supply needs based on existing water quantity, quality, or reliability. - Establish specific need for reuse (if appropriate) as part of an integrated water resources plan. - Complete advance project planning and/or preliminary design for future funding for pilot projects, WWTP upgrades, and delivery systems. - In the future, reconsider feasible projects that may not be cost effective at this time, as the value of recycled water to municipalities grows as limits and reliability of existing sources are strained further.
Cost of treatment plant upgrades to tertiary treatment is an obstacle. Further tightening of discharge requirements will help support reuse as funds are committed to treatment plant upgrades.	- Plan for tertiary treatment upgrades in WWTP facility plans. - Identify funding sources other than recycled water projects for WWTP upgrades.
Brine disposal in the inland setting is a major hurdle for reuse (and any other salt management efforts).	- Incorporate recycled water planning into salt and nutrient management planning to identify the best management measures.
Benefits	
Reuse has clear benefits but many of the benefits are distributed across all water users. Most cost effective opportunities provide water supply benefits beyond the municipalities producing the recycled water.	- Grant funding can help address the contradiction between the lead agency / primary funding source and project beneficiaries. - Advocate for grant funding of recycled water projects in areas attempting to reduce dependence on local groundwater to improve project economic viability.
Legal	
Existing groundwater users do not have a mechanism to transfer their groundwater rights in exchange for use of alternative water supplies as is the case in most adjudicated groundwater basins.	- Start discussions with all groundwater basin pumpers to develop a mechanism to exchange groundwater rights for use of alternatives water supplies.

Obstacle	Recommendation
Financing	
Reliance on a single or low number of customers can cause payback issues if the demand is overestimated or the customer may not exist in the future.	- Confirm recycled water demand estimates and costs to convert each potential recycled water customer. - Get customer commitments prior to start of design and construction to properly design facilities and ensure revenue for loan payments.
Institutional	
Recycled water projects are often times positioned to provide regional benefits that face the challenges of bringing multiple sub-regional political entities together with diverse goals.	- Leverage existing sub-regional water planning groups, such as NCMA and NMMA, to identify key stakeholders and gain support.
Water and wastewater are handled by separate agencies in some areas, causing cost sharing / allocation issues.	- Define water and wastewater benefits of recycled water projects to support cost allocation.
Public Acceptance	
Recycled water projects, particularly involving potable reuse, require thorough, planned public outreach efforts; however, these efforts tend to be underfunded and reactionary instead of proactive, all-embracing, and well-timed.	- Make sure to include funding for initial and ongoing public outreach specific to the targeted groups.
Regulatory	
Recycled water project implementation is tied to compliance with regulations and policies to protect surface water and groundwater that may present obstacles in terms such as requiring treatment upgrades or making certain types of reuse projects infeasible.	- Evaluate project feasibility based on applicable regulations and policies. - Move forward with salt and nutrient planning in all basins where reuse is being considered and incorporate recycled water plans into the effort. - Track new regulations and policies for impacts on water recycling.
Policies	
Mandatory use and other similar policies are not in place in most jurisdictions.	- Any jurisdiction implementing a recycled water project should adopt a mandatory use ordinance to demonstrate political support and to be eligible for most grant funds or low-interest loans. - Have developers include 'purple pipe' in new developments within a reasonable distance from the WWTP or planned distribution system. If the development is large enough and recycled water demand high enough, have developers include water reclamation plants in the development. - Consider applying California Water Code (CWC) 13551[3] provisions if necessary.

[3] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

Landscape Irrigation

Urban landscape irrigation represents the second most common type of reuse across California followed after agricultural irrigation. It tends to be the first use for recycled water considered for most urban areas since opportunities for agriculture irrigation are limited in these settings. As a result of decades of project operations, implementation of landscape irrigation projects is generally straightforward and involves the least obstacles – with the exception of cost.

There is limited opportunity for cost effective landscape irrigation in the region for a combination of reasons:

- There is a limited amount of large landscape areas due to long-standing water conservation measures taken.
- Most of the existing large landscape areas are golf courses and most of these use at least some recycled water or non-potable groundwater. (Although significant volumes of potable water are used at these courses too to meet irrigation demand and flush salts).
- Potential large landscape areas identified in the RRWSP are too far from existing WWTPs and/or demands are too small for cost effective distribution to the sites.
- The small opportunities that exist require WWTP upgrades to tertiary treatment, which generally have high unit costs on a small scale.

Several potential landscape irrigation projects are identified in the RRWSP. The cost effective projects are closest to the WWTP and/or include a golf course that uses large volumes of potable water. Implementation of the smaller projects is probably more feasible due to the total cost as long as the tertiary treatment portion of the cost can be managed. In addition, successful implementation of small recycled water projects could spur support for expansion in the future.

Agricultural Irrigation

Of the types of recycled water projects evaluated in the RRWSP, agricultural reuse has the most potential across the region. Agricultural water use represents approximately 75% of total water use across the region. Agricultural reuse is advantageous because of the relatively high demand in concentrated areas combined with proximity to the existing WWTPs. Also, agricultural reuse represents matching water quality to use thus freeing potable water for potable uses. Finally, agricultural reuse in coastal locations can serve as a seawater intrusion barrier.

There are many hurdles to successful agricultural reuse projects in the region:

- Recycled water producers realizing a water supply benefit. The benefit can be realized if the agricultural customer agrees to reduce pumping from potable groundwater aquifer(s) by the amount of recycled water used.
- Providing recycled water at a competitive price to existing agricultural water supplies. Recycled water can be sold to agricultural customers at or below their current cost of water supply (primarily groundwater at up to $300/af), but the revenue from recycled water sales would most likely not cover the cost of the recycled water project on its own. To economically justify such a project, the avoided cost of new water supply acquisition must be considered as well as the potable water revenue received from the new potable supply.
- Gaining willing agricultural customers of recycled water due to real and perceived issues.

- Identifying or creating a lead agency with the capability and authority to develop, construct, and operate a regional project.

Agricultural reuse offers one of the best opportunities for recycled water use in the region while also having several obstacles to overcome. Considering this, the region can start to take efforts to address the obstacles by starting discussions on governance, water supply benefits, and recycled water pricing. In addition, steps can be taken to address grower concerns over recycled water use so that these issues can be resolved while the other non-customer issues are addressed. Recommended next steps include:

- Reach out to agricultural interests to determine steps necessary to gain willing customers.
- Conduct educational tours of existing agricultural reuse projects in Northern, Central, and Southern California.
- Conduct technical studies considering specific recycled water quality, soil conditions, and crops.
- If deemed beneficial, follow technical studies with pilot studies, potentially set in conjunction with Cal Poly[4], similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source(s) for a pilot project.
- Leverage the agricultural resources of the local Resource and Conservation Districts during outreach and implementation.
- Consider application of CWC Section 13551[5] to gain agricultural customers based on the availability of recycled water of adequate quality and at a reasonable cost. (Refer to Section 13.2.1 for further discussion).

Groundwater Recharge

Groundwater recharge with recycled water has some potential opportunities across the region, but geological constraints and treatment requirements may cause projects to be too expensive. The two primary areas considered for recharge – Northern Cities Management Area and Paso Robles Groundwater Basin – have limited areas where water recharged from the surface can reach the potable water aquifers. Injection would be needed where surface recharge locations are lacking and injection requires the additional costs of injection wells and advanced treatment (beyond tertiary) of recycled water.

Use of recycled water to prevent seawater intrusion of groundwater along the coast is an option worthy of further consideration. Several key steps were identified for successful implementation of a potential seawater intrusion barrier projects for SSLOCSD. Other than cost, the primary obstacles to GWR with recycled water are:

- Better understanding of potential groundwater basin recharge locations and storage potential.
- Definition of benefits other than a new water supply, such as preventing seawater intrusion and/or subsidence.
- Receipt of water supply benefits by project sponsors or sharing of costs across all basin beneficiaries.

[4] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org
[5] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

- For use of tertiary recycled water, significant volumes of dilution water would be required for a GWR project to meet regulations.
- Basins may not have sufficient assimilative capacity to apply recycled water unless additional treatment is provided.

Streamflow Augmentation

Streamflow augmentation is an attractive reuse option since many streams now have minimum flow requirements for habitat and/or wildlife preservation. For example, offsetting Lopez Dam releases to Arroyo Grande Creek or increasing stream flow in other portions of the region to allow for pumping would create new water supplies.

However, the largest obstacles to implementation of these projects are surface water discharge regulations. Existing surface water discharge regulations add significant treatment costs and anticipated future regulations would require even higher levels of treatment with associated costs.

To assess streamflow augmentation options in the future:

- Fully assess flow and water quality requirements and restrictions in in Arroyo Grande Creek and other potential sites across the region.
- Track surface water discharge regulations and their implications for streamflow augmentation.

Concluding Remarks

The best opportunities for reuse – agriculture and groundwater recharge – align with the region's water resources profile: agriculture comprises approximately 75% of total water use and groundwater represents approximately 90% of water supplies. However, institutional and other implementation issues arise when attempting to allocate costs and realize benefits for agriculture and GWR projects because recycled water is produced by public agencies but beneficiaries extend beyond the municipalities.

Recycled water offers one of the region's best options for new water supplies, especially when compared with the cost and environmental impacts of desalination. However, many recycled water projects are more expensive than additional conservation or fully realizing the relatively recent investments in surface water projects. Additionally, water supply conditions and the associated need for recycled water vary by individual agency while recycled water projects require regional scale to achieve significant water supply benefits and acceptable costs due to economies of scale.

The 2014 drought conditions have highlighted the benefits of developing a local, reliable water supply for municipalities as well as agricultural and industrial water users. In particular, the sustainability of and long-term impacts from groundwater overdraft have increased interest in recycled water. For example, some growers in the Morro Valley have expressed the desire to the City of Morro Bay to develop recycled water for agricultural reuse. The full cost of recycled water appears to be too high for many areas at this time, but will become more competitive in the future as other options become more expensive, the value of local supplies increases, and successful grant funding helps to subsidize local costs. In the meantime, the region should take the initial steps outlined in the RRWSP to address hurdles to implementation of feasible recycled water projects and provide minimal initial investment in projects to position them for grant funding.

1. INTRODUCTION

The County of San Luis Obispo (County) is investigating opportunities for the use of treated wastewater (recycled water) across the County as part of the San Luis Obispo Region Integrated Regional Water Management (IRWM) Plan (SLO IRWMP). The Regional Recycled Water Strategic Plan (RRWSP) is one of the components of an update to the SLO IRWMP and is funded by a Round 2 IRWM Regional Planning Grant from the California Department of Water Resources (DWR).

This chapter provides background information on the RRWSP as well as agencies participating in the planning effort, defines plan purpose and objectives, and outlines the remaining chapters of the RRWSP.

1.1 Background

Currently there are seven operational non-potable reuse (NPR) projects across the County primarily consisting of golf course irrigation with disinfected secondary recycled water from treatment plants serving planned residential communities. (Some plants, such as the City of San Luis Obispo and Woodlands WWTP, produce tertiary effluent). The City of San Luis Obispo operates the only recycled water distribution system in the County, serving primarily City parks for landscape irrigation. In addition, unplanned or incidental reuse occurs in the County via discharge of secondary effluent to percolation ponds from wastewater treatment plants without an ocean outfall. The ponds discharge to the underlying groundwater or an adjacent river (or river underflow) and are eventually used for potable or non-potable (agriculture) use.

Increased interest in recycled water use has been expressed across the County through individual agency water and wastewater planning efforts and through County-wide efforts, such as SLO IRWMP and the County Master Water Report. The interest in recycled water is driven by a variety of factors, particularly the acknowledgement of limited existing water sources and the desire to maximize the benefit of local resources. In addition, the 2014 drought conditions have increased interest in the beneficial use of a local, reliable water supply.

Historically, the primary obstacles to recycled water implementation were cost competiveness with existing water supplies and some future water supplies, as well as, in some cases, public or customer acceptance of reuse. Some of these obstacles still exist and are explored in the RRWSP.

The 2007 SLO IRWMP (County, 2007) identified recycled water as one of the key strategies from providing long-term water supply reliability for the region in addition to diversifying water supply portfolios, reducing reliance on surface water imports, eliminating the discharge of treated wastewater to the ocean, and reducing conflicts associated with limited regional water sources. In addition, the 2014 drought conditions have increased interest in the beneficial use of a local, reliable water supply.

The 2007 IRWMP identified a large number of individual project proposals for the IRWM grant program. The projects, which were classified as Tier 2 (medium priority), were in two main planning categories: 1) Salt and Nutrient Management Planning (SNMP) and Reuse/Recycled Water Planning (RWMP), and 2) Watershed Management Planning. The IRWMP determined that focusing on a broad, regional planning approach rather than planning for individual projects better addresses the needs of the various agencies and the region. As a result, the RRWSP was one of five tasks defined in the SNMP/RWMP category in the Round 2 IRWM Regional Planning Grant application.

Recycled water planning proposals were received from:

- City of Morro Bay
- Nipomo Community Services District (NCSD)
- City of Pismo Beach
- South San Luis Obispo County Sanitation District (SSLOCSD)
- Templeton Community Services District (TCSD)

The scope of the RRWSP expanded the participating agencies to include the potable water purveyors in the SSLOCSD service area (and the purveyors are also on the SSLOCSD Board):

- City of Arroyo Grande
- City of Grover Beach
- Oceano Community Services District (OCSD)

As shown in Figure 1-1, the agencies were grouped into four study areas for the RRWSP:

1. Morro Bay
2. Nipomo CSD
3. Northern Cities (Arroyo Grande, Grover Beach, Pismo Beach, OCSD, and SSLOCSD)
4. Templeton CSD

1.2 RRWSP Purpose, Objectives, and Approach

The purpose of the RRWSP is to identify and prioritize potentially viable next steps in successfully implementing water reclamation across the County in a safe and cost-effective manner. The RRWSP objectives are to:

- Update previously defined recycled water projects, identify new projects, and identify opportunities for inter-regional cooperation.
- Apply a similar cost and benefit basis to all projects to identify higher regional priorities.
- Advance existing recycled water planning efforts for each study area based on the progress and needs of each area.
- Define the critical next steps for individual agencies and regional entities to move priority projects forward.
- Identify one or more projects for the final round of Proposition 84 implementation grant funding, which is scheduled for 2015.

The approach of RRWSP was to build upon the technical information developed by each agency, including treatment plant upgrades, market assessments, and project descriptions. This work also updated relevant information for previously identified projects and identified potential modifications to those projects to lower cost while maintaining potential benefits. The RRWSP identifies high-priority projects based on costs and benefits and defines critical next steps for each project. The RRWSP also addresses policy, regulatory, permitting, legal, and funding / financing considerations for different types of recycled water projects.

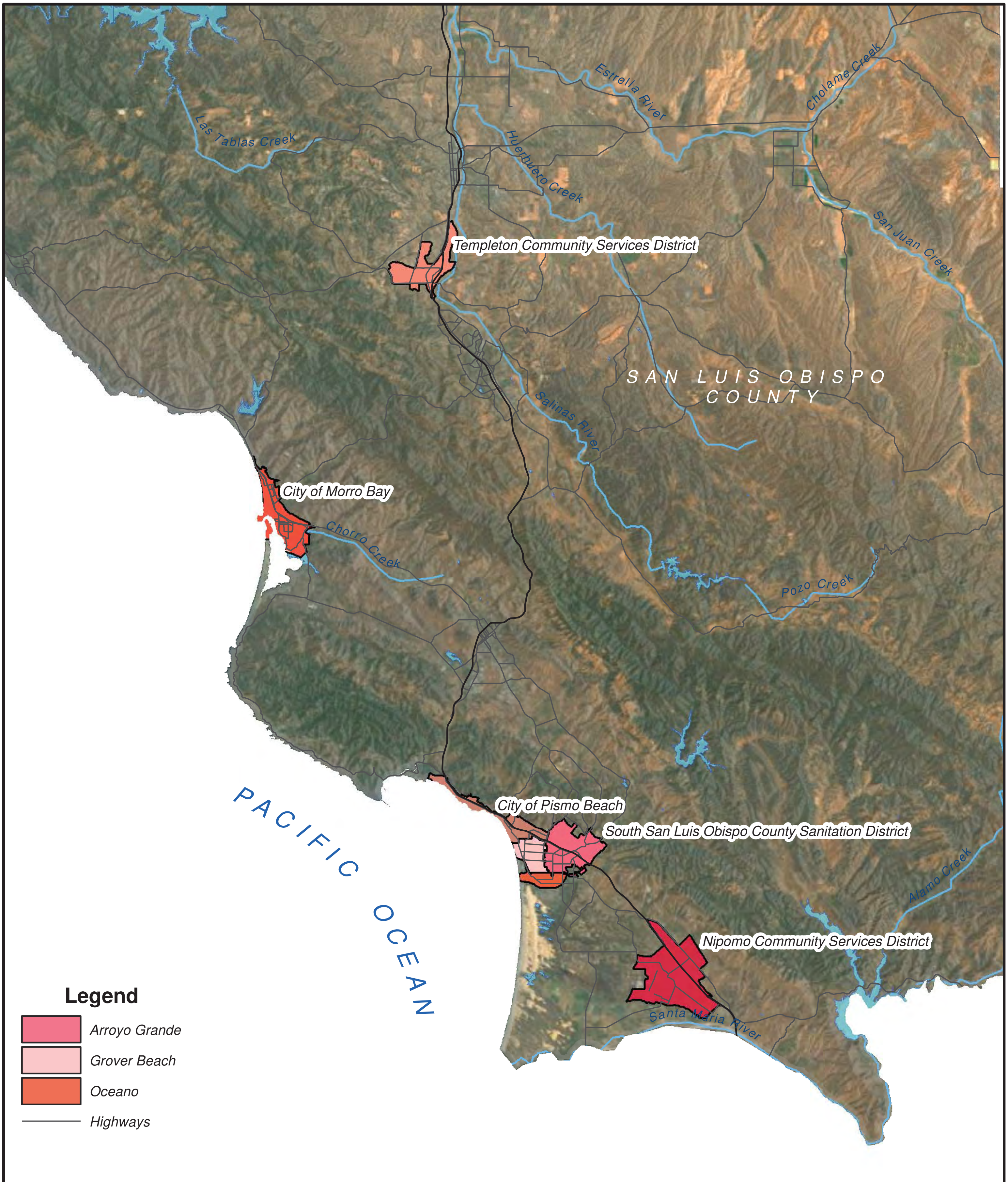

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Figure 1-1: RRWSP Study Areas
San Luis Obispo County
Regional Recycled Water Strategic Plan
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1.3 IRWMP Recycled Water Goals and Objectives

This section reviews how recycled water has been incorporated into the SLO Region IRWM Plan.

1.3.1 SLO Region IRWM Priorities, Goals, and Objectives

The IRWM Regional Water Management Group (RWMG) and interested stakeholders identified recycled water as a priority for the region to address (IRWMP Section E.1). Recycled water is key component of the IRWMP Water Supply Goal (IRWMP Section E.2.1). An objective of the goal is to "*diversify water supply sources, including the use of recycled and desalinized water*."

The quantified measurement of the objective is to ensure every community has a secondary water supply source (IRWMP Section E.4).

1.3.2 SLO Region IRWM Findings and Recommended Project Elements

The IRWMP includes Recommended Project Elements, which "*are provided as a means to implement each resource management strategy (RMS) throughout the IRWM Planning and project implementation process. The Recommended Project Elements are meant to be actions endorsed by the RWMG to be included in the implementation of IRWM projects, when and where possible, to achieve the highest success in meeting the water management strategies and findings of the RMS evaluation"* (IRWMP Section F.3).

Recycled water is explicitly included in two RMS that are further discussed in this section:

- Increase Water Supply – Municipal Recycled Water
- Improve Water Quality – Matching Water Quality to Use

RMS: Increase Water Supply – Municipal Recycled Water

"*Recycled municipal wastewater, similar to desalinization, meets the goal to diversify the regional water supply portfolio and to ensure a long-term, verifiable, reliable, and sustainable supply to meet current and future agricultural, urban, and environmental demands. Recycled wastewater would help meet objectives by* (IRWMP Section F.3.3):

- "Diversifying supply sources to improve redundancy, water quality, rate stability, and reliability of water supplies
- Helping to avoid impacts to existing users by providing a new supply
- Supporting disadvantaged and other communities in meeting wastewater disposal and permit requirements
- Matching water quality to appropriate uses and supplying treated wastewater to extend use of constrained existing water supplies
- Improving wastewater effluent water quality for discharge to fresh water rivers and ocean
- Supporting to meet 20 percent conservation goals in the region"

RMS: Improve Water Quality – Matching Water Quality to Use

Reuse is also an important component of matching water quality to use. "*As a resource strategy, full implementation of a "Matching Water Quality to Use" program would require significant investment in regionalization of groundwater, surface water, recycled water, and desalinized water treatment and conveyance facilities*." For example, *"where indoor and outdoor uses share in the allocation of overall least cost alternatives, such as: developing a recycled* *water system for outdoor irrigation, rather than extracting additional groundwater (high quality, drought protection)* (IRWMP Section F.3.6).

1.3.3 Central Coast Basin Plan Objectives

Recycled water also supports specific objectives of the Central Coast Basin Plan, including (IRWMP Section E.1.2.2):

- Protect and enhance all basin waters, surface and underground, fresh and saline, for present and anticipated beneficial uses, including aquatic environmental values.
- Manage municipal and industrial wastewater disposal as part of an integrated system of fresh water supplies to achieve maximum benefit of fresh water resources for present and future beneficial uses and to achieve harmony with the natural environment.
- Achieve maximum effective use of fresh waters through reclamation and recycling.
- Continually improve waste treatment systems and processes to assure consistent high quality effluent based on best economically achievable technology.

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2. STUDY AREA SETTING

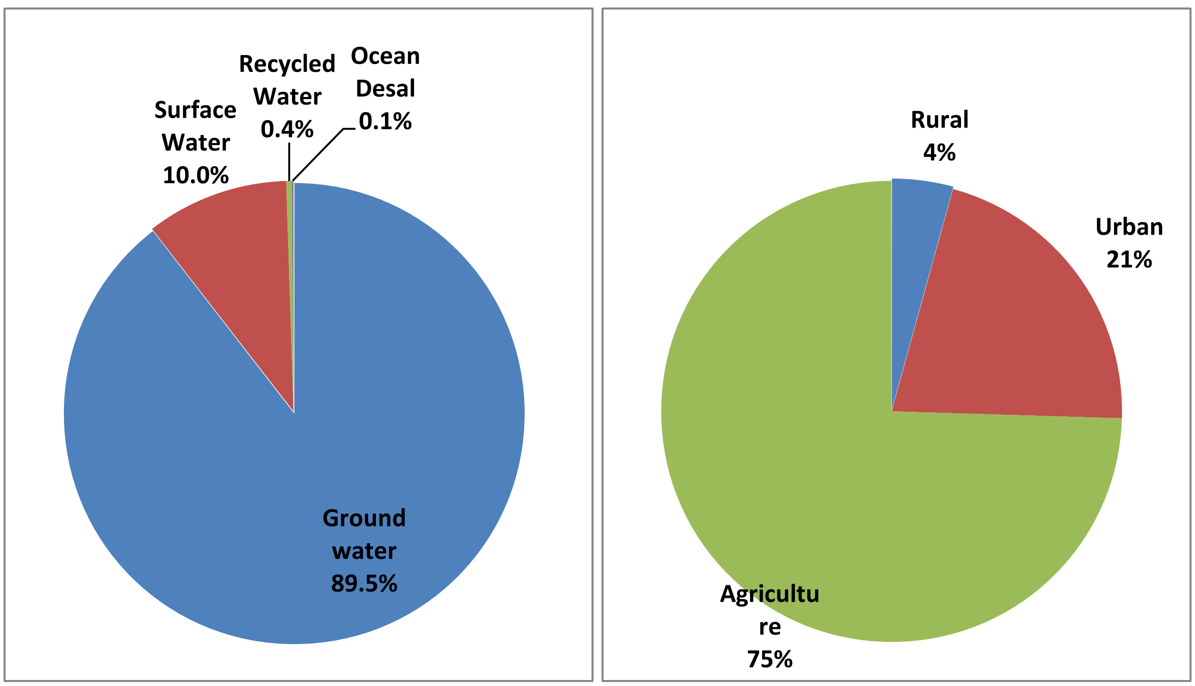
The water and wastewater setting for the SLO Region and each of the four study areas is discussed in this section.

2.1 Regional Description

2.1.1 Regional Overview

The County's water supplies consist of groundwater, local and imported surface water, recycled water, and ocean desalination. The specific water supply portfolio for each water purveyor varies according to its location and previous investments in water supply infrastructure. For example, many purveyors are entirely dependent on groundwater, while a limited number use groundwater only to meet peak season demand. As reflected in Figure 2-1, most water purveyors have a heavy reliance on groundwater.

Figure 2-1. County Water Supply Portfolio & Types of Water Use



Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

In general, there are limited untapped groundwater supplies for municipal drinking water use. As a result, many purveyors have invested in surface water supplies over the past two decades, such as the State Water Project (SWP) and Nacimiento Water Project. These new surface supplies have eased the stress on many groundwater basins. In addition, some historical supplies may be reduced in the future – whether from unsustainable pumping of groundwater, groundwater quality issues, or reductions in surface water availability. Climate change also has the potential to reduce the County's water supplies.

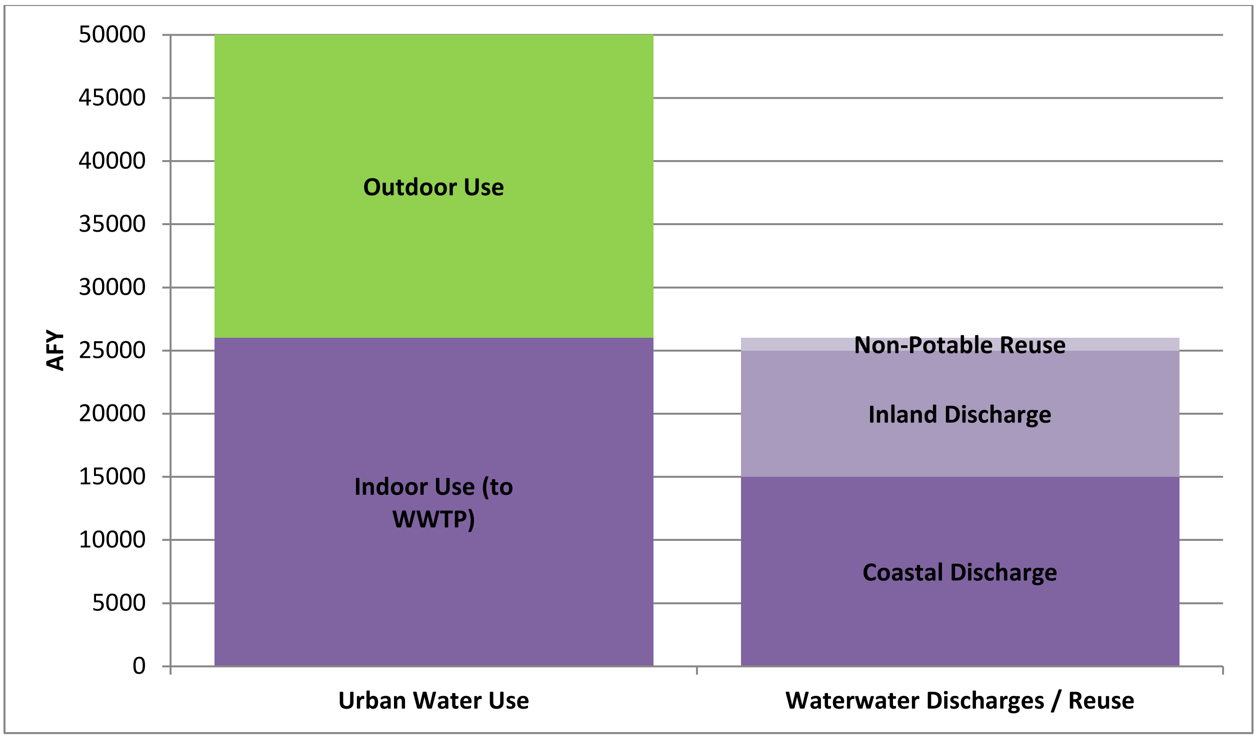
These conditions, among others, have spurred interest in recycled water, particularly in locations where treated wastewater is discharged to the ocean and no associated water supply benefit is realized. Recycled water drivers for the region include:

- New water supply for planned growth or future annexation

- Reduce areas of groundwater overdraft / depression
- Seawater intrusion barrier
- Streamflow augmentation to meet minimum environmental flows

Urban water use accounts for approximately 21% of total water use across the County, which equates to approximately 50,000 acre-feet per year (afy)[6]. As shown in Figure 2-2, approximately half of this volume is used outdoors and the other half is used indoors. Most indoor urban water use is conveyed to municipal wastewater treatment plants (WWTPs) and has the potential for reuse. Municipal WWTPs across the County are shown on Figure 2-3. After accounting for water losses and reuse within the WWTPs, approximately 20,000 afy (or roughly 10% of total water use across the County) has the potential for reuse. Finding the highest and best beneficial reuse for this volume of water is the focus of the RRWSP.

Figure 2-2. Estimated Municipal Water Use and Wastewater Production



Source: San Luis Obispo County IRWM Region Public Draft (June 2014), Section D. Water Supply, Demand, and Water Budget

Currently there are seven operational non-potable reuse (NPR) projects across the region primarily consisting of golf course irrigation with disinfected secondary recycled water from treatment plants serving planned residential communities. (Some plants, such as the City of San Luis Obispo and Woodlands WWTP, produce tertiary effluent). The City of San Luis Obispo operates the only recycled water distribution system in the region, serving primarily City parks for landscape irrigation. Also, the County Department of Public Works is currently constructing a recycled water treatment and distribution system for the community of Los Osos, which will be operational in 2016. In total, approximately 830 afy of effluent is currently reused across the region by the following existing non-potable reuse projects:

[6] The Water Education Foundation describes an acre-foot as enough water to flood a football field, which is roughly one acre in size – 1 foot deep.

- Atascadero (300 afy to Chalk Mountain Golf Course)
- California Men's Colony (200 afy to Dairy Creek Golf Course)
- Nipomo CSD, Blacklake WWTP (50 afy to Blacklake Golf Course)
- Rural Water Company WWTP (50 afy to Cypress Ridge Golf Course)
- City of San Luis Obispo (180 afy to nearby golf courses, schools, and commercial establishments; in addition to a minimum of 1,800 afy to San Luis Obispo Creek for streamflow augmentation)
- San Simeon CSD (Trucking of recycled water for irrigation started in 2014)
- Woodlands MWC WWTP (50 afy to Monarch Dunes Golf Course)

In addition, approximately 790 afy of discharges are counted toward groundwater rights:

- Nipomo CSD Southland WWTP (640 afy percolated to Nipomo Mesa groundwater)
- Templeton CSD Meadowbrook WWTP (150 afy infiltrated for Salinas River underflow)

It should be noted that many WWTPs with inland discharges are not considered planned water reuse projects but do contribute to their area's overall groundwater balance. Unplanned or incidental reuse occurs in the County via discharge of disinfected secondary effluent to percolation ponds from WWTPs without an ocean outfall. The ponds discharge to the underlying groundwater or an adjacent river and may eventually be used for potable or non-potable use, such as agriculture.

For example, a WWTP that discharges to a dry creek likely recharges the shallow / alluvial groundwater for future extraction during the dry season and, during the wet season, is carried downstream for use by others or is discharged to the ocean. The entity discharging the effluent may not receive a water supply benefit from the discharge but could receive a water supply benefit through planned reuse. The recycled water project may need to consider impacts to downstream water rights holders, including environmental flows. In either case, the existing water supply benefits of inland discharges should be considered during the evaluation of potential recycled water projects.

Unlike inland discharges, effluent discharge via ocean outfalls has no existing water supply benefit. Therefore, reuse of effluent from WWTPs with ocean outfalls would provide the largest water supply benefit. Approximately 5,700 afy of effluent is currently discharged to the ocean and the volume will rise as growth occurs in these areas. These discharges offer the highest opportunity for water supply benefit through reuse since the effluent does not provide any water supply benefit at this time. The coastal plants include:

- Avila Beach CSD
- Cambria CSD
- Cayucos CSD
- Morro Bay
- Pismo Beach
- San Simeon CSD
- SSLOCSD

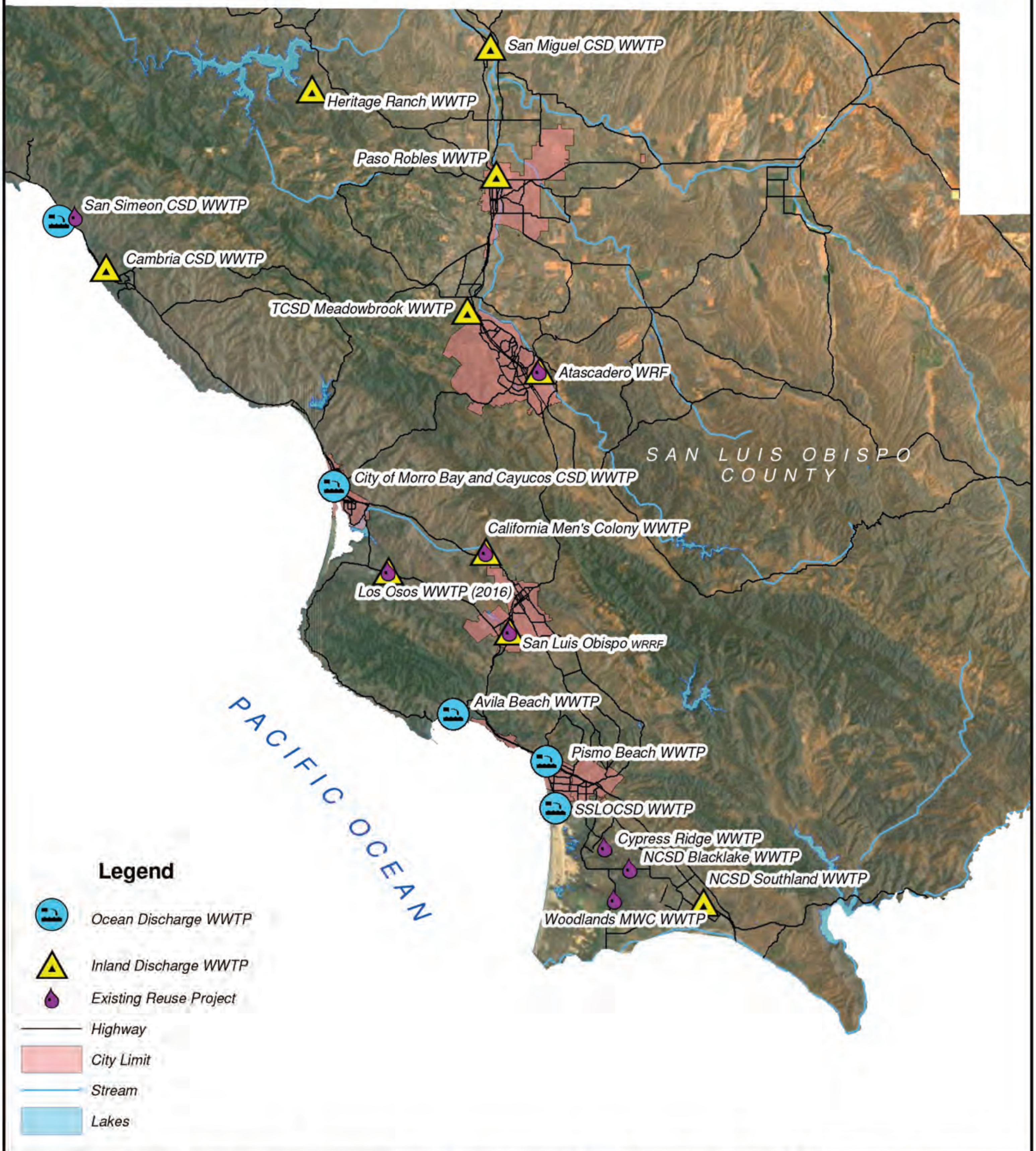


Figure 2-3: Municipal Wastewater Treatment Plants within San Luis Obispo County

Cannon

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

2.1.2 Other Recycled Water Plans

Figure 2-3 shows all the WWTPs across the County. The RRWSP investigates recycled water opportunities within Morro Bay, Nipomo CSD, Pismo Beach, SSLOCSD, and Templeton CSD. Background on reuse in each study area is presented in Sections 2.2 to 2.5. Many other areas around the County have investigated implementing and/or expanding reuse within their jurisdictions. Brief descriptions of the status of recycled water in each of these areas are included in the following sections:

City of Atascadero

The Atascadero WRF is owned and operated by the City of Atascadero. The Atascadero Mutual Water Company provides potable water services. The WRF design flow is 2.4 mgd (approximately 2,700 afy). Approximately 1.0 mgd (1,100 afy) of treated effluent is discharged annually to percolation ponds (Fugro, 2010). Chalk Mountain Golf Course pumps groundwater containing the percolated effluent for fairway irrigation. The remaining effluent recharges the Salinas River alluvium aquifer.

The City of Atascadero is currently preparing a Wastewater Collection System and Treatment Plant Master Plan update that is evaluating reuse at local parks and Atascadero Lake but no projects were defined at the time this report was prepared.

Avila Beach CSD

Avila Beach CSD completed a recycled water feasibility study in 2008. The nearby Avila Beach Golf Course could use approximately 250 afy; however, the golf course currently uses an onsite, shallow well so reuse would not offset potable water use. Also, recycled water service was estimated to be cost three to four times as much as the existing supply (Wallace, 2011).

California Men's Colony

The CMC WWTP provides tertiary treatment via oxidation ditches, sand filtration, and disinfection. The plant has a 1.2 mgd (1,300 afy) design capacity. All effluent is dechlorinated prior to discharge to Chorro Creek, where a minimum continuous flow rate of 0.75 cubic feet per second (cfs) must be maintained. The Dairy Creek Golf Course uses approximately 200 afy of recycled water for irrigation.

Cambria CSD

The CCSD owns and operates a 1.0 mgd (1,100 afy) design capacity WWTP that provides secondary treatment. The treated effluent is pumped approximately 2.5 miles north to percolation ponds, which are located off of San Simeon Creek Road along the lower reach of San Simeon Creek. The percolated effluent serves as a barrier to slow the seaward migration of subterranean fresh water, while also preventing saltwater intrusion toward the up-gradient San Simeon aquifer potable supply wells (CCSD, 2012).

Although the CCSD does not provide planned reuse of its effluent, the district is pursuing the completion of an indirect reuse project, which will extract brackish groundwater near the percolation ponds, process it through an advanced water treatment plant, and re-inject it as highly treated potable water to help recharge the CCSD's San Simeon well field wells during dry periods. The project is currently one of five recommended projects to be included in the region's 2014 IRWM Drought Grant funding application. The CCSD recently completed a detailed groundwater modeling effort for this project, which is being used to further define the project for use in completing subsequent environmental, permitting, and design tasks.

Besides its indirect potable reuse project work, past CCSD water master planning developed a planning-level distribution system for a recycled water system, which would be used for landscape irrigation. A 2004 report (Recycled Water Distribution System Master Plan (Kennedy/Jenks) estimated that approximately 50 af per dry season of existing demands could be converted and served by a recycled water system. The CCSD further estimates approximately 16 af per dry season of future irrigation demands could be met by serving a planned community park within the east Fiscalini Ranch area.

The CCSD is also in the process of soliciting proposals to plan future upgrades to its WWTP. The WWTP planning work will include a study for providing denitrification of the plant effluent, future Title 22-compliant unit processes, as well as a possible alternate point of discharge, which would provide for greater operational flexibility.

Heritage Ranch CSD

Heritage Ranch CSD (HRCSD) treats effluent from most of the homes and the few businesses of Heritage Ranch. Some private septic systems occur in the area.

The district's WWTP has a design capacity of 0.4 mgd (450 afy) and currently treats approximately 0.2 mgd (225 afy). The plant produces secondary effluent via aeration lagoons and partial treatment with sand filters. The effluent is currently percolated and eventually enters an unnamed tributary to the Nacimiento River. The district is considering construction of a spray irrigation site for effluent disposal management.

Los Osos (San Luis Obispo County)

The Los Osos Water Recycling Facility will provide tertiary filtration and UV disinfection with a design capacity of 0.9 mgd (1,000 afy). Construction of the facility is scheduled to begin in 2014 with startup planned for 2016. When completed, the facility will provide recycled water for agricultural irrigation and landscape irrigation. Wastewater not reused will be discharged to leach fields.

City of Paso Robles

The City of Paso Robles is currently upgrading its WWTP to an advanced secondary (nutrient removal) process. The purposes of the upgrade are to bring the City's discharge to the Salinas River into compliance with water quality regulations and facilitate future production of up to 4.9 mgd (5,500 afy) of recycled water. The upgrade will be complete in fall 2015.

In April 2014, the City began preliminary design of filtration and disinfection processes that are necessary to produce tertiary quality recycled water. The preliminary design will position the City to compete for grants and low-interest loans and prepare the City proceed with building the recycled water production facilities within five years if customer demand increases rapidly.

In April 2014, the City adopted a Recycled Water Master Plan (AECOM), which identifies areas in east Paso Robles where recycled water may be used to offset pumping from the Paso Robles Groundwater Basin. These include irrigation of City parks, golf courses, new development areas, and vineyards to the north and east of the City. A major vineyard owner has expressed interest in purchasing Paso's recycled water to be blended with raw Nacimiento Water, for in-lieu recharge of the Paso Robles Groundwater Basin.

Rural Water Company

The Cypress Ridge Wastewater Facility, which is owned and operated by the Rural Water Company, reuses all effluent for irrigation of the Cypress Ridge Golf Course. Total reuse in 2012 was approximately 50 afy (NMMA, 2013).

City of San Luis Obispo

Water recycling has been part of the overall water supply strategy in San Luis Obispo since the 1980's. In 1994, the City completed a major capital improvement project at its Water Resources Reclamation Facility (WRRF) that included addition of tertiary treatment and other unit processes required to meet stringent effluent quality limits intended to protect and enhance the receiving waters of San Luis Obispo Creek. The City is required to maintain a minimum average daily release, year-round, of treated effluent to San Luis Obispo Creek at a rate of 2.5 cfs (1.6 mgd or 1,800 afy) to provide satisfactory habitat and flow volume for steelhead trout within the creek environment.

The Water Reuse Project started recycled water deliveries in late 2006. By 2013, the City increased recycled water deliveries to 178 afy to 31 sites for landscape irrigation. A construction water program was started in 2009.

The City completed a Water Reuse Master Plan in 2004 with the objective to utilize approximately 1,000 acre-feet per year of recycled water. The 2004 Master Plan identified initial recycled water users and future users as well as phased expansion of the Water Reuse Project's service area to meet the Project's overall objective. The plan included the following goals:

- Increase the City's safe annual yield by utilizing recycled water for non-potable purposes, thereby offsetting the use of potable water.
- Develop a dependable water supply to meet a portion of the City's non-potable demand.
- Offset the use of potable water for non-potable purposes.
- Efficiently manage the City's water resources.
- Provide non-potable water to meet future non-potable demand.

The City will complete an update of the Master Plan in 2014 and is exploring recycled water sales to agricultural customers outside of the city limits.

San Miguel CSD

The San Miguel CSD WWTP discharges approximately 130 afy of effluent to the Salinas River alluvium aquifer (Fugro, 2010). No recycled water plans have been developed for the San Miguel CSD.

San Simeon CSD

The San Simeon WWTP discharges secondary treated municipal wastewater to the ocean via an outfall and diffuser. The plant's average dry weather flow design capacity is 0.2 mgd (225 afy). The current flows are 0.070 mgd (80 afy) are not projected to increase based on the current building moratorium.

In 2006, preliminary engineering was completed for 0.2 mgd tertiary filtration facilities. However, the approximate $600,000 (2006 dollars) cost was deemed to be too high to proceed with implementation.

In 2013, San Simeon CSD started operation of a 36,000 gpd (40 afy) tertiary filtration and advanced oxidation / disinfection system. The system meets California Division of Drinking Water (CDDW), formerly the California Department of Public Health (CDPH) requirements for disinfected tertiary recycled water (Title 22). San Simeon CSD has defined a four-phase plan to implement recycled water:

1. Increase recycled water system capacity
2. Deliver recycled water via truck to customers
3. Construct conveyance system on the west side of Highway 1
4. Construct conveyance system and storage on the east side of Highway 1

Currently, recycled water that is in excess of demand continues to discharge to the ocean. San Simeon CSD is currently seeking funds to implement the remaining phases of its plan. Phase 3 is currently one of five recommended projects to be included in the region's 2014 IRWM Drought Grant funding application.

Woodlands Mutual Water Company

The Woodlands WWTP, which is owned and operated by the Woodlands Mutual Water Company, reuses all effluent for irrigation of the Monarch Dunes Golf Course. Total reuse in 2012 was approximately 52 afy (NMMA, 2013).

2.2 Morro Bay

Per the County Master Water Report, the City of Morro Bay is part of Morro Bay Water Planning Area (WPA) 4 in the North Coast Sub-Region and is described as follows:

> *The Morro Bay WPA includes the City of Morro Bay, the Chorro Valley Water System, (California Men's Colony, Cuesta College, Camp San Luis Obispo (National Guard), County Operations Center/Office of Education), agricultural and other rural overlying users. The only groundwater supplies include the Morro and Chorro Valley Groundwater Basins. Other major supply sources include the State Water Project, desalination (City of Morro Bay), Whale Rock Reservoir, Chorro Reservoir, and recycled water. The issues in this WPA include drought impacts to groundwater supplies and groundwater quality, and availability/reliability of State Water from year to year.*

Morro Bay provides domestic water service and wastewater collection, treatment, and disposal services. Morro Bay has a population of approximately 10,000 residents with notable seasonal increases from tourism and seasonal residents. The City owns and operates the Morro Bay WWTP, which has a dry weather design flow 2.4 mgd (2,600 afy).

2.2.1 Water Supply Setting

Morro Bay has multiple source of water, including two groundwater basins (Morro and Chorro), SWP water, ocean desalination, and emergency supply agreements for use during outages. The emergency supplies include water transfer and exchange opportunities with the California Men's Colony Water Treatment Plant (supplies from Whale Rock, Chorro, and Salinas Reservoirs), Whale Rock system, and Morro Bay Power Plant.

Historically, the City exclusively relied on groundwater but now uses SWP water for the majority of its supply. The Morro and Chorro Basins are shallow alluvial aquifers with limited storage capacity that are sensitive to annual rainfall. Both basins are susceptible to nitrate contamination from nitrate-based agricultural fertilizer use. The City installed reverse osmosis

(RO) treatment in the Morro Basin to address nitrate issues and is currently working on solutions, including blending and treatment, in the Chorro Basin. Recently, several Chorro Valley groundwater wells were taken out of service due to nitrate contamination. Also, two wells were taken out of service after CDPH determined them to be under the influence of Chorro Creek surface water, which requires filtration to meet the drinking water standard per the Surface Water Treatment Rule.

Morro Basin groundwater was previously unavailable for potable use due to methyl tertiary butyl ether (MTBE) contamination. In 2008, the RWQCB issued a report indicating that as a result of remedial action and natural attenuation, groundwater and MTBE-impacted soil had been sufficiently cleaned / removed and the need for further investigation or clean-up action was eliminated. Seawater intrusion concerns in the Morro Basin appear to have been addressed by limiting City pumping to the existing pumping rights.

The City constructed a seawater desalination plant in 1992 under emergency drought conditions. The current seawater reverse osmosis (SWRO) system is limited by iron fouling, and the plant is only used to help meet seasonal peaking demands and during SWP delivery outages. The facility was expanded in 2009 with brackish water reverse osmosis (BWRO) treatment to treat nitrate contaminated groundwater from the Morro Basin. The BWRO system provides the City's primary water supply during SWP delivery outages and is used to meet peak demands during SWP deliveries.

According to the City's 2010 Urban Water Management Plan (UWMP) (CH2MHill, 2011):

> *The City plans to make full beneficial use of its appropriative rights in both the Morro and Chorro Groundwater Basins while implementing conservation and using surface water conjunctively. Beyond these recent water supply shortages, the City needs to identity sufficient water supplies to serve the City under the following conditions: 1) To improve water supply operational reliability during droughts. 2) To plan for short-term supply shortfalls when State Water or other City water supplies are not available.*

Table 2-1. Existing Water Supplies – Morro Bay

Supply	2010 Use		Maximum Rights / Capacity	
State Water Project	873 afy	69%	1,313 afy[1]	35.5%
Groundwater	*386 afy*	*31%*	*1,724 afy*[2]	*47%*
Chorro Basin	312 afy	25%	1,143 afy (3.2 cfs)[2,3]	31%
Morro Basin	74 afy	6%	581 afy (1.2 cfs)[2]	16%
Desalination	--	--	645 afy	17.5%
Total	**1,259 afy**	**100%**	**3,682 afy**	**100%**

Source: Morro Bay 2010 UWMP (CH2MHIll, 2011)
Notes:

1. The City also has a 174% drought buffer
2. Groundwater rights are lower in drought years
3. Chorro rights can only be pumped when Chorro Creek flows exceed 1.4 cfs

2.2.2 Wastewater Setting

The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility (WRF). The effort became necessary after the California Coastal Commission voted in January 2013 to deny the Coastal Development Permit for construction of an upgraded wastewater treatment plant at its existing location. Existing and projected recycled wastewater flows are presented in Table 2-2.

Table 2-2. Existing and Projected Effluent Flows – Morro Bay

	Existing (2010)		Projected (2035)	
Morro Bay	0.87 mgd	975 afy	1.0 mgd	1,121 afy
Cayucos CSD	0.25 mgd	275 afy	0.3 mgd	326 afy
Total	**1.12 mgd**	**1,250 afy**	**1.3 mgd**	**1,437 afy**

Source: Draft City of Morro Bay and Cayucos Sanitary District 2012 Recycled Water Feasibility Study (Dudek, 2012)

2.2.3 Recycled Water Setting

The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility (WRF). One key goal of the new facility is to produce disinfected tertiary effluent for reuse. In February 2014, the City set a goal to have the new WRF online in five years from issuance of the final NPDES permit (anticipated for late 2014/early 2015). The City Council is scheduled to decide on a site in late 2014.

There are a range of recycled water opportunities in and around the city, including landscape irrigation, agricultural irrigation, and groundwater recharge / streamflow augmentation. The city wants to maximize reuse from the new WRF. However, implementation of each type of potential reuse is subject to constraints, and feasible recycled water options are ultimately dependent on the site selected for the new WRF.

The New Water Reclamation Facility Project Report on Reclamation and Council Recommended WRF Sites (May 8, 2014) identified potential types of reuse from the new WRF:

- Irrigated Agriculture
- Streamflow Augmentation in Creeks
- Irrigation of Landscaping, Parks, and Golf Courses
- Groundwater Recharge

The largest opportunity is agricultural irrigation in Morro Valley (primarily avocados and some row crops) and, to a lesser extent, in the Chorro Valley. There are important though less plentiful opportunities within the City itself as well as in Cayucos, primarily related to landscaping and parks. Table 2-3 summarizes the estimated annual demand for irrigated agriculture, parks, landscaping, and golf courses in the various areas near the city.

Several creeks in the area are potential candidates for streamflow augmentation. Additional streamflow has the potential to provide enhanced habitat or to augment existing water supplies. However, discharge to creeks is strictly regulated and it is not known at this time what permit conditions would be attached with such a use, which would depend to some extent on the characteristics of the creeks and their associated beneficial uses as described in the Basin Plan. In addition, the water rights issues associated with this approach must be resolved before it can be considered a feasible approach to meeting the city's goals.

Use of secondary effluent for irrigation of feed and fodder crops was not included in the 2012 Recycled Water Feasibility Study but is a feasible reuse alternative. Demands associated with the potential types of reuse are summarized in Table 2-3.

Table 2-3. Potential Non-Potable Reuse – Morro Bay

Area	Number of Sites	Average Annual Demand	Notes
Morro Valley	56	2,736 afy	All 56 sites are irrigated agriculture, totaling about 1,094 acres.
Chorro Valley	4	1,058 afy	About 398 acres of irrigated agriculture on 2 large parcels; Other 2 sites are Dairy Creek Golf Course and the Botanical Gardens.
City of Morro Bay	23	427 afy	Includes the Morro Bay Golf Course, various parks and elementary schools, and roadway landscaping.
Cayucos	9	538 afy	Includes irrigated agriculture, parks, roadways, and the Cayucos---Morro Bay Cemetery.
Total	**92**	**4,760 afy**	

Source: New Water Reclamation Facility Project Report on Reclamation and Council Recommended WRF Sites (May 8, 2014), Table ES-1

2.3 Nipomo Community Services District

Per the County Master Water Report, the NCSD is part of the South Coast WPA 7 in the South Coast Sub-Region and is described as follows:

> *The South Coast WPA includes Edna Valley (Golden State Water Company); the Northern Cities Management Area (NCMA), which includes the Cities of Pismo Beach, Arroyo Grande, and Grover Beach, Oceano Community Services District, agricultural and rural overlying users; the Nipomo Mesa Management Area (NMMA), which includes the Golden State Water Company, Nipomo Community Services District (NCSD), Rural Water Company, Woodlands Mutual Water Company (Woodlands MWC), Phillips 66, agricultural and rural overlying users; the Santa Maria Valley Management Area (SMVMA), which includes the City of Santa Maria, agricultural and rural users; and agricultural and rural users outside of the three management areas.*
>
> *The primary groundwater supplies include the Edna, Pismo Creek, and Arroyo Grande Valley Sub-basins, the Santa Maria Valley Groundwater Basin, and the Pismo Formation. Other major supply sources include the State Water Project, Lopez Lake Reservoir, and recycled water. The issues in this WPA include adjudicated groundwater basins, limited groundwater supply, and to some extent groundwater quality.*

NCSD provides domestic water service to approximately 12,000 residents and wastewater collection and treatment to approximately 9,000 residents. NCSD is part of the Nipomo Mesa Management Area (NMMA) for management of groundwater.

Development of recycled water opportunities within NCSD relied upon several previous reports:

- Evaluation of Supplemental Water Alternatives – TM No. 1: Constraints Analysis (AECOM, 2007)
- NCSD 2010 UWMP (WSC, 2011)
- NMMA – 2012 Annual Report (NMMA Technical Group, 2013)
- Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, 2009)

The following sections summarize NCSD's water supply, wastewater, and recycled water settings.

2.3.1 *Water Supply Setting*

The NCSD currently relies exclusively on groundwater from the Santa Maria Valley Groundwater Basin to meet demands. NCSD signed a Stipulation regarding the groundwater basin in 2005 that divided the basin into three administrative management areas: 1) the Northern Cities Management Area (NCMA), 2) the NMMA, and 3) the Santa Maria Valley Management Area (SMVMA). The NMMA is discussed further here, the NCMA is discussed in Section 2.4.1, and the SMVMA is outside the study area (in Santa Barbara County). The NMMA includes NCSD, Golden State Water Company (GSWC), Rural Water Company, Woodlands Mutual Water Company, Phillips 66, and representatives of stipulated overlying users.

The Stipulation also provides that a minimum of 2,500 afy of supplemental water from the City of Santa Maria be transmitted to the NMMA by NCSD with funding participation from Woodlands, GSWC, and Rural Water Company. In June 2013, the NCSD Board approved construction of a supplemental water pipeline to transmit water from Santa Maria to Nipomo. The project is being built in three phases. The initial phase, which is under construction and scheduled to start deliveries in late 2015, can convey up to 650 afy. The second phase is planned to convey a total of 1,600 afy and the third phase is planned to convey a total of 3,000 afy. Implementation of the second and third phase is pending funding availability.

NCSD has pumped up to 2,900 afy of groundwater over the past several years. Once the supplemental water project is online, the Santa Maria water will be used as the District's baseline supply and the amount of future groundwater pumping will be reduced by the volume of Santa Maria water used. Water demand projections in the 2010 UWMP projects demand to reach approximately 4,000 afy by 2030 to be met by a combination of Santa Maria water and groundwater.

2.3.2 *Wastewater Setting*

The NCSD owns and operates two WWTPs: the Blacklake WWTP and Southland WWTF. The Blacklake WWTP collects and treats approximately 0.06 mgd (60 afy) of wastewater from the Blacklake community sewer system. The plant provides secondary effluent for irrigation of the adjacent Blacklake Golf Course water hazards. The plant has a 0.2 mgd (220 afy) design flow capacity. A plant master plan update is currently being prepared.

The Southland WWTF treats wastewater from the 'Town Sewer' collection system. The current facility produces secondary effluent with aerated lagoons and has a design capacity of 0.9 mgd (1,000 afy). The plant is currently undergoing an upgrade to produce advanced secondary effluent with an extended aeration via a Parkson Biolac® system. The initial design capacity is 0.9 mgd (1,000 afy) with an opportunity for expansion to 1.8 mgd (2,000 afy).

Table 2-4. Existing and Projected Recycled Wastewater Supplies – Nipomo CSD

	Existing (2010)		Future (2030)	
Blacklake WWTP	0.07 mgd	80 afy	0.07 mgd	80 afy
Southland WWTF	0.8 mgd	900 afy	1.7 mgd	1,900 afy

Source: 2010 NCSD UWMP (WSC, 2011)

2.3.3 *Recycled Water Setting*

NCSD completed a disposal alternatives study for the Southland WWTF in 2009 (AECOM) that included reuse as part of the larger master planning and design effort to upgrade the plant. The

District is currently preparing an updated master plan for the Blacklake WWTP. Both plants currently maximize reuse (planned and unplanned). Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. The Southland WWTF effluent percolates into the underlying groundwater basin, and these flows are included in the NMMA water balance.

The 2009 study identified potential non-potable reuse opportunities from the Southland WWTF at local parks and regional golf courses with tertiary treatment. Reuse at these locations would offset pumping in existing groundwater depressions and could provide more direct benefits to NCSD than existing percolation discharge could provide. However, NCSD would not necessarily receive new water from this type of project since percolated water from Southland WWTF is already accounted for in the NMMA water balance.

Recycled water use for agricultural irrigation was considered in the 2009 study and found to be the most cost-effective reuse option. However, the option was also not carried forward due to a lack of significant water supply benefit. If landscape or agricultural irrigation with recycled water occurs in strategic locations, such as offsetting pumping in groundwater depressions, NCSD would receive a small benefit of marginal groundwater level recovery in the area.

Regardless of a water supply benefit, the 2009 study recommended further consideration of both reuse via landscape and agricultural irrigation in the event that the Southland WWTF effluent disposal is restricted in the future.

Table 2-5. Potential Non-Potable Reuse – Nipomo CSD

Type of Non-Potable Reuse	Average Annual Demand		Peak Day Demand
	afy	mgd	mgd
Existing Landscape Irrigation	200	0.2	0.4
Existing Independent Irrigation	900	0.8	1.6
Existing Agricultural Irrigation	1,000+	0.9+	1.8+
New Development	--	--	--
Total	**2,100+**	**1.9+**	**3.8+**

Note: Refer to Section 7.3 for discussion of the potential recycled water market.

Groundwater recharge of recycled water was considered in the 2007 TM (AECOM) but was not recommended due to the lack of a water supply benefit. A small benefit could be derived from recharge if were to occur within the existing pumping depression, but the benefit is marginal.

2.4 Northern Cities

The four agencies coordinating for the Northern Cities (Pismo Beach, Arroyo Grande, Oceano CSD, Grover Beach, and SSLOCSD) are part of the South Coast WPA 7, which was described in the previous section.

Water and wastewater services provided by each agency are as follows:

- Pismo Beach provides domestic water service and wastewater collection and treatment services.
- Arroyo Grande provides domestic water service and wastewater collection.
- Grover Beach provides domestic water service and wastewater collection.
- Oceano CSD provides domestic water service and wastewater collection.

- SSLOCSD provides wastewater treatment and disposal services for sewer flows from Arroyo Grande, Grover Beach, and Oceano CSD.

Development of recycled water opportunities within the Northern Cities has relied upon several previous reports:

- Arroyo Grande 2010 Urban Water Management Plan (City of Arroyo Grande,2012)
- Grover Beach 2010 Urban Water Management Plan (City of Grover Beach, 2011)
- Incremental Reclaimed Water Study in The City of Pismo Beach (RRM, 2008)
- Pismo Beach 2010 Urban Water Management Plan (Carollo, 2011a)
- Pismo Beach Water Reuse Study (Carollo, 2007)
- Recycled Water Distribution System Conceptual Plan - SSLOCSD WWTP TM and Recycled Water Distribution System Conceptual Plan - Pismo Beach WWTP TM (Wallace Group, 2010)
- San Luis Obispo County Draft Facilities Inventory – Chapter 4: Oceano
- SSLOCSD Water Recycling Update Report (Wallace, 2009)
- Zone 3 2010 Urban Water Management Plan (Wallace, 2011)

The following sections summarize the Northern Cities' water supply, wastewater, and recycled water settings.

2.4.1 Water Supply Setting

The four water purveyors in the study area have a mix of water supplies, as summarized in Table 2-6. Each agency is exploring new water supplies as existing supply quantity and/or reliability decreases. For example, each agency has reduced groundwater production to manage overdraft conditions and reduce the potential for seawater intrusion.

Table 2-6. Existing Water Supplies – Northern Cities

	Pismo Beach	Arroyo Grande	Grover Beach	Oceano CSD
Groundwater[1]	X	X	X	X
Lopez Reservoir	X	X	X	X
State Water Project	X			X

Note:

1. Santa Maria Groundwater Basin, Northern Cities Management Area; Paso Robles Formation gravel zones and the Careaga Formation sand.

Groundwater for Northern Cities purveyors is from the Santa Maria Valley Groundwater Basin. The purveyors are signatories to the 2005 Settlement Stipulation for the Santa Maria Groundwater Basin Adjudication (Stipulation) regarding the groundwater basin from 2005. The Stipulation divided the groundwater basin into three administrative management areas: 1) Northern Cities Management Area (NCMA), 2) Nipomo Mesa Management Area (NMMA), and 3) Santa Maria Valley Management Area (SMVMA). The NCMA includes the Cities of Pismo Beach, Arroyo Grande, and Grover Beach, Oceano Community Services District, agricultural and rural overlying users. The NMMA is discussed in Section 2.3.1and the SMVMA is outside the study area (in Santa Barbara County).

2.4.2 Wastewater Setting

The Pismo Beach WWTP is owned and operated by the City of Pismo Beach. The plant collects wastewater from within city limits. The current WWTP provides advanced disinfected secondary treatment with oxidation ditches and secondary clarifiers and has a design flow capacity of 1.9 mgd (2,100 afy). The treated effluent is pumped to the joint (with SSLOCSD) ocean outfall, which has a capacity of 8.5 mgd that is shared between SSLOCSD (56% of capacity) and the City of Pismo Beach (44%).

The SSLOCSD WWTP is owned and operated by SSLOCSD. The plant treats wastewater from Arroyo Grande, Grover Beach, and Oceano CSD. The current WWTP provides secondary treatment using a fixed film reactor and disinfection and has a design flow capacity of 5 mgd (5,600 afy). Treated effluent is discharged through the existing joint ocean outfall line.

Table 2-7. Existing and Projected Recycled Wastewater Supplies - Northern Cities

	Existing		Projected (2035)	
Pismo Beach	1.1 mgd	1,230 afy	1.8 mgd	2,020 afy
SSLOCSD	2.6 mgd	2,910 afy	3.5 mgd	3,920 afy
Total	**3.7 mgd**	**4,140 afy**	**5.3 mgd**	**5,940 afy**

2.4.3 Recycled Water Setting

Each agency in the area has previously investigated the use of recycled water. The results of these and other efforts are discussed for the Pismo Beach WWTP and SSLOCSD WWTP below.

Pismo Beach WWTP

Pismo Beach completed a recycled water planning study in 2007. Since 2007, recycled water plans have continually been refined as related planning efforts have progressed, including the Spanish Springs development, Incremental Reclaimed Water Study (RRM, 2008), and Arroyo Grande Recycled Water Distribution System Conceptual Plan from Pismo Beach WWTP TM (Wallace, 2010). The 2007 study defined a range of potential projects, and the 2008 study defined infrastructure required for initial system phases.

The 2007 study identified several landscape irrigation customers that could be served cost effectively from the WWTP, but the prospect of updating treatment for the relatively small volume of demand was deemed not cost effective.

The 2010 Arroyo Grande TM evaluated reuse within Arroyo Grande from the Pismo Beach WWTP with and without WWTP tertiary treatment upgrades. Use of the existing disinfected secondary effluent limited reuse to one or two customers. The potential tertiary upgrade expanded the non-potable reuse potential, but no cost-effective non-potable reuse projects were identified.

The most recent documentation of Pismo Beach recycled water plans is the Pismo Beach 2010 UWMP (Carollo, 2011a). The 2010 UWMP identified several components to a future system:

- Upgrade the Pismo Beach WWTP to tertiary treatment and disinfection to meet Title 22 criteria for disinfected tertiary recycled water.
- Construct a distribution system to the proposed Price Canyon development for landscape and agricultural irrigation reuse (approximately 340 afy).

- Construct a distribution system to existing Pismo Beach sites for landscape irrigation reuse (approximately 330 afy).
- Use the remaining recycled water (700 afy in 2015 to 1,300 afy in 2035) for indirect potable reuse from groundwater recharge via surface spreading or injection to increase groundwater supplies. This project could also be used to prevent seawater intrusion.

As part of their development agreement with the City, the developers of “Spanish Springs” were proposing to fund an upgrade the Pismo Beach WWTP to tertiary treatment and use this non-potable water for all of the landscape needs within the development as well as provide the infrastructure to irrigate the Pismo Beach Sports Complex and install a pipeline stub out to the Cal Trans right-of-way for non-potable irrigation of landscaping along US Highway 101. However in June of 2014, the City Council took no action with respect to the project or development agreement. In November of this year the Citizens of Pismo Beach will vote on an initiative that will not allow the scale of development in the Price Canyon planning area that has been proposed to date, should the land be annexed into the City.

SSLOCSD WWTP

SSLOCSD completed a recycled water planning study in 2009 (Wallace). In 2010, Arroyo Grande completed a complementary study – Recycled Water Distribution System Conceptual Plan from SSLOCSD WWTP TM (Wallace, 2010).

Substantial reuse from SSLOCSD WWTP will require an upgrade to tertiary treatment, and additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or the types of reuse (e.g., stream augmentation and indirect potable reuse). The 2009 study addressed these upgrades and identified several viable projects:

- Agricultural irrigation
- Stream augmentation (Arroyo Grande Creek)
- Groundwater recharge

Landscape irrigation within the SSLOCSD service area was evaluated as part of the study but deemed not cost effective. In addition, several steps were identified as a follow-up study to substantiate the feasibility of the viable projects.

The Arroyo Grande TM evaluated reuse within Arroyo Grande and Grover Beach with and without WWTP tertiary upgrades. Use of the existing effluent limited reuse to one or two customers. The tertiary upgrade expanded the non-potable reuse potential, but neither study identified cost-effective non-potable reuse projects from either WWTP.

Currently, SSLOCSD’s efforts are focused on improving the existing system processes to improve effluent quality. SSLOCSD is not pursuing implementation of recycled water projects but does consider reuse as part of future operations and is considering future tertiary upgrades as part of the current WWTP improvement efforts.

Summary

Non-potable reuse opportunities from Pismo Beach WWTP and SSLOCSD WWTP are summarized in Table 2-8.

Table 2-8. Potential Non-Potable Reuse – Northern Cities

	Pismo Beach WWTP			SSLOCSD WWTP		
	Average Annual		Peak Day	Average Annual		Peak Day
Type of Non-Potable Reuse	afy	mgd	mgd	afy	mgd	mgd
Existing Landscape Irrigation	260	0.23	0.46	270	0.24	0.48
Existing Independent Irrigation	80	0.08	0.16	--	--	--
Existing Agricultural Irrigation	--	--	--	9,000	8.0	16.0
New Development	340	0.30	0.60	--	--	--
Total	**680**	**0.61**	**1.22**	**9,270**	**8.24**	**16.5**

Note: Refer to Section 8.3 and Section 9.3 for discussion of the potential recycled water market for Pismo Beach and SSLOCSD, respectively.

2.5 Templeton CSD

Templeton CSD is part of the Atascadero/Templeton WPA 13. Per the County Master Water Report:

> *The Atascadero/Templeton WPA includes the Templeton Community Services District (Templeton CSD), Atascadero Mutual Water Company, Garden Farms Community Water District, agricultural and rural users. The primary sources of water supply for this WPA are the Atascadero Groundwater Sub-basin (Paso Robles Formation and Salinas River Underflow), recycled water, and the Nacimiento Water Project. The issues in this WPA include limited basin yield and State managed water rights to the Salinas River underflow.*

Templeton CSD provides domestic water service and wastewater collection, treatment, and disposal services. TCSD has 2,585 water service connections and approximately 1,327 sewer service connections (TCSD, 2013). Recent water demand (2006 – 2010) was 1,645 afy and is projected to increase to 2,512 afy at build-out. TCSD owns and operates the Meadowbrook WWTP, which has a permitted capacity of 0.6 mgd (670 afy).

Note that the information provided in this section relied primarily upon the Water and Wastewater Master Plan Update (TCSD, October 2013).

2.5.1 Water Supply Setting

TCSD's primary source of water is groundwater from three shallow wells pumping from the unconfined Salinas River alluvial aquifer (Salinas River Underflow) and 10 deep wells pumping from the confined Atascadero sub-basin[7] within the Paso Robles Groundwater Basin (Table 2-9). TCSD operates the wells within water rights constraints to meet the seasonal demands, which generally results in reliance on the deep aquifer wells during the high-demand summer season. Two deep wells require blending to address periodic drinking water maximum contaminant level exceedances for nitrate (at one well) and arsenic (at more than one well).

[7] Identified as the Templeton Sub-Area in the Central Coast Basin Plan.

Table 2-9. Existing Water Supplies – Templeton CSD

Supply	Max (afy)	Notes
Atascadero Sub-Basin	1,040	Based on sustainable yield
Salinas River Underflow		
Water Rights Permit 8964	500	Limited to 10/1 to 3/31
Greer Riparian Right	102	Limited to 4/1 to 10/15
Riparian Right Agency Agreements	60	Matches actual use by riparian customers
Meadowbrook WWTP	164	Recent average discharge less 2% conveyance loss
Nacimiento Water	245	Contract amount less 2% conveyance loss
Total	**2,111**	

Source: TCSD, 2013

Salinas River underflow is augmented by two TCSD sources: treated wastewater effluent and untreated Nacimiento water. TCSD's Meadowbrook WWTP treated effluent discharges into rapid infiltration basins at the Selby Percolation Pond Site (Selby Ponds). The treated wastewater percolates into the Salinas River underflow. For municipal purposes, TCSD retrieves the amount of water percolated, less 2% for conveyance losses, at TCSD wells located downstream.

In 2011, the Nacimiento Water Project was completed and the District began receiving deliveries at the Selby Ponds. TCSD currently discharges the untreated Nacimiento water at the Selby Ponds and will start capturing the flow at TCSD's Salinas River underflow wells downstream in 2014.

2.5.2 Wastewater Setting

TCSD has two wastewater tributary areas. One area (approximately 0.15 mgd or 170 afy) flows to Meadowbrook WWTP, which is owned and operated by TCSD, and the other area (approximately 0.22 mgd or 250 afy) flows to the Paso Robles WWTP under an agreement with the City of Paso Robles.

The Meadowbrook WWTP is an Advanced Integrated Pond System (AIPS) that applies a series of treatment ponds. As discussed above, the effluent is discharged into the Selby Ponds where it percolates into the underflow and retrieved downstream by TCSD. The Paso Robles WWTP discharges approximately 3.0 mgd (3,400 afy), including 0.22 mgd (250 afy) from TCSD, directly to the Salinas River.

Flows to the Meadowbrook WWTP are projected to increase from 0.15 mgd (170 afy) to 0.67 mgd (750 afy) under build-out conditions in 2040, as summarized in Table 2-10.

Table 2-10. Existing and Projected Effluent Flows – Meadowbrook WWTP

	Existing		Projected (Build-Out, 2040)	
Existing	0.15 mgd	170 afy	0.40 mgd	450 afy
With Diversion	0.37 mgd	410 afy	0.67 mgd	750 afy

Source: TCSD, 2013

In August 2012, TCSD received approval from the SWRCB to redirect sewer flows currently treated at the Paso Robles WWTP instead to the Meadowbrook WWTP. The Meadowbrook WWTP has a permitted capacity to treat 0.6 mgd (670 afy) and discharge to the Selby Ponds. Flows would remain within permitted capacity with the addition of 0.22 mgd (250 afy) of diverted flow. TCSD also retains the right to capture for municipal purposes the amount of water percolated less a conveyance loss.

The diversion would be achieved with the East Side Force Main and Lift Station Project, which was recommended for implementation in the recent Master Plan Update. The diversion requires construction of new conveyance infrastructure, including a new pump station and approximately 12,000 linear feet (LF) of pipeline.

2.5.3 Recycled Water Setting

Templeton CSD is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges through augmentation of Salinas River underflow. However, the Selby Ponds may not have enough capacity to percolate all of the proposed diverted flow in addition to the untreated Nacimiento water currently being discharged. Currently, TCSD is in the process of investigating options to improve effluent quality with the intention of improving recharge basin performance and related capacity.

TCSD has not completed a recycled water study but, based on preliminary customer information collected during preparation of the 2013 Master Plan Update and conversations with TCSD, the following types of reuse may be feasible and will be investigated as part of the RRWSP:

- Irrigation of “feed and fodder” crops, which commonly include alfalfa, barley, and grasses
- Irrigation of vineyards, orchards, or row crops
- Municipal landscape irrigation of parks, schools, and future residential developments
- Commercial landscape irrigation of equestrian farms
- Recharge of a deep groundwater basin via surface spreading or direct injection

Table 2-11. Potential Non-Potable Reuse – Templeton CSD

Type of NPR	Average Annual		Peak Day
	afy	mgd	mgd
Existing Municipal Irrigation	20	0.02	0.04
Existing Independent Irrigation	200	0.18	0.36
Existing Agricultural Irrigation	300	0.27	0.54
New Development	TBD	TBD	TBD
Total	**520**	**0.47**	**0.93**

TBD To be determined
Note: Refer to Section 10.3 for discussion of the potential recycled water market.

2.6 Summary of Recycled Water Setting

2.6.1 Study Area

The following is a summary of the current recycled water setting for each area:

- **Morro Bay** is currently conducting a planning effort to identify a new water reclamation facility. The site selected for the new facility will determine the potential for reuse by Morro Bay because of proximity to, and water quality limits of, potential customers / types of reuse. Types of potential reuse include landscape irrigation, agricultural irrigation, stream enhancement, and groundwater recharge. The City Council is scheduled to decide on a site in late 2014. The next steps for Morro Bay recycled water should be better understood at this time.
- **Nipomo CSD** has two treatment plants, and both reuse all effluent. Blacklake WWTP effluent is reused at Blacklake Golf Course, and Southland WWTF effluent is discharged to (and recharges) the underlying groundwater basin. Reuse of Southland WWTF effluent for landscape irrigation in strategic locations, such as offsetting pumping in groundwater depressions, could provide more direct benefits to NCSD but would not necessarily provide new water. Also, Southland WWTF would need a tertiary treatment upgrade or an equivalent soil aquifer treatment and pumping system.
- **Northern Cities** has two potential recycled water sources – Pismo Beach and SSLOCSD. Studies for each plant identified limited viable existing municipal reuse opportunities. Both plants will require an upgrade to tertiary treatment and may require additional treatment to meet regulatory or customer needs for some reuse options. The most cost-effective opportunity identified for Pismo Beach was the implementation of a recycled water system in conjunction with new development in Price Canyon. The most cost-effective opportunity identified for SSLOCSD was agricultural irrigation, potentially combined with Arroyo Grande Creek stream augmentation. Studies for both plants identified groundwater recharge as a potential use of remaining recycled water.
- **Templeton CSD** is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges and is planning to divert district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the wastewater diversion in addition to untreated Nacimiento water, so reuse opportunities are being explored. Most reuse options will require an upgrade to tertiary treatment.

Table 2-12 summarizes existing and projected effluent flows for each plant in the study area. Table 2-13 summarizes the potential non-potable reuse identified for each agency.

Table 2-12. Existing and Projected Effluent Flows – RRWSP Agencies

Agency / WWTP	Existing		Projected (2030/2035)	
TCSD Meadowbrook WWTP	0.15 mgd	170 afy	0.40 mgd	450 afy
With Diversion	0.37 mgd	410 afy	0.67 mgd	750 afy
Morro Bay WRF	0.87 mgd	975 afy	1.0 mgd	1,121 afy
With Cayucos CSD	1.12 mgd	1,250 afy	1.3 mgd	1,437 afy
Pismo Beach WWTP	1.1 mgd	1,230 afy	1.8 mgd	2,020 afy
SSLOCSD WWTP	2.6 mgd	2,910 afy	3.5 mgd	3,920 afy
NCSD Blacklake WWTP	0.07 mgd	80 afy	0.07 mgd	80 afy
NCSD Southland WWTF	0.8 mgd	900 afy	1.7 mgd	1,900 afy
Total	**5.6 mgd**	**6,250 afy**	**9.0 mgd**	**10,100 afy**

Note: Each treatment plant will need treatment upgrades to meet regulatory and customer water quality requirements for most types of reuse.

Table 2-13. Potential Non-Potable Reuse – RRWSP Agencies

	TCSD	Morro Bay	Pismo Beach	SSLOCSD	NCSD
Existing Potential Supply	170	1,250	1,230	2,910	1,000
Projected Build-out Supply	750	1,440	2,020	3,920	2,000
Type of Non-Potable Reuse					
Existing Municipal Irrigation	20	853	260	270	200
Existing Independent Irrigation	200	275	80	--	900
Existing Agricultural Irrigation[1]	300[1]	3,731[1,2]	--	2,400[1]	1,000[1]
New Development	TBD	--	340	--	--
Total	**520**	**4,760**	**680**	**3,100**	**2,100**

Note: All values in afy

1. Morro Bay non-potable opportunities are for four areas within and near the city. Opportunities will be limited to those within an economical distance from the new WRF location, which has not been selected. Refer to Table 2-3 for a breakdown between areas.
2. Agricultural irrigation demand estimates vary depending on potential acreage included, which is based on distance from recycled water source, actual demand per acre factors (crop type, soil type, etc.), and pricing of recycled water. Actual demand could be significantly higher or lower.

2.6.2 Outside Study Area

Other recycled water opportunities existing across the County that are not explored further in the RRWSP but are relevant to regional reuse include:

- Reuse from plants with coastal/ocean outfalls (Avila Beach CSD and San Simeon CSD) would provide a 1:1 water supply benefit, since the existing discharges do not provide any existing water supply benefits
- San Simeon CSD recently added a tertiary treatment system and is providing recycled water for delivery via truck to customers. They are now seeking funding to construct a distribution system.
- Cambria CSD currently percolates effluent to serve as a seawater intrusion barrier and is currently pursuing an indirect potable reuse project. The Cambria CSD's indirect reuse project will pump a portion of the percolated effluent for advanced treatment and inject near the CCSD's San Simeon well field.
- Reuse of effluent within the Paso Robles Groundwater Basin to help to alleviate existing groundwater overdraft conditions
- Opportunities to serve recycled water to agricultural customers to offset groundwater pumping

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3. REGULATORY, PERMITTING, AND LEGAL REQUIREMENTS

This chapter identifies the regulatory, permitting, and legal requirements for implementing non-potable water reuse projects, potable water reuse projects, and inland surface water discharge projects for streamflow or reservoir augmentation using recycled water. More detailed information is presented in the Regulatory, Permitting, and Legal Requirements for Recycled Water TM in Appendix B and the Regulatory, Permitting, And Legal Requirements for Surface Water Discharges TM in Appendix C. The chapter is organized into the following sections:

- DDW (formerly CDPH)[8] regulations
- SWRCB policies
- RWQCB requirements
- Permitting water reuse projects

The use of recycled water (potable and non-potable) is regulated under the Clean Water Act when applicable (for example, when a project involves discharge to a Water of the U.S.), the Safe Drinking Water Act, and several State laws, regulations, and policies, with different responsibilities assigned to the SWRCB, the SWRCRB DDW, and the nine RWQCBs.

The California Water Code (CWC) and Health and Safety Code contain California's statutes that regulate the use of water and the protection of water quality, public health, water recycling, and water rights. The key statutes that are relevant to water recycling include:

- Water rights
- Recycled water definitions for potable and non-potable reuse
- Authority for adopting state policies to protect water quality and develop regulations to protect drinking water
- Authority related to issuance of recycled water permits
- Authority to develop recycled water regulations

A complete compendium of applicable statutes is available on the DDW website.[9]

3.1 DDW Regulations

Applicable DDW recycled water regulations are presented in the following sections:

- Non-potable reuse regulations
- Groundwater recharge regulations
- Surface water augmentation regulations

3.1.1 Non-Potable Reuse Regulations

The non-potable reuse criteria in Title 22 of the California Code of Regulations (CCR) establish levels of treatment and use area requirements for irrigation, recreational impoundments, cooling water, and other uses, such as toilet flushing, commercial car washing, laundries, and

[8] Effective July 1, 2014, the CDPH Drinking Water Program (including recycled water responsibilities) was transferred to the SWRCB and named the DDW.
[9] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RecycledWater.shtml

decorative fountains.[10] Regulations pertaining to backflow prevention are codified in CCR Title 17.[11] A compendium of applicable regulations is available on the DDW website.[12]

In general, the higher the degree of public contact with recycled water, the higher the level of treatment required. Four levels of treatment are defined in Title 22:

- **Disinfected Tertiary** (oxidation, filtration, disinfection).
  - For granular media filtration:
    - The wastewater has been coagulated and filtered at a rate not to exceed 5 gallons per minute per square foot (gpm/ft^2) for gravity, upflow or pressure filters, or not to exceed 2 gpm/ft^2 for traveling bridge backwash filters.
    - The turbidity of the filtered wastewater must meet an average of 2 Nephelometric Turbidity Units (NTU) within a 24-hour period, 5 NTU more than 5% of the time within a 24-hour period, and 10 NTU at any time. For membrane filtration, the turbidity of the filtered wastewater must meet 0.2 NTU more than 5% of the time within a 24-hour period and 0.5 NTU at any time.
    - For irrigation of food crops, parks and playgrounds, schoolyards, residential landscaping, golf courses with unrestricted access, flushing toilets, and other purposes specified in Title 22, coagulation is not required if the filtered effluent turbidity is less than 2 NTU and the turbidity influent to the filters is continuously measured, does not exceed 5 NTU for more than 15 minutes (with the capability to automatically divert if it is), and never exceeds 10 NTU.
  - For disinfection:
    - Chlorination following filtration that provides a CT (the product of the chlorine residual multiplied by the modal contact time) of at least 450 milligram-minutes per liter with a modal contact time of at least 90 minutes based on peak dry weather flow.

      or
    - A disinfection process that, combined with filtration, can inactivate 5 logs of virus (bacteriophage or polio virus).
    - The total coliform concentration in the disinfected effluent is less than 2.2 most probable number (MPN)/100 milliliters (mL) based on the seven-day median and less than 23 MPN/100 mL in more than one sample in any 30-day period. No sample can exceed 240 MPN/100 mL.
- **Disinfected Secondary-2.2** (oxidation, disinfection): The total coliform concentration in the disinfected effluent is: than 2.2 MPN/100 mL based on the 7-day median and less than 23 MPN/100 mL in more than one sample in any 30-day period.
- **Disinfected Secondary-23** (oxidation, disinfection): The total coliform concentration in the disinfected effluent is: less than 23 MPN/100 mL based on the 7-day median and less than 240 MPN/100 mL in more than one sample in any 30-day period.

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[10] California Code of Regulations, Title 22, Chapter 3, Water Recycling Criteria
[11] California Code of Regulations, Title 17, Chapter 5, Sanitation
[12] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RecycledWater.shtml

- **Undisinfected Secondary** (oxidation): Wastewater in which the organic matter has been stabilized, is non-putrescible, and contains dissolved oxygen. The water has not been disinfected.

Approved uses under consideration by RRWSP participants, as well as the minimum treatment for each type of use, are summarized in Table 3-1.

Table 3-1. Summary of Title 22 Approved Types of Non-potable Reuse Applications

Disinfected Tertiary
Irrigation of food crops (including root crops, where the edible portion contacts recycled water), parks and playgrounds, schoolyards, residential landscaping, unrestricted access golf courses
Disinfected Secondary-2.2
Irrigation of food crops (where the edible portion is above ground and not contacted by recycled water)
Disinfected Secondary-23
Irrigation of cemeteries, freeway landscaping, restricted-access golf courses, ornamental nursery stock and sod farms (unrestricted access), pasture for animals producing milk for human consumption, any nonedible vegetation (controlled access), and orchards and vineyards (edible portion)[1]
Undisinfected Secondary
Irrigation of orchards (no recycled water contact with edible portion)[1], vineyards (no recycled water contact with edible portion)[1], non-food-bearing trees, fodder and fiber crops for animals not producing milk for human consumption

Note:

1. In 2003, at the request of the California Department of Health Services (formerly CDPH) Food and Drug Branch (FDB), the CDPH Division of Drinking Water and Environmental Management and FDB sent a memo to all RWQCBs regarding permit conditions for existing and proposed recycled water projects involving vineyard and orchard crops. Both agencies believed the use of undisinfected secondary recycled water represented a health threat, particularly during harvesting, and recommended that recycled water used to irrigate vineyards and orchards meet Disinfected Secondary-2.2 Recycled Water standards at a minimum. Any future changes to the Title 22 non-potable reuse regulations are expected to codify this requirement.

Review of California Agricultural Water Recycling Criteria

An expert panel consisting of nine nationally recognized experts reviewed California's Title 22 criteria for use of recycled water for agricultural irrigation, including food crop irrigation. The purpose of the review was to address whether the use of recycled water, produced in conformance with Title 22, has been protective of public health. The expert panel report was released in September 2012 (NWRI, 2012a). The key conclusions were:

- Current agricultural practices that are consistent with Title 22 do not measurably increase public health risk; modifying the standards to make them more restrictive will not measurably improve public health.
- The turbidity requirements specified in Title 22 for wastewater that has received media filtration are adequate.
- Coliforms are still an appropriate indicator of disinfection performance.
- Regarding plant uptake of pathogens, there are no definitive links to any outbreaks or sporadic illnesses associated with the irrigation of California produce with recycled wastewater, nor with recycled water used extensively in Florida for irrigation.

3.1.2 Groundwater Recharge Regulations

The CWC defines groundwater recharge as the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system. Prior to June 18, 2014, Title 22 included narrative requirements for planned GWR projects. The regulations stated that recycled water "shall be at all times of a quality that fully protects public health" and that DDW recommendations will be made on "an individual case basis" and "will be based on all relevant aspects of each project, including the following factors: treatment provided; effluent quality and quantity; spreading area operations; soil characteristics; hydrogeology; residence time; and distance to withdrawal."

Since 1976, CDPH issued numerous draft versions of more detailed GWR regulations that served as guidance for the six permitted GWR projects in California (all of which are located in Southern California). Final GWR regulations were adopted and went into effect June 18, 2014.[13] The GWR Regulations are organized by type of project:

- Surface application (surface spreading); and
- Subsurface application (injection or vadose zone wells)

The regulations address the following key project requirements:

- Source control
- Emergency response plan
- Pathogen control
- Nitrogen control
- Regulated chemicals control
- Initial recycled water contribution (RWC)[14]
- Increased RWC
- Advanced treatment criteria
- Application of advanced treatment.
- Soil aquifer treatment (SAT) performance (surface application)
- Response retention time

Revisions to 2008 Draft GWR Regulations

GWR projects previously considered by Morro Bay and the Northern Cities were evaluated under the August 2008 Draft GWR Regulations. A number of substantive changes made in the final GWR Regulations provide more flexibility for project implementation, including higher amounts of recycled water that can be used based on how the RWC is determined and the time recycled water must be held underground prior to extraction. Significant changes include the following:

- The derivation of the allowable RWC under final GWR Regulations uses a longer averaging period (120 months versus 60 months), which can allow for a higher RWC for a surface spreading projects where diluent water (e.g., dilution water, such as storm

[13] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.shtml
[14] The RWC is defined as: (1) the recycled water applied at the GWR Project ÷ (recycled water + credited dilution water) and (2) Initial Minimum RWC = 0.5 mg/L ÷ the maximum total organic carbon concentration in the recycled water (before or after recharge) based on a 20-week running average.

water) is a necessary component, since it has the potential to factor in wet periods for a longer time period.

- The process to progress from the initial RWC to higher RWCs has been streamlined for both surface and subsurface application projects, eliminating requirements in the 2008 GWR Draft Regulations for expert panel review and demonstrations of recycled water percentages in monitoring wells.
- Alternatives to total organic carbon (TOC) for establishing a project's RWC are allowed. One possibility is biodegradable organic carbon (BDOC), which has been reviewed and sanctioned by a DDW convened expert panel (NWRI, 2012b). The TOC approach has a limiting effect on the RWC calculation inasmuch as there may be some recalcitrant TOC that is primarily derived from the drinking water source that ultimately becomes wastewater. Thus, it is expected that by using BDOC in lieu of TOC the allowable RWC could be higher. This is of particular significance for surface spreading projects that do not subject the entire recycled water for recharge to advanced water treatment (AWT).
- The six-month minimum underground residence time for recycled water has been eliminated for pathogen control for surface and subsurface application projects and replaced by specific pathogen log reduction requirements for treatment from raw wastewater through final product water, including residence time underground between application and the closest drinking water well. For a GWR surface spreading project that uses tertiary effluent, a six-month retention time would still be necessary to help achieve the required virus reduction. For projects that use AWT, some residence time may be needed to meet the virus reduction requirement. Required residence time is also a function of the new response retention time (RRT). The RRT is the time recycled water must remain underground for project sponsors to respond to treatment failures; the minimum time requirement is two months but is not a given and, in fact, must be approved by DDW.
- Criteria have been established for RO and AOP, thereby eliminating uncertainty for design.
- The recycled water nitrogen (N) requirements for both surface and subsurface application projects are less stringent in the final GWR Regulations (10 mg/L versus 5 mg/L as N).

Specifically for GWR surface application projects, the following changes were made:

- For projects that use tertiary recycled water, the RWC for at least the first year is limited to 20% unless an alternative RWC is approved by DDW and the treatment prior to surface application can achieve a TOC = 0.5 mg/L based on a 20-week running average. However, there is greater flexibility to move to higher RWCs if TOC requirements can be met concomitant with the desired RWC, which is possible depending on SAT performance in reducing TOC (or BDOC if approved in lieu of TOC). Dilution water is still a necessary component for projects that use tertiary recycled water.
- For projects that use AWT, it may be possible to start off at higher RWCs than 20% pending DDW approval.
- Projects must demonstrate SAT performance for constituents of emerging concern.

Specifically for GWR subsurface application projects, the following change was made:

- For projects that use AWT meeting the RO and AOP criteria, the initial RWC could be as high as 100% (as compared with 50% in the 2008 Draft GWR Regulations). A 100% RWC would eliminate the need for dilution water.
- The draft regulations still require that all recycled water used for injection must undergo AWT (and meet a TOC of less than or equal to 5 mg/L).

3.1.3 Reservoir Augmentation Regulations

Surface water augmentation is defined in the CWC as the planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water. DDW has developed an internal draft of its surface water augmentation regulations that has been presented to the Expert Panel to Advise on Developing Uniform Recycling Criteria for Indirect Potable Reuse via Surface Water Augmentation and on the Feasibility of Developing Such Criteria for Direct Potable Reuse (Expert Panel). It is not yet available for informal or formal public review. Senate Bills 322 and 918 require DDW, in consultation with the SWRCB, to investigate and report to the Legislature by the end of December 2016 on the feasibility of developing uniform criteria for direct potable reuse (DPR) and reservoir augmentation with the assistance of an Expert Panel[15] and Advisory Group.[16] Since the regulatory criteria are not yet available, approval of any reservoir augmentation project by DDW would be made on a case-by-case basis.

Some information on what the criteria might look like is available from the City of San Diego's proposed San Vicente Reservoir Augmentation Project. The City initiated discussions with DDW in 2008 regarding potential requirements for the proposed project and submitted a proposal in March 2012 to DDW. The key elements of the proposal included:

- Wastewater source control (similar to requirements in the final GWR Regulations).
- Advanced treatment for the entire flow stream using RO and AOP to meet DDW requirements.
- Establishment of critical control points monitoring and establishing measures to identify and validate treatment malfunctions and divert advanced treated recycled water within approximately 10 hours. (This is the approximate retention time in the conveyance pipeline to the reservoir.)
- Reservoir requirements including a 12-month hydraulic retention time, minimum dilution of advanced treated recycled water with ambient reservoir water of 100:1, discharge above the thermocline, and withdrawal of reservoir water below the thermocline (when present).
- Water from the reservoir to be treated at a full conventional water treatment plant prior to distribution as potable water.
- Ability to take the reservoir offline as a source of supply to the municipal water system within 24 hours.

3.2 State Water Resources Control Board Policies

Two types of policies have particular importance with respect to all recycled water projects for protection of water quality and human health:

- Anti-degradation Policies
- Recycled Water Policy

[15] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_DPR_advisorygroup.shtml
[16] www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RW_SWA_DPRexpertpanel.shtml

In addition, the California Toxics Rule (CTR) and the SWRCB Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP) may apply to surface water augmentation or GWR projects that involve a discharge to a water of the U.S. The CTR and SIP would not apply to a project if the receiving surface water is not deemed to be a Water of the U.S. in the applicable RWQCB Water Quality Control Plan (Basin Plan).

3.2.1 Anti-degradation Policies

California's anti-degradation policies are found in Resolution 68-16, Policy with Respect to Maintaining Higher Quality Waters in California and Resolution 88-63, Sources of Drinking Water Policy. These resolutions are binding on all State agencies. They apply to both surface water and groundwater, protect both existing and potential uses, and are incorporated into RWQCB Basin Plans. The resolutions are discussed further in Appendix B.

3.2.2 Recycled Water Policy

The Recycled Water Policy was adopted by the SWRCB on February 3, 2009, and became effective on May 14, 2009. It was subsequently amended in January 22, 2013, with regard to monitoring constituents of emerging concern (CECs) [17] for groundwater recharge projects based on recommendations of an expert panel. The panel did not recommend CEC monitoring for landscape irrigation projects using recycled water. The Policy was a critical step in creating uniformity in how RWQCBs were individually interpreting and implementing Resolution 68-16 for water recycling projects. The critical provisions in the Policy related to landscape irrigation and GWR projects include:

- Development of SNMPs
- Requirements for landscape irrigation projects
- RWQCB GWR requirements
- Anti-degradation and assimilative capacity
- CECs

Salt Nutrient Management Plans

The Recycled Water Policy requires the development of SNMPs for every groundwater basin/sub-basin by May 2014 (May 2016 with a RWQCB-approved extension). The SNMP must identify salt and nutrient sources, identify basin/sub-basin assimilative capacity and loading estimates (including estimates for GWR and landscape irrigation projects that use recycled water), and evaluate the fate and transport of salts and nutrients. The SNMP must include implementation measures to manage salt and nutrient loadings in the basin on a sustainable basis as well as an anti-degradation analysis demonstrating that all recycling projects identified in the plan will collectively satisfy the requirements of Resolution No. 68-16. The SNMP must also include an appropriate cost-effective network of monitoring locations to determine whether salts, nutrients, and other constituents of concern (as identified in the SNMPs) are consistent with applicable water quality objectives.

Landscape Irrigation Project Requirements

[17] CECs are generally chemicals for which there are no established water quality standards. These chemicals may be present in waters at very low concentrations and are now detected as the result of more sensitive analytical methods. CECs include several types of chemicals such as pesticides, pharmaceuticals and ingredients in personal care products, veterinary medicines, and endocrine disruptors.

The Recycled Water Policy establishes requirements for control of incidental runoff of recycled water from irrigation areas, such as unintended minimal overspray from sprinklers. These requirements include the implementation of an operations and maintenance plan, proper design and aim of sprinklers, discontinuation of irrigation during precipitation events, and management of storage ponds to prevent overflow. The Recycled Water Policy also contains provisions for streamlined permitting of landscape irrigation projects, including:

- Application of recycled water at agronomic rates
- Site supervisor training
- Periodic inspections
- Use of smart controllers
- Appropriate use of fertilizers

Landscape irrigation projects that meet the streamlining criteria will not be required to perform groundwater monitoring unless required to do so as part of an SNMP.

RWQCB Groundwater Requirements

The Recycled Water Policy does not limit the authority of a RWQCB to include more stringent requirements for GWR projects to protect designated beneficial uses of groundwater, provided that any proposed limitations for the protection of public health may only be imposed following consultation with DDW. In addition, the Recycled Water Policy does not limit the authority of a RWQCB to impose additional requirements for a proposed GWR project that has a substantial adverse effect on the fate and transport of a contaminant plume (for example, those caused by industrial contamination or gas stations), or changes the geochemistry of an aquifer thereby causing the dissolution of naturally occurring constituents, such as arsenic, from the geologic formation into groundwater.

Anti-degradation and Assimilative Capacity

Assimilative capacity is typically defined as the difference between the ambient groundwater concentration and the concomitant groundwater quality objective. In accordance with the Recycled Water Policy, two assimilative capacity thresholds were established for GWR projects in light of the type of assimilative capacity that must be conducted. A GWR project that uses less than 10% of the available assimilative capacity in a groundwater basin/sub-basin (or multiple projects utilizing less than 20% of the available assimilative capacity in a groundwater basin/sub-basin) must conduct an anti-degradation analysis verifying the use of the assimilative capacity. In the event that a project or multiple projects utilize more than the fraction of the assimilative capacity (e.g., 10% or 20%), the project proponent must conduct a RWQCB-deemed acceptable anti-degradation analysis. Some SNMPs use these assimilative capacity values as thresholds for evaluating impacts of salt and nutrient loadings and implementation measures.

A landscape irrigation project that meets the Recycled Water Policy streamlining criteria, which is within a groundwater basin with an approved SNMP, may be approved by a RWQCB without further anti-degradation analysis if the project is consistent with the SNMP. A landscape irrigation project that meets the streamlining criteria, which is within a groundwater basin preparing an SNMP, may be approved by a RWQCB by demonstrating using a salt/nutrient mass balance or equivalent analysis that the project uses less than 10% of the available assimilative capacity or less than 20% of the available assimilative capacity for multiple projects.

CECs

As part of the Recycled Water Policy, a Science Advisory Panel was formed to identify a list of CECs for monitoring in recycled water used for GWR and landscape irrigation. The Panel completed its report in June 2010 and recommended monitoring selected health-based and treatment performance indicator CECs and surrogates for GWR projects.[18] The Panel concluded that CEC monitoring was unnecessary for landscape irrigation. The GWR monitoring recommendations were directed at surface spreading using tertiary recycled water (specifically monitoring recycled water and groundwater) and injection projects using RO and AOP (specifically monitoring recycled water).

The Recycled Water Policy was amended by the SWRCB on January 22, 2013 to include the CEC monitoring program, and the Office of Administrative Law approved the Amendment on April 25, 2013. The Amendment provides the final list of specific CECs and monitoring frequencies for GWR projects and procedures for both evaluating the data and responding to the results. These requirements will be incorporated into the permits for existing GWR projects and will be included as requirements for all future projects. As part of the final GWR Regulations, DDW has its own CEC requirements and monitoring locations that must be met in addition to the Recycled Water Policy requirements. The next update of CEC monitoring by a SWRCB expert panel will occur in 2015.

3.2.3 California Toxics Rule and SIP

In 2000, the U.S. Environmental Protection Agency (USEPA) adopted the CTR that included aquatic life criteria for 23 priority pollutants and human health criteria for 57 priority pollutants. There are two types of human health criteria: (1) criteria based on consumption of water and organisms, and (2) criteria based on consumption of organisms only.

In the same year, the SWRCB adopted implementation procedures for the CTR through the SIP. The SIP was amended in 2005. The CTR criteria and SIP are applicable to discharges of wastewater (and recycled water) to all inland surface waters and enclosed bays and estuaries of California with some exceptions, such as cases where site specific water quality objectives have been adopted in Basin Plans.

The SIP includes procedures to determine which priority pollutants need effluent limitations; methods to calculate water quality-based effluent limitations; and policies regarding mixing zones, metals translators, monitoring, pollution prevention, reporting levels for determining compliance with effluent limitations, and whole effluent toxicity control. Using the SIP, permit limits are established for those CTR constituents that have the reasonable potential to cause or contribute to an excursion above any applicable criteria including consideration of a mixing zone if authorized by a RWQCB. The SIP also allows the SWRCB to grant an exception to complying with priority pollutant criteria in situations wherein site-specific conditions in individual water bodies or watersheds differ sufficiently from statewide conditions, wherein the exception will not compromise protection of beneficial uses, and wherein the public interest will be served.

Constituents with Challenging CTR Criteria

For water reuse projects that involve a discharge to a surface water designated in a Basin Plan as a Municipal and Domestic Supply (MUN), if reasonable potential exists to establish effluent limitations, there may be challenges meeting some of the CTR human health criteria (water and organisms) even with AWT. Examples of some these pollutants include three disinfection by-products:

[18] sccwrp.org/ResearchAreas/Contaminants/ContaminantsOfEmergingConcern/RecycledWaterAdvisoryPanel.aspx

- N-Nitrosodimethylamine (NDMA): 0.69 nanograms per liter (ng/L).
- Chlorodibromomethane (CDBM): 0.401 µg/L
- Dichlorobromomethane (DCBM): 0.56 µg/L

Unless a mixing zone is granted by the RWQCB, the criteria must be met at the end-of-pipe. The allowance of mixing zones is discretionary and is determined on a discharge-by-discharge (and pollutant-by-pollutant) basis. If a mixing zone is not allowed, meeting these criteria end-of-pipe would likely require additional advanced treatment processes beyond RO and AOP. For example, removal of CDBM and DCBM may require the use of air stripping, and removal of NDMA would require application of higher doses of ultraviolet irradiation (UV) photolysis.

3.3 Central Coast RWQCB Requirements

The Central Coast RWQCB is responsible for regulating recycled water discharges to surface water and groundwater, which are subject to State water quality regulations and statutes. For a surface water discharge, the RWQCB issues a National Pollutant Discharge Elimination System (NPDES) permit that would include provisions to implement applicable the CTR, State water quality control policies and plans, including water quality objectives and implementation policies established in the Basin Plan. NPDES permits must consider wasteload allocations in approved Total Maximum Daily Loads (TMDLs) developed for surface waters that do meet water quality standards. For a discharge to land, the RWQCB would issue Waste Discharge Requirements (WDRs) that would include provision to implement applicable State water quality control policies and plans and water quality objectives and implementation policies established in the Basin Plan.

3.3.1 Basin Plan

The Basin Plan designates beneficial uses for surface waters and groundwaters and establishes surface water and groundwater quality objectives to project those uses. Identified uses of surface water bodies by hydrologic unit are presented in Table 2-1 of the Central Coast Basin Plan. Groundwater throughout the Central Coast basins (except for the Soda Lake Sub-basin) is deemed suitable for municipal, agricultural, and industrial use.

Groundwater Requirements

The Basin Plan has general narrative objectives for taste and odor that apply to all groundwater basins. To protect the MUN beneficial use, the Basin Plan establishes water quality criteria for bacteria and incorporates primary and secondary maximum contaminant levels (MCLs). The Basin Plan also includes narrative groundwater objectives to protect agricultural beneficial uses and soil productivity, and sub-basin specific numeric objectives for TDS, chloride, sulfate, boron, sodium, and nitrogen (Basin Plan Table 3-8). Table 3-2 presents the Central Coast groundwater quality objectives that are relevant for the study area.

Table 3-2. Central Coast RWQCB Basin Plan Groundwater Quality Objectives

Basin		Paso Robles		Estero Bay	Estero Bay	Santa Maria
Sub-Basin						
Constituent	Units	Atascadero	Templeton	Chorro	Arroyo Grande	Lower Nipomo Mesa
TDS	mg/L	550	730	1,000	800	710
Chloride	mg/L	70	100	250	100	95
Sulfate	mg/L	85	120	100	200	250
Boron	mg/L	0.3	0.3	0.2	0.2	0.15
Sodium	mg/L	65	75	50	50	90
Nitrogen (as N)	mg/L	2.3	2.7	5	10	5.7[1]

Source: Central Coast Basin Plan (CC RWQCB, 2011), Table 3-8.

1. Note from Basin Plan table: The basin exceeds useable mineral quality.

Surface Water Requirements

The Basin Plan also designates beneficial uses and water quality objectives for surface waters. Narrative or numeric objectives have been established that are applicable to all inland surface waters for color; taste and odor; floating material; suspended material; settleable material; oil and grease; biostimulatory substances; sediment; turbidity; dissolved oxygen; temperature; toxicity; pesticides; other organics; and radioactivity. Specific water quality objectives have been applied to select surface waters for TDS, chloride, sulfate, boron, and sodium (see Table 3-7 in the Basin Plan). Surface water discharges that recharge groundwater (for example in unlined creeks or streams) are assigned a GWR beneficial use, and the Basin Plan groundwater quality objectives also apply. Discharges to surface water must be of sufficient water quality to not impact groundwater quality beneficial use(s). Table 3-3 presents the Central Coast surface water quality objectives that are relevant for the study area.

Table 3-3. Central Coast RWQCB Basin Plan Surface Water Quality Objectives

Constituent	Units	Salinas River, Above Bradley	Chorro Creek	Arroyo Grande Creek
TDS	mg/L	250	500	800
Chloride	mg/L	20	50	50
Sulfate	mg/L	100	50	200
Boron	mg/L	0.2	0.2	0.2
Sodium	mg/L	20	50	50

Source: Central Coast Basin Plan (CC RWQCB, 2011), Table 3-7.

Note: The objectives are mean annual values based on preservation of existing water quality believed attainable follow control of discharges of point sources.

3.3.2 Total Maximum Daily Loads

Surface waters that do not meet water quality standards are placed on the Clean Water Act (CWA) section 303(d) list of impaired waters, and the RWQCB must complete a TMDL for each listing. The TMDL is a calculation of the maximum amount of a pollutant from point and non-point sources that a water body can receive and still meet water quality standards with a margin of safety. The TMDL and implementation plan are incorporated into the Basin Plan as amendments. The wasteload allocations established in TMDLs are translated into NPDES permit limits to ensure that compliance with the discharge limits will allow the water body to attain standards.

The 2010 USEPA approved 303(d) list for California includes impairment of Arroyo Grande Creek for bacteria; Chorro Creek for bacteria, nutrients, and sedimentation; and the Upper Salinas River for chloride, sodium, and pH. Wasteload allocations have been established for Chorro Creek for nutrients and dissolved oxygen (the creek was delisted for oxygen depletion in 2010). The nutrient wasteload allocations in the Chorro Creek TMDL were applied to the California Men's Colony NPDES permit.[19] It is not entirely clear from the Chorro Creek TMDL whether it considered and allowed future new discharges of nitrogen and orthophosphorus. The Arroyo Grande Creek Upper Salinas River listings and subsequent wasteload allocations in a TMDL would not impact a wastewater discharge that meets Title 22 disinfected tertiary requirements. The Upper Salinas River listing and subsequent wasteload allocation in a TMDL for sodium and chloride could require additional treatment beyond Title 22 disinfected tertiary requirements, depending on the adopted wasteload allocation. The list does not include any other TMDLs for the RRWSP study area. The list will be updated periodically and should be tracked.

3.4 Permitting Recycled Water Projects

3.4.1 SWRCB General Permit

On June 3, 2014, the SWRCB adopted Order WQ 2014-0090-DWQ General Waste Discharge Requirements for Recycled Water (General Permit). This permit supersedes the 2009 SWRCB General WDR for Landscape Irrigation Uses of Recycled Water. The General Order provides statewide authorization of all of Title 22 uses of recycled water by Producers, Distributors, and Users except GWR and is intended to streamline project permitting. To obtain coverage under the General Order, an applicant must have an approved Engineering Report and submit a Notice of Intent to the RWQCB within its jurisdiction. Producers, Distributors, or Users of recycled water covered under existing permits may elect to continue or expand coverage under the existing permits or apply for coverage under the General Order. If a RWQCB determines that a recycled water project could result in one or more of the following, the project would be subject to an individual permit issued by the RWQCB (WDRs and/or Water Recycling Requirements (WRRs)).

- The proposed project would result in water quality degradation.
- The proposed method of recycled water storage could cause degradation or contribute to pollution or nuisance.
- The proposed project does not implement mitigation measures adopted in a site-specific California Environmental Quality Act document.
- The proposed use of recycled water is not consistent with a Total Maximum Daily Load waste load allocation or implementation plan.
- The proposed use of recycled water is not consistent with Basin Plan provisions for implementing an SNMP.

[19] For the California Men's Colony NPDES permit, the monthly maximum nitrate-N concentration was set at 10 mg/L-N and the median orthophosphorus-P concentration of effluent from May through September must not exceed current levels, as measured by a comparison with the effluent concentration from 2004 and 2005.

3.4.2 Individual Non-Potable Reuse Project Permits

Effective July 1, 2014, the DDW as part of the SWRCB has the statutory authority to issue WDRs and WRRs. As the DDW transition proceeds during Fiscal Year 2014/15, more information will be available on how permitting responsibilities will be handled by DDW and RWQCBs.

Under the current permitting framework where the RWQCB issues the permit, for WDRs or WRRs, project sponsors are required to submit an Engineering Report to DDW and RWQCB, as well as a Report of Waste Discharge to the RWQCB. In issuing the permit, the RWQCB is required to consult with DDW. Any reclamation requirements included in a permit must conform to Title 22. The RWQCBs have the option of issuing a Master Reclamation Permit in lieu of individual WRRs for a project involving multiple uses. The Master Permit can be issued to a recycled water supplier or distributor, or both.

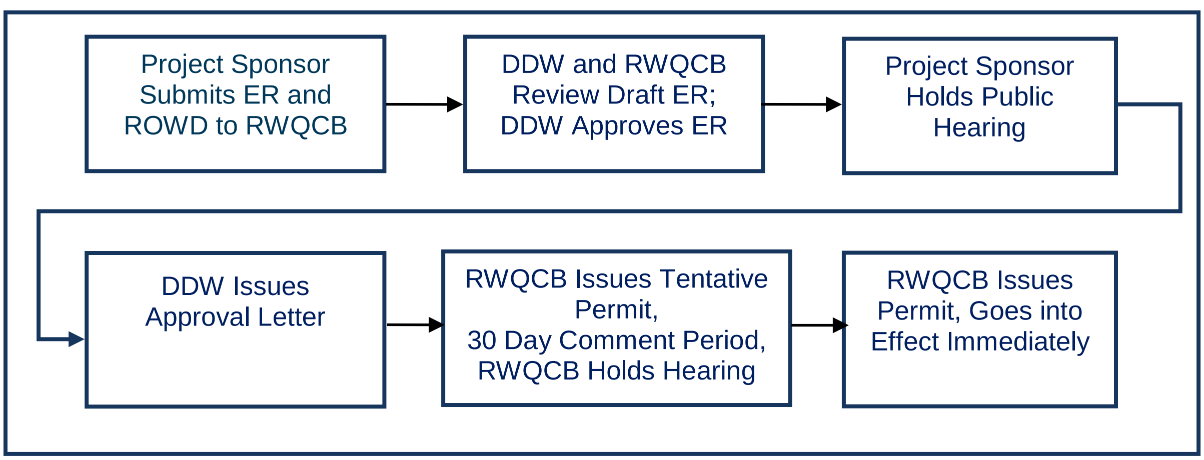
Some wastewater agencies holding NPDES permits may intend to use some effluent for water recycling prior to making any change in the point of discharge, place of use or purpose of use of treated wastewater. In these cases, the owner of the wastewater treatment plant must obtain approval from the SWRCB in accordance with CWC sections 1210-1212. As a result of the drought, the SWRCB has pledged to expedite 1211 petitions for change with new guidance available on the SWRCB website.[20]

Additional information on the procedures and agreements in place between DDW, SWRCB, and RWQCBs related to permitting can be found in the Memorandum of Agreement between DDW and SWRCB. Now that DDW is part of the SWRCB, it is not clear if and how the Memorandum of Agreement will be modified or utilized.

3.4.3 Groundwater Recharge Projects

The current (or potentially interim) process for project approval and permitting of GWR projects is depicted in Figure 3-1. The RWQCB would issue the permit based on requirements consistent with the GWR Regulations, Basin Plans, SNMPs, and State policies. The type of permit (WDR and/or WRR) issued depends on how and where the recycled water is "discharged".

Figure 3-1. Current Regulatory Process for GWR Projects Using Recycled Water

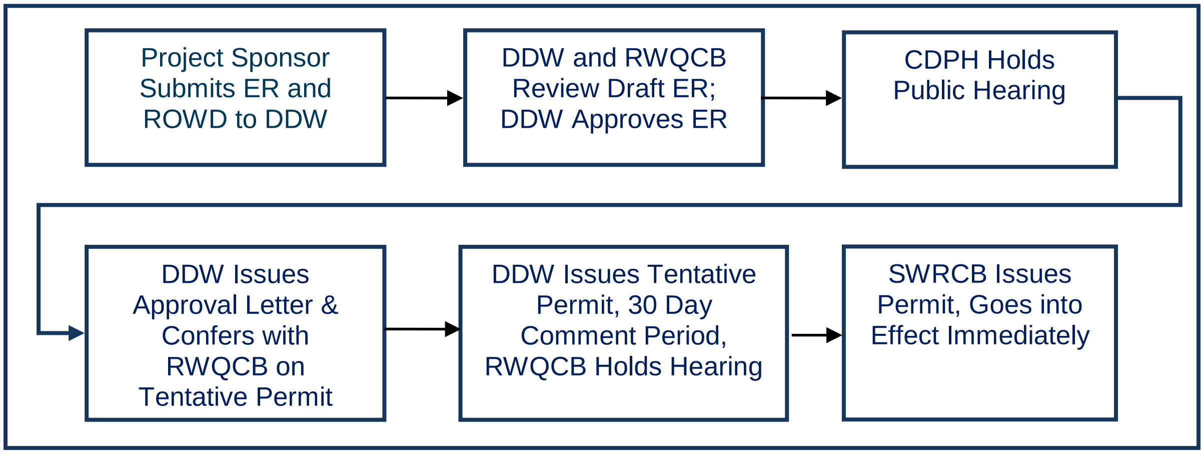


ER Engineering Report
ROWD Report of Waste Discharge

[20] www.waterboards.ca.gov/waterrights/water_issues/programs/applications/wastewaterchange/index.shtml

If DDW becomes the permitting authority for GWR projects, the possible approval and permitting process may follow the steps shown in Figure 3-2.

Figure 3-2. Potential Regulatory Process for GWR Projects Using Recycled Water



ER Engineering Report
ROWD Report of Waste Discharge

3.4.4 Surface Water Augmentation

Surface water augmentation projects include both stream augmentation and reservoir augmentation. The discharge of a waste to a body of water in the U.S. is regulated under the CWA and CWC and subject to an NPDES permit for discharge into an inland surface water based on:

- All applicable water quality objectives in the Central Coast Basin Plan (Section 3.3.1)
- Water quality criteria in the California Toxics Rule (CTR) (Section 3.2.3)
- Implementation measures for the CTR in SIP (Section 3.2.3)

In addition to these requirements, reservoir augmentation projects are subject to the pending DDW regulations discussed in Section 3.1.3.

Future Policies

Future State policies that may impact surface water discharge project include:

- Proposed Policy for Toxicity Assessment and Control
- Proposed Policy for Nutrients for Inland Surface Waters
- Statewide Methylmercury Water Quality Objectives
- USEPA Revisions to Human Health Criteria
- Constituents of Emerging Concern

The SWRCB has prepared a draft Policy for Toxicity Assessment and Control (Toxicity Policy) that proposes numeric toxicity objectives, a standardized method of data analysis, corresponding monitoring and reporting requirements, and provisions for compliance determination that will apply to inland surface waters and enclosed bays and estuaries. The Toxicity Policy is being developed to address the lack of a statewide consistent approach among the RWQCBs to toxicity controls and monitoring. The SWRCB released a draft Toxicity Policy in 2011 and a revised draft in June 2012. The Policy is expected to be adopted in 2015.

The SWRCB has initiated the process to develop a Nutrient Policy for inland surface waters, excluding inland bays and estuaries. The SWRCB intends to develop narrative nutrient objectives, with guidance on how to translate the narrative objectives into numeric permit limits.

The SWRCB held a California Environmental Quality Act (CEQA) scoping meeting in October 2011, has released a Workplan for development of the objectives, and has convened stakeholder, regulatory, and scientific advisory panels. A public draft of the Nutrient Policy is expected in 2015; the adoption date is not known.

The SWRCB is developing an amendment to the SIP to include water quality objectives for methylmercury and mercury control programs to protect humans and wildlife that consume locally caught fish. The objectives will likely be expressed as a methylmercury concentration in fish tissue. They will apply to California's inland surface waters, enclosed bays, and estuaries. The SWRCB intends for RWQCBs to convert a fish tissue-based objective into effluent limits. Depending on the objective adopted and the effluent limitation approach utilized, the methylmercury permit limit could be very low. However, studies conducted by the National Association of Clean Water Agencies using clean sampling methods and sensitive analytical methods have shown that methymercury is present at very low (ng/L) level concentrations in wastewater.

The USEPA has updated its national recommended water quality criteria for human health for 94 chemical pollutants to reflect the latest scientific information and USEPA policies, including updated fish consumption rates. Once finalized, the USEPA water quality criteria provide recommendations to states and tribes authorized to establish water quality standards under the CWA. For human health criteria that are predominantly based on fish consumption exposure, the new criteria are more stringent than the criteria in the CTR based on the use of revised fish consumption rates and relative source contribution factors. If the CTR were to be amended (or the SWRCB elected to adopt its own water quality based on the revised human health criteria), this would impact surface water discharge limits.

The SWRCB is working on developing a CEC monitoring framework for surface water discharges. In 2012, an expert panel prepared a report (SCCWRP, 2012) that provides the State with recommendations on appropriate monitoring and management strategies for CECs to limit the impact of CECs on oceans, estuaries and coastal wetlands, and freshwater ecosystems. An expert panel has provided monitoring recommendations. To vet the recommendations, the Southern California Coastal Water Research Project is developing a pilot study for regions within the State.

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4. COMMON TYPES OF REUSE

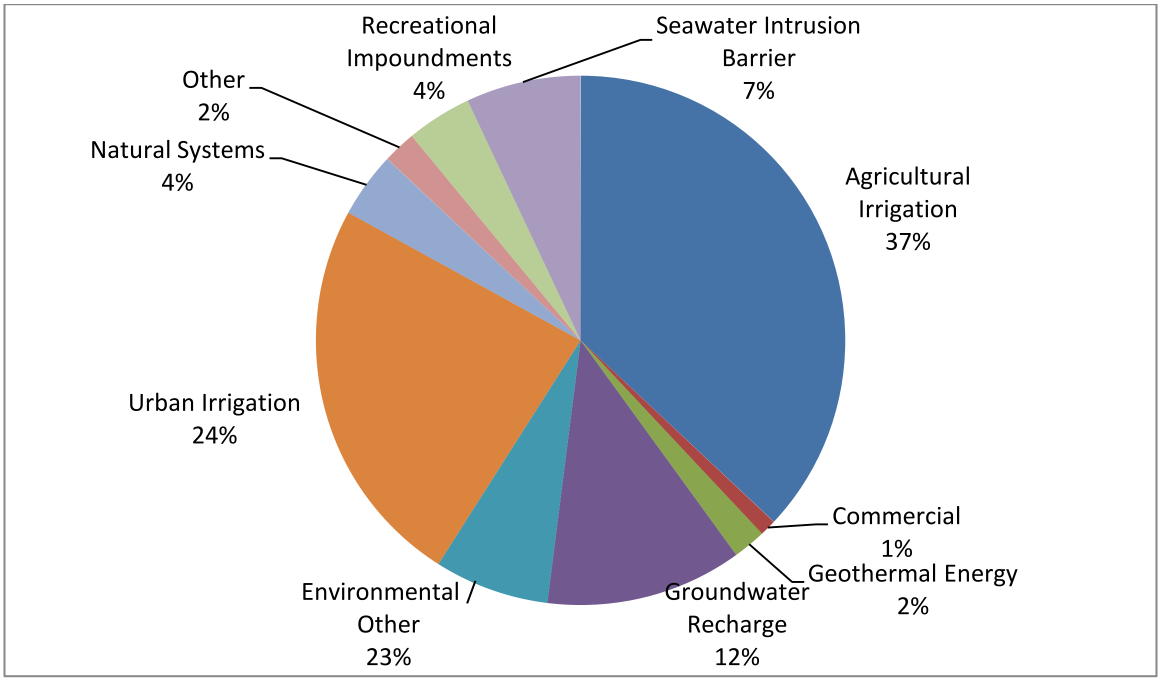
Common types of water reuse can be divided into the following categories:

- Urban Reuse - Landscape Irrigation
  - Common locations of use include parks, golf courses, cemeteries, school yards, freeway landscaping, sod farms, nurseries, and residential landscaping.
  - Minimum level of treatment is based on the type of use and whether the site is restricted or unrestricted. Approved uses based on minimum level of treatment, as defined by Title 22, was listed in Section 3.1.1.
- Urban Reuse - Other Uses
  - Dual plumbing (flushing toilets and urinals), priming drain traps, structural and nonstructural fire fighting, decorative fountains, commercial laundries, consolidation of backfill around pipelines, artificial snow making for commercial outdoor use, commercial car washes (no public contact with washing), fish hatcheries with public access, soil compaction, mixing concrete, dust control on roads and streets, and cleaning roads, sidewalks and outdoor work areas, sanitary sewer flushing.
- Agricultural Irrigation
  - Orchards and vineyards (edible portion); food crops, including root crops, where the edible portion contacts recycled water.
  - Food crops (where the edible portion is above ground and not contacted by recycled water); pasture for animals producing milk for human consumption; any nonedible vegetation (controlled access).
- Impoundments
  - Unrestricted Recreational: No limitations are imposed on body-contact water recreation activities.
  - Restricted Recreational: Activities limited to fishing, boating, and other non-body contact activities.
  - Landscape (without fountains): Recycled water is stored or used for aesthetic enjoyment or landscape irrigation, or which otherwise serves a similar function and is not intended to include public contact.
- Environmental Reuse
  - The use of recycled water to create, enhance, sustain, or augment water bodies, including wetlands, aquatic habitats, or stream flow.
- Industrial Reuse
  - Use of recycled water in industrial applications and facilities, power production, and extraction of fossil fuels. Common industrial uses include for cooling tower makeup water, boiler feed water, and industrial processes.
- Potable Reuse
  - Indirect Potable Reuse: Augmentation of a drinking water source (surface water or groundwater) with recycled water followed by an environmental buffer. Groundwater may receive additional treatment prior to use (for example disinfection); surface water would receive conventional surface water treatment.

- Direct Potable Reuse: The introduction of recycled water into a public water system (e.g., distribution system) or into a raw water supply upstream of a water treatment plant.

The distribution of types of reuse in California is shown in Figure 4-1.

Figure 4-1. Distribution of Types of Reuse in California



Source: Municipal Wastewater Recycling Survey for California Water Recycling Funding Program (SWRCB, 2009)

Of the types of reuse listed above, the following applications are not relevant to study area and are not discussed further in this chapter:

- Restricted impoundments are common recycled water storage methods for golf courses and agricultural fields but are not an end use. Use of recycled water for unrestricted impoundments is not considered in the RRWSP.
- Direct potable reuse has recently emerged as a viable recycled water alternative being considered across the United States. While direct potable reuse can legally be implemented in California, several years of study and development of specific regulations await before a feasible project could be initiated in the County.

4.1 Urban Reuse

Urban reuse includes irrigation of golf courses, parks, and other landscapes, fire protection, and toilet flushing. The RRWSP focuses on turfgrass irrigation, which includes landscape, recreation field, and golf course irrigation.

The cost effectiveness of a recycled water project is dependent on actual recycled water use. A challenge for landscape irrigation projects centers on the need to connect all identified customers while fully realizing their demand estimates. Ultimately, the customer must choose to convert to recycled water unless forced to convert through enforcement of a mandatory use ordinance by the local authority (see Section 13.2.1). Proper planning for successful urban reuse project can anticipate these issues and must consider:

- Water supply benefit realization
- Water quality needs
- Level of service: delivery pressure, redundancy, and reliability
- Treatment plant improvements
- Cost to convert the site to recycled water
- Customer / public acceptance

4.1.1 Water Supply Benefit

The cost effectiveness of the project is dependent on actual recycled water use. Some potential customers ultimately do not to connect to the system, for example. Moreover, actual irrigation demands for those that do connect are often lower by the time deliveries start due to conservation measures implemented in the meantime, delays or cancellation in planned site expansions, future changes in site uses, and/or partial conversion due to retrofit complications.

Actual irrigation demands are often lower by the time recycled water deliveries start due to conservation measures and/or partial conversion due to retrofit complications. Partial conversions can be avoided – or at least planned for – by properly assessing the cost to convert the system. Moreover, some potential customers ultimately choose not to connect to the system because of the perception that the regulatory restrictions and requirements placed on recycled water sites outweigh the benefits of reuse. Although, the California Water Code 13551 states that recycled water should be used if the water is of suitable quality and reasonable cost. (Refer to Section 13.2.1 for further discussion).

Landscape irrigation projects that offset existing municipal water use offer a direct water supply benefit by replacing potable water use with non-potable water. However, many landscape irrigation sites in the RRWSP currently irrigate with private wells. The recycled water provider only receives a water supply benefit with the ability to pump a similar amount of groundwater not pumped by the customer due to recycled water use. Several issues arise during the consideration of recycled water service to offset use by private wells:

- Proper design of a recycled water system requires the determination of actual water use, which is usually not well understood during the planning phase.
- Customers must agree to refrain from pumping their existing irrigation wells and/or to purchase a minimum amount of recycled water to achieve demand estimates.
- Conversions can be simplified by bringing the recycled water pipe to the existing well location if the well water is only used for non-potable applications.

4.1.2 Water Quality

Tertiary effluent provides suitable water quality for irrigation of most plants and turfgrasses with the exception of those that are sensitive to salt. General irrigation water quality guidelines are presented in Table 4-1. Most plants and turfgrasses can tolerate mineral water quality in the slight to moderate range. Recycled water from most of the WWTPs in the RRWSP fall within the lower range of slight to moderate degrees of restriction due to salinity and specific ion toxicity. The water quality should have minimal impact on typical landscape irrigation activities, which tend to have some salinity and toxicity tolerance. The actual sensitivity is dependent on the type of turfgrass being irrigated as well as soil type, drainage, climate, and irrigation method. In particular, sensitive turfgrass, such as golf course greens, may require additional treatment or other mitigation measures. Potential mitigation measures include:

- Blending irrigation water
- Applying extra water to leach excess salts below the turfgrass root zone
- Providing adequate drainage
- Using soil amendments
- Modifying turf management practices
- Modifying root zone mixture
- Irrigating sensitive areas separately with existing water supply
- Installing onsite treatment for individual customers with specific water quality needs

Table 4-1. Turfgrass Irrigation Water Quality Guidelines for Salinity

Parameter	Units	Degree of Restriction of Use		
		None	Slight to Moderate	Severe
Salinity (TDS)	mg/L	< 450	450 - 2,000	> 2,000
Infiltration	SAR	< 3	3 – 9	> 9
Sodium	mg/L	< 70	> 70	
Chloride	mg/L	< 100	> 100	

Source: USEPA, 2012

1. Dissolved salts can build up in the root zone, causing water absorption inhibition and other problems.
2. SAR = Sodium Adsorption Ratio; at a given SAR, infiltration rate increases as water salinity increases.
3. Sodium and chloride may be absorbed through the leaves of sensitive flora, causing leaf burn.

4.1.3 Level of Service

Development of recycled water systems requires tradeoffs between creating a system that operates similarly to a potable water system, such as service reliability, and the system's capital and O&M costs. For example, potable water systems are typically constructed as grid piping systems that allow for high service reliability if one water source (well, water treatment plant, etc.) is not available or if a portion of the distribution system fails (pipe break). Conversely, a recycled water system typically uses a branched piping system with one source of water where a system failure in one location will leave all downstream locations without service. In addition, fire flow conditions typically determine sizing of potable water distribution facilities. As a result, pipe, pump, and tank size are more than sufficient to meet potable water demands. Finally, potable water system costs are spread across a broad customer base such that unit costs of water are acceptable.

Design of a recycled water distribution system includes the following factors:

- WWTP equalization
- Treatment capacity
- Onsite storage
- Pump station capacity
- Pipeline capacity
- Distribution system elevated storage
- Looping of major distribution pipelines
- Establishment of separation of potable water and recycled water mains

- Seasonal and daily customer demand variations
- Customer delivery conditions (quality, pressure, flow)
- Customer onsite facilities (storage, treatment, pumps)

The size pipes, pumps, and tanks in recycled water systems are typically determined by peak flows. Pipes are typically sized for peak-hour flows, pump stations are sized for peak-hour or peak-day flows depending on system storage, and tanks are sized for peak-day volume. A hydraulic model would refine facility sizing but is beyond the scope of the RRWSP. Peak demands for irrigation– the most common municipal recycled water customer type – can exceed nine times the annual average demand. This often results in facility capacity that remains unused for most of the year. Therefore, the system rarely operates at full capacity. The capital cost of the system sized for peak demand, combined with a small customer base, can result in unacceptable recycled water unit costs.

Therefore, balancing the cost of providing a robust recycled water system with providing an acceptable product to customers requires tradeoffs. Common tradeoffs to consider are:

- Reliability
- Peak season supplies
- Pipeline sizing

Reliability

Interruptions in water service can have a significant financial impact on some large commercial or industrial customers. However, the majority of irrigation customers can continue to function properly if irrigation service is interrupted for a short time. Therefore, landscape irrigation and agricultural irrigation systems can tolerate lower levels of reliability – especially if the customer maintains a well onsite that can temporarily replace recycled water.

Peak Season Supplies

Large irrigation systems are typically limited by the ability of peak season recycled water supply to meet peak season demands. If the system is designed to meet peak demand with maximum available recycled water supply, then 50% of available recycled water is typically not reused due to seasonal irrigation demands. Supplementing the recycled water supply with an alternative source during peak periods can help increase reuse through the rest of the year.

One approach involves having some customers use existing water supplies, such as onsite wells, during peak demand periods so that the system does not need to be sized to meet peak hour demand. A simpler approach for the customer is to blend water at the recycled water pump station at the treatment plant. However, the system would still need to be sized to meet the peak hour demand.

Pipeline Sizing

A critical factor in system performance relative to flow, pressure, and water quality is pipeline sizing. The recommended approach is to size pipelines for peak hour flows and adopt velocity criteria similar to water system design criteria. Water agencies commonly use this approach. Undersized pipelines can limit the capacity for future demand growth and increase energy costs as pipeline velocity and pressure losses approach design criteria. On the other hand, oversized pipelines can create water quality issues as water age exceeds the residual disinfection. As a result, implementation of NPR projects must balance the need to serve customers in the near term under satisfactory water age conditions while allowing for future growth, despite the difficulty of predicting the prospects for system growth.

Determining the location and length of pipeline runs is another important factor affecting recycled water projects. An area with a high density of potential users may justify a pipeline reach to that area. Conversely, an area with limited potential users or demand may not warrant a pipeline. Distribution pipelines present a significant cost for any recycled water project. Deciding which areas justify construction of a distribution pipeline or pipeline system is critical for any project.

4.1.4 Treatment Plant Improvements

Treatment plants will likely require additional treatment steps to meet minimum regulatory and/or customer water quality requirements. Treatment options are discussed further in Section 5.1.1.

In addition, the difference between diurnal WWTP influent variation and diurnal irrigation demand variation must be addressed so that sufficient supplies are available during the hours each day they are needed. WWTP flows typically peak in the late morning, peak again in the evening, and decrease significantly overnight. In contrast, most landscape irrigation demand occurs at night due to regulatory restrictions regarding time of use. As a result, recycled water demands are at their highest when WWTP flows are at their lowest.

The most common way to address this issue is through equalization and/or product water storage. An hourly comparison of effluent produced and system demand should be prepared in order to properly size necessary recycled water storage. However, for the purposes of the RRWSP, storage is set equal to the peak day demand for irrigation projects without distribution system storage. For projects that can deliver continuously for 24 hours – irrigation projects with storage, potable reuse projects, and surface water augmentation projects, for example – storage is set equal to ½ day demand.

4.1.5 Customer Conversions

The cost to convert (also referred to as “retrofit”) existing sites to recycled water has a high variance depending on the age and complexity of the existing irrigation system, as well as on the availability of adequate records or staff knowledge of the onsite irrigation and potable water piping. Most existing irrigation customers have separate potable-water and irrigation meters. The simplest conversion entails bringing the new recycled water supply to the existing irrigation meter. Older sites may have improperly connected potable water features, such as drinking fountains or bathrooms, to the irrigation system or may not have a separate irrigation meter. These sites must consider the cost to separate the non-potable (irrigation) system and potable systems, such as installing new potable lines to the drinking fountains or bathrooms. Also, recycled water irrigation systems must avoid spraying eating areas and drinking fountains, which may require re-routing of underground irrigation pipes.

When determining the cost to convert, agencies must consider the site’s service needs, including water quality, delivery pressure, interface with irrigation system (tanks, pumps, etc.), and reliability. The cost of facilities to provide recycled water to the customer’s satisfaction must be included in project costs, except possibly in cases where a mandatory recycled water use ordinance is in effect.

Regulatory

The following regulatory restrictions and requirements have the potential to increase costs to the customer if they convert to recycled water.

- Irrigating overnight instead of during the day (to limit human exposure), which can impact operations staffing
- Cross-connection and backflow device testing
- Maintaining warning signage
- Runoff restrictions
- Reporting
- Customer training
- Designated site representative (optional)

New Development

Installation of recycled water systems during construction of new developments prevents many of the initial conversion costs discussed above by integrating recycled water infrastructure into design and construction. Reuse in new developments typically occurs in common areas, such as medians, greenbelts, and parks. The developer typically bears the cost of constructing the system. Many municipalities have ordinances that require installation of recycled water systems for new developments if they are located within an existing or planned area of the recycled water system.

4.1.6 Public Acceptance

Any recycled water project requires proper public outreach to address concerns. The higher the level of potential contact with recycled water, the more opposition is typically encountered. Common concerns include public health, water quality, economics, growth-inducing impacts, and environmental justice / equity (Asano et. al., 2007). A public outreach plan should be developed in parallel with recycled water system planning. This will enable incorporation of feedback into planning and design while also addressing concerns early in the process.

4.1.7 Recycled Water Pricing

California Water Code 13580.7 limits recycled water rates to the estimated reasonable cost of providing the service. Recycled water rates are commonly lower than potable water rates to promote customer acceptance. The Water Reuse Rates and Charges, Survey Results (AWWA, 2008) showed that most rates range from 50 percent to 100 percent of potable water rates, with a median rate of 80 percent. This excludes settings where the purpose of reuse is wastewater disposal, since many of these situations involve free or low rates for wastewater. The discount acknowledges cost to convert onsite systems, as well as a lower level of service.

Rates can be set for full cost recovery (capital and O&M) or less than full recovery. Rates often vary based on the customer. For example, some industrial customers may be willing to pay higher than potable rates to ensure reliable water supply (if water quality requirements are met). And some golf courses may value the lack of water use restrictions during drought conditions, as well as the ability to reduce fertilizer applications.

Customers that are not part of a potable water system, such as sites using groundwater, may require rates to be set at the cost of existing or future supplies, which are less than potable water rates. This is discussed further in Section 4.2.3.

4.2 Agricultural Irrigation

Agricultural irrigation demand can vary from 1.5 afy to 3.0 afy per acre of crops, depending on crop type, rotation, and cycles. Connecting agricultural irrigation customers is contingent upon their willingness to use recycled water. Their willingness generally depends on a combination of:

- Delivered water quality
- Price of recycled water
- Market acceptance of food irrigated with recycled water

In addition, the recycled water provider must be able to realize a water supply benefit. Each of these topics is discussed further in this section.

4.2.1 Delivered Water Quality

Recycled water may meet minimum water quality requirements for DDW public health protection, but some crops are sensitive to specific constituents. Four common categories of water quality-related issues are (Ayers and Wescot,1985):

- Salinity: Salts in soil or water reduce water availability to the crop to such an extent that yield is affected.
- Water Infiltration Rate: Relatively high sodium or low calcium content of soil or water reduces the rate at which irrigation water enters soil to such an extent that sufficient water cannot be infiltrated to supply the crop adequately.
- Specific Ion Toxicity: Certain ions (sodium, chloride, or boron) from soil or water accumulate in a sensitive crop to concentrations high enough to cause crop damage and reduce yields.
- Miscellaneous: Excessive nutrients reduce yield or quality. Unsightly deposits on fruit or foliage reduce marketability. Excessive corrosion of equipment increases maintenance and repairs.

For the purposes of the RRWSP, water quality goals are based on agricultural use with no restrictions per the concentrations established in Table 4-2. Preliminary water quality objectives for agricultural reuse used in the RRWSP are compared with water quality objectives and water quality for other California recycled water agricultural projects in Table 4-3. Finally, existing effluent quality is compared with conceptual water quality objectives for agricultural reuse in Table 4-4.

Table 4-2. Agricultural Irrigation Water Quality Comparison

Constituents	Units	Degree of Restriction of Use[1]: None	Slight to Moderate	Severe
Salinity				
Electrical Conductivity (EC_w)	dS/m	< 0.7	0.7 – 3.0	> 3.0
Total Dissolved Solids (TDS)	mg/L	< 500	500 - 2,000	> 2,000
Infiltration (evaluate using SAR and EC_w)[2]				
SAR 0 – 3	and ECw (dS/m)	> 0.7	0.7 – 0.2	< 0.2
SAR 3 – 6	and ECw (dS/m)	> 0.7	0.7 – 0.2	< 0.2
SAR 6 – 12	and ECw (dS/m)	> 0.7	0.7 – 0.2	< 0.2
Specific Ion Toxicity				
Sodium (Na)				
Surface Irrigation[3]	SAR	< 3	3 - 9	> 9
Sprinkler Irrigation[4]	mg/L	< 70	> 70	
Chloride (Cl)				
Surface Irrigation[3]	mg/L	< 140	140 - 350	> 350
Sprinkler Irrigation[4]	mg/L	< 100	> 100	
Boron	mg/L	< 0.7	0.7 - 3.0	> 3.0
Miscellaneous				
Total Nitrogen[5]	mg/L	< 5.0	5 – 30	> 30
Bicarbonate[6]	mg/L	< 90	90 - 500	> 500
Residual Chlorine	mg/L	< 1.0	1.0 – 5.0	> 5.0
pH		Normal Range: 6.5 - 8.4		

Notes:

1. Sources: Metcalf & Eddy, 2007, Table 17-5 (Adapted from University California Committee of Consultants (1974); and Ayers and Wescot (1985))
2. SAR is the sodium adsorption ratio; at a given SAR, infiltration rate increases as water salinity increases.
3. For surface irrigation, most tree crops and woody plants are sensitive to sodium and chloride; most annual crops are not sensitive.
4. With overhead sprinkler irrigation and low humidity (< 30 percent), sodium and chloride may be absorbed through the leaves of sensitive crops, causing leaf burn.
5. Excess N may affect production or quality of certain crops, such as sugar beets, citrus, avocados, and apricots.
6. Overhead sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves, which reduces market acceptability but is not toxic to the plant.

Table 4-3. Recycled Water Quality – Existing Agricultural Reuse Projects

Constituent	Unit	Existing Projects						Conceptual Goal[7]
		MRWPCA Tertiary Effluent[1]	PVMWA Blended Supply[2]	PVMWA Water Quality Goals[3]	IRWD Tertiary Effluent[4]	Oxnard AWPF Effluent[5]	Santa Rosa Tertiary Effluent[6]	
TDS	mg/L	807	607	500	820	230	450	500
SAR		4.8	2.55	3.0	4.6	N/A	N/A	3.0
Sodium	mg/L	172	94	--	149	47	82	70
Chloride	mg/L	262	103	140	150	70	64	140
Boron	mg/L	N/A	N/A	N/A	0.3	0.5	0.4	0.5
Nitrogen (as N)	mg/L	9.5	5.4	10	11.9	5	11	5

N/A Not Available

Notes:

1. Recycled water is blended with groundwater and surface water in portions of the distribution system. Recycled water represents approximately 2/3 of the supply. Source: Presentation by Brad Hagemann (Assistant General Manager for the Monterey Regional Water Pollution Control Agency (MRWPCA)) on November 6, 2013 at the SLO County WRAC meeting.
2. Average of 440 samples collected from the distribution system since March, 2009. Tertiary effluent is blended with groundwater to reduce TDS. Recycled water represents approximately 2/3 of the supply. Source: Pajaro Valley Water Management Agency (PVWMA) Water Quality and Project Operations Committee Meeting #40 (September 11, 2013) Minutes.
3. Source: PVMWA Revised Basin Management Plan (RMC, 2002).
4. Source: Irvine Ranch Water District (IRWD) Michelson Water Recycling Plant effluent water quality average from June 2013 to May 2014 (personal communication on 6/9/14 with Greg Herr, IRWD, Planning and Resources Specialist).
5. Projected recycled water quality for Oxnard Advanced Water Purification Facility (AWPF) based on water quality testing between June and September 2012 and adjusted for aged membranes. Provided by Thien Ng, Senior Engineer for the City of Oxnard on June 13, 2014.
6. Average of samples taken from January 2000 through December 2011. ci.santa-rosa.ca.us/departments/utilities/recycle/landscapeinfo/Pages/RecycledWaterQualityandPlantNeeds.aspx
7. Based on agricultural use with no restrictions per the concentrations established in Table 4-2.

Table 4-4. Existing WWTP Effluent Quality and Conceptual Agricultural Reuse Goals

Constituent	Unit	Existing WWTPs					Conceptual Goal[6]
		TCSD Meadow-brook[1]	Morro Bay[2]	Pismo Beach[3]	SSLOCSD[4]	NCSD Southland[5]	
TDS	mg/L	1,400	942	1,100	855	800 – 1,000	**500**
SAR		N/A	N/A	6	3.9	N/A	**3.0**
Sodium	mg/L	263	223	240	160	180 – 210	**70**
Chloride	mg/L	397	369	340	230	200 – 240	**140**
Boron	mg/L	N/A	0.4	0.35	0.29	N/A	**0.5**
Nitrogen (as N)	mg/L	14	37.5	14	N/A	ND – 10	**5**

N/A Not Available; ND Not Detected

Notes:

1. Source: *TCSD Wastewater System Evaluation* (HMM, 2012), Table 3B.
2. Source: 2012 Recycled Water Feasibility Study for Morro Bay and Cayucos Sanitary District (Dudek); for existing effluent from six samples taken in February 2012.
3. Source: Pismo Beach Water Reuse Study (Carollo, 2007), Table 2-7, for grab samples collected on 9/25/2006. Nitrogen value is only for nitrate. Total nitrogen was not available.
4. Source: 2009 Recycled Water Study (Wallace), Table ES-3; based on composite sample on 12/17/2008
5. Source: Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, 2009), Table 3-1; for Projected Future Concentrations with WWTF Upgrade (to be completed in 2014)
6. Based on agricultural use with no restrictions per the concentrations established in Table 4-2.

Based on the information presented above, chloride concentrations could pose issues for the sensitive crops. TDS, sodium, and chloride concentrations would need to be reduced in order to achieve the preliminary water quality goals for agricultural irrigation. However, it should be noted that the water quality goals identified in the table are a first draft. In practice, the water quality goals should be developed with customers' participation and with consideration for crops and soil, among other factors. Therefore, further discussions with agricultural community members are necessary to establish their water constituent concerns. There is a history of success with agricultural use of recycled water (see Section 4.2.5 Market Acceptance).

Water Quality Management Options

Reduction of the above-mentioned concentrations could be achieved through additional treatment, blending with higher quality sources, and/or constituent source management. Reverse osmosis treatment removes approximately 98% of aqueous salts and metal ions. Application of RO to a portion of tertiary effluent would reduce TDS, sodium, and chloride to acceptable concentrations.

Salinity (TDS, chloride, sodium) levels in wastewater are primarily influenced by the potable water supply sources, human excretion, types of waste discharges, water conservation practices, and the use of water softeners. An alternative to treatment involves taking proactive steps to reduce salinity inputs to wastewater that can be managed, such as restricting water softener operation (e.g., requiring use of exchangeable canisters that can be discharged at an ocean outfall).

Another potential alternative for agricultural use of recycled water is to forego salt reduction in the effluent (a significant project cost reduction) and perform irrigation with recycled water of crops that are more tolerant as they come up in the planting cycles. Additional study in coordination with the agricultural community would be necessary to determine whether this solution is viable.

Concentrate Management

Any treatment process that involves RO results in production of a concentrate (also referred to as "brine") that must be disposed of. The concentrate can be disposed of via an ocean outfall. There are several options for disposal if the treatment occurs too far from an ocean outfall. These options are discussed further in Section 5.1.1. The costs of concentrate disposal can be significant and must be considered as part of a project with advanced treatment processes.

4.2.2 System Design

Beyond water quality, the primary consideration for recycled water system design is the time of water use. Agricultural customers can receive recycled water at any time, but operational experience on other agricultural reuse projects indicates that customers prefer to receive water during the day for multiple reasons, including planned staff presence and ability to observe any issues with irrigation. Based on this assumption, recycled water delivery to agricultural customers is assumed to occur over a 12-hour duration and forms the basis for sizing distribution system facilities.

Facilities would be smaller if deliveries could occur over a 24-hour duration. Recycled water could be delivered to a water supply pond or directly into the local irrigation system. Spreading deliveries over 24 hours instead of 12 hours allows for smaller storage, pumps, and pipes, thus reducing project cost. This option depends on the availability of onsite ponds for onsite storage and/or the willingness of growers to use water during the night.

Both durations are defined for the agricultural reuse projects in the RRWSP for sake of comparison.

4.2.3 Water Supply Benefit

Agricultural irrigation water supply does not come from municipal water supplies. As a result, use of recycled water by agricultural customers does not directly create a new water supply for municipal water suppliers. The municipal water supply benefit results from recycled water offsetting agriculture water supplies that could be used by municipalities. For example, if municipalities and agriculture both pump from the same groundwater aquifer, the groundwater formerly pumped by agriculture could then be used by municipal pumpers for potable water.

4.2.4 Water Quality Benefit

Agricultural reuse can also offer water quality benefits, including reducing potential for seawater intrusion caused by overdrafting of the aquifer under influence by coastal zones and reliable and controlled water quality delivered as compared to a surface water quality, such as canals and rivers exposed to the elements.

4.2.5 Recycled Water Pricing

Most municipal water supplies, particularly new supplies, are more expensive than agricultural irrigation's typical supply of pumping groundwater. In particular, most recycled water projects result in a cost of water that is higher than that of the existing agricultural water supplies from the deep aquifer. As a result, potential agricultural customers have limited incentive to participate in a recycled water project if the cost of recycled water is higher than the cost of their existing supply. The cost of groundwater supply generally includes amortized replacement cost of the well equipment and O&M costs. Therefore, recycled water projects that offset the customer's use of groundwater should be priced around the cost of the groundwater supply. A slight price reduction may need to be factored into the rate in order to incentivize agricultural users to convert.

In this scenario, the recycled water would be sold at an apparent loss. However, this does not consider the larger water resources picture. The recycled water project would be providing a new municipal water supply – the groundwater not pumped by agriculture – so the project cost is essentially the cost to acquire this new groundwater. From this perspective, the cost of the recycled water project should be compared with other potential new municipal water supplies just as a typical landscape irrigation recycled water project is evaluated. The evaluation considers cost as well as other factors such as reliability and drought resistance.

Another cost to municipailities of realizing the new groundwater supply results from the need to pump and treat the groundwater. This cost could be roughly offset by the revenue from sales of recycled water to agricultural customers.

Agricultural reuse without an exchange of groundwater could be justified by avoided seawater intrusion and avoided costs associated with intrusion, such as desalination of the groundwater or acquisition of a new supply

4.2.6 Market Acceptance

Market acceptance is dependent on perceived and real public health risks. To protect public health, DDW restricts recycled water irrigation of edible food crops to a minimum of tertiary treatment. Moreover, several agricultural reuse projects in California demonstrate the market acceptance of crops irrigated with recycled water.

Monterey Regional Water Pollution Control Agency (MRWPCA) has sold18 mgd of tertiary effluent for irrigation of food crops in the Monterey Peninsula for the past 15 years. The major crops grown are artichokes, broccoli, celery, strawberries, and lettuce. In addition, the Pajaro Valley Water Management Agency has sold 5 mgd of tertiary effluent for irrigation of food crops in the Watsonville area (just north of the Monterey area) for the past five years. The major crops grown are strawberries and vegetable row crops. The Irvine Ranch Water District (in Orange County, California) has successfully used tertiary treated recycled water for food crop irrigation since the late 1960s, with strawberries being a prime example.

In addition, the case studies in the following section demonstrate the acceptability of recycled water use in a range of agricultural settings, including row crops and vineyards.

4.2.7 Case Studies

There are several examples of agricultural reuse projects with tertiary treated water across the State. Seven projects are profiled in this section:

- Monterey County Water Recycling Projects
- Pajaro Valley Water Management Agency
- City of Oxnard
- City of Santa Rosa
- City of Healdsburg
- Town of Windsor
- Irvine Ranch Water District

The case studies reveal that each system has a unique history, project drivers, and economics. The unique setting for each project is described in the individual sections. Overall, limited groundwater supplies and, in some cases, seawater intrusion drove the agricultural reuse projects. These conditions are similar to agricultural reuse drivers for the region.

Funding / Financing Overview

An essential component of these projects is how the funding and financing applied to enable provision of recycled water at an acceptable rate. An overview of project funding / financing provides a good prospective for potential agricultural reuse projects in the region. Key funding and financing findings from the case studies include:

- No project was fully funded by the recycled water rate for agricultural customers. All of the projects are subsidized in some manner by combination of
    - Grant funding
    - Non-agricultural recycled water rates

    - Wastewater management funds
    - Groundwater basin management funds
    - Potable water supply funds.
- Most of the projects were aggressive in acquisition of State and Federal grant funds.
- The highest recycled water rates are set at the avoided cost of groundwater pumping (with one exception). If necessary, other sources of revenue are used to cover the remainder of projects costs.
- The one exception with higher rates is where the agricultural customer would like to expand production but is limited by existing groundwater rights and the cost of recycled water can be recovered.
- The rates that are set substantially lower than the cost of pumping are where most system costs are sunk costs and were driven other needs – primarily historical wastewater disposal management. Many projects constructed distribution infrastructure to support wastewater disposal that is now used for recycled water delivery to agricultural customers
- Some recycled water rates are subsidized by potable water rates where agricultural use of recycled water allows the municipality to use the groundwater for potable uses.
- Some areas apply groundwater basin management fees that are intended to fund supplemental water projects.
- Some projects serve municipal customers that pay a recycled water rate that is higher than the agricultural rates.

Regarding potential agricultural reuse projects in the region, agricultural recycled water rates should be set at or below the avoided cost of groundwater pumping. Funding the remaining projects costs should include a combination of the following options.

- *Grant funding:* A key recommendation in RRWSP Chapter 13 is to position for State and Federal grant funding by developing an agricultural reuse project (either alone or as part of a larger program) to a point where costs and benefits are defined and gain support from a range of regional stakeholders
- *Potable water supply rates / funds:* The higher tier(s) of potable water rates should be set at the marginal cost of new water supplies and recycled water is one of the likely supplies. For example, municipal receipt of groundwater in exchange for recycled water justifies the potable rates. Also, new development funds for new water demands could be applied to the recycled water project.
- *Groundwater basin management funds:* There are no existing entities in the region that have the authority to define and collect groundwater basin management funds but they may be in place in the future. For example, the proposed water district for the Paso Robles Groundwater Basin would be able to collect funds for supplemental water projects

Monterey County Water Recycling Projects

The Monterey Regional Water Pollution Control Agency began planning for regional wastewater treatment and reuse in the mid-1970s. The need for regional treatment was driven by old WWTPs that were over capacity with non-compliant discharge quality. The need for reuse was driven by seawater intrusion from large agricultural and municipal groundwater demands starting in the 1940s. Growers were motivated to use recycled water due to the rapid pace of seawater intrusion and crop restrictions due to deteriorating water quality.

An agricultural reuse demonstration study, the Monterey Wastewater Reclamation Study for Agriculture, was conducted in Castroville, CA from 1976 to 1987. Based on the based on positive results of the demonstration study and after a decade of planning, design, and construction, a full-scale water reclamation facility and recycled water distribution system, the Castroville Seawater Intrusion Project (CSIP), was completed in 1997. In 1998, CSIP began conveying recycled water to approximately 12,000 acres for food crop irrigation, including lettuce, celery, broccoli, cauliflower, artichokes, and strawberries.

The construction cost of the water reclamation plant, which is a tertiary treatment plant adjacent to the regional secondary treatment plant, and recycled water distribution system were funded by low interest loans. The loans and O&M costs are paid for by two sources in roughly equal proportion: property taxes and recycled water rate. Property taxes within the CSIP service area for FY11/12 were approximately $300 per acre while agricultural land outside the service area was $5 to $12 per acre. The water delivery charge for FY11/12 was $72/af. The combined cost for FY11/12 was approximately $223/af (based on water use of 2 af/acre). 95 percent of growers within the CSIP service area are using recycled water.

Key factors to successful implementation of the project include (Bob Holden, p.c.):

- Successful Proposition 218 effort to assess some cost through county tax rolls
- Pursuit and receipt of State and Federal grants and low interest loans
- Funding wastewater treatment plant expansion separately funding from the distribution system
- Funding and financing actions reduced the recycled water purchase price to be competitive with groundwater

In addition, specific accommodations were made for growers to get their support (Bob Holden, p.c.):

- Long-term (50-year) contract guarantee
- Limited time of use restrictions (that is managed by notification to system operator)
- Guarantee minimum 10 feet of head at highest point in parcel
- Installed ‘No Trespassing’ and “Irrigation Water – Do Not Drink” signs instead of DDW standard of “Recycled Water – Do Not Drink”
- Implementation of a Water Quality and Operations Committee for ongoing system feedback

In addition, growers like the extensive water quality testing conducted on recycled water for water quality confidence and reduction of RWQCB agricultural reporting requirements.

Pajaro Valley Water Management Agency

The Pajaro Valley Water Management Agency (PVWMA) was established to “efficiently and economically manage existing and supplemental water supplies in order to prevent further increase in, and to accomplish continuing reduction of, long-term overdraft and to provide and ensure sufficient water supplies for present and anticipated needs within its boundaries.” Agriculture represents approximately 85% of total water use in the area with production consisting mostly of strawberries, caneberries, and vegetables.

PVWMA is implementing a basin management plan to for the Pajaro Basin. One of the primary strategies is pursuing new water supplies for coastal agricultural irrigation in lieu of coastal groundwater pumping to reduce seawater intrusion. Offset of pumping would serve as a seawater intrusion barrier. Recycled water was identified as a key component to address groundwater overdraft and seawater intrusion in the area.

In 2009, construction was completed of the Watsonville Area WRF, which provides tertiary treatment and disinfection, and the Coastal Distribution System (CDS), which conveys water to over 7,000 acres of agricultural land along the coastal areas impacted by seawater intrusion. The WRF can produce up to 4,000 afy of tertiary treated water that is blended with other local water sources to reduce salt concentrations. The CDS delivers blended recycled water to coastal agricultural customers.

Delivered water charge for FY13/14 were $329/af based on the estimated avoided cost of pumping plus the basin augmentation charge for parcels within the CDS of $210/af. The augmentation charge for groundwater use outside the CDS was $174/af. The charges pay for debt service, O&M, and agency operations. PVWMA has received over $50 million in State and Federal grants for implementation of various basin plan projects, which has helped to ensure rates are manageable for all groundwater basin users and recycled water customers.

City of Oxnard

The City of Oxnard is implementing their Groundwater Recovery Enhancement and Treatment (GREAT) program to increase water supplies and improve groundwater basin management. Integral to the program is recycled water use. Initial uses of recycled water may include: irrigation of parks, medians, golf courses and athletic fields; watering of agriculture crops; and process water for local industries. In addition, the recycled water can be injected into the groundwater to create a seawater intrusion barrier.

The city constructed a tertiary treatment plant to provide recycled water for landscape irrigation. Also, they recently completed construction of an Advanced Water Purification Facility (AWPF), consisting of microfiltration, reverse osmosis, and advanced oxidation (MF/RO/AOP), to further treat recycled water for agricultural use and groundwater recharge. The AWPF reduces TDS concentration to approximately 200 mg/L.

In general, existing agricultural sites pump groundwater and use allocation within the Fox Canyon Groundwater Management Area (FCGMA)[21]. Potential agricultural recycled water customers are motivated to use recycled water due to a combination of factors (depending on the individual situation):

- Expand production with recycled water in addition to groundwater allotment
- Increase production of existing crops with same volume of water due to lower TDS concentration of recycled water compared with existing supply
- Avoid use groundwater with increasing salt concentrations due to seawater intrusion

[21] FCGMA manages and protects both confined and unconfined aquifers within several groundwater basins underlying the southern portion of Ventura County. The FCGMA is an independent special district, separate from the County of Ventura or any city government. It was created by the California Legislature in 1983 to oversee Ventura County's vital groundwater resources. All lands lying above the deep Fox Canyon aquifer account for more than half of the water needs for 0.7 million residents in the cities of Ventura, Oxnard, Port Hueneme, Camarillo, and Moorpark, plus the unincorporated communities of Saticoy, El Rio, Somis, Moorpark Home Acres, Nyeland Acres, Leisure Village, Point Mugu and Montalvo. (Source: www.fcgma.org/about-fcgma)

Proposed rates for recycled water are approximately $650/af if a similar volume of groundwater allocation is provided to the city in exchange for recycled water or approximately $1,400/af for delivery of recycled water without an exchange of groundwater allotment. The former value is based on recycled water system treatment and delivery costs and the latter value is based on cost recovery for the portion of the system associated with agricultural deliveries. Also, the city has been successful in receiving both State and Federal grants to partially fund the recycled water system.

The City of Oxnard is currently negotiating recycled water agreements with individual land owners.

City of Santa Rosa

The City of Santa Rosa started to provide secondary treated wastewater for agricultural irrigation, primarily for hops, since the 1950s and upgraded to tertiary treatment in 1990. In addition to reuse for landscape irrigation and energy production, the city currently provides recycled water for irrigation of approximately 5,800 acres of agricultural land. Crops include pasture, hay and silage crops, vineyards, and vegetables and specialty crops. Also, in 1997, Gallo Wines partnered with the city to use recycled water to meet all of their daily operations.

The city originally paid agricultural customers to reuse effluent since agricultural reuse was originally driven by the need for wastewater disposal. The upgrade to tertiary

The city currently provides recycled water to agricultural customers for free due to zero discharge conditions imposed during the dry season. The city is currently developing rates due to the high demand for recycled water from urban and agricultural customers.

City of Healdsburg

The City of Healdsburg upgraded their WWTP in 2008 from a lagoon system to tertiary treatment with a membrane bioreactor (MBR) system due to implementation of stricter discharge limits. In 2014, the city received approval to provide recycled water to local vineyards. The vineyards will use recycled water produced by the MBR system without any additional salt removal since TDS concentration in the city’s recycled water is approximately 400 mg/L.

The city ultimately plans to construct a distribution system to the vineyards but recycled water deliveries via truck were initiated in May 2014 due to ongoing drought conditions. The city is currently providing the recycled water free of charge to trucks that fill up via hydrants at the WWTP. Once the distribution system is constructed, they plan to charge for the recycled water based on cost recovery of distribution.

4.3 Industrial Reuse

Use of recycled water for industrial purposes covers a variety of potential applications. These range from uses with high volume combined with low water quality needs to those with strict water quality needs combined with low use. Most industrial processes include heating and cooling. As a result, cooling towers are the most common form of industrial reuse. Other applications include (Asano et al., 2007):

- Boilers
- Auto washing
- Pulp and paper industry
- Textile industry
- Oil and gas production

- Oil refineries
- Chemical manufacturing
- Semiconductor industries
- Solid waste incineration

Each application has its own specific supply requirements, but most have sensitivity to specific constituents impacting the specific industrial process. In the study area, the most likely industrial reuse applications are cooling towers, boilers, and oil and gas production. These uses are discussed further in this section.

Industrial customers can provide several benefits to recycled water systems by maximizing use of distribution system capacity. This is because industrial demands have a lower seasonal peaking factor due to year-round demand, and use is typically during the day. The relatively high use during the typically low irrigation demand of winter prevents common recycled water system issues, such as odor and other water quality issues due to water aging. Industrial demand during the day results in the use of distribution system capacity at the opposite time that most recycled water irrigation occurs. Therefore, serving industrial customers may not require additional capacity.

The challenges associated with meeting industrial reuse service needs cause recycled water purveyors to avoid these potential customers. This section discusses specific issues to address for potential industrial uses in the study area.

4.3.1 Cooling Towers

Common applications of cooling towers include cooling the circulating water used in oil refineries, chemical plants, power plants, and heating, ventilation, and air conditioning systems. Most cooling water systems that use recycled water are recirculating because the volume of water required for once-through cooling can only be met by massive amounts of water. Cooling water systems water quality concerns center on corrosion, scaling, and biological fouling. Specific constituents of concern depend on the system materials and operating conditions.

Conversion of a cooling tower to recycled water requires a site-specific assessment of on-site infrastructure and cooling tower components. Some topics that commonly need to be addressed include:

- Cycles of concentration (COC) refers to the number of times the same water is circulated through the tower before being discharged. Circulation results in concentration of dissolved minerals because the water evaporates but the minerals remain. COC is limited by maximum concentrations of dissolved minerals that are dependent on the type of cooling system in place. Use of a water with different water quality than that of existing operations could reduce the operational COC, which results in increased discharges and requires a higher volume of water to achieve the same cooling as was achieved with the original water supply.
- The existing water supply is likely treated to some extent to avoid corrosion and scale. This treatment can include reverse osmosis. The existing treated water quality should be met with recycled water. Recycled water treatment could occur at the SSLOCSD WWTP, or some treatment could occur at the WWTP and use the refinery's existing system.
- The impact of ammonia on copper tubing has required many recycled water systems to implement nitrification or nitrification-denitrification in addition to tertiary filtration.

- On-site water system piping tends to be complicated at industrial sites and. As a result, isolating the system that provides water to the cooling towers can lead to significant new infrastructure costs. In particular, the retrofit can be complicated if the fire safety system is combined with the process water system.
- Contract maintenance is typical for large cooling towers, and the contractor will likely have refined operation of the towers over time. Introduction of water with different water quality can be met with resistance from the contractor for various reasons.
- Worker safety is a common concern for customers unfamiliar with recycled water. This can be addressed with training and education.

4.3.2 Boilers

Boilers are closed combustion vessels used to produce steam or heat water. Steam is produced in boilers by heating water until it vaporizes. Boilers are classified as low-, medium-, or high-pressure. Water quality requirements are generally dependent on the boiler's operational pressure. Low-pressure boilers typically use tertiary effluent, while high-pressure boilers typically require ion exchange or reverse osmosis treatment of water. In general, water used for boilers must reduce hardness to close to zero to prevent scaling. Also, alkalinity and organics can be a concern due to foaming.

Conversion of boilers to recycled water requires a site-specific assessment of on-site infrastructure and water quality requirements.

4.3.3 Oil and Gas Production

Oil and gas production water quality needs range from minimal- to high-purity water, depending on the application. For example, production typically entails pumping an oil/water mixture from the ground, separating the oil products, and then returning the water to the ground using injection wells. The return water is slightly lower in volume than the pumped oil/water mixture. The State Department of Conservation, Division of Oil, Gas, and Geothermal Resources requires some sites to re-inject as much total liquid as they extract from the oil formations. This requires a supplemental water supply to meet the net deficit.

Use of recycled water for oil and gas production requires a site-specific assessment of on-site infrastructure and water quality requirements.

4.4 Environmental Reuse (Stream Augmentation)

Environmental reuse is the use of recycled water to create, enhance, sustain, or augment water bodies, including wetlands, aquatic habitats, or stream flow. In the study area, the primary environmental reuse is for stream augmentation. The concept is explored for Arroyo Grande Creek with SSLOCSD effluent. Also, Morro Bay's new WRF may involve Chorro Creek depending on the selected WRF location.

These projects are driven by regulations defining minimum treatment requirements. Other implementation considerations (in addition to cost) include the risk of stricter treatment requirements in the future, as well as public acceptance. Each topic is discussed further in this section.

4.4.1 Regulations & Water Quality

As discussed in Section 0, stream augmentation projects are subject to a NPDES permit for discharge into an inland surface water. Effluent permit requirements would be based on:

- All applicable water quality standards (beneficial uses, water quality objectives to protect the uses, and anti-degradation policies) in the Central Coast Basin Plan,
- Water quality criteria in the California Toxics Rule (CTR) for protection of aquatic life and human health, and
- Implementation measures for the CTR in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP).

The primary requirements that could impact water quality and associated treatment are:

- Surface water quality objectives for TDS, chloride, and sodium would necessitate the use of membrane treatment such as RO or ultrafiltration.
- The MUN beneficial use designation that trigger Basin Plan objectives such as MCLs, and CTR criteria if there is reasonable potential to cause or contribute to a violation of a water quality standard
- Cold Fresh Water Habitat (COLD) beneficial use designation could establish effluent limits for temperature to meet the narrative temperature objectives, thereby requiring additional treatment, such as cooling towers or chillers, or the application of best management practice, such as providing shade trees, to meet permit requirements.

Concentrate Management

Any treatment process that involves RO results in production of a concentrate (also referred to as “brine”) that must be disposed of. The concentrate can be discharged via an ocean outfall; however, the salinity may impact the mixing zone for the ocean outfall facility and hence compliance with ocean discharge limits based on the California Ocean Plan would have to be assessed. There are several options for disposal if the treatment occurs too far from an ocean outfall. These options are discussed further in Section 5.1.1. The costs of concentrate disposal can be significant and must be considered as part of a project with advanced treatment processes.

4.4.2 Future Regulations

A primary implementation consideration for surface water augmentation projects (in addition to cost) is the risk of stricter treatment requirements in the future. There is also a risk of increased monitoring for new constituents, which can be expensive. The risk of stricter treatment requirements is higher for surface water augmentation projects because criteria must be met for both human and aquatic health, as well as to protect all beneficial uses assigned to the receiving water in the Basin Plan. Some possible limits, such as for disinfection byproducts based on CTR criteria, would likely require additional treatment beyond AWT and would further increase the costs of the projects.

Potential future discharge restrictions or all surface water augmentation projects could occur as a result of:

- New permit limits from any TMDL wasteload allocations based on future 303(d) listings.
- Chronic toxicity limits based on the future California Toxicity Assessment and Control Policy to be proposed in 2015.
- Permit limits for nitrogen, phosphorus, and other nutrient-related parameters based on the future California Nutrient Policy for Inland Surface Waters to be proposed in 2015.
- Statewide methylmercury objectives for inland surface waters, enclosed bays, and estuaries.

- Any future amendments to the CTR criteria based on updated recommended human health criteria.

4.4.3 Permits

Construction projects in the vicinity of streams typically require additional permits, which can increase planning and construction costs. The US Army Corps of Engineers 404 permit and the California Department of Fish and Wildlife 1602 permit are commonly needed.

4.4.4 Public Acceptance

Public perspective of augmentation projects with minimum flows for habitat as a primary purpose is likely less critical than that of augmentation projects that directly increase drinking water supplies.

4.5 Potable Reuse – Groundwater Recharge

Similar to environmental reuse, GWR projects are driven by regulations defining minimum treatment requirements. In addition, several DDW requirements impact other project components, such as the use of dilution water and underground residence time for recycled water prior to extraction at the closest drinking water well. Other implementation considerations (in addition to cost) include the risk of stricter treatment requirements in the future, as well as public acceptance. Each topic is discussed further in this section.

Two types of GWR projects are discussed: 1) surface spreading within recharge basins, and 2) injection with wells. Aspects of the regulatory requirements are different for each type of GWR application.

4.5.1 Regulations & Water Quality

GWR projects are regulated by both DDW and RWQCB. DDW regulations are focused on drinking water and protection of public health. The final GWR Regulations include specific provisions for approving GWR projects to ensure protection of public health, including water quality. The RWQCB issues the permit for a GWR project based on DDW recommendations as well as requirements consistent with the Basin Plan, and State policies. As SNMPs are adopted as amendments to Basin Plans, their pertinent requirements will also be applied to projects. Based on this understanding, the following requirements will form the basis for GWR projects:

- For all GWR projects, the discharge cannot impact beneficial uses for the applicable groundwater basin. This requirement may be applied as end-of-pipe limits using the Basin Plan groundwater objectives; however, the SWRCB allows for attenuation and dilution to be considered.
- For all GWR projects, in the absence of an SNMP, conduct an assimilative capacity analysis according to the provisions in the Recycled Water Policy. After an SNMP is adopted as a Basin Plan amendment, any requirements related to a GWR project (or projects) must be met.
- For surface spreading projects, a minimum of tertiary treatment is required.
- For surface spreading projects, the initial RWC cannot be greater than 20% unless an alternative is approved by DDW that can achieve a TOC of 0.5 mg/L, which would require AWT or using an alternative to TOC such as BDOC. If a project starts at 20%, it may be possible to increase the RWC after the first year.
- For injection projects, the entire flow must be treated by RO and AOP and achieve a TOC of 0.5 mg/L.

Table 4-5 presents preliminary water quality goals for the most critical Basin Plan groundwater objectives for the MUN beneficial use and the mineral objectives that apply to specific groundwater sub-basins in comparison to existing WWTP effluent quality.

Table 4-5. Existing WWTP Effluent Quality and Preliminary Basin Plan Goals

Constituent	TCSD		Morro Bay		Pismo Beach		SSLOCSD		NCSD Southland	
	EFfluent[1]	Basin Plan Goal	EFfluent[2]	Basin Plan Goal	EFfluent[3]	Basin Plan Goal	EFfluent[4]	Basin Plan Goal	EFfluent[5]	Basin Plan Goal
All values in mg/L										
TDS	1,446	730[6] 500-1,000[7]	942	500-1,000[7]	1,100	500-1,000[7]	855	500-1,000[7]	800 – 1,000	500-1,000[7]
Chloride	489	100[6] 250-500[7]	369	250-500[7]	340	250-500[7]	230	250-500[7]	200 – 240	250-500[7]
Boron	N/A	0.3[6]	0.4	---	0.35	---	0.29	---	N/A	---
Nitrogen (as N)	14	2.7[6] 10[7]	37.5	10[7]	14	10[7]	N/A	10[7]	ND – 10	10[7]

N/A - Not Available; ND – Not Detected

Notes:

1. Source: Average concentration over four years (2010 to 2013) and *TCSD Wastewater System Evaluation* (HMM, 2012), Table 3B.
2. Source: 2012 Recycled Water Feasibility Study for Morro Bay and Cayucos Sanitary District (Dudek); for existing effluent from six samples taken in February 2012.
3. Source: Pismo Beach Water Reuse Study (Carollo, 2007), Table 2-7, for grab samples collected on 9/25/2006. Nitrogen value is only for nitrate. Total nitrogen was not available.
4. Source: 2009 Recycled Water Study (Wallace), Table ES-3; based on composite sample on 12/17/2008
5. Source: Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, 2009), Table 3-1; for Projected Future Concentrations with WWTF Upgrade (to be completed in 2014)
6. Based on the Central Coast Basin Plan mineral objectives for the Paso Robles Templeton Sub-basin; none of the other potentially impacted groundwater basins have identified mineral objectives in the Basin Plan.
7. Goal is based on the MCL.
   a. For minerals, the secondary recommended to upper range is presented.
   b. For nitrogen, the nitrate + nitrite (as N) primary MCL is presented.

Based on the information presented in Table 4-5, tertiary effluent will likely require treatment for reduction in TDS, chloride, and nitrogen concentrations depending on assessments related to assimilative capacity performed as part of SNMPs. As a conservative step in advance of adoption of SNMPs, application of RO to a percentage of tertiary effluent is assumed as minimum treatment requirements for a surface application GWR project.

Regarding the RWC for surface spreading projects, at present TOC monitoring is not typically conducted for WWTPs. Without information on TOC concentrations in wastewater, the maximum initial RWC of 20% (per the final GWR Regulations) is a reasonable conservative assumptions, even if a minimum percentage of RO is applied. (An RWC of 20% means that 4,000 afy of dilution water must be recharged for every 1,000 afy of recycled water recharged.) The RWC requirement makes many GWR projects infeasible due to lack of available dilution water.

Dilution water for surface spreading is typically conserved stormwater or purchased potable water. DDW has also allowed the use of groundwater underflow on a case-by-case basis. The

RWC would be higher based on actual operations and TOC reduction via SAT. For example, the Chino Basin Groundwater Recharge Project, which uses tertiary recycled water for replenishment, can achieve RWCs for its non-contiguous spreading basins ranging from 25% to 45% based on TOC concentrations after percolation. RWCs could be higher using an alternative to TOC such as BDOC.

Application of full AWT to all effluent should remove the need for dilution water for surface spreading projects. All injection projects must include full AWT. It is important to consider that RO systems do not recover all of the feed water treated. Recoveries range from 75% to 85% unless a third stage RO system is included.

Concentrate Management

Any treatment process that involves RO produces a concentrated waste stream (called the concentrate or brine). The disposal of the concentrate can be challenging. Examples of concentrate disposal include discharge to another wastewater treatment system, discharge to the ocean, discharge to a saline surface water, evaporation ponds, and deep well injection. These options are discussed further in Section 5.1.1. The costs of concentrate disposal can be significant and must be considered as part of a project with advanced treatment processes.

4.5.2 Water Supply Benefit

Most of the study area's municipal groundwater supplies are from groundwater within a confined aquifer. Water can recharge the confined aquifer in notable volumes from the surface if the aquifer has an unconfined area. Injection is the only option to replenish a confined aquifer if there is not a known unconfined area. In addition, injection may be desired to locate the recharged water in specific locations, such as within pumping depressions or along the coast to act as seawater intrusion barriers.

GWR via surface spreading that does not reach municipal supplies would require some kind of water exchange with the entity that benefits from the recharge. For example, because agriculture may pump from a shallow aquifer, a GWR project for this aquifer will likely require an arrangement with municipal pumpers to realize a water supply benefit. As discussed above for agricultural reuse, use of recycled water (via recharge) by agricultural customers does not directly create a new water supply for municipal water suppliers. The municipal water supply benefit results from recycled water offsetting pumping from the deep aquifer by agriculture. The deep aquifer groundwater formerly pumped by agriculture could then be used by municipal pumpers for potable water.

Finally, the GWR project sponsor must have confidence that the water being recharged will replenish the intended aquifer and can be recovered (to the extent possible).

4.5.3 Public Acceptance

Public acceptance of GWR projects has increased over the past ten years based on successful projects such as the OCWD Groundwater Replenishment Project. Any GWR project will require a public outreach effort. The WateReuse Research Foundation has an interactive website to help communities plan and introduce potable reuse projects.[22] The additional costs associated public outreach efforts will result in a higher planning cost estimate.

[22] www.watereuse.org/water-replenish/index.html

4.6 Potable Reuse – Reservoir Augmentation

Reservoir augmentation is the placement of highly treated recycled water into a reservoir for eventual potable use after treatment at the reservoir water's drinking water treatment plant. This type of project must meet Basin Plan, CTR, and SIP inland surface water discharge requirements and comply with pending DDW regulations for the use of recycled water for reservoir augmentation. DDW is currently developing regulations with input from an expert panel and advisory group. There is a statutory deadline of December 31, 2016 to adopt the regulations. Projects can be approved by DDW on a case-by-case basis in the interim. (The status of the DDW reservoir augmentation regulations is discussed in Section 3.1.3.) Based on a conceptual DDW regulatory framework developed by the City of San Diego's for its proposed reservoir augmentation project, the following requirements are envisaged to apply:

- The recycled water would receive AWT prior to discharge to the reservoir.
- The recycled water would be kept in the reservoir for at least 12 months before withdrawal.
- Water from the reservoir would be treated at a conventional water treatment plant prior to distribution as potable water

The potential surface water discharge and DDW requirements are likely to translate to significant costs in comparison to other potable reuse options. There are currently no operational reservoir augmentation projects in California. The original project proposed by the City of San Diego was subject to significant public opposition as a result of local political circumstances; however, the current proposed project has public and for now political support. This change in outlook was accomplished in part by broad public outreach efforts and by conducting a Water Purification Demonstration Project. On April 23, 2013, the San Diego City Council unanimously accepted the Demonstration Project final report and directed staff to bring forward to the City Council preferred plans for both IPR and direct potable reuse system.[23]

[23] For project updates see www.sandiego.gov/water/waterreuse/demo/articles.shtml

5. RRWSP PROJECT DEVELOPMENT

Chapters 6 through 10 define recycled project concepts for each area in the study. The purpose of developing these projects is to: 1) Identify opportunities for each individual area, and 2) identify the most promising opportunities from a regional perspective by enabling comparison of projects across the areas.

Project concepts were updated from previous reports, and new concepts were developed using the same design criteria and cost basis to facilitate comparison between projects. This chapter describes the common criteria applied to project concepts in the RRWSP. The chapter includes:

- Facilities
- Cost estimating

5.1 Facilities

Recycled water systems consist of three primary sets of facilities:

- Treatment plant facilities (treatment, concentrate management, storage / equalization, and product water pump station)
- Distribution system facilities (pipelines, storage, and booster pump stations)
- Customer facilities (treatment, storage, and booster pump stations) or Recharge facilities (recharge basins or injection wells)

In addition, many systems include access to supplemental water supplies. The basis for sizing recycled water facilities is presented in Table 5-1.

Table 5-1. Recycled Water System Facilities Design Criteria

Facilities	Design Criteria
WWTP Facilities	
Tertiary Treatment	Capacity based on peak day demand
Equalization / Product Storage	Capacity based on peak day demand
Product Water Pump Station	Capacity based on peak hour demand
Concentrate Management	Capacity based on concentrate production at maximum treatment process capacity
Distribution System Facilities	
Pipelines	Sized for peak hour demand based on: - Maximum 8 fps for seasonally variable deliveries - Maximum 5 fps for seasonally constant deliveries
Booster Pump Stations	Capacity based on peak hour demand for downstream customers
System Storage	Not used in the RRWSP to simplify hydraulic evaluation but should be considered as part of future steps
Customer / Recharge Facilities	
Customer Facilities	Proper criteria requires evaluation individual customers so a lump sum cost is included for “average” customer
Recharge Basins	Assume a recharge rate 1 ft/day and 80% of land used for recharge
Injection Wells	Assume an injection rate of 1,000 gpm

Note: Pump station sized based on 75% pump / motor efficiency. Redundant pumps are not included assuming that the lower reliability is acceptable based on the lower cost.

5.1.1 Treatment

Several levels of treatment are considered in the RRWSP:

- Secondary effluent for feed and fodder irrigation
- Tertiary filtration and disinfection for unrestricted irrigation
- Tertiary filtration and disinfection plus treatment of partial flow with RO for
  - Agricultural irrigation to reduce TDS and/or chloride to address some sensitive crops
  - Groundwater recharge via surface spreading to meet Basin Plan groundwater quality objectives
  - Stream augmentation to meet Basin Plan surface water quality objectives and CTR limits
- Full AWT for
  - Groundwater recharge via surface spreading to reduce the need for blend water
  - Groundwater recharge via injection to meet regulations
  - Stream augmentation to meet potential regulations
  - Reservoir augmentation to meet potential regulations

Each of the treatment plants in the RRWSP have completed evaluations for upgrading to tertiary treatment. The components of tertiary treatment upgrades vary between plants based on existing processes and effluent quality. Therefore, the design and cost estimates prepared in these previous reports are included in the RRWSP with costs escalated to a common basis (see ENR CCI in Section 5.1.2). On the other hand, unit costs were developed for treatment beyond tertiary – for partial RO or full AWT. The tertiary treatment upgrades include:

- NCSD evaluated two options to meet tertiary treatment requirements: 1) traditional filtration, and 2) percolation and pumping of percolated water
- The City of Pismo Beach evaluated the addition of tertiary filtration at two capacities: 0.15 mgd and 1.6 mgd (build-out) (Carollo, 2007)
- SSLOCSD evaluated the addition of tertiary filtration (Wallace, 2009)
- TCSD considered WWTP improvements for its existing secondary treatment system, WWTP expansion for future growth, and the addition of high-rate filters for tertiary filtration (HMM, 2012)

Concentrate Management

Any treatment process that involves RO results in production of a concentrate (also referred to as “brine”) that must be disposed of. The existing potable reuse projects that use RO membranes are located along the Southern California coast and have access to wastewater treatment plant ocean outfalls for concentrate disposal. There are several options for disposal if the RO treatment occurs too far from an ocean outfall or cannot use the ocean outfall because of its limited mixing zone or discharge location. These options include: 1) deep well injection, 2) evaporation, 3) a concentrating system, and 4) combination of these options.

Deep well injection, which is currently practiced at the Laguna County Sanitation District (in northern Santa Barbara County) can be cost effective in a specific setting – namely, where oil production has occurred previously, sufficient capacity exists for the disposal, and the permitting process is not difficult. Therefore, the practice has limited applicability without further investigations.

The most cost-effective manner for concentrate disposal in a setting with available land is the use of evaporation ponds with subsequent hauling of solids to appropriate landfills. Generally, concentrating systems become more cost effective as land becomes less available and/or more expensive. This may be resolved by adding a concentration process to reduce volume. Depending on the location of the evaporation ponds, a RWQCB may requirement installation of a liner.

Evaporation ponds are assumed for concentrate disposal based on a cursory assessment due to relatively inexpensive land and moderate evapotranspiration rates in the study area. Alternatives that warrant further consideration at the facility plan level are deep well injection, crystallization (misters, forced circulation crystallizer), concentrators (membrane process, vibratory shear enhanced processing membrane system (VSEP), electrodialysis reversal, mechanical evaporation) prior to selected disposal mechanism, and zero liquid discharge.

5.1.2 Demand Estimates and Peaking Factors

Recycled water landscape irrigation demand estimates in the RRWSP are primarily based on demand estimates conducted for prior studies. If information was not available, a landscape irrigation demand of 2.0 afy per acre was applied for Nipomo and 2.5 afy per acre Templeton, which is similar to factors applied in prior studies.

Seasonal and hourly peaking factors were developed based on evapotranspiration rates developed in the prior studies. Seasonal peaking factors are used to adjust the annual average demand estimates for seasonal variations. Typically, irrigation demands increase with hotter temperatures and decrease during cooler temperatures. In addition, precipitation lowers irrigation demands. A maximum month day peaking factor of 2.0 times average annual demand was applied in the RRWSP.

Hourly peaking factors are used to adjust the daily demand estimates depending on the daily time of recycled water use. Generally, irrigation customers are required to operate at night for public health purposes. A peak hour peaking factor of 3.0 times maximum month day demand was applied in the RRWSP based on 8 hours of irrigation per day.

Table 5-2. Landscape Irrigation Peaking Factors

Peaking Factor for RRWSP			Prior Study Peaking Factors		
			SSLOCSD	Pismo Beach	Morro Bay
Maximum Month	2.0	times Average Annual Demand	2.0	2.3	2.0
Maximum Day	1.0	times Maximum Month	1.5	1.3	1.0
Peak Hour	3.0	times Max Month Day	2.0	3.0	3.0
	6.0	times Average Annual Demand	6.0	9.0	6.0

Sources: SSLOCSD: Wallace, 2009; Pismo Beach: Carollo, 2007; Morro Bay: Dudek, 2012

5.2 Cost Estimating

5.2.1 Cost Estimate Classification

Association for Advancement of Cost Estimating International's (AACE) cost estimate classification system includes five classes of project cost estimates. Cost estimates in the RRWSP fall within Class 4 estimates, which have an expected accuracy of +50% to -30%. Per AACE (2011): "Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams for main process systems, and preliminary engineered process and utility equipment lists."

5.2.2 Project Unit Costs

Unit costs of the various alternatives will be compared using the annual payment method. The unit cost is calculated with this method by adding the annual payment for borrowed capital costs to the annual O&M cost and dividing by the annual project yield. This method provides a simple comparison between alternatives in the RRWSP. The factors described below are used to calculate the unit cost with the annual payment method.

The economic factors used to analyze the estimated costs for each of the project concepts are:

- **Escalation:** Engineering News Record's (ENR) Construction Cost Index (CCI) for California is used as the common cost basis. The costs in this report reflect the ENR California CCI for June 2013 of 5802. The CCI for cost estimates from previous reports was used to escalate those estimates to the CCI applied for this report.
- **Inflation:** Escalation of capital and O&M costs is assumed to be 3.0% based on a combination of California CCI and Western Region Consumer Price Index (CPI) for the past 10 years (June 2003 to June 2013). The average annual escalation rate for California CCI is 3.8%, while the average annual inflation rate for CPI is 2.3%. The California CCI is likely high due to the significant increases from 2003 to 2008 as part of the housing bubble. CPI does not necessarily capture material and prevailing wage increases.
- **Project Financing:** Interest Rate & Payback Period: 5% over 30 years. Note that State Revolving Fund (SRF) loans are at a lower rate and potentially shorter payback period. Refer to Chapter 11 for further discussion of SRF and other loan options.
- **Useful Life of Facilities:** The useful life of facilities will vary based on several factors, including type of facility, operating conditions, design life, and maintenance upkeep. Structural components of most facilities are typically designed to last 50 years or longer. However, mechanical and electrical components tend to have a much shorter lifespan and typically require replacement or rehabilitation at regular intervals. To simplify the lifecycle evaluation, the RRWSP assumes that all facilities have a useful life matching the financing payback period of 30 years.

More sophisticated cost evaluation methods, such as unit lifecycle costs using present value, are recommended for comparison with alternative water supplies so that proper cost comparisons can be conducted. Recycled water projects tend to have high capital costs due to the large amount of new distribution infrastructure required while many imported water projects have higher O&M costs due to annual purchase costs.

5.2.3 Construction and O&M Cost Basis

The following tables present the construction and operation and maintenance (O&M) costs for recycled water system facilities.

Table 5-3. Recycled Water System Facilities – Unit Costs

Facilities	Construction Cost[1,2]	Notes	O&M Cost[1]
Electricity	--		\$0.13/kw-hr
WWTP Facilities			
Treatment		Refer to Table 5-4	
Equalization / Product Water Storage	\$1.5/gal	Includes 10% markup for yard piping	1% of capital cost
Product Water Pump Station[3]	See Formula in Notes	$ = 2*10^(0.7583*log(Qp)+3.1951) Qp = Peak Flow [gpm]	5% of capital cost
Distribution System Facilities			
Pipelines	See Notes (\$/LF)	4" (\$110), 6" (\$130), 8" (\$150), 10" (\$170), 12" (\$190), 16" (\$220), 24" (\$250)	1% of capital cost
Booster Pump Stations[3]		Refer to product water pump station	
System Storage		Refer to Equalization / Product Water Storage	
Customer / Recharge Facilities			
Irrigation Customer Retrofit	\$15,000/ea	Represents average of multiple customers	
Industrial Customer Retrofit	\$100,000/ea		
Recharge Basins	\$15,000/ac		\$5,000/ac
Evaporation Ponds	\$80,000/ac	Similar to recharge basins but with a liner	\$5,000/ac
Injection Wells	\$1.5 M/ea		2% of capital cost
Land Purchase	200,000/ac	For agricultural land	--

Notes:

1. Sources: The basis for unit costs is included in Appendices D, E, F, and H. (The same information is repeated in each appendix).
2. Contingencies and factors presented in Section 5.2.4 are added to these unit costs.
3. Pump station sized based on 75% pump / motor efficiency. Redundant pumps are not included assuming that the lower reliability is acceptable.

Table 5-4. Recycled Water Treatment – Reference Unit Costs

	Average Annual Flow	Capital Cost[1]	Unit Capital Cost ($/gal)	Annual O&M Cost ($/gal)[1,2]	Annual Payment Unit Cost ($/af)[3]
NCSD Southland WWTF					
Tertiary Filtration	1.67 mgd	$3.5 M	$2.1	$0.15	$260
Percolation	1.67 mgd	$0.8 M	$0.5	$0.02	$50
Pismo Beach WWTP Tertiary Filtration	0.15 mgd	$2.1 M	$14.0	$0.15	$950
	1.6 mgd	$3.2 M	$2.0	$0.15	$250
SSLOCSD WWTP Tertiary Filtration	2.7 mgd	$6.4 M	$2.4	$0.15	$280
TCSD Meadowbrook WWTP Tertiary Treatment	0.67 mgd	$4.4 M	$6.5	$0.15	$510
Partial Reverse Osmosis	N/A	N/A	$3.4	$0.20	$450
Full AWT (MF/RO/AOP)	N/A	N/A	$10.1	$0.60	$1,430

Notes:

1. The source for each cost is included in Appendices D, E, F, and H. (The same information is repeated in each appendix). Capital cost Includes contingencies and factors.
2. A common unit cost for tertiary treatment is applied for consistency between areas.
3. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield.

5.2.4 Total Capital Cost Factors

Construction contingency and implementation factors are added to the raw construction cost derived from the unit costs in the previous section.

Construction Contingency

Construction contingencies are defined as unknown or unforeseen costs. In general, higher contingencies should be applied to projects of high risk or with significant unknown or uncertain conditions. Such unknown and risk conditions for construction cost estimates could include project scope, level of project definition, occurrence of groundwater and associated dewatering uncertainties, unknown soil conditions, unknown utility conflicts, etc. **A 30% contingency will be applied to construction cost estimates based on Class 4 estimates.**

Implementation Factor

Implementation factors are included to try to capture the entire capital costs associated with the implementation of the project in addition to construction costs. While these costs can vary greatly from project to project and from component to component, it is most common to assume a standard factor on the estimated construction costs across all projects and project types when analyzing alternatives and project options. The following defines the typical efforts and factors for these additional services:

- Planning, environmental documentation, and permits
- Engineering services (pre-construction)
- Engineering services during construction

- Construction management and inspection
- Legal and administrative services

For the RRWSP, two percentages of the estimated project construction costs are used to account for these additional services applied depending on the type of project. **Landscape and agricultural irrigation projects have a 30% factor, while potable reuse and stream augmentation projects have a 40% factor.** The increased factor for latter projects is due to the higher number of studies required for a successful project and the extended implementation timeline from project conception to start-up.

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6. RECYCLED WATER PROJECTS – MORRO BAY

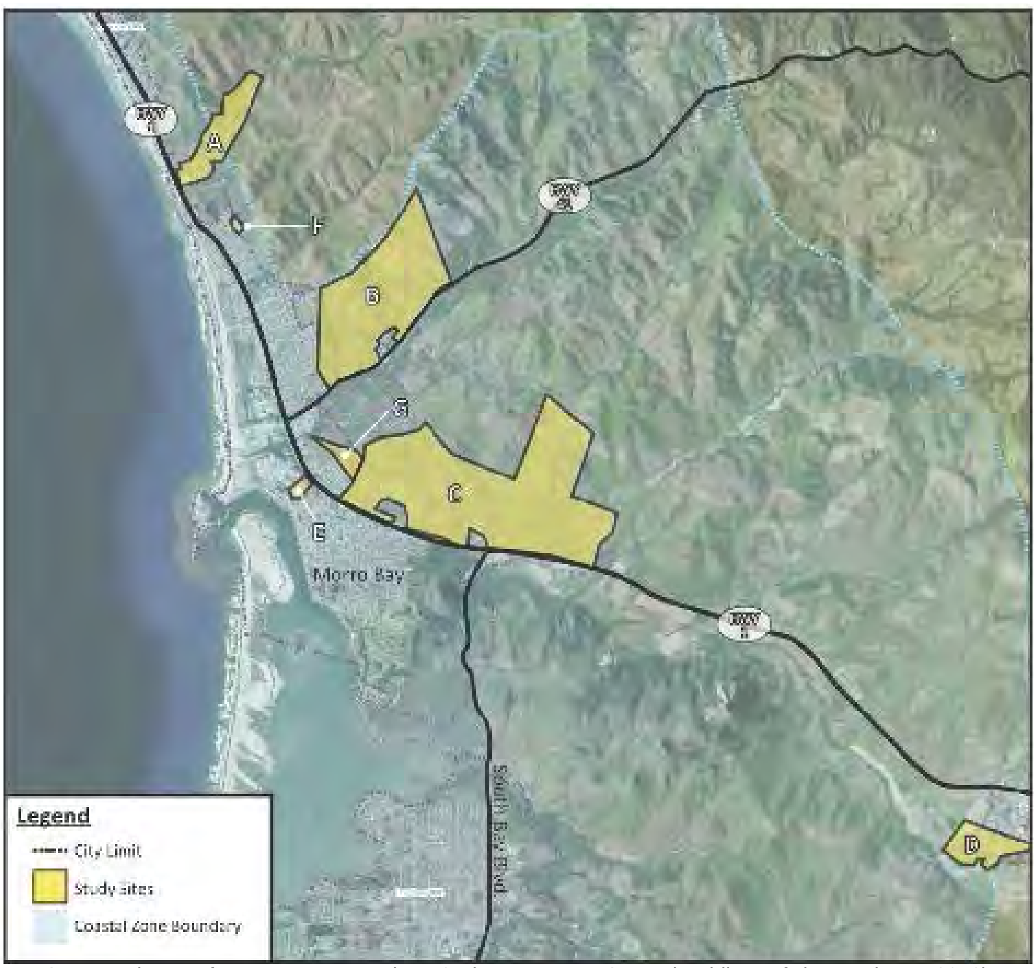
6.1 New WRF Status

The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility. The information presented in this report is based on the New Water Reclamation Facility Project, Second Public Draft Options Report (Rickenbach, December 5, 2013). The report was prepared to assist "the City Council in making a decision about an appropriate location to build a new WRF to replace the City's existing WWTP." According to the report, the new WRF is intended to accomplish several goals, including:

- Produce tertiary, disinfected effluent in accordance with Title 22 requirements for unrestricted urban irrigation
- Designed to produce recycled water for potential users, including landscape areas, agriculture, or groundwater recharge

The report evaluated seven potential sites (Figure 6-1). In February 2014, the City set a goal to have the new WRF online in five years from issuance of the final NPDES permit (anticipated for late 2014/early 2015). The City Council is scheduled to decide on a site in late 2014. To meet the 5-year schedule goal, a facilities plan would be completed by 2016, followed by final construction completion in 2019 or 2020 depending on issuance of the final NPDES permit.

Figure 6-1. New WRF Sites Evaluated by Morro Bay



Source: Figure 1 from New WRF Project: Options Report – Second Public Draft (December 5, 2013)

6.2 Recycled Water Overview

The new WRF is estimated to produce between 0.9 mgd (1,010 afy) (existing) to 1.0 mgd (1,120 afy) (projected). The city wants to maximize reuse from the new water reclamation facility. However, implementation of each type of potential reuse is subject to constraints, and feasible recycled water options are ultimately dependent on the site selected for the new WRF.

The New Water Reclamation Facility Project Report on Reclamation and Council Recommended WRF Sites (May 8, 2014) identified potential types of reuse from the new WRF:

- Irrigated Agriculture
- Streamflow Augmentation in Creeks
- Irrigation of Landscaping, Parks, and Golf Courses
- Groundwater Recharge

The largest opportunity is agricultural irrigation in Morro Valley (primarily avocados and some row crops) and, to a lesser extent, in the Chorro Valley. There are important though less plentiful opportunities within the City itself as well as in Cayucos, primarily related to landscaping and parks. Table 6-1 summarizes the estimated annual demand for irrigated agriculture, parks, landscaping, and golf courses in the various areas near the city.

Table 6-1: Morro Bay Irrigation Reuse Opportunities

Area	Number of Sites	Average Annual Demand	Notes
Morro Valley	56	2,736 afy	All 56 sites are irrigated agriculture, totaling about 1,094 acres.
Chorro Valley	4	1,058 afy	About 398 acres of irrigated agriculture on 2 large parcels; Other 2 sites are Dairy Creek Golf Course and the Botanical Gardens.
City of Morro Bay	23	427 afy	Includes the Morro Bay Golf Course, various parks and elementary schools, and roadway landscaping.
Cayucos	9	538 afy	Includes irrigated agriculture, parks, roadways, and the Cayucos---Morro Bay Cemetery.
Total	**92**	**4,760 afy**	

Source: New Water Reclamation Facility Project Report on Reclamation and Council Recommended WRF Sites (May 8, 2014), Table ES-1

The City recently noted that the current drought has increased the desire agricultural reuse throughout the Morro Valley. The drought has resulted in rapidly declining groundwater table that has impacted nearly all growers in the valley. Some growers have been trucking water for over a year at extremely high costs and some growers have “stumped”[24] their groves due to these costs. Several growers have completely removed their trees, resulting in barren soil that is likely to experience significant soil and wind erosion. This represents a significant economic loss to the community.

In addition, the Morro Bay Golf Course has formally expressed interest in receiving recycled water from the City.

Several creeks in the area are potential candidates for streamflow augmentation, including:

- Chorro Creek

[24] “Stumping” is the cutting down of existing trees to their stumps to preserve the trees until the drought abates. Production from stumped groves take three to five years to start after water is available again at an acceptable cost.

- Morro Bay Estuary
- Morro Creek
- Little Morro Creek
- Willow Creek
- Toro Creek
- Alva Paul Creek
- Old Creek
- Cayucos Creek

Additional streamflow has the potential to provide enhanced habitat or to augment existing water supplies. However, discharge to creeks is strictly regulated and it is not known at this time what permit conditions would be attached with such a use, which would depend to some extent on the characteristics of the creeks and their associated beneficial uses as described in the Basin Plan. In addition, the water rights issues associated with this approach must be resolved before it can be considered a feasible approach to meeting the City's goals.

Overall, implementation of a new WRF will have substantial rate impacts, which will reduce the potential funding capacity for recycled water projects. Also, the city must complete a salt and nutrient management plan (SNMP) regardless of the type of project selected. Findings from the SNMP may impact WRF treatment requirements and the types of reuse recommended.

6.3 Next Steps

The City recently noted that the 2014 drought conditions appears to have increased the willingness of potential customers to pay for recycled water, which has increased the opportunities for reuse compared with the previous market assessment in 2011.

Based on this information, the following next steps are identified for the City of Morro Bay:

- Decide on a location for the new water reclamation facility
- Refine recycled water study completed in 2011
- Pursue reuse opportunities specific to the WRF location
- Work cooperatively with the agricultural community and other potential customers to develop a recycled water distribution system
- Incorporate recycled water planning into salt and nutrient management planning

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7. RECYCLED WATER PROJECTS – NIPOMO CSD

7.1 Recycled Water Overview

Nipomo CSD completed a recycled water study for the Southland WWTF in 2009 (*Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives*; AECOM, 2009) as part of the larger master planning and design effort to upgrade the plant. The District is currently preparing an updated master plan for the Blacklake WWTP. Both plants currently maximize reuse. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. Southland WWTF is percolated into the underlying groundwater basin, and these flows are included in the Nipomo Mesa Management Area water balance.

Table 7-1. Existing and Projected Recycled Wastewater Supplies – Nipomo CSD

	Existing (2010)		Future (2030)	
Blacklake WWTP	0.07 mgd	80 afy	0.07 mgd	80 afy
Southland WWTF	0.8 mgd	900 afy	1.7 mgd	1,900 afy

Source: 2010 NCSD UWMP (WSC, 2011)

The 2009 study considered reuse of Southland WWTF effluent for landscape irrigation at the District's largest park and local golf courses. Reuse at these locations would offset pumping in existing groundwater depressions and could provide more direct benefits to NCSD than existing percolation can provide. However, Boyle (2007) estimated a 10% water supply benefit for every unit of direct reuse (for example, 1 afy of new water supply benefit for every 10 afy of direct reuse).

The 2009 study identified potential direct non-potable reuse opportunities at District parks and regional golf courses with two additional treatment step options: 1) add tertiary treatment and disinfection, or 2) pump percolated water with soil aquifer treatment credit. Agricultural irrigation and groundwater recharge were also evaluated. The potential Southland WWTF reuse projects have not been pursued due to the existing benefits of effluent percolation.

The following sections explore treatment needs and project concepts within each potential market.

7.2 Treatment

NCSD is only considering landscape irrigation projects at this time, so tertiary filtration for unrestricted irrigation is assumed for all NCSD projects. NCSD considered two alternatives to achieve Title 22 tertiary water quality requirements (AECOM, 2009):

- Tertiary filtration and disinfection
- Percolation and pumping

The percolation and pumping option relies upon the soil to provide tertiary filtration. The approach is much less expensive than installation of typical tertiary filtration facilities but would require additional planning costs for regulatory approval. The percolated effluent was assumed to require only pH adjustment and potentially some disinfection.

Table 7-2. Southland WWTF Tertiary Treatment Cost Estimates

Tertiary Treatment Option	Average Annual Flow (mgd)	Capital Cost ($)[1]	Unit Capital Cost ($/gal)	Annual O&M Cost ($/mgd)[1,2]	Annual Payment Unit Cost ($/af)[1,3]
Tertiary Filtration and Disinfection	1.67 mgd	$3.5 M	$2.1	$0.15 M	$260/af
Percolation and Pumping		$0.8 M	$0.5	$0.02 M	$50/af

1. Refer to Appendix D for detailed cost estimates. Capital cost Includes contingencies and factors. Costs exclude grants or low-interest loans.
2. A common unit cost for tertiary treatment is applied for consistency between areas.
3. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield. Includes contingencies and factors. Annual yield assumes reuse of all effluent; however, projects with seasonal demands will have a lower actual reuse than available effluent. The unit cost will increase since the annual yield is lower.

7.2.1 Water Quality Objectives

Water quality objectives from the Central Coast RWQCB Basin Plan (Table 7-3) influence treatment requirements beyond minimum Title 22 treatment requirements. For recycled water projects from the Southland WWTF, the Basin Plan groundwater quality objectives and existing groundwater quality will be considered in the area's Salt and Nutrient Management Plan (SNMP). Findings from the SNMP could impact minimum treatment requirements for irrigation projects. There appears to be some assimilative capacity in the basin based on the existing groundwater quality and the objectives.

Table 7-3. Basin Plan Groundwater Quality Objectives – Nipomo CSD

Constituents	Unit	Groundwater		Southland WWTF[3]
		Objective[1]	Existing Average[2]	
TDS	mg/L	710	< 600	800 – 1,000
Chloride	mg/L	95	< 60	200 – 240
Sulfate	mg/L	250	N/A	175 – 210
Boron	mg/L	0.15	N/A	N/A
Sodium	mg/L	90	N/A	180 – 210
Nitrogen (as N)	mg/L	5.7	< 10	Non-Detect – 10

N/A Not Available
Sources:
1. Central Coast Basin Plan (CC RWQCB, 2011) for Lower Nipomo Mesa Sub-Basin.
2. 2012 NMMA Annual Report (NMMA Technical Group, 2013) for Nipomo Mesa Management Area.
3. Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, 2009), Table 3-1; for Projected Future Concentrations with WWTF Upgrade (to be completed in 2014).

7.3 Project Concepts

7.3.1 Landscape Irrigation

Potential Market

Three landscape irrigation projects (Figure 7-1) were developed to capture the range of project sizes:

1. **Alt N1a:** Nipomo Regional Park Project (51 afy)
2. **Alt N1b:** Blacklake Golf Course Extension Project (+500 afy)
3. **Alt N1c:** Monarch Dunes Golf Course Extension Project (+400 afy)

Water Supply Benefit

As mentioned above, Boyle (2007) estimated a 10% water supply benefit for every unit of direct reuse. In addition, a majority of the potential landscape irrigation demand is currently served by private wells. Therefore, NCSD would need to take additional steps to ensure it gains water supply benefits. Refer to Section 4.1.1 for further discussion.

Water Quality

Based on the information presented in Section 4.1.2, tertiary effluent from NCSD Southland WWTF would fall on the lower range of slight to moderate degrees of restriction due to salinity and specific ion toxicity. The concentration of constituents identified should have minimal impact on typical landscape irrigation activities. However, sensitive turfgrass, such as golf course greens, may require additional treatment or non-treatment mitigation (i.e., additional root zone flushing, adequate drainage, soil amendments, separate irrigation with existing water supply). No additional treatment beyond the addition of tertiary treatment is assumed for landscape irrigation project concepts based on the above analysis.

Project Concepts

Alt S1a – Nipomo Regional Park Project

This project concept serves the District's largest irrigation customer – Nipomo Regional Park – with an estimated demand of 51 afy. The demand estimate is based on NCSD billing data. The park is located approximately 2.4 miles north of Southland WWTF.

Alt S1b – Blacklake Golf Course Extension Project

This project concept extends Alt S1a to Blacklake Golf Course, which has an estimated demand of 500 afy. The estimated demand is based on a demand of "900,000 gpd during the irrigation season" (AECOM, 2009) in addition to reuse from Blacklake WWTP and 180 days of irrigation season assumed. The course appears to irrigate from onsite ponds / lakes, which would allow delivery of recycled water to the ponds on a 24-hour basis. This would reduce conveyance facility sizing but may require additional pond water treatment to address increased nutrient loading.

Alt S1c – Monarch Dunes Golf Course Extension Project

This project concept extends Alt S1b to Monarch Dunes Golf Course, which has an estimated demand of 400 afy. The estimated demand is based on the two most recent reports: AECOM, 2009 and Boyle, 2007. The combined demand of the three projects is 1,080 afy, which is larger than the projected available supply during the peak summer season. During this time, one or more of the customers would need to pump groundwater to supplement recycled water to meet peak demands. The course appears to irrigate from onsite ponds / lakes, which would allow delivery of recycled water to the ponds on a 24-hour basis. This would reduce conveyance facility sizing but may require additional pond water treatment to address increased nutrient loading.

<u>Summary</u>

The following tables summarize the facilities and cost of each landscape irrigation project concept. Tertiary treatment upgrade is assumed for all projects, so the upgrade cost is separated from the core project cost. No treatment processes beyond tertiary filtration, such as RO and full AWT, are included in the NCSD project concepts.

Table 7-4. NCSD Landscape Irrigation Project Concepts – Facilities

Alt	Description	# of Customers	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
N1a	Nipomo Park	1	Tertiary	0.09 mgd	0.09 MG	10 hp	2.4 mi
N1b	N1a + Blacklake Extension	2	Tertiary	1.0 mgd	1.0 MG	30 hp	6.4 mi
N1c	N1a + Monarch Dunes Extension	3	Tertiary	1.7 mgd	1.7 MG	50 hp	7.1 mi

Table 7-5. NCSD Landscape Irrigation Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates		Unit Cost Based on	
	Annual Average	Peak Day	Peak Flow	Capital Cost[1]	Annual O&M Cost[1]	Annual Demand[1,2]	Water Supply Benefit[1,3]
N1a	51 afy	0.09 mgd	190 gpm	$3.3 M	$0.03 M	$4,790/AF	$47,900/AF
N1b	551afy	0.98 mgd	810 gpm	$12.8 M	$0.12 M	$1,730/AF	$17,300/AF
N1c	951 afy	1.70 mgd	1,306 gpm	$16.6 M	$0.16 M	$1,310/AF	$13,100/AF

Notes:

1. Refer to Section 5.2 for the basis for cost estimates and Appendix D for detailed cost estimates. Costs exclude grants or low-interest loans.
2. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield. Includes contingencies and factors.
3. Unit cost estimate based on water supply benefit to NCSD, which is roughly 10% of the project yield.

Implementation Considerations

Implementation considerations for landscape irrigation projects are discussed in Section 4.1, including:

- Water supply benefit
  - Properly estimating demand
  - Gaining water supply benefit
- Water quality
  - Guidelines
  - Mitigation measures

- Level of service
    - Reliability
    - Peak season supplies
    - Facilities sizing
- Treatment plant improvements
- Customer conversions
    - Estimating costs
    - Regulatory restrictions and requirements
    - New development
- Public acceptance
- Recycled water pricing

Of particular concern for the NCSD project concepts are:

- Confirming demand estimates
- Gaining water supply benefits from private wells
- Properly evaluating golf course conversions

7.3.2 Agricultural Irrigation

The 2009 San Luis Obispo County Agriculture Commissioner survey of the 2009 crop types and acreage for San Luis Obispo County identified 2,231 acres of irrigated acreage. Agricultural irrigation of approximately 2,912 afy represents approximately 25% of the groundwater pumping in the NMMA (NMMA TG, 2013). Of this area, approximately 600 acres of irrigated agricultural acreage are located within 1.5 miles south and west of Southland WWTF (see Figure 7-2).

Additional treatment steps may be necessary to meet customer-specific water quality requirements, such as reduction of TDS, chloride, and sodium for agriculture. The additional treatment would also require concentrate management, which would be an additional cost

Project concepts were not defined for agricultural irrigation despite the potential demand due to the limited water supply benefit gained from direct reuse from Southland WWTF.

7.3.3 Groundwater Recharge

The 2007 TM (AECOM) evaluated groundwater recharge with Southland WWTF effluent but was not recommended because the approach would not increase water supply to NCSD since the effluent is already part of the NMMA return flows. The option could help manage the existing groundwater pumping depression, but the cost benefits would be marginal (i.e., slightly less pumping head required). Moreover, direct injection (versus recharge) may be necessary to ensure the recycled water reaches its intended location.

7.4 Recycled Water Summary

The effluent from both of NCSD's WWTPs is reused. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course and percolated Southland WWTF effluent is included in the NMMA water balance. Reuse of Southland WWTF effluent for landscape irrigation in strategic locations could provide benefits to NCSD but would not necessarily provide new water.

7.4.1 Project Concepts Summary

Potential landscape irrigation, agricultural irrigation, and groundwater recharge projects from Southland WWTF were explored in the RRWSP. However, the projects were not cost effective ($10,000+/af) primarily because NCSD would only receive a 10% water supply benefit for every unit of recycled water use since percolated Southland WWTF effluent is already part of the NMMA water balance. (The water balance assumes 10% of percolated water is lost during transport to the groundwater table and reuse of the effluent for irrigation would avoid these losses). In summary, NCSD beneficially reuses 90% of treated effluent from Southland WWTF and would only be able to receive a maximum new water supply benefit of 90 afy if all 900 afy of existing effluent is reused for irrigation.

7.4.2 Opportunities and Constraints

Based on findings from the project concepts development process, preliminary NCSD recycled water opportunities and constraints include:

- Limited water supply benefit (10% of reuse) from direct reuse (i.e., landscape or agricultural irrigation) and no water supply benefit from recharge
- Limited opportunity for direct offset of NCSD potable water use since largest potential customers pump water from their own well
- Substantial agricultural demand exists in proximity to the Southland WWTF. Approximately 600 acres of irrigated agricultural acreage are located within 1.5 miles south and west of Southland WWTF.
- Southland WWTF will an require upgrade to tertiary filtration or pumping after percolation to implement a recycled water project
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) resulting in additional costs for treatment and concentrate management

Based on this assessment, a water supply benefit will not drive a NCSD recycled water project. However, recycled water projects could be driven by the need for alternative disposal methods in the future based on stricter waste discharge requirements from the RWQCB.

7.4.3 Next Steps

- Continue to monitor potential mounding of effluent recharge at the Southland WWTF and, if mounding is realized, pursue reuse opportunities
- Work with SSLOCSD representatives on potential cross-basin reuse projects
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

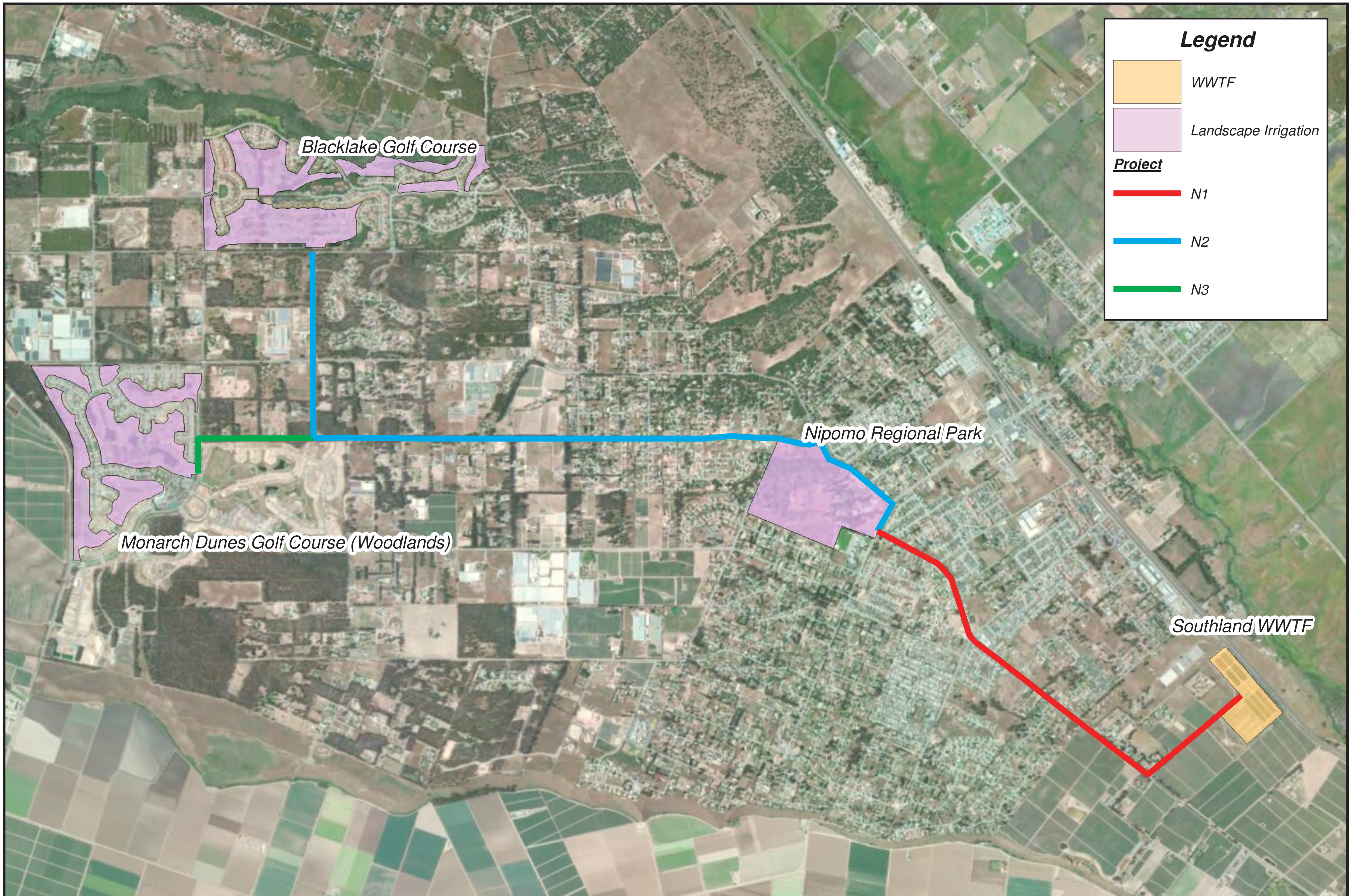


Figure 7-1: Potential Landscape Irrigation Projects - NCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

Cannon

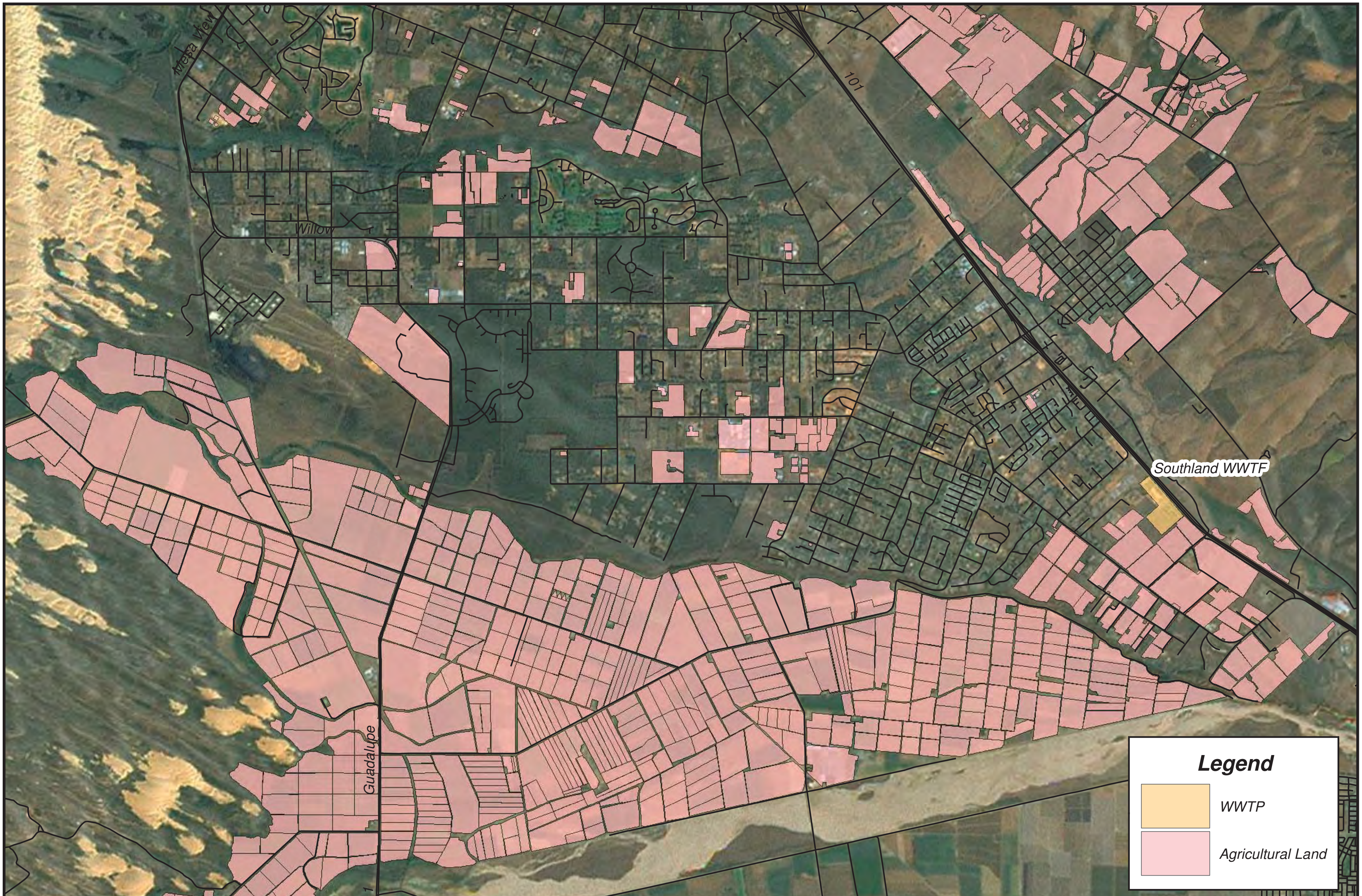


Figure 7-2: Agricultural Land in Vicinity of Southland WWTF

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

Cannon
1050 Southwood Drive
San Luis Obispo CA93401

8. RECYCLED WATER PROJECTS – PISMO BEACH

8.1 Recycled Water Overview

The Pismo Beach WWTP currently discharges approximately 1.1 mgd (1,230 afy) of disinfected secondary effluent through the joint Pismo Beach / SSLOCSD ocean outfall. By 2035, effluent flows are projected to increase to 1.8 mgd (2,010 afy) if annexations occur. The most recent documentation of Pismo Beach recycled water plans, the Pismo Beach 2010 UWMP (Carollo, 2011a), identified several components of a future system:

- Upgrade the Pismo Beach WWTP to tertiary treatment and disinfection.
- Construct distribution system to Price Canyon development for landscape and agricultural irrigation reuse (approximately 340 afy).
- Construct distribution system to existing Pismo Beach sites for landscape irrigation reuse (approximately 330 afy).
- Use remaining recycled water (700 in 2015 to 1,300 afy in 2035) for indirect potable reuse from groundwater recharge via surface spreading or injection to increase groundwater supplies. This project could also be used to prevent seawater intrusion.

As part of their development agreement with the City, the developers of “Spanish Springs” were proposing to fund an upgrade the Pismo Beach WWTP to tertiary treatment and use this non-potable water for all of the landscape needs within the development as well as provide the infrastructure to irrigate the Pismo Beach Sports Complex and install a pipeline stub out to the Cal Trans right-of-way for non-potable irrigation of landscaping along US Highway 101. However, in June 2014, the City Council took no action with respect to the project or development agreement. In November 2014, the citizens of Pismo Beach will vote on an initiative that will not allow the scale of development in the Price Canyon planning area that has been proposed to date if the land is annexed into the City.

The next steps for Pismo Beach recycled water are currently being re-evaluated as part of a Recycled Water Facilities Planning Study, which is partially funded by the SWRCB. The RRWSP is focused on existing landscape irrigation customers and excludes future development due to its uncertain future. A plant upgrade to tertiary filtration for unrestricted irrigation is assumed for landscape irrigation projects. Use of remaining effluent for groundwater recharge is included in the SSLOCSD WWTP evaluation in Section 9.3.3.

8.2 Treatment

Previous Pismo Beach studies only considered landscape irrigation projects within the City, so tertiary filtration for unrestricted irrigation is assumed for all Pismo Beach projects. Two capacity alternatives were previously defined – 0.15 mgd for a small expansion and 1.6 mgd for full expansion. As shown in Table 8-1, the unit cost for the small expansion is more than four times the unit cost for the full expansion.

Table 8-1. Pismo Beach Tertiary Treatment – Unit Costs

Average Annual Flow[1]	Capital Cost[1]	Unit Capital Cost	Annual O&M Cost[1,2]	Annual Payment Unit Cost[3]
0.15 mgd	$2.1 M	$14.0 / gal	$0.15 M / mgd	$950 / af
1.6 mgd	$3.2 M	$2.0 / gal	$0.15 M / mgd	$250 / af
1.1 mgd	$2.6 M	$2.4 / gal	$0.15 M / mgd	$280 / af

Notes:

1. Refer to Appendix E for detailed cost estimates. Capital costs include contingencies and factors. Costs exclude grants or low-interest loans.
2. A common unit cost for tertiary treatment is applied for consistency between areas.
3. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield. Includes contingencies and factors. Annual yield assumes reuse of all effluent; however, projects with seasonal demands will have a lower actual reuse than available effluent. The unit cost will increase since the annual yield is lower.

8.3 Project Concepts

8.3.1 Landscape Irrigation

Potential Market

The previous recycled water studies identified 23 potential landscape irrigation customers within Pismo Beach with up to 340 afy of demand. The customers are spread across the area, requiring approximately 12 miles of pipe to reach all the customers. Seven landscape irrigation project concepts were developed based on a new distribution system that focused on logical phasing of the distribution system to each set of customers (Figure 8-2):

1. **Alt PB1:** Pismo Beach Sports Complex
2. **Alt PB2:** Caltrans and Middle School
3. **Alt PB3:** Price House Historic Park
4. **Alt PB4:** South to Arroyo Grande
5. **Alt PB5:** Pismo State Beach Golf Course
6. **Alt PB6:** Dinosaur Caves
7. **Alt PB7:** Palisades Park

In addition, the City of Pismo Beach could use the existing outfall pipeline that conveys effluent from the Pismo Beach WWTP to the joint ocean outfall by the SSLOCSD WWTP as a transmission line to convey recycled water to customers in the vicinity of the line. Two primary groups of customers could be served (Figure 8-3):

- **Alt PB8:** Pismo State Beach Golf Course
- **Alt PB9:** Western Grover Beach

Service to the golf course with a new distribution system from Pismo Beach is part of Alt PB5. Service to the six potential western Grover Beach customers with a new distribution system from SSLOCSD is part of Alt S1c.

Water Supply Benefit

Most of the potential customers are existing Pismo Beach customers or Arroyo Grande customers but one large customer, Pismo State Beach Golf Course, irrigates with its own well. The water supply benefit from the golf course must be ensured to implement service to the customer.

Water Quality

Based on the information presented in Section 4.1.2, tertiary effluent from Pismo Beach WWTP would fall on the lower range of slight to moderate degrees of restriction due to salinity and specific ion toxicity. The concentration of constituents identified should have minimal impact on typical landscape irrigation activities. However, sensitive turfgrass, such as golf course greens, may require additional treatment or non-treatment mitigation (i.e., additional root zone flushing, adequate drainage, soil amendments, separate irrigation with existing water supply). For the purposes of the RRWSP, no additional treatment beyond the addition of tertiary treatment is assumed for landscape irrigation project concepts based on the above analysis.

Project Concepts

Alt PB1: Pismo Beach Sports Complex

This project concept serves a single customer that is adjacent to the WWTP – the Pismo Beach Sports Complex. The site used to be irrigated with a shallow, non-potable well but now uses potable water from Pismo Beach.

Alt PB2: Caltrans and Middle School

This project concept serves three customers located northwest of the WWTP within 0.5 miles but across Pismo Creek. The location and demand of one of the largest customers, Caltrans, should be confirmed since the service location previously identified for Caltrans is a few thousand feet from Highway 101, but service typically occurs at locations adjacent to the highway's irrigation system.

Service to Caltrans provides a conveyance system benefit because Caltrans can irrigate during the day while most landscape irrigation customers must irrigate at night (to reduce potential for human exposure). Service during the day allows for the maximized use of system capacity.

Alt PB3: Price House Historic Park

This project concept serves a single customer located just north of the WWTP – the Price House Historic Park. A demand of 28 afy was identified for the site, but the existing aerial (Google Earth, 8/23/2013) does not reveal any landscape irrigation. Therefore, the demand estimate should be confirmed.

Also, the conveyance route to the park was originally included as part of recycled water service to the proposed Price Canyon development. Design of the conveyance system for the park should consider whether to increase its size to serve future demand from potential development.

Alt PB4: South to Arroyo Grande

This project concept serves seven Pismo Beach and Arroyo Grande customers located south of the WWTP. The set of customers does not include a single large customer, so the unit cost is relatively high.

Alt PB5: Pismo State Beach Golf Course

This project concept serves the Pismo State Beach Golf Course and three other customers along the conveyance route.

The golf course currently irrigates with its own well, which is unmetered. Therefore, the volume and source of the golf course irrigation demand must be confirmed in order to determine the potential water supply benefits.

Alt PB6: Dinosaur Caves Park

This project concept extends along Price Street to Dinosaur Caves Park and Mary Harrington Park.

Alt PB7: Palisades Park

This project concept extends further along Price Street from Dinosaur Caves Park to Palisades Park. The set of seven customers does not include a single large customer, so the unit cost is relatively high.

Alt PB8: Pismo State Beach Golf Course (from Existing Outfall)

This project concept serves the Pismo State Beach Golf Course with a new turnout from the existing Pismo Beach to the joint outfall line near SSLOCSD WWTP. The concept is an alternative to a new distribution system from the WWTP that is captured by Alt PB5 but has the same golf course service considerations as discussed for Alt PB5.

This project concept requires a 100% conversion of the Pismo Beach WWTP to tertiary effluent because the outfall line could not convey secondary effluent to the ocean outfall if recycled water service off of the outfall line were planned. Also, wet weather influent equalization is required so that all influent can be treated within planned capacity limits under wet weather conditions.

Alt PB9: Western Grover Beach

This project concept serves six potential Grover Beach customers in relative proximity to the existing Pismo Beach outfall line. The customers have approximately 84 afy of demand. The concept is an alternative to a new distribution system from SSLOCSD WWTP that is captured by Alt S1c (see Section 9.3.1).

As described for Alt PB8, this project concept requires a 100% conversion of the Pismo Beach WWTP to tertiary effluent and the addition of wet weather influent equalization.

Implementation Considerations

Implementation considerations for landscape irrigation projects are discussed in Section 4.1, including:

- Water supply benefit
    - Properly estimating demand
    - Gaining water supply benefit
- Water quality
    - Guidelines
    - Mitigation measures
- Level of service
    - Reliability
    - Peak season supplies
    - Facilities sizing
- Treatment plant improvements
- Customer conversions
    - Estimating costs
    - Regulatory restrictions and requirements
    - New development
- Public acceptance
- Recycled water pricing

Of particular concern for the Pismo Beach project concepts are the following:

- Confirming demand estimates, particularly for anchor customers (i.e., customers with large demands that fortify a recycled water project)
- Gaining water supply benefits from customers with private wells (Pismo State Beach Golf Course)
- Properly evaluating golf course conversion (Pismo State Beach Golf Course)
- Gaining water supply benefits from service to customers served by other municipal water systems (Arroyo Grande and Grover Beach)
- Phasing of non-potable system and treatment plant
- Determining the impact of new development on planning for treatment plant upgrades, distribution system design, and funding

8.4 Recycled Water Summary

The Pismo Beach WWTP currently discharges approximately 1.1 mgd (1,230 afy) of disinfected secondary effluent through the joint Pismo Beach / SSLOCSD ocean outfall. Nine landscape irrigation project concepts from the Pismo Beach WWTP were defined. In addition, use of Pismo Beach WWTP effluent in combination with SSLOCSD effluent for larger, regional projects, such as agricultural reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation are discussed under SSLOCSD in the following section.

8.4.1 Project Concepts Summary

The following tables and figure summarize the facilities and cost of each landscape irrigation project concept. Tertiary treatment upgrade is assumed for all projects, so the upgrade cost is separated from the core project cost.

Table 8-2. Pismo Beach Landscape Irrigation Project Concepts – Facilities

Alt	# of Customers	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
PB1	1	Tertiary	0.03 mgd	0.03 MG	2 hp	0.1 mi
PB2	3	Tertiary	0.16 mgd	0.16 MG	12 hp	0.9 mi
PB3	1	Tertiary	0.05 mgd	0.05 MG	4 hp	0.4 mi
PB4	7	Tertiary	0.05 mgd	0.05 MG	5 hp	2.6 mi
PB5	4	Tertiary	0.15 mgd	0.15 MG	12 hp	1.4 mi
PB6	2	Tertiary	0.08 mgd	0.08 MG	6 hp	1.9 mi
PB7	7	Tertiary	0.11 mgd	0.11 MG	10 hp	4.1 mi
PB8	1	Tertiary	0.14 mgd	0.14 MG	11 hp	1.0 mi
PB9	6	Tertiary	0.15 mgd	0.15 MG	12 hp	2.3 mi

Note: Alternatives PB8 and PB9, which propose to use the existing outfall, also include wet weather influent equalization to enable tertiary treatment of all flows during wet weather conditions.

Table 8-3. Pismo Beach Landscape Irrigation Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
PB1	16	0.03	58	$0.30	$0.01	$1,680	+ $ 340
PB2	89	0.16	180	$1.61	$0.02	$1,440	+ $ 340
PB3	28	0.05	104	$0.73	$0.01	$2,080	+ $ 340
PB4	26	0.05	97	$3.06	$0.02	$8,550	+ $ 340
PB5	86	0.15	319	$2.62	$0.03	$2,350	+ $ 340
PB6	47	0.08	175	$2.43	$0.02	$3,880	+ $ 340
PB7	62	0.11	232	$5.00	$0.04	$5,850	+ $ 340
PB8	77	0.14	285	$2.68	$0.03	$2,610	+ $ 340
PB9	84	0.15	313	$4.34	$0.04	$3,790	+ $ 340

Note: Refer to Section 5.2 for the basis for cost estimates, and to Appendix E for detailed cost estimates. Costs exclude grants or low-interest loans. Tertiary treatment costs are scaled to the cost of the maximum size plant (1.1 mgd) based on peak day demand.

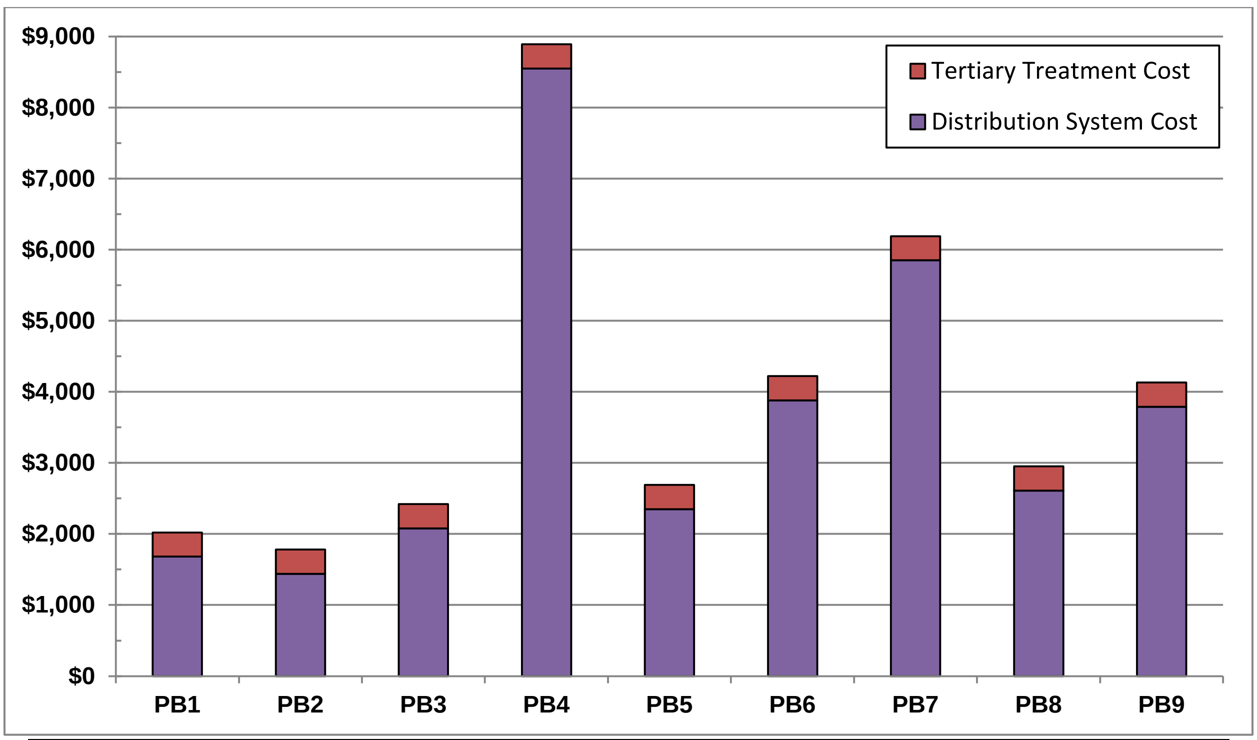
Pismo Beach Recycled Water Project Concepts

PB1: Pismo Beach Sports Complex
PB2: Caltrans and Middle School
PB3: Price House Historic Park
PB4: South to Arroyo Grande
PB5: Pismo State Beach Golf Course

PB6: Dinosaur Caves Park
PB7: Palisades Park

Projects from the Existing Outfall
PB8: Pismo State Beach Golf Course
PB9: Western Grover Beach

Figure 8-1: Unit Costs of Pismo Beach Landscape Irrigation Project Concepts ($/AF)



AFY	16	89	28	26	86	47	62	77	84

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

8.4.2 Opportunities and Constraints

Based on findings from the project concepts development process, preliminary recycled water opportunities and constraints for Pismo Beach include:

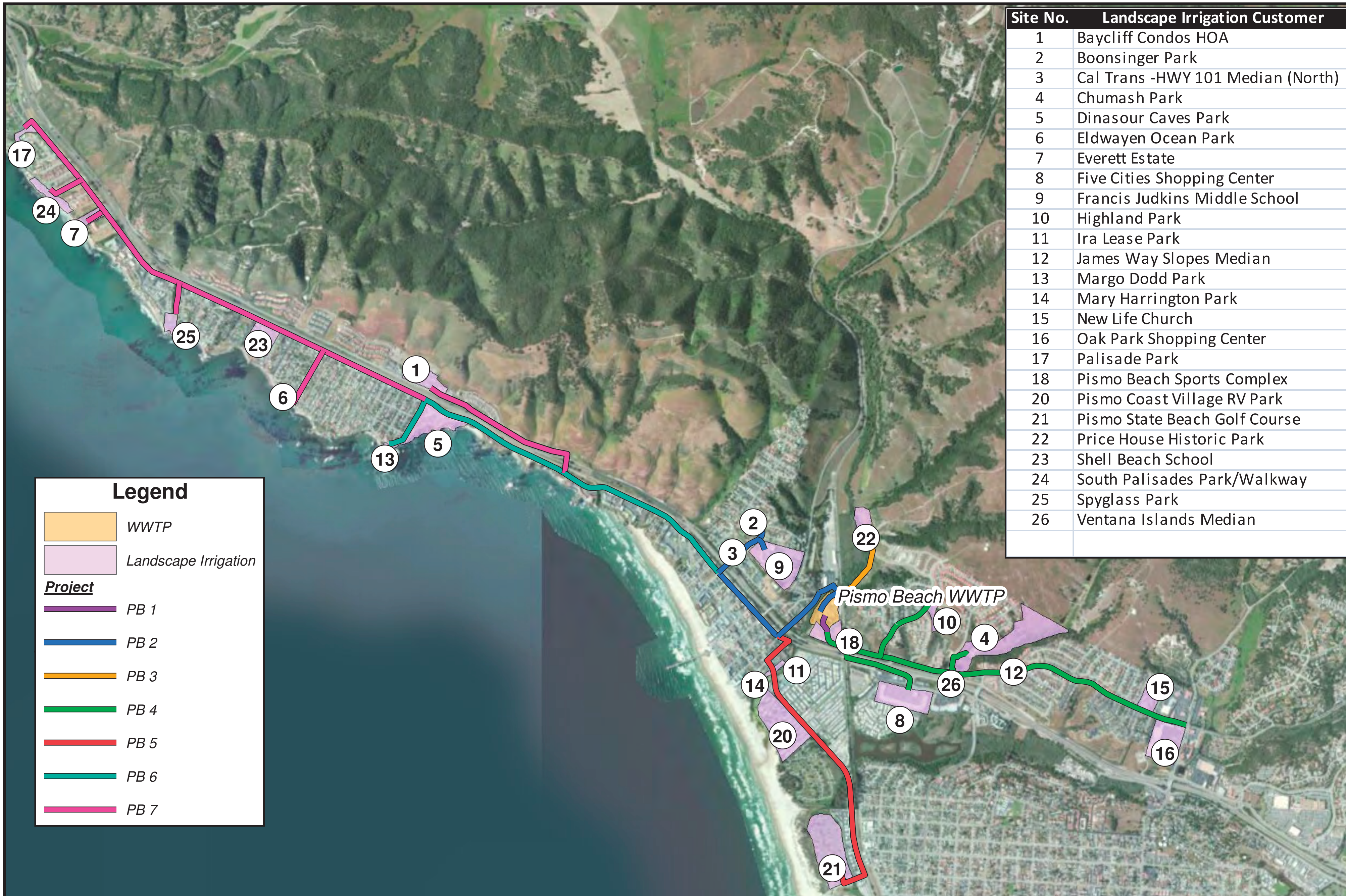
- Maximizing reuse will require more types of uses than just existing landscape irrigation.
- Approximately 130 afy of landscape irrigation demand is located within 0.5 mile of the WWTP, which offers promising reuse opportunities. However, demand estimates for several key potential customers must be confirmed before proceeding much further with planning.
- Tertiary treatment upgrades for small treatment plant commonly have high unit costs due to the lack of scale and could result in high project unit costs for service to customers close to the WWTP.
- There is potential for large recycled water use from new development if approved by the City.
- Pismo State Beach Golf Course is not Pismo Beach potable water customer so their water supply benefit must be achieved through groundwater exchange.
- Most landscape irrigation customers have relatively low demands and are spread across the city, which causes service to these customers have high unit costs.
- Use of Pismo Beach effluent for agricultural irrigation is potentially the most cost-effective reuse project as long as the Pismo Beach receives a water supply benefit. Agricultural irrigation is included in the SSLOCSD section.
- Use of Pismo Beach effluent for groundwater recharge is a viable option and is included in the SSLOCSD section.

The City is in the process of obtaining abandoned oil pipelines with the intent to consider their use for conveyance of recycled water. This option could potentially reduce distribution infrastructure costs and make more landscape irrigation projects cost effective. This concept will be evaluated as part of the City's Recycled Water Facilities Plan, which is currently being prepared and is expected to be completed in early 2015.

8.4.3 Next Steps

- Complete Recycled Water Facilities Plan that is in progress in consultation with regional stakeholders and the SWRCB.
- Complete investigation that is in progress into the ability to use abandoned oil lines for recycled water conveyance. The RRWSP did not consider this option and its application could make non-potable reuse cost effective for the City.
- Confirm demand estimates for cost effective projects.
- Explore alternative tertiary treatment method geared toward relatively small flows (i.e. 0.1 to 0.3 mgd).
- Evaluate the cost to retrofit Pismo Beach State Golf Course and the ability for the city to receive groundwater benefits.
- Refine potential projects to develop a phased recycled water program.
- Continue discussions with new development (if approved by the City) regarding recycled water demand and funding.
- Consider use of the existing outfall as a recycled water conveyance facility (but only if 100% tertiary treatment conversion and wet weather influent equalization is planned).

- Compare costs of viable projects with alternative water supplies
- Continue to participate in discussions with regional SSLOCSD projects that could put Pismo Beach effluent to beneficial use and confirm the ability of the City to receive a water supply benefit
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.



Site No.	Landscape Irrigation Customer
1	Baycliff Condos HOA
2	Boonsinger Park
3	Cal Trans -HWY 101 Median (North)
4	Chumash Park
5	Dinasour Caves Park
6	Eldwayen Ocean Park
7	Everett Estate
8	Five Cities Shopping Center
9	Francis Judkins Middle School
10	Highland Park
11	Ira Lease Park
12	James Way Slopes Median
13	Margo Dodd Park
14	Mary Harrington Park
15	New Life Church
16	Oak Park Shopping Center
17	Palisade Park
18	Pismo Beach Sports Complex
20	Pismo Coast Village RV Park
21	Pismo State Beach Golf Course
22	Price House Historic Park
23	Shell Beach School
24	South Palisades Park/Walkway
25	Spyglass Park
26	Ventana Islands Median

Figure 8-2: Potential Landscape Irrigation Projects - Pismo Beach

San Luis Obispo County
Regional Recycled Water Strategic Plan
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1050 Southwood Drive
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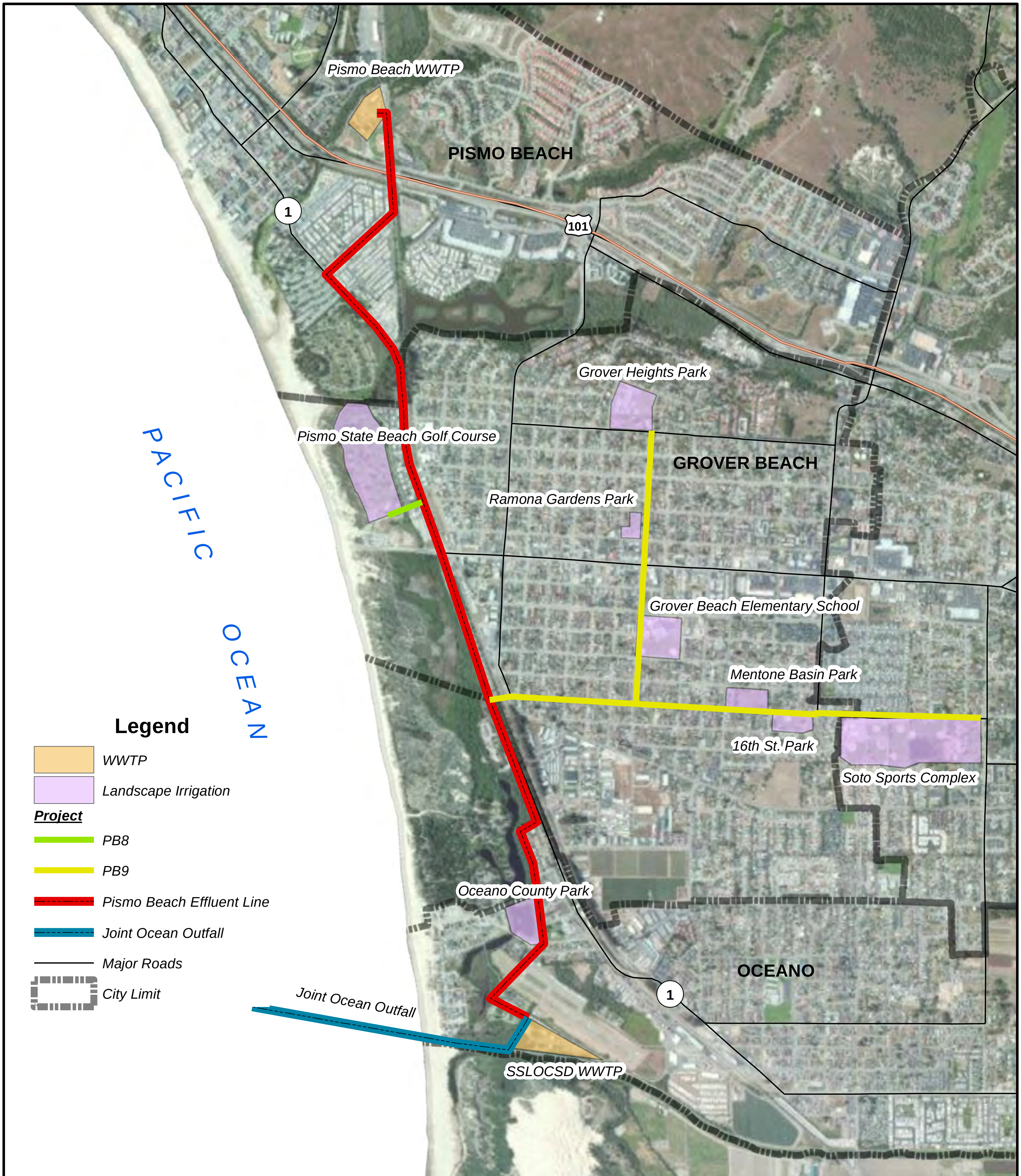

Figure 8-3: Potential Landscape Irrigation Projects along Pismo Beach Effluent Line

San Luis Obispo County
Regional Recycled Water Strategic Plan

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9. RECYCLED WATER PROJECTS – SSLOCSD

9.1 Recycled Water Overview

The SSLOCSD WWTP currently discharges approximately 2.6 mgd of disinfected secondary effluent through a joint (with Pismo Beach) ocean outfall. In addition, approximately 1.1 mgd of disinfected secondary effluent from Pismo Beach WWTP is discharged through the same ocean outfall. By 2035, effluent flows are projected to increase to 3.5 mgd and 1.8 mgd for SSLOCSD and Pismo Beach, respectively, to a total of 5.3 mgd. Approximately 1.0 mgd of effluent must be maintained through the joint ocean outfall to avoid siltation in the diffusers. For the purposes of this evaluation, an available of flow of 2.7 mgd is assumed for SSLOCSD projects based on the maximum flow available from both SSLOCSD and Pismo Beach after accounting for minimum joint ocean outfall flows (as shown in Table 9-1). Any reuse by the City of Pismo Beach would reduce this available flow by a similar amount.

Table 9-1. Potential Recycled Water Supplies - SSLOCSD

	Existing		Projected (2035)	
Pismo Beach	1.1 mgd	1,230 afy	1.8 mgd	2,010 afy
SSLOCSD	2.6 mgd	2,910 afy	3.5 mgd	3,920 afy
Total	**3.7 mgd**	**4,140 afy**	**5.3 mgd**	**5,930 afy**
Minimum Ocean Outfall Flow	(1.0) mgd	(1,120) afy	(1.0) mgd	(1,120) afy
Maximum Available Effluent	**2.7 mgd**	**3,020 afy**	**4.3 mgd**	**4,810 afy**

Both agencies have conducted several recycled water studies, but no existing reuse is occurring outside the plant. Based on a review of previous studies, discussions with SSLOCSD, and further investigation of potential opportunities, the following potential recycled water market has been identified for SSLOCSD:

- **Landscape Irrigation:** Up to 270 afy of demand from 21 potential customers was identified within Arroyo Grande, Grover Beach, and Oceano.
- **Agricultural Irrigation:** Approximately 1,600 acres of irrigated agriculture with an average annual demand of 2,400 afy.
- **Groundwater Recharge** (via surface spreading or via injection): Up to 2,800 afy (2.5 mgd) of tertiary effluent with partial (60%) reverse osmosis (RO) treatment or 2,400 afy (2.1 mgd) of effluent with full advanced water treatment (AWT)[25] could be recharged.
- **Surface Water Augmentation** (via stream or via lake): Up to 2,700 afy (2.1 mgd) of tertiary effluent with partial (80%) RO treatment or 2,400 afy (2.1 mgd) of full AWT effluent could be released. The water could augment Lopez Lake supplies if discharged into the lake, replace discharges from Lopez Lake to Arroyo Grande Creek if discharged to the creek, or recharge the shallow aquifer if discharged to Los Berros Creek.

The following sections explore project concepts within each potential market.

[25] Per proposed 2013 CDPH Groundwater Recharge regulations, advanced water treatment (AWT) includes reverse osmosis (RO) and an advanced oxidation process (AOP). A typical AOP process uses ultraviolet light with hydrogen peroxide. RO is typically preceded by microfiltration (MF), so the typical AWT treatment train is MF/RO/AOP. This is the process used by the Orange County Water District's Groundwater Replenishment System.

9.2 Treatment

SSLOCD WWTP would need at least a tertiary treatment upgrades in order to create a sufficient market for reuse. Four levels of treatment beyond existing secondary effluent are considered to improve SSLOCSD effluent for reuse:

- Tertiary filtration for unrestricted irrigation
- Tertiary filtration plus treatment of partial flow with RO for:
    - Agricultural irrigation to reduce TDS to address some sensitive crops
    - Groundwater recharge via surface spreading to meet Basin Plan groundwater quality objectives
    - Surface water augmentation to meet Basin Plan surface water quality objectives
- Tertiary filtration plus treatment of all flow with RO for industrial reuse
- Full AWT for:
    - Groundwater recharge via surface spreading to reduce the need for blend water
    - Groundwater recharge via injection to meet regulations
    - Stream augmentation to meet potential regulations
    - Reservoir augmentation to meet potential regulations

Table 9-2. SSLOCSD Treatment Upgrade Cost Estimates

Treatment Method	Average Annual Flow (mgd)	Capital Cost ($)[1]	Unit Capital Cost ($/gal)	Annual O&M Cost ($/mgd)[1,2]	Annual Payment Unit Cost ($/af)[3]
Tertiary Filtration	2.7 mgd	$6.4 M	$2.4	$0.15 M	$280/af
Partial Reverse Osmosis	2.7 mgd	$9.2 M	$3.4	$0.20 M	$450/af
Full AWT (MF/RO/AOP)	2.7 mgd	$27.4 M	$10.1	$0.60 M	$1,430/af

Notes:
1. Refer to Appendix F for detailed cost estimates. Capital cost Includes contingencies and factors.
2. A common unit cost for tertiary treatment is applied for consistency between areas.
3. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield. Includes contingencies and factors. Annual yield assumes reuse of all effluent; however, projects with seasonal demands will have a lower actual reuse than available effluent. The unit cost will increase since the annual yield is lower.

9.2.1 Water Quality Objectives

Water quality objectives from the Central Coast RWQCB Basin Plan (Table 9-3) influence treatment requirements beyond minimum Title 22 treatment requirements. For recycled water projects from the SSLOCSD WWTP, the Basin Plan water quality objectives and existing groundwater quality will be considered in the area's Salt and Nutrient Management Plan (SNMP). Findings from the SNMP could impact minimum treatment requirements for irrigation projects. The SNMP likely would not impact groundwater recharge via injection well projects, since full AWT effluent water quality is better than each water quality objective. In fact, the full AWT effluent could improve groundwater quality and/or be identified as a mitigation measure in the SNMP.

Table 9-3. Surface and Ground Water Quality Objectives and Applied Waters

Constituent	Existing SSLOCSD Effluent (mg/L)[1]	Surface Water Objectives[2]		Groundwater Objectives[3]			
		Arroyo Grande Creek		Estero Bay Basin, Arroyo Grande Sub-Basin		Santa Maria Basin, Lower Nipomo Mesa Sub-Basin	
		Objective (mg/L)	% of SSLOCSD	Objective (mg/L)	% of SSLOCSD	Objective (mg/L)	% of SSLOCSD
TDS	855	800	94%	800	94%	710	83%
Chloride	230	50	22%	100	43%	95	41%
Boron	0.29	0.2	69%	0.2	69%	0.15	52%
Sodium	160	50	31%	50	31%	90	56%
Nitrogen (as N)	N/A			10		5.7	

N/A Not Available

Notes:

1. Source: 2009 Recycled Water Study (Wallace).
2. Source: Basin Plan Table 3-7 (Surface Water Quality Objectives).
3. Source: Basin Plan Table 3-8 (Median Groundwater Quality Objectives).

9.2.2 Tertiary Treatment Upgrade

The SSLOCSD Study (Wallace, 2009) assumed tertiary treatment would be achieved with coagulation and sedimentation ahead of filtration and disinfection. The upgrade components and cost estimates were based on a prior study by Kennedy/Jenks in 1994.

9.2.3 Tertiary Treatment with Partial Reverse Osmosis

Tertiary effluent meets minimum water quality requirements for DDW public health protection, but some crops are sensitive to specific constituents, as shown in Table 4-2. Therefore, further discussions with agricultural community members are necessary to establish their water constituent concerns. For the purposes of the RRWSP, we established water quality objectives based on agricultural use with no restrictions per the concentrations established in Table 4-4.

Based on water quality goals discussed in Section 4.2.1 for agriculture, SSLOCSD WWTP effluent requires RO treatment of 40% of effluent to meet a maximum concentration of 500 mg/L TDS and 5 mg/L total nitrogen. Note that agricultural reuse project concepts without RO treatment are evaluated because there are several feasible methods to improve delivered water quality other than treatment. These options were discussed in Section 4.2.1.

In addition, partial RO treatment of 60% of effluent will meet the chloride groundwater quality objective (100 mg/L) and partial RO treatment of 80% of effluent will meet the surface water quality objective (50 mg/L).

9.2.4 Tertiary Treatment with Full Reverse Osmosis

Full RO may be required for industrial reuse; however, site specific treatment requirements must be determined for each potential customer.

9.2.5 Full Advanced Water Treatment

Full AWT is required for groundwater recharge via injection. Full AWT is also a treatment alternative for groundwater recharge via surface spreading, stream augmentation, and reservoir augmentation. (Refer to Section 3.1.2 for discussion of regulations).

9.2.6 Concentrate Disposal

SSLOCSD can use the existing joint ocean outfall for concentrate disposal to avoid additional costs for concentrate disposal.

9.3 Project Concepts

The project concepts are organized by end-use type:

1. Landscape Irrigation
    a. Small Landscape Irrigation Project
    b. Core Landscape Irrigation Project
    c. Extension to Grover Beach Project
    d. Extension North of Highway 101 Project
    e. Nipomo Mesa Golf Courses
2. Agricultural Irrigation
    a. Direct delivery over 12 hours each day (Tertiary)
    b. Direct delivery over 12 hours each day (40% RO)
    c. Direct delivery over 24 hours each day (Tertiary)
    d. Direct delivery over 12 hours each day; 50% of Total Demand (Tertiary)
3. Groundwater Recharge
    a. Groundwater recharge via surface spreading at existing basins (60% RO)
    b. Groundwater recharge via surface spreading at new basins (60% RO)
    c. Groundwater recharge via surface spreading at new basins (Full AWT)
    d. Groundwater recharge via injection (Full AWT)
4. Surface Water Augmentation
    a. Arroyo Grande Creek Augmentation (80% RO)
    b. Arroyo Grande Creek Augmentation (Full AWT)
    c. Los Berros Creek Augmentation (80% RO)
    d. Los Berros Creek Augmentation (Full AWT)
    e. Lopez Reservoir Augmentation (Full AWT)
5. Industrial Reuse
    a. Tertiary Treatment
    b. Full RO

Overall, the amount of reuse for landscape irrigation is limited by the demand, while supply limits the amount of agricultural irrigation during the peak demand season (summer). Groundwater recharge and reservoir augmentation are limited by supply. Stream augmentation could be limited by supply or demand depending on future regulatory scenarios related to the volume of flow required at different points in the creek in the Habitat Conservation Plan.

9.3.1 Landscape Irrigation

Potential Market

The previous recycled water studies identified 21 potential landscape irrigation customers within Arroyo Grande, Grover Beach, and Oceano with up to 270 afy of demand. The customers are spread across the area, requiring approximately 7 miles of pipe to reach all the customers and two pressure zones.

It should be noted that demand estimates varied between the *2009 SSLOCSD Recycled Water Study* (Wallace) and the *2010 Arroyo Grande / SSLOCSD Recycled Water Conceptual Plan* (Wallace). The 2009 report identified 14 customers with 145 afy of demand, and the 2010 report identified 18 customers with 247 afy of demand. After consolidation of the two market assessments, 21 customers with 310 afy of demand were applied for the RRWSP.

Five landscape irrigation projects (Figure 9-3 and) were developed to capture the range of project sizes:

- **Alt S1a:** Small Landscape Irrigation Project (12 afy; close to the WWTP)
- **Alt S1b:** Core Landscape Irrigation Project (162 afy; highest demand customers)
- **Alt S1c:** Extension to Grover Beach Project (+44 afy; lateral to five customers)
- **Alt S1d**: Extension North of Highway 101 Project (+52 afy; laterals to four customers)
- **Alt S1e**: Nipomo Mesa Golf Courses (~1,500 afy)

Water Quality

Based on the information presented in Section 4.1.2, tertiary effluent from SSLOCSD would fall on the lower range of slight to moderate degrees of restriction due to salinity and specific ion toxicity. The concentration of constituents identified should have minimal impact on typical landscape irrigation activities. However, sensitive turfgrass, such as golf course greens, may require additional treatment or non-treatment mitigation (i.e., additional root zone flushing, adequate drainage, soil amendments, separate irrigation with existing water supply). No additional treatment beyond the addition of tertiary treatment is assumed for landscape irrigation project concepts based on the above analysis.

Project Concepts

Alt S1a: Small Landscape Irrigation Project

This project concept could be used as a demonstration project for the purposes of promoting and confirming the viability of reuse, since necessary facilities are small and could be temporary. The potential customer – Oceano County Park – is located approximately 3,000 feet from the WWTP. The annual average demand estimate of 12 afy translates to a peak demand flow of 30 gpm. Therefore, a small treatment and conveyance system could be implemented on a pilot / demonstration scale to convey up to 30 gpm of recycled water.

Alt S1b: Core Landscape Irrigation Project

This project concept serves the largest identified landscape irrigation customers and smaller customers located along the pipeline route. In total, 9 customers with 202 afy of estimated demand are included in addition to Oceano County Park in Alt S1a.

Soto Sports Complex is included in this alternative. A portion of the site's irrigation demand is met with stormwater captured and stored on-site. The recycled water demand estimate (40 afy) assumes that a portion of irrigation demand is met with stormwater and the balance is met with recycled water. Although, the volume of stormwater will vary each year depending on the volume of rainfall and other stormwater capture and storage factors.

In addition, Alt S3a considers recharge of recycled water at the Soto Sports Complex stormwater basins. The groundwater recharge project could be combined with this non-potable project is the recharge option is deemed feasible.

Alt S1c: Extension to Grover Beach Project

This project concept extends a lateral from Alt S1b pipeline to five customers in Grover Beach with a total demand of 44 afy.

Alt S1d: Extension North of Highway 101 Project

This project concept extends two laterals from the terminus of the Alt S1b pipeline to four customers in Arroyo Grande north of Highway 101 with a total demand of 52 afy.

Alt S2e: Nipomo Mesa Golf Courses

Three large golf courses operate within the Nipomo Mesa Management Area: Blacklake, Cypress Ridge, and Monarch Dunes. Each course uses approximately 50 afy of recycled water for irrigation from the local WWTPs that serves the residential and commercial activities around each course. However, irrigation demands far exceed available recycled water. In total, the courses use approximately 2,000 afy of groundwater for irrigation and will increase to approximately 2,500 afy once Monarch Dunes completes a planned 18-hole course (p.c. LeBrun). For the purposes of this evaluation, 1,500 afy is assumed.

This project concept would construction recycled water lines to the three golf courses. Also, the courses appear to irrigate from onsite ponds / lakes, which would allow delivery of recycled water to the ponds on a 24-hour basis. This reduces conveyance facility sizing but may require additional pond water treatment to address increased nutrient loading.

A potential implementation issue associated with this project concept is conveying effluent produced within the NCMA for use within the NMMA. Addressing the issue will require discussions between the two groups.

Summary

The following tables summarize each landscape irrigation project concept.

Table 9-4. SSLOCSD Landscape Irrigation Project Concepts – Facilities

Alt	# of Customers	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
S1a	1	Tertiary	0.02 mgd	0.02 MG	2 hp	0.5 mi
S1b	9	Tertiary	0.36 mgd	0.36 MG	29 hp	4.9 mi
S1c	5	Tertiary	0.08 mgd	0.08 MG	9 hp	1.8 mi
S1d	4	Tertiary	0.09 mgd	0.09 MG	9 hp (WWTP) 9 hp (Boost)	1.8 mi
S1e	3	Tertiary	2.7 mgd	2.7 MG	75 hp (WWTP) 75 hp (Boost)	9.3 mi

Table 9-5. SSLOCSD Landscape Irrigation Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
S1a	12	0.02	45	$0.6	$0.01	$4,090	+ $540
S1b	202	0.36	503	$7.0	$0.07	$2,580	+ $540
S1c	44	0.08	164	$2.4	$0.03	$4,230	+ $540
S1d	52	0.09	192	$3.2	$0.04	$4,780	+ $540
S1e	1,500	2.7	1,880	$23.7	$0.49	$1,350	+ $540

Notes: Refer to Section 5.2 for the basis for cost estimates and Appendix F for detailed cost estimates. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd). Costs exclude grants or low-interest loans.

Implementation Considerations

Implementation considerations for landscape irrigation projects are discussed in Section 4.1, including:

- Water supply benefit
  - Properly estimating demand
  - Gaining water supply benefit
- Water quality
  - Guidelines
  - Mitigation measures
- Level of service
  - Reliability
  - Peak season supplies
  - Facilities sizing
- Treatment plant improvements
- Customer conversions
  - Estimating costs
  - Regulatory restrictions and requirements
  - New development
- Public acceptance
- Recycled water pricing

Of particular concern for the SSLOCSD landscape irrigation project concepts are:

- Confirming demand estimates
- Evaluating conversion needs for anchor customers

9.3.2 Agricultural Irrigation

Potential Market

The most recent crop information for the area in the vicinity of SSLOCSD WWTP is shown in Figure 9-5. According to the 2012 NCMA Annual Monitoring Report (GEI), there are about 1,600 acres of irrigated agriculture within the NCMA. The associated demand estimates range from approximately 2,100 afy (1.9 mgd) in wet years to 2,400 afy (2.15 mgd) in average years to 2,700 afy (2.4 mgd) in dry years. Crops primarily consist of 'truck crops', such as broccoli, onions, and strawberries (GEI, 2013).

Irrigation demands during the summer can roughly double the average annual demand, which translates to approximately 4.3 mgd on average. Therefore, potential agricultural irrigation demand could use all of the available WWTP effluent – existing and projected – during the summer. During the winter, some effluent would continue to be discharged to the joint ocean outfall.

Water Supply Benefit

As discussed in Section 4.2.3, use of recycled water by agricultural customers does not directly create a new water supply for municipal water suppliers. The municipal water supply benefit results from recycled water offsetting pumping from the deep aquifer by agriculture. The deep aquifer groundwater formerly pumped by agriculture could then be used by municipal pumpers for potable water.

Water Quality

As discussed in Section 4.2.1, treatment of 40% of effluent with RO is necessary to meet agricultural water quality objectives without implementing non-treatment alternative measures to meet these objectives. Therefore, project concepts are defined for full tertiary and partial RO treatment. In Oceano, the predominant leafy vegetable crops can be irrigated with tertiary effluent (with no further treatment). However, irrigation of the 140 acres of avocadoes and citrus groves may require additional treatment because of these crops' sensitivity to salts (Wallace, 2009).

Project Concepts

Four project concepts were developed for agricultural irrigation (Figure 9-6):

- **Alt S2a:** Delivery over 12 hours
- **Alt S2b:** Delivery over 12 hours with partial (40%) RO treatment
- **Alt S2c:** Delivery over 24 hours
- **Alt S2d:** Alt S2a; Serving 50% of total estimated demand

All alternatives assume maximized delivery during the summer and reduced deliveries during the winter. The system would depend on groundwater to meet peak period demands. The groundwater could be provided centrally and mixed into the system, or by each of the sites with their individual wells.

Project Concepts

Alt S2a: Agricultural Irrigation Delivery over 12 hours

This project concept would deliver tertiary effluent to agricultural customers over a 12-hour duration. Agricultural customers could receive recycled water at any time, but operational experience on other agricultural reuse projects indicates that customers prefer to receive water during the day for multiple reasons, including planned staff presence and ability to observe any issues with irrigation.

Alt S2b: Agricultural Irrigation Delivery over 12 hours (Partial RO)

This project concept is identical to Alt S2a with the addition of RO treatment of 40% of effluent to lower TDS and chloride to more acceptable concentrations for some crops. Brine would be discharged through the existing joint ocean outfall.

Alt S2c: Agricultural Irrigation Delivery over 24 hours

This project concept would deliver tertiary effluent to agricultural customers over a 24-hour duration. Delivery could occur into a water supply pond or directly into the local irrigation system. Spreading deliveries over 24 hours instead of 12 hours allows for smaller storage, pumps, and pipes, thus reducing project cost. This option depends on the availability of onsite ponds for onsite storage and/or the willingness of growers to use water during the night.

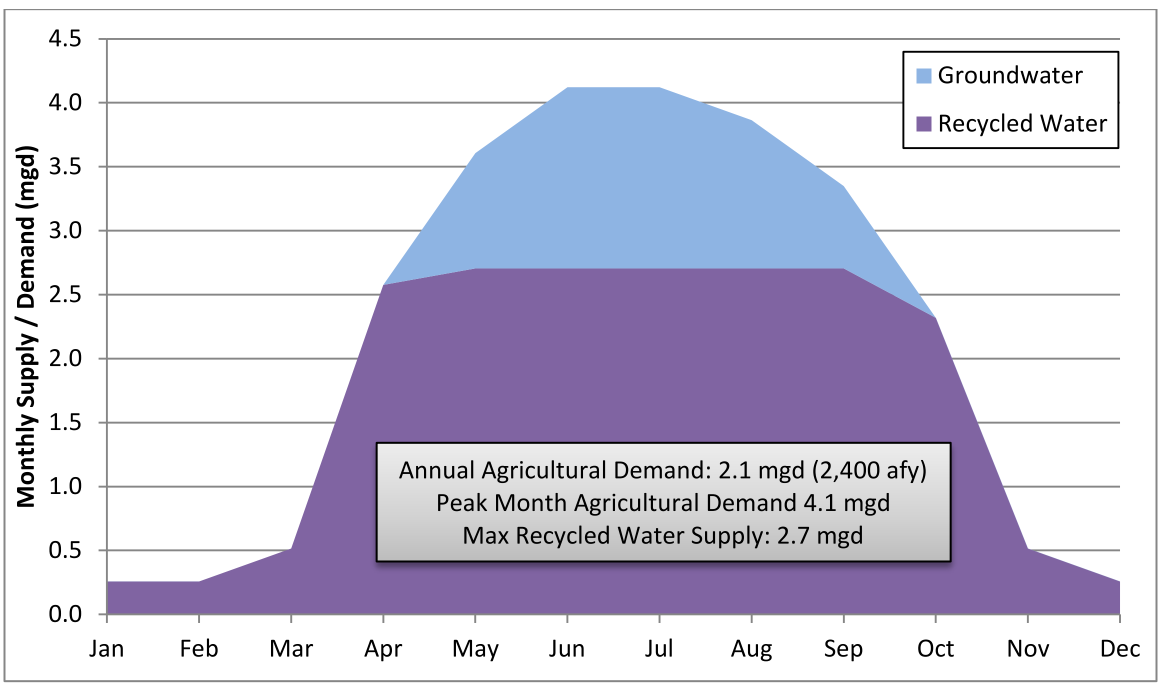
Alt S2d: Alt S2a; Serving 50% of total estimated demand

This project concept is similar to Alt S2a but assumes only 50% of the total estimated agricultural demand (1,200 afy of 2,400 afy total) connects to the system.

Project Operations

Alt S2a, S2b, and S2c assume all agricultural customers connect to the recycled water system. Total estimated demand for agricultural irrigation in the NCMA is approximately 2,400 afy (2.1 mgd). Based on historical evapotranspiration, summer demands likely will increase to 4.1 mgd, which exceeds the estimated available amount of tertiary effluent (2.7 mgd). Therefore, agricultural customers would need to supplement demand during the summer with groundwater. As shown in Figure 9-1, approximately 1,890 afy of the total of 2,400 afy of total demand could be met with recycled water and the balance by groundwater.

Figure 9-1: Monthly Water Sources for Potential Agricultural Demand



Summary

The following tables summarize the facilities and cost of each agricultural reuse project concept.

Table 9-6. SSLOCSD Agricultural Reuse Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
S2a	Tertiary	2.7 mgd	2.7 MG	150 hp	5.9 mi
S2b	Tertiary with 40% RO	2.7 mgd 1.1 mgd	2.7 MG	140 hp	5.9 mi
S2c	Tertiary	2.7 mgd	2.7 MG	75 hp	5.9 mi
S2d	Tertiary	2.1 mgd	2.1 MG	120 hp	5.9 mi

Table 9-7. SSLOCSD Agricultural Reuse Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates[2] Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)[3]
	Annual Average (afy)[1]	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
S2a	1,890	2.7	3,750	$18.9	$0.25	$790	+ $430
S2b	1,810	2.5	3,530	$22.5	$0.46	$1,060	+ $430
S2c	1,890	2.7	1,880	$12.9	$0.18	$550	+ $430
S2d	1,200	2.1	2,970	$20.1	$0.37	$1,400	+ $540

Notes:
1. Total estimated agricultural irrigation demand is 2,400 afy. Recycled water demand estimates are less than this amount because summer irrigation demand exceeds available recycled water supply per Figure 9-1.
2. Refer to Section 5.2 for the basis for cost estimates, and to Appendix F for detailed cost estimates. Costs exclude grants or low-interest loans.
3. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd).

Implementation Considerations

Implementation considerations for agricultural irrigation projects are discussed in Section 4.2, including:

- Delivered water quality
  - Guidelines
  - Management measures
  - Concentrate Management
- System design
  - Storage
  - Facilities sizing
- Water supply benefit
- Recycled water pricing
- Market acceptance

Of particular concern for the SSLOCSD agricultural irrigation project concepts is development of a project that creates a market for reuse with willing customers through consideration of water quality, pricing, and delivery.

9.3.3 Groundwater Recharge

Potential Market

Groundwater recharge (GWR) of recycled water has the potential to reuse all available effluent from SSLOCSD – up to 4.3 mgd (4,800 afy) (per Section 9.1). Two methods of GWR are considered within the Tri-Cities Mesa – Arroyo Grande Plain (Northern Cities Management Area, or NCMA): 1) surface spreading (with percolation basins), and 2) injection (with injection wells). Two NCMA aquifers were evaluated for recharge: 1) Shallow aquifer, which is primarily used by agriculture, and 2) Deep aquifer, which is the primary municipal groundwater supply and also used by agriculture.

Water Quality

As discussed in Section 4.5.1, groundwater recharge projects are regulated by both DDW and RWQCB. DDW regulations are intended to protect public health and are defined in the final GWR Regulations. The RWQCB or DDW would issue a permit based on the final GWR Regulations and requirements consistent with Basin Plan, Salt and Nutrient Management Plan, and State policies. Based on this understanding, the following requirements will form the basis for GWR projects in the NCMA:

- For all GWR projects, meet Basin Plan's groundwater quality objectives for TDS, chloride, and nitrogen for the applicable groundwater basin.
- For all GWR projects, meet TDS, chloride, and nitrogen loading limits to be determined in a Salt and Nutrient Management Plan (SNMP) for the applicable groundwater basin.
- For surface spreading projects, a minimum of tertiary treatment is required.
- For surface spreading projects, the recycled water contribution (RWC) – the percentage of blend water (i.e., water other than recycled water) required for reducing TOC concentrations to 0.5 mg/L.
- For injection projects, full AWT is required.

As shown in Table 9-3, chloride concentrations need to be reduced by approximately 60% to meet groundwater quality objectives. Therefore, application of reverse osmosis to 60% of tertiary effluent is assumed as minimum treatment requirements for a GWR via surface spreading project. This assumes that more restrictive objectives or loading limits are not found in the NCMA SNMP.

Application of full AWT to all effluent should remove the need for blending for surface spreading projects. All injection projects must include full AWT.

Project Concepts

In total, three GWR projects were defined from SSLOCSD WWTP for the NCMA (Figure 9-7):

- GWR via Surface Spreading – Shallow Aquifer
    - **Alt S3a:** Partial (60%) RO at existing basins (300 afy)
    - **Alt S3b:** Partial (60%) RO at new basins (2,760 afy after brine losses)
    - **Alt S3c:** Full AWT at new basins (2,390 afy after brine losses)

- **Alt S3d:** GWR via injection – deep aquifer (Full AWT) (2,390 afy after brine losses)

A GWR via surface spreading project for the deep aquifer was discussed initially but not carried forward because no reliable areas for recharge of the deep aquifer via surface spreading have been identified. For the NCMA, GWR via surface spreading projects is restricted by the area available at the surface to recharge the deep aquifer. Some possible areas have been identified along the Wilmar Avenue Fault, which roughly follows Highway 101, but no reliable areas for recharge of the deep aquifer via surface spreading have been identified. As a result, GWR via surface spreading of the deep aquifer was not considered further in the RRWSP.

Blend Water

As discussed in the Section 3.1.2, the final GWR Regulations specify how to derive the maximum RWC. For surface spreading using tertiary effluent, the initial RWC is limited to 20%[26] unless an alternative RWC is approved by DDW that can achieve a TOC of 0.5 mg/L. An RWC of 50% or higher can be reached depending on soil aquifer treatment (SAT) performance or if BDOC is used for derivation of the RWC. SAT performance must be demonstrated during project operations so the higher maximum RWC of 50% or higher could only be achieved after several years of operations and monitoring.

The application of RO to 60% of effluent, as proposed for Alternative S3a, should result in an initial RWC above 20%. For the purposes of this report, an ultimate RWC of 50% is assumed. As a result, Alternative S3a includes costs to provide an equal amount of blend water as recycled water to meet 50/50 blend (or 1:1 blend).

For surface spreading using AWT effluent, DDW could approve an initial RWC up to 100%. For groundwater injection projects, which must apply AWT, the initial RWC could be as high as 100%. In both cases that AWT is applied, a 100% RWC could be achieved a few years operations start if an initial RWC of 100% is not approved by DDW. Therefore, the GWR projects proposed that apply AWT are assumed to have a RWC of 100%. As a result, costs associated with providing blend water during the period to achieve an RWC of 100% are not included.

GWR via Surface Spreading at Existing Basins

The Soto Sports Complex has stormwater basins with approximately 100 af of storage capacitythat recharge the underlying groundwater basin and have the ability to pump water to Arroyo Grande Creek. Records of captured or recharged stormwater are not available. A rough estimate of 300 afy of stormwater recharge in an average year was calculated based on:

- The tributary area to the basins is approximately is approximately 460 acres
- Average annual rainfall is 17 inches
- Assuming 50% of runoff is captured

Based on a 50/50 blend, up to 300 afy of recycled water could be recharged in the basins. However, the GWR Regulations require a minimum of six months of travel time for recharge projects with tertiary effluent to help achieve virus reduction. The close proximity of potable water wells to the recharge basins may be a fatal flaw.

GWR via Surface Spreading at New Basins

[26] An RWC of 20% translates to 4 af of blend water recharged for every 1 af of recycled water. Recycled water is 1 af of a total of 5 af. (1/5 = 20%).

GWR via surface spreading over most of the NCMA would replenish the shallow aquifer. Because the shallow aquifer is used primarily by agriculture, a GWR project for this aquifer requires an arrangement with municipal pumpers to realize a water supply benefit. As discussed above for agricultural reuse, use of recycled water (via recharge) by agricultural customers does not directly create a new water supply for municipal water suppliers. The municipal water supply benefit results from recycled water offsetting pumping from the deep aquifer by agriculture. The deep aquifer groundwater formerly pumped by agriculture could then be used by municipal pumpers as potable water.

Project implementation will require the following facilities:

- Treatment (tertiary effluent storage, RO or AWT)
- Recycled water conveyance facilities (pump station, pipelines)
- Blend water conveyance facilities (pump station, pipelines)
- Recharge basins

The level of treatment necessary to implement the project is a tradeoff between the various regulatory requirements – particularly blend water supplies. Two levels of treatment are defined:

- RO of 60% of flow to meet minimum water quality requirements
- Full AWT to potentially eliminate the need for blend supplies

Based on these treatment plans, up to 2,760 afy (2.5 mgd) could be recharged based on RO treatment of 60% of tertiary effluent, and up to 2,390 afy (2.1 mgd) of full AWT effluent could be recharged.

Conveyance facilities are sized to convey the average annual volume at a constant rate for 24 hours per day over 365 days per year. Recharge basins are sized to recharge the average annual volume at a constant rate for 24 hours per day over 365 days per year. Land for the basins must be purchased as well.

<u>GWR via Injection</u>

GWR via injection would inject highly treated recycled water into the NCMA deep aquifer to replenish the basin. Up to 2,760 afy (2.1 mgd) of full AWT effluent could be recharged. Full AWT effluent would meet the Basin Plan groundwater objectives discussed for GWR via surface spreading and should address other DDW and RWQCB requirements. The final Regulations may allow a new GWR via injection project to start without any blend water requirements if certain criteria are met. The project concept assumes four wells are necessary to inject up to 2,760 afy based on each well injecting roughly 1,000 afy (0.9 mgd or 620 gpm on a year-round basis). The injection could be located:

- Along the coastline to serve as a seawater intrusion barrier and supplemental groundwater supply
- Inland in the vicinity of the existing pumping depression in relative proximity to existing municipal wells (though sited a minimum distance and travel time from the municipal wells)

Extraction of recharged water would rely on existing municipal wells that have scaled back production due to declining groundwater levels. The NCMA wells are currently under capacity due to concerns about seawater intrusion. However, additional analysis would need to be performed to determine the benefit to groundwater yield that could be realized by the municipal agencies and if it would require additional extraction wells to realized.

<u>Summary</u>

The following tables summarize the facilities and cost of each groundwater recharge project concept.

Table 9-8. SSLOCSD Groundwater Recharge Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Storage	Recharge Basins / Injection Wells	Pump Station(s)	Pipelines
S3a	Tertiary with 60% RO	0.3 mgd 0.2 mgd	0.15 MG	5 ac (Existing)	10 hp	2.6 mi
S3b	Tertiary with 60% RO	2.7 mgd 1.6 mgd	1.35 MG	19.0 ac	50 hp	3.8 mi
S3c	Full AWT	2.7 mgd	1.35 MG	8.2 ac	50 hp	3.8 mi
S3d	Full AWT	2.7 mgd	1.35 MG	3 Wells	30 hp	2.2 mi

Table 9-9. SSLOCSD Groundwater Recharge Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment[1]			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
S3a[2]	300	0.3	186	$5.0	$0.11	$1,460	+ $290
S3b[3]	2,760	2.5	1,710	$25.5	$1.19	$1,040	+ $290
S3c	2,390	2.1	1,480	$44.7	$1.82	$1,990	--
S3d	2,390	2.1	1,482	$46.8	$1.84	$2,050	--

Notes:

1. Refer to Section 5.2 for the basis for cost estimates and Appendix F for detailed cost estimates. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd). Costs exclude grants or low-interest loans.
2. An average annual volume of 300 afy of stormwater is assumed to provide a 50/50 blend with 300 afy of recycled water.
3. The recharge basins are sized to recharge 2,760 afy of recycled water and 2,760 afy of blend water. Blend could be a combination of surplus Lopez Lake water or water diverted from Arroyo Grande Creek. Also, underflow from Arroyo Grande Creek could count toward blend calculations. Therefore, the cost of blend water purchase is excluded from Total Annual Cost pending further investigation into blend supplies. Similarly, the project yield excludes blend water recharge yield.

Implementation Considerations

Implementation considerations for groundwater recharge projects are discussed in Section 4.5, including:

- Confidence in receipt of the water supply benefit
- Risk of stricter treatment requirements in the future
- Additional permits
- Public acceptance

9.3.4 Surface Water Augmentation

Potential Market

Surface water augmentation has the potential to reuse all available effluent from SSLOCSD – up to 2.7 mgd (3,000 afy) (per Section 9.1) less any brine losses. Three locations were considered:

1. Arroyo Grande Creek
2. Los Berros Creek
3. Lopez Lake

Water Quality

As discussed in Section 0, surface water augmentation projects are subject to an NPDES permit for discharge into an inland surface water. Effluent permit requirements would be based on:

- All applicable water quality standards (beneficial uses, water quality objectives to protect the uses, and anti-degradation policies) in the Central Coast Water Quality Control Plan (Basin Plan),
- Water quality criteria in the CTR for protection of aquatic life and human health, and
- Implementation measures for the CTR in the SIP.

As shown in Table 9-3, the chloride surface water objective is even stricter than the groundwater objectives and, as a result, chloride concentrations need to be reduced by approximately 80%. Therefore, application of RO to 80% of tertiary effluent is assumed as minimum treatment requirements for a stream augmentation project. This assumes that the treatment train can also meet existing CTR criteria.

As a result of having to meet water quality criteria for both human health and aquatic life, surface water augmentation projects have the strictest discharge limits. A more conservative approach is to assume full AWT is necessary to meet all potential water quality requirements. Therefore, options for 80% RO treatment and full AWT are included.

In addition, DDW reservoir augmentation regulations must be met by the Lopez Lake augmentation project (but not by stream augmentation projects). DDW is currently developing regulations with planned approval by the end of 2016. (The status of the DDW reservoir augmentation regulations is discussed in Section 3.1.3). Among the proposed requirements is subjecting all flow to full AWT.

Project Concepts

Two levels of treatment were considered based on existing and potential regulations:

- Partial (80%) RO to meet surface water quality objectives
- Full AWT

In total, five surface water augmentation projects were defined (Figure 9-8):

- Arroyo Grande Creek Stream Augmentation
    - **Alt S4a:** Partial (80%) RO (2,670 afy after brine losses)
    - **Alt S4b:** Full AWT (2,390 afy after brine losses)
- Los Berros Creek Stream Augmentation
    - **Alt S4c:** Partial (80%) RO (2,670 afy after brine losses)

- **Alt S4d:** Full AWT (2,390 afy after brine losses)
- **Alt S4e:** Lopez Lake Augmentation – Full AWT (3,800 afy after brine losses)

Augmentation of Lopez Terminal Reservoir, the water body adjacent to the Lopez Water Treatment Plant, was considered. However, using the conceptual surface augmentation criateria approved by DDW for the Cityh of San Diego's project, the detention time (30 to 45 days) does not meet minimum conceptual criteria of 12 months, and the minimum blend requirement of 100:1 would limit augmentation to approximately 8 afy based on an approximate volume of 844 af.

Arroyo Grande Creek Stream Augmentation

Up to 6 cfs (3.9 mgd, 4,350 afy) is released from Lopez Lake to Arroyo Grande Creek for endangered species protection and maintenance and to meet downstream water rights. This demand could be almost met from SSLOCSD depending on effluent treatment requirements. The two project concepts for Arroyo Grande Creek are based on the minimum potential treatment requirements (Alt S4a: 80% RO) and the likely required treatment (Alt S4b: Full AWT).

The concept is to deliver the treated water to the base of Lopez Dam to offset releases from Lopez Lake that could then remain in the lake for potable use.

Los Berros Creek Stream Augmentation

Los Berros Creek runs along the base of the Nipomo Mesa overlooking the agricultural fields on the south side of Arroyo Grande Creek. This project concept is to release treated water to the creek with the intent of recharging the shallow groundwater basin. This will in turn increase agricultural supplies from the shallow aquifer with the intent of a similar decrease in agricultural pumping from deep aquifer. Similar to Alt S3a and Alt 3b, municipal pumping could then increase in the deep aquifer.

Similar to those developed for Arroyo Grande Creek, two project concepts were developed for Los Berros Creek based on the minimum potential treatment requirements (Alt S4c: 80% RO) and the likely required treatment (Alt S4d: Full AWT).

Lopez Lake Augmentation

This project concept proposes to deliver highly treated water to Lopez Lake for eventual use as a potable water supply as part of the Lopez Project. The concept entails construction of a full AWT plant and transmission pipeline to Lopez Lake. The water then blends with native reservoir water and stays in the reservoir for at least several months prior to conveyance to the Lopez Water Treatment Plant and distribution as potable water.

Summary

The following tables summarize the facilities and cost of each landscape irrigation project concept.

Table 9-10. SSLOCSD Surface Water Augmentation Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
S4a	Tertiary with 80% RO	2.7 mgd 2.2 mgd	1.2 MG	110 hp	12.1 mi
S4b	Full AWT	2.7 mgd	1.1 MG	110 hp	12.1 mi
S4c	Tertiary with 80% RO	2.7 mgd 2.2 mgd	1.2 MG	60 hp	3.0 mi
S4d	Full AWT	2.7 mgd	1.1 MG	60 hp	3.0 mi
S4e	Full AWT	2.7 mgd	1.1 MG	100 hp (WWTP) 100 hp (Booster)	16.0 mi

Table 9-11. SSLOCSD Surface Water Augmentation Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
S4a	2,670	2.4	1,656	$34.8	$1.20	$1,300	+ $280
S4b	2,390	2.1	1,482	$59.5	$1.98	$2,450	--
S4c	2,670	2.4	1,656	$19.1	$1.03	$860	+ $280
S4d	2,390	2.1	1,482	$40.3	$1.80	$1,850	--
S4e	2,390	2.1	1,482	$35.3	$1.97	$1,790	--

Notes: Refer to Section 5.2 for the basis for cost estimates and Appendix F for detailed cost estimates. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd). Costs exclude grants or low-interest loans.

Implementation Considerations

Implementation considerations for surface water augmentation projects are discussed in Section 4.4 (Stream Augmentation) and Section 4.6 (Reservoir Augmentation), including:

- Public acceptance
- Risk of stricter treatment requirements in the future

9.3.5 Industrial Reuse

Potential Market

The Phillips 66 refinery on the Nipomo Mesa is the only industrial customer identified in previous studies. The refinery uses approximately 1,100 afy of groundwater from the NMMA (NMMA TG, 2013) for potable use and industrial processes. The industrial processes include cooling towers and boilers; however, a breakdown of water use between different types of water uses was not available at the time of the writing of this report.

Previous NCSD studies evaluated reuse of brine from process water after RO treatment (NCSD SWAEC, 2013) and use of the refinery site for a desalination plant (Cannon, 2007). However, direct use of recycled water by the refinery has not been evaluated. This is likely because reuse of effluent from NCSD's Southland WWTF would not create a new water supply, since the effluent currently recharges the NMMA groundwater basin. The project considered in the RRWSP proposes to convey recycled water from the SSLOCSD WWTP. The SSLOCSD plant is farther than Southland WWTF from the refinery but reuse of SSLOCSD effluent would result in a water supply benefit.

Water Quality

As discussed in Section 4.3, conversion of cooling towers and boilers to recycled water requires a site-specific assessment of water quality requirements due to system components' sensitivity to small quantities of specific constituents. Also, cooling towers and boilers can be manufactured with several types of materials that have specific water quality concerns. On-site treatment and application of chemicals is also likely. Therefore, conversion of a cooling tower or boiler to recycled water requires a site-specific assessment of on-site treatment and system components. Therefore, an evaluation of recycled water suitability for the refinery is not possible in the RRWSP. Potential treatment needs include:

- Nitrification or nitrification-denitrification treatment in addition to tertiary filtration for ammonia removal
- RO treatment for cooling towers to prevent corrosion and scale
- RO treatment for high-pressure boilers to reduce hardness to close to zero and reduce alkalinity and organics.

Project Concepts

Two project concepts are defined for reuse at the Phillips 66 refinery in an attempt to bracket treatment requirements: 1) tertiary treatment and 2) reverse osmosis. Actual treatment requirements are likely somewhere between the two levels of treatment. For the purposes of this comparison, recycled water quality is assumed to be compatible with all on-site non-potable uses (approximately 1,100 afy). As noted previously, a site-specific evaluation and understanding of water demand and water quality requirements is necessary to define potential projects properly. The two projects defined are intended to capture the range of costs associated with a recycled water project with the refinery. The two projects are (Figure 9-9):

- **Alt S5a:** Tertiary Treatment (1,100 afy)
- **Alt S5b:** RO Treatment (1,100 afy)

Project facilities are sized assuming a 1.3 seasonal demand peaking factor and operations over 18 hours per day. Both are typical industrial water use factors and need to be reviewed for actual operations at the refinery.

A site conversion cost of $150,000 is included to account for the complexity of converting a large existing and operational industrial facility. Also, redundant pumping and treatment capacity is included in Alt S5b to address the higher level of service demanded by large industrial operations.

<u>Summary</u>

The following tables summarize the facilities and cost of each industrial reuse project concept.

Table 9-12. SSLOCSD Industrial Reuse Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
S5a	Tertiary	1.3 mgd	1.3 MG	70 hp	7.3 mi
S5b	Full RO	1.5 mgd	1.3 MG	70 hp	7.3 mi

Table 9-13. SSLOCSD Industrial Reuse Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
S5a	1,100	1.3	1,179	$15.6	$0.18	$1,090	+ $350
S5b	1,100	1.3	1,179	$25.1	$0.51	$1,950	+ $400

Notes: Refer to Section 5.2 for the basis for cost estimates and Appendix F for detailed cost estimates. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd). Costs exclude grants or low-interest loans.

Implementation Considerations

Conversion of cooling towers and boilers to recycled water requires a site-specific assessment of on-site infrastructure and water quality requirements. Considerations for recycled water use at cooling towers and boilers were discussed in Section 4.3, including:

- Water quality needs and associated treatment
- Existing on-site treatment
- Existing on-site conveyance infrastructure
- Costs to address cross-connections with other potable, non-potable, and fire safety uses
- Impact of changes to cycles of concentration on discharge volume and recycled water needed
- Existing system operations contractor
- Worker safety

9.4 Recycled Water Summary

The SSLOCSD WWTP currently discharges approximately 2.6 mgd of disinfected secondary effluent through a joint ocean outfall (shared with Pismo Beach). Approximately 1.1 mgd of disinfected secondary effluent from Pismo Beach WWTP is discharged through the same ocean outfall. SSLOCSD has the largest volume of effluent considered in the RRWSP and the largest opportunities for large-scale reuse; however, landscape irrigation projects are expensive ($3,000+/af) and the more cost effective reuse opportunities – agricultural irrigation, industrial reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation – will require institutional, legal, outreach, and financial planning to be feasible.

9.4.1 Project Concepts Summary

The demand and cost for each SSLOCSD project concept are summarized in Table 9-14 and the unit costs are presented in Figure 9-2. Tertiary treatment upgrade is assumed for all projects, so the upgrade cost is separated from the core project cost. Treatment processes beyond tertiary filtration, such as RO and full AWT, are included in the core project cost. Overall, the amount of reuse for landscape irrigation is limited by the demand, while supply limits the amount of agricultural irrigation during the peak demand season (summer). Groundwater recharge and reservoir augmentation are limited by supply. Stream augmentation could be limited by supply or demand depending on future regulatory scenarios related to the volume of flow required at different points in the creek in the Habitat Conservation Plan.

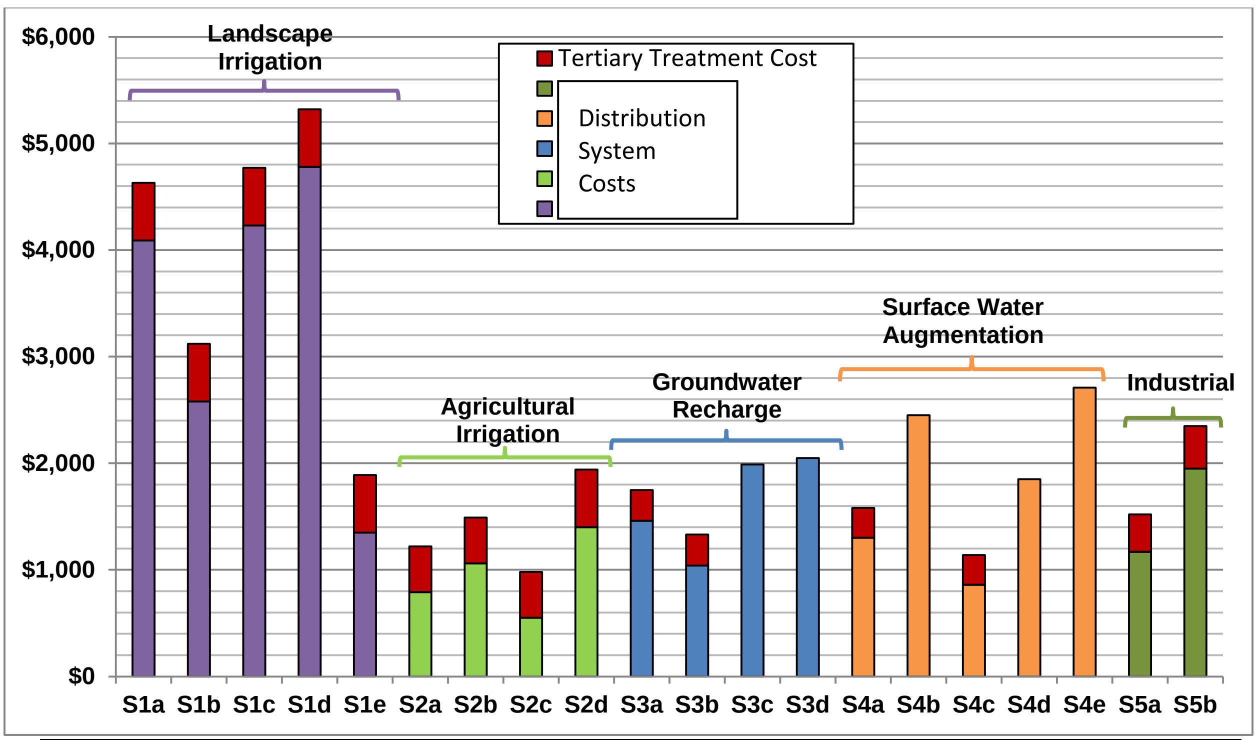
Table 9-14. Summary of SSLOCSD Project Concepts

Alt	Level of Treatment	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
		Annual Average (afy)	Capital Cost ($M)	Annual O&M Cost ($M)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
Landscape Irrigation Project Concepts								
S1a	Tertiary	12	0.02	45	$0.6	$0.01	$4,090	+ $540
S1b	Tertiary	202	0.36	503	$7.0	$0.07	$2,580	+ $540
S1c	Tertiary	44	0.08	213	$2.5	$0.03	$4,230	+ $540
S1d	Tertiary	52	0.09	192	$3.2	$0.04	$4,780	+ $540
S1e	Tertiary	1,500	2.7	1,875	$23.7	$0.49	$1,350	+ $540
Agricultural Reuse Project Concepts								
S2a	Tertiary	1,890	2.7	3,750	$18.9	$0.25	$790	+ $430
S2b	40% RO	1,810	2.5	3,530	$22.5	$0.46	$1,060	+ $430
S2c	Tertiary	1,890	2.7	1,880	$12.9	$0.18	$550	+ $430
S2d	Tertiary	1,200	2.1	2,970	$20.1	$0.37	$1,400	+ $540
Groundwater Recharge Project Concepts								
S3a	Soto Basins 60% RO	300	0.3	186	$5.0	$0.11	$1,460	+ $290
S3b	New Basin 60% RO	2,760	2.5	1,710	$25.5	$1.19	$1,040	+ $290
S3c	Spreading Full AWT	2,390	2.1	1,480	$44.7	$1.82	$1,990	--
S3d	Injection Full AWT	2,390	2.1	1,482	$46.8	$1.84	$2,050	--
Surface Water Augmentation Project Concepts								
S4a	Los Berros 80% RO	2,670	2.4	1,656	$34.8	$1.20	$1,300	+ $280
S4b	Los Berros Full AWT	2,390	2.1	1,482	$59.5	$1.98	$2,450	--
S4c	AG Creek 80% RO	2,670	2.4	1,656	$19.1	$1.03	$860	+ $280
S4d	AG Creek Full AWT	2,390	2.1	1,482	$40.3	$1.80	$1,850	--
S4e	Lopez Full AWT	2,390	2.1	1,482	$66.5	$2.15	$2,710	--
Industrial Reuse Project Concepts								
S5a	Tertiary	1,100	1.3	1,179	$16.9	$0.19	$1,170	+ $350
S5b	100% RO	1,100	1.3	1,179	$25.2	$0.51	$1,950	+ $400

Note: Refer to Section 5.2 for the basis for cost estimates and Appendix F for detailed cost estimates. Tertiary treatment costs are based on construction of the maximum size plant (2.7 mgd). Costs exclude grants or low-interest loans.

SSLOCSD Recycled Water Project Concepts	
Landscape Irrigation Project Concepts	Groundwater Recharge Project Concepts
S1a. Small Landscape Irrigation Project	S3a. GWR via surface spreading @ existing basins (60% RO)
S1b. Core Landscape Irrigation Project	S3b. GWR via surface spreading @ new basins (60% RO)
S1c. Extension to Grover Beach Project	S3c. GWR via surface spreading @ new basins (Full AWT)
S1d. Extension North of Highway 101 Project	S3d. GWR via injection (Full AWT)
S1e. Nipomo Mesa Golf Courses	Surface Water Augmentation Project Concepts
Agricultural Irrigation Project Concepts	S4a. Arroyo Grande Creek Augmentation (80% RO)
S2a. Direct delivery over 12 hours / day (Tertiary)	S4b. Arroyo Grande Creek Augmentation (Full AWT)
S2b. S2a with 40% RO	S4c. Los Berros Creek Augmentation (80% RO)
S2c. Direct delivery over 24 hours / day (Tertiary)	S4d. Los Berros Creek Augmentation (Full AWT)
S2d. S2a; Serving 50% of estimated demand	S4e. Lopez Reservoir Augmentation (Full AWT)
	Industrial Reuse Project Concepts
	S5a. Tertiary Treatment
	S5b. Full RO

Figure 9-2: Unit Costs of SSLOCSD Project Concepts ($/AF)



AFY	12	162	44	52	1500	1890	1810	1890	1200	300	2760	2390	2390	2670	2390	2670	2390	2390	1100	1100

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

9.4.2 Opportunities and Constraints

Based on the project concepts development process, SSLOCSD recycled water opportunities and constraints include the following:

- Reuse from SSLOCSD WWTP will require upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or discharge regulations for specific types of reuse (e.g., stream augmentation or indirect potable reuse).
- Landscape irrigation projects have the highest unit costs due to limited demand in proximity to the SSLOCSD WWTP.
- Agricultural irrigation projects have the lowest unit costs due to substantial agricultural demand in proximity to the SSLOCSD WWTP.
- GWR and stream augmentation projects offer the highest volume of reuse, have moderate unit costs, and include a range of costs primarily due to the level of treatment assumed for each project.
- Industrial reuse has moderate unit costs and could be combined with the Nipomo golf courses or agricultural reuse alternatives since they have similar pipeline alignments.

9.4.3 Next Steps

General

- Complete planned treatment plant improvements and re-evaluate facilities needed to implement tertiary treatment upgrade.
- Track regulatory drivers and their impacts on reuse opportunities, including:
    - RWQCB Waste Discharge Requirements (NPDES Permit)
    - NOAA Habitat Conservation Plan
    - California Coastal Commission Coastal Development Permit
    - Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003
- Address institutional issues and potential funding mechanisms for regional projects
    - Discuss cost sharing of projects between water and wastewater agencies or water/sewer funds.
    - Discuss operations and management of the project
    - Discuss the logistics and legal basis for groundwater exchanges.
    - Coordinate with Pismo Beach reuse plans to identify the most cost effective reuse projects for the NCMA.
    - Develop project concepts sufficiently to position for grant funding opportunities
    - Initiate discussions with member agencies about project funding between the water supply entities (Arroyo Grande, Grover Beach, and Oceano CSD) and SSLOCSD.
    - Investigate funding mechanisms for regional projects that benefit NCMA pumpers in addition to SSLOCSD and its member agencies.
    - Discuss support for use of SSLOCSD recycled water in the NMMA and the related ability to receive water supply benefits in the NCMA.

- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

Landscape Irrigation

- Except for the Nipomo Mesa Golf Courses option, the landscape irrigation alternatives have unit costs exceeding $3,000/af. However, unit costs can be reduced if some non-potable projects can be reduced to less than $2,000/af when are combined with groundwater recharge at the Soto Sports Complex Stormwater basins.

Nipomo Mesa Golf Courses

- Confirm demand estimates that account for future growth
- Address issues associated with use of NCMA effluent in the NMMA.

Agricultural Irrigation

- Initiate planning for agricultural reuse program to enable a project to be developed within 10 years.
- Conduct outreach to agricultural operations in the area determine willingness to use recycled water in the future and obstacles to implementation.
- Set up a pilot study potentially in conjunction with Cal Poly[27] similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source for a pilot project.
- In conjunction with GWR hydrogeological characterization, attempt to define locations of agricultural pumping compared with municipal pumping.

Industrial Reuse

- Discuss reuse options with Phillips 66 refinery.
- Address issues associated with use of NCMA effluent in the NMMA.

Groundwater Recharge / Seawater Intrusion Barrier

- Further investigate the water supply benefits of implementing a small groundwater recharge project at the Soto Sports Complex Stormwater basins. Considering combining this project with a non-potable project. Determine if the close proximity of potable water wells to the recharge basins is a fatal flaw.
- Further investigate the NCMA groundwater basin, potentially with a groundwater model, to identify surface recharge locations, inland injection locations, and coastal injection locations. Define the benefits of these projects to the basin, particularly the prevention of seawater intrusion.
- Determine benefits of and need for a seawater intrusion barrier (via direct injection or in-lieu reuse) and groundwater levels that would necessitate its use. Determine the value of groundwater protected from seawater intrusion.

Streamflow Augmentation

- Continue to track developments in Arroyo Grande Creek flow requirements / restrictions.
- Track new and potential surface water discharge regulations.

[27] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org

9.5 Regulatory Scenarios

Future regulatory conditions cannot be predicted with certainty, but possible scenarios should be considered that would substantially impact implementation of recycled water projects from the SSLOCSD WWTP. Potential regulatory scenarios include:

- RWQCB Waste Discharge Requirements (NPDES Permit)
- NOAA Habitat Conservation Plan
- California Coastal Commission Coastal Development Permit
- Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003

9.5.1 RWQCB Waste Discharge Requirements (NPDES Permit)

The SSLOCSD WWTP NPDES permit effluent water quality limits are primarily driven by water quality objectives and effluent limitations established in the California Ocean Plan. Similar to inland discharges, ocean outfall water quality requirements will likely continue the trend of increased stringency as new issues are discovered and regulated. As a result, increasing treatment levels to tertiary effluent in the future is a feasible scenario. In this situation, the cost of tertiary treatment upgrades would be borne by SSLOCSD instead of a recycled water project.

The cost to upgrade tertiary treatment is separated from other recycled water facilities (i.e., storage, pumps, pipelines) to facilitate comparison of projects without the cost of tertiary treatment included. Costs for treatment beyond tertiary are included in individual projects.

9.5.2 Habitat Conservation Plan for Arroyo Grande Creek

The San Luis Obispo County Flood Control and Water Conservation District Zone 3 (Zone 3) operates and maintains Lopez Lake, in the Arroyo Grande Creek watershed, for municipal and agricultural water supplies. A Habitat Conservation Plan (HCP) is under development in consultation with NOAA to address the quality and availability of habitat to protect endangered species (steelhead and red-legged frogs). The habitat is impacted by the operation of Lopez Lake and associated releases into Arroyo Grande Creek in addition to other project operations and maintenance activities performed by the District.

Zone 3 currently releases approximately 6 cfs (3.9 mgd, 4,350 afy) year-round to meet HCP needs as well as downstream water rights for agriculture. Zone 3 anticipates the need to continue these releases after the HCP is completed.

In addition, NOAA may require reduced downstream diversions and/or shallow groundwater pumping to maintain flow in the creek during certain periods of the year. The vast majority of the water use that would be impacted is agricultural. In this scenario, the reduced agricultural water supply could be replaced by additional pumping from the deep aquifer or recycled water. The deep aquifer is the primary source for municipal groundwater supplies, and municipal pumpers have reduced pumping in recent years to avoid seawater intrusion. As a result, additional agricultural pumping would create negative impacts – either further municipal reductions or increased potential for seawater intrusion. Instead, recycled water could be used by agriculture to replace the creek diversions and/or shallow groundwater pumping. This situation could create an additional incentive for agricultural use of recycled water.

9.5.3 California Coastal Commission Coastal Development Permit

The California Coastal Commission recommended denial of the Morro Bay onsite WWTP project because of its proximity to the ocean and creek, making it susceptible to flooding, sea level rise caused by climate change, and tsunamis. The SSLOCSD WWTP is in a similar setting and could face similar restrictions to treatment plant upgrades if a Coastal Development Permit is required.

The consequences of a Coastal Development Permit denial would include the relocation of the entire WWTP from its existing location to a new location outside of the 100-year flood zone and tsunami hazard zone. Similar to the Morro Bay setting, movement of the existing plant would likely increase water recycling opportunities by placing the source closer to the demand – including municipal, agricultural, and potable reuse. This would lower the cost of implementing recycled water projects.

Also, the risk of a requirement for a new WWTP location increases the risk of lost investment in recycled water project planning and design based on the existing plant location.

9.5.4 Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003

The plant will remain within the 100-year flood zone even after levee improvements are made along Arroyo Grande Creek. The RWQCB could require protection from the 100-year flood to prevent inundation and likely sewer system overflows that would result from electrical and/or pumping equipment failure. In this instance, the cost to upgrade the facility for flood protection would require significant investment and may drive relocation of the plant outside of the flood zone. Plant relocation would likely increase water recycling opportunities by placing the source closer to the demand – including municipal, agricultural, and potable reuse. This would lower the cost of implementing recycled water projects.

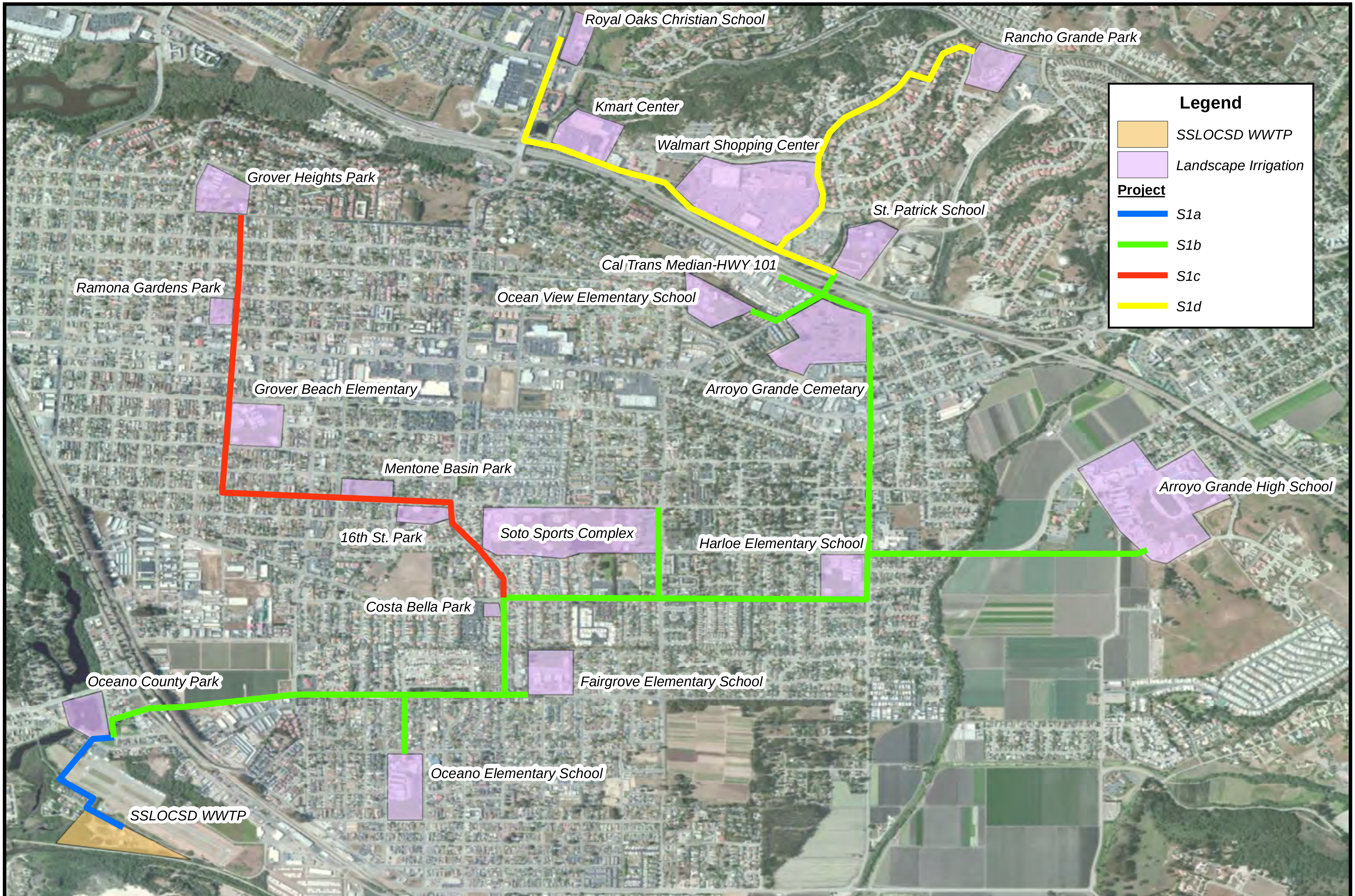


Figure 9-3: Potential Landscape Irrigation Projects - SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan

FINAL NOVEMBER 2014

Cannon

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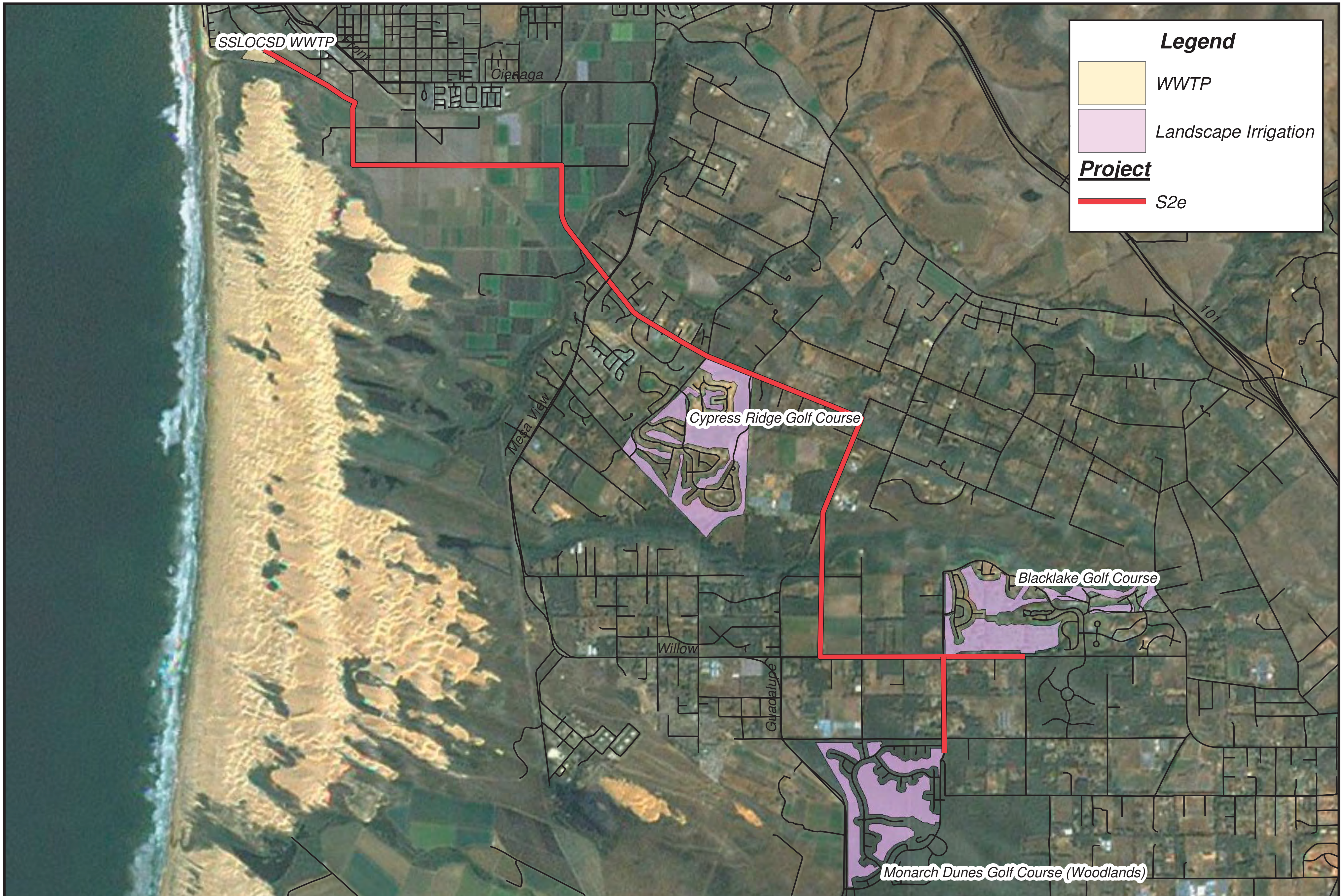

Figure 9-4: Nipomo Mesa Golf Courses Project - SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

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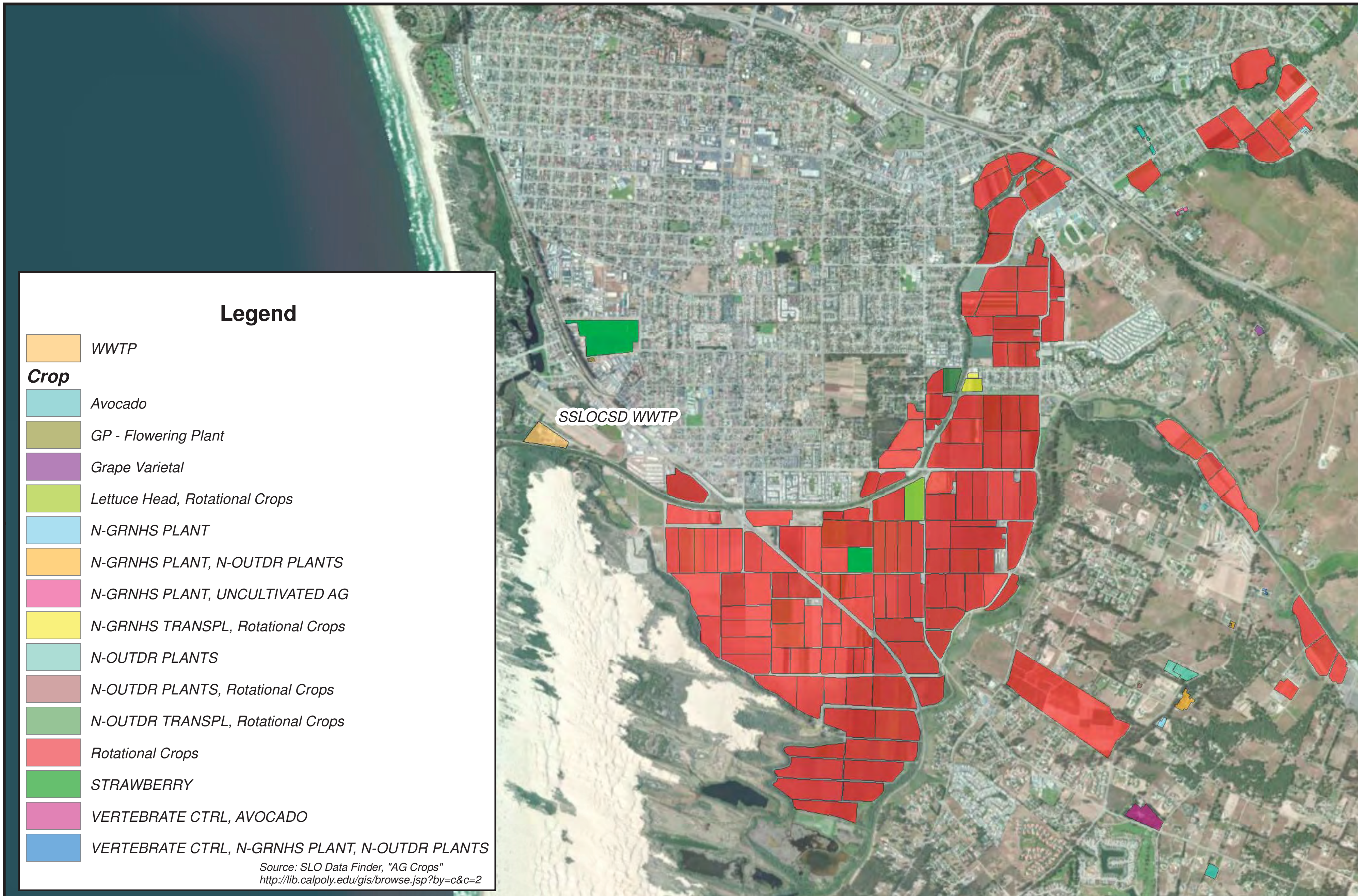

Figure 9-5: Agricultural Land in Vicinity of SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

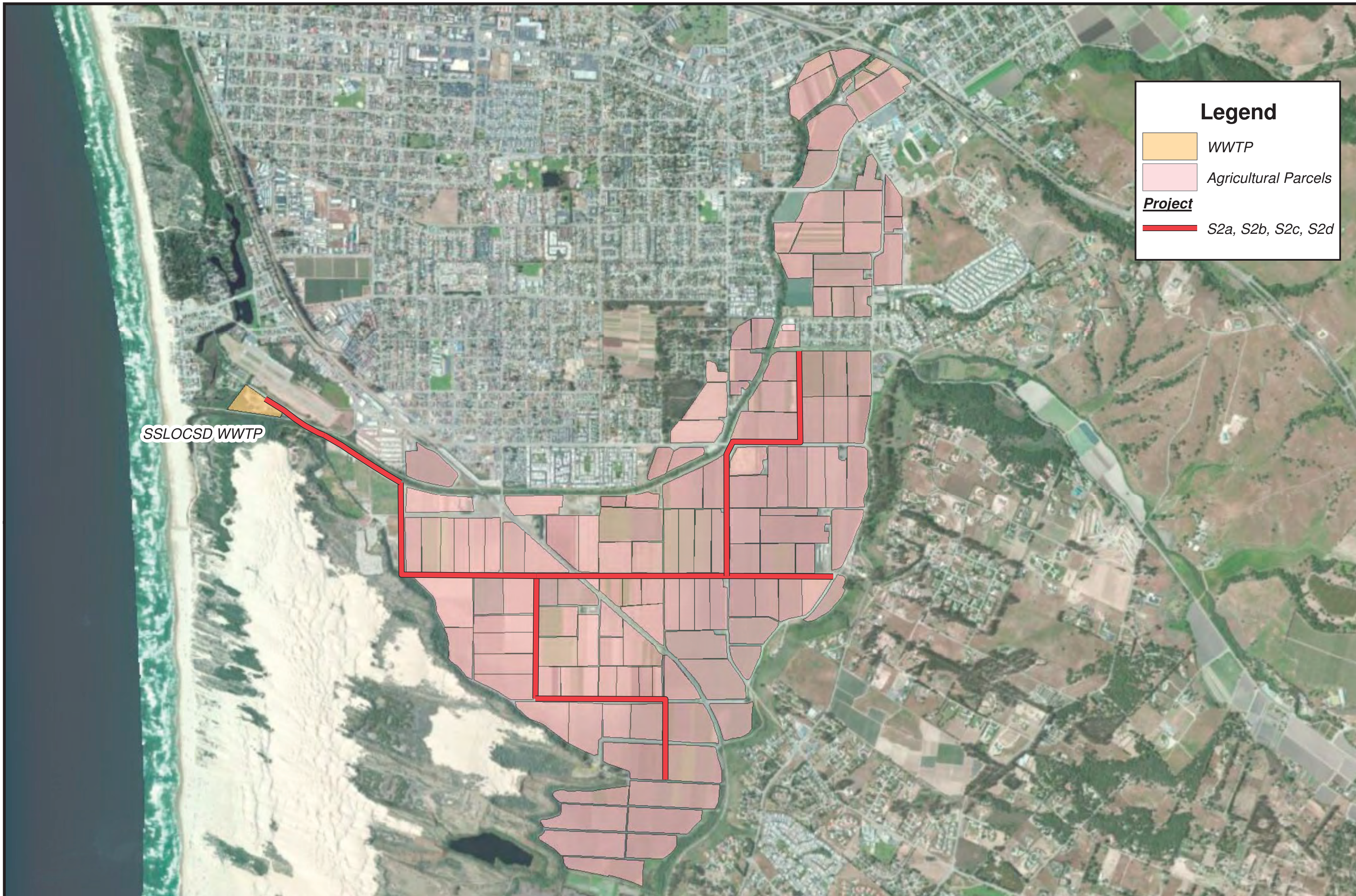

Figure 9-6: Potential Agricultural Irrigation Project - SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

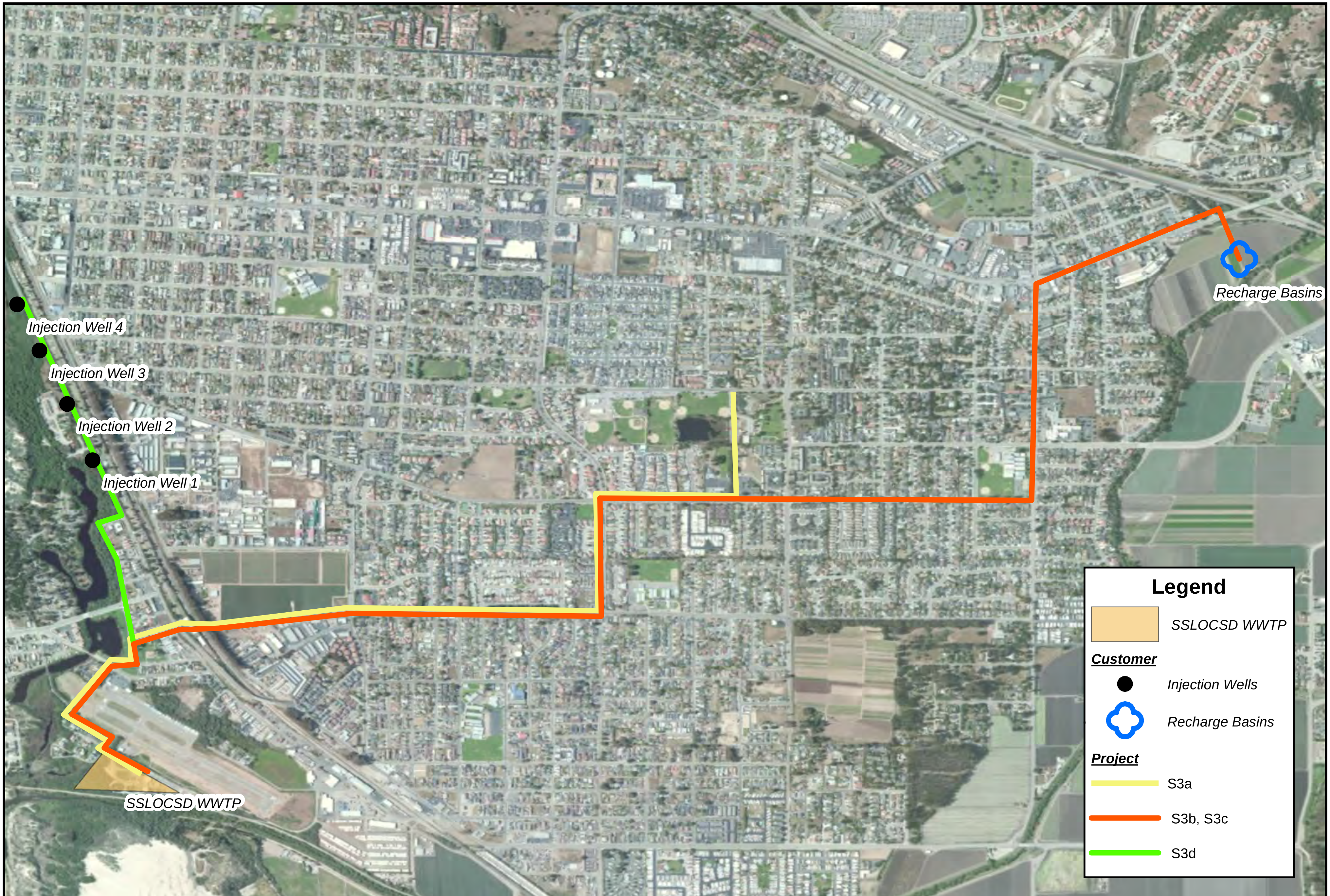

Figure 9-7: Potential Groundwater Recharge Projects - SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

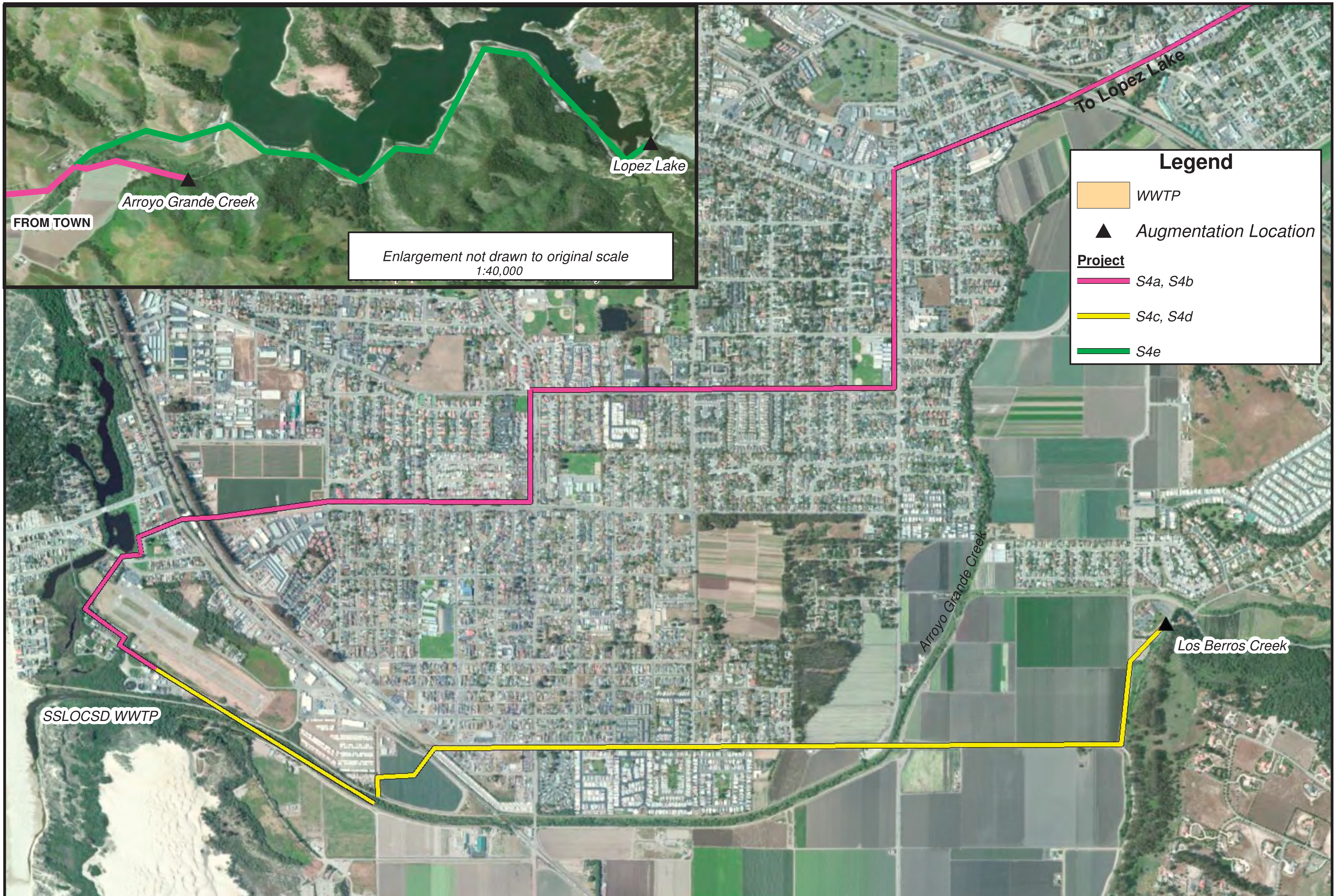

Figure 9-8: Potential Surface Water Augmentation Projects - SSLOCSD

San Luis Obispo County

Regional Recycled Water Strategic Plan

FINAL NOVEMBER 2014

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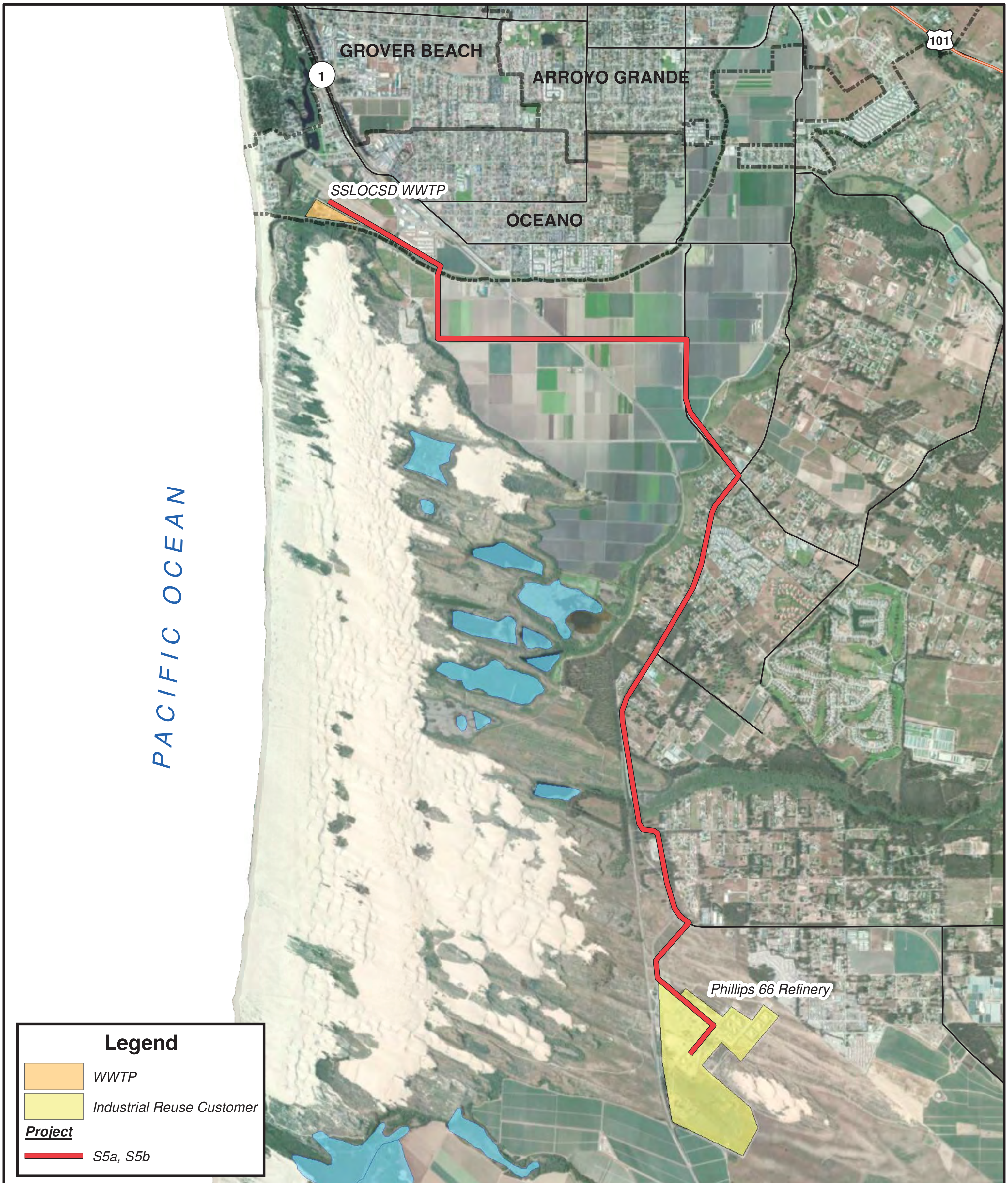

Figure 9-9: Potential Industrial Reuse Project - SSLOCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

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Cannon

10. RECYCLED WATER PROJECTS – TEMPLETON CSD

10.1 Recycled Water Overview

TCSD completed the Water and Wastewater Master Plan Update in October 2013 and plans to prepare an Integrated Water Resources Strategic Plan (IWRSP) in 2014. The master plan identified the need for new water supplies in the near future depending on actual growth in water demand. The East Side Force Main and Lift Station Project (East Side Project), which would increase sewer flows to TCSD's Meadowbrook WWTP, was identified as a potential new water supply in the master plan, but project implementation recommendations are pending completion of the IWRSP.

TCSD beneficially uses all existing effluent from Meadowbrook WWTP through discharge to the Selby Ponds, percolation to the Salinas River underflow, and downstream retrieval by potable water wells. TCSD's future recycled water opportunities are dependent on increased flows to the Meadowbrook WWTP, which is related to growth within the existing treatment plant sewershed and implementation of the East Side Project. An additional 0.52 mgd (580 afy) of effluent is projected (0.67 mgd - 0.15 mgd = 0.52 mgd) based on build-out growth and implementation of the East Side Project, as shown in Table 10-1.

Table 10-1. Existing and Projected Effluent Flows – Meadowbrook WWTP

	Existing		Projected (Build-Out, 2040)	
Existing	0.15 mgd	170 afy	0.40 mgd	450 afy
With Diversion	0.37 mgd	410 afy	0.67 mgd	750 afy

Source: TCSD, 2013

TCSD would like to maximize effluent discharge for percolation to the Salinas River underflow and eventual retrieval by potable water wells. The potential percolation capacity of the Selby Ponds ranges from 0.36 mgd to 0.78 mgd (HMM, 2012) depending on recharge water quality and pond maintenance. The higher percolation rate was based on high-quality water from the Nacimiento Water Project and maintained ponds. Therefore, future effluent flows will likely exceed percolation capacity without a combination of improved effluent quality, increased pond maintenance, pond rehabilitation, and/or increased pond area. TCSD will investigate these options as part of the IWRSP. This purpose of this investigation is to define feasible recycled water project concepts beyond continued discharge at the Selby Ponds for consideration in the IWRSP.

TCSD is currently investigating treatment process modifications to improve effluent water quality to improve the percolation rate in the Selby Ponds. The expected percolation rate for Selby Ponds with improved effluent quality cannot be estimated at this time. Therefore, the RRWSP describes potential projects for up to the additional 0.52 mgd (580 afy) of effluent with an understanding that all or a portion of this flow could be retrieved via Selby Ponds percolation. Other potential recycled water projects include:

- Feed and fodder irrigation: Up to 120 afy reuse with existing effluent
- Municipal landscape irrigation: Up to 76 afy with tertiary treatment upgrade
- Commercial landscape irrigation: Up to 160 afy with tertiary treatment upgrade
- Agricultural / vineyard irrigation: Over 300 afy with tertiary treatment upgrade

- Groundwater recharge: Up to 100% reuse via surface spreading or injection with either partial reverse osmosis treatment or full advanced water treatment[28] (AWT) upgrade

The following sections explore treatment options and project concepts within each potential market.

10.2 Treatment

As noted above, the minimum level of treatment necessary for each reuse opportunity is determined by the type of reuse. Three levels of treatment beyond existing secondary effluent are considered to improve Meadowbrook WWTP effluent for reuse:

- Tertiary filtration for unrestricted irrigation
- Tertiary filtration with partial RO to reduce constituents for
    - Agricultural reuse
    - Groundwater recharge via surface spreading
- Full advanced water treatment (AWT) for:
    - Groundwater recharge via surface spreading to reduce the need for blend water
    - Groundwater recharge via injection to meet regulations

10.2.1 Water Quality Objectives

Permitted discharge limits (Table 10-2) and water quality objectives from the Central Coast RWQCB Basin Plan (Table 10-3) influence treatment requirements beyond minimum Title 22 treatment requirements. For recycled water projects from the Meadowbrook WWTP, the Basin Plan water quality objectives and existing groundwater quality will be considered in the area's Salt and Nutrient Management Plan (SNMP). Findings from the SNMP could impact minimum treatment requirements for irrigation projects. The SNMP likely would not impact groundwater recharge via injection well projects, since full AWT effluent water quality is better than each water quality objective. In fact, the full AWT effluent could improve groundwater quality and/or be identified as a mitigation measure in the SNMP.

Table 10-2. Existing Wastewater Discharge Limits – Meadowbrook WWTP

Constituents	Units	Discharge Specifications[1]		Groundwater Limitations[2]	Meadowbrook WWTP Effluent (Average)[3]
		Mean	Max		
TDS	mg/L	1,200	1,446	1,450	1,400
Sodium	mg/L	265	404	360	263
Chloride	mg/L	360	489	440	397
Total Nitrogen (as N)	mg/L	11	14	20	14

Notes:
1. Source: RWQCB WDR R3-2007-0029 for spray disposal or percolation bed discharge.
2. Source: *TCSD Wastewater System Evaluation* (HMM, 2012), Table 3B.
3. Source: *TCSD Wastewater System Evaluation* (HMM, 2012), Table 2B. Groundwater constituents measured at an upgradient well (MWS-1 Well) and a downgradient well (Smith Well).

[28] Per final GWR Regulations, advanced water treatment (AWT) includes reverse osmosis (RO) and an advanced oxidation process (AOP). A typical AOP process uses ultraviolet light with hydrogen peroxide. RO is typically preceded by microfiltration (MF), so the typical AWT treatment train is MF/RO/AOP. This is the process used by the Orange County Water District's Groundwater Replenishment System.

Table 10-3. Basin Plan Water Quality Objectives – Templeton CSD

Constituents	Paso Robles Groundwater Basin, Atascadero Sub-Basin: Objective[1]	Paso Robles Groundwater Basin, Atascadero Sub-Basin: Existing Average[2]	Salinas River, Above Bradley: Objective[1]	Salinas River, Above Bradley: Existing Average[2]	Meadowbrook WWTP[3]
TDS	730	570	250	192	1,446
Chloride	100	80	20	6.5	489
Sulfate	120	120	100	30.5	222
Boron	0.3	0.9	0.2	Not Available	Not Available
Sodium	75	37	20	7.9	404
Nitrogen (as N)	2.7	1.8	Not Applicable	Not Available	14

Sources:

1. Central Coast Basin Plan (CC RWQCB, 2011)
2. Paso Robles Groundwater Basin Study, Final Report (Fugro West and Cleath and Associates, 2002)
3. Average concentration over four years (2010 to 2013) and TCSD Wastewater System Evaluation (HMM, 2012), Table 3B.

10.2.2 Tertiary Treatment Upgrade

The TCSD Wastewater System Evaluation (HMM, 2012) recommended improvements to the existing WWTP processes and installation of a high-rate filtration package unit to improve water quality. The filtration unit would also meet tertiary treatment for unrestricted non-potable reuse. Meadowbrook WWTP operational and capital improvements include weir gate at influent flow splitting structure, brush aerators, piping modifications to bypass final three ponds, piping modifications to bypass storage pond K, and pond covers for final three ponds. The filtration upgrade includes a package high rate filter system (0.9 mgd capacity based on projected peak month) and ancillary equipment (pumps, pipes, and electrical, instrumentation, and controls).

The treatment plant upgrade may be implemented separately from the reuse projects described in the following sections because the improved effluent from the upgrade should increase the recharge capacity of the existing Selby Ponds and, thus, increase reuse with existing infrastructure (other than the treatment plant upgrade).

Table 10-4. Meadowbrook WWTP Tertiary Treatment Upgrade Costs

	Average Annual Flow	Capital Cost[1]	Unit Capital Cost	Annual O&M Cost[1,2]	Annual Payment Unit Cost[3]
Tertiary Filtration	0.67 mgd	$4.4 M	$6.5 / gal	$0.15 M / mgd	$510/af
Partial Reverse Osmosis	--	--	$3.4 / gal	$0.20 M / mgd	$450/af
Full AWT (MF/RO/AOP)	--	--	$10.1 / gal	$0.60 M / mgd	$1,430/af

Notes:

1. Source: TCSD Wastewater System Evaluation (HMM, 2012) plus RRWSP contingencies and factors described in Section 5.2.4.
2. A common unit cost for tertiary treatment is applied for consistency between areas.
3. Equivalent annual payment (= annual capital payment + annual O&M) divided by annual yield. Includes contingencies and factors. Annual yield assumes reuse of all effluent; however, projects with seasonal demands will have a lower actual reuse than available effluent. The unit cost will increase since the annual yield is lower.

10.2.3 Tertiary Treatment with Partial Reverse Osmosis

Tertiary effluent meets minimum water quality requirements for DDW public health protection, but some crops are sensitive to specific constituents, as shown in Table 4-2. Therefore, further discussions with agricultural community members are necessary to establish their water constituent concerns. For the purposes of the RRWSP, we established water quality objectives based on agricultural use with no restrictions per the concentrations established in Table 4-4.

In particular, grapes are considered moderately sensitive to salinity (TDS, sodium, chloride) and sensitive to nitrogen. However, rootstocks used for certain tree and vine crops (grapes) can appreciably influence salinity tolerance because the rootstocks differ in their ability to exclude salt – especially the toxic sodium and chloride ions.

Based on water quality goals discussed in Section 4.2.1 for agriculture and, in particular, grapevines, Meadowbrook WWTP effluent requires RO treatment of 65% of effluent to meet a maximum concentration of 500 mg/L TDS and 5 mg/L total nitrogen.

Note that agricultural reuse project concepts without RO treatment are evaluated because there are several feasible methods to improve delivered water quality other than treatment. These options were discussed in Section 4.2.1.

10.2.4 Full Advanced Water Treatment

Full AWT is required for groundwater recharge via injection well. (Refer to Section 3.1.2 for discussion of regulations).

10.2.5 Concentrate Disposal

Because Templeton CSD does not have access to an ocean outfall, its concentrate disposal must occur on land. As discussed in Section 5.1.1, the most cost-effective manner of concentrate disposal in a setting with available land is the use of evaporation ponds with subsequent hauling of solids. This option is assumed for TCSD.

10.3 Project Concepts

This section includes project descriptions of potential recycled water projects for reuse of up to the projected additional 0.52 mgd (580 afy) of effluent from Meadowbrook WWTP. The costs of the East Side Force Main and Lift Station Project are excluded from all of the projects because the project may be implemented independent of this evaluation and the cost would be the same for all projects.

The project concepts are organized by end-use type:

1. Landscape Irrigation
    a. Core project
    b. Evers Sports Park Extension Project
    c. Vineyard Elementary School Extension Project
    d. Jermin Park Extension Project
    e. Commercial Irrigation Project
2. Agricultural / Vineyard Irrigation
    a. Direct delivery over 12 hours each day (Tertiary)
    b. Direct delivery over 12 hours each day (65% RO)
    c. Direct delivery over 24 hours each day (Tertiary)
3. Groundwater recharge via injection project

   a. Groundwater recharge via surface spreading (65% RO)
   b. Groundwater recharge via surface spreading (Full AWT)
   c. Groundwater recharge via injection (Full AWT)
4. Feed and fodder project

Overall, the amount of reuse for individual irrigation is limited by the demand, while supply limits the amount of total irrigation during the peak demand season (summer). Groundwater recharge is limited by supply.

10.3.1 Landscape Irrigation

Potential Market

TCSD performed a preliminary market assessment during development of the Master Plan. TCSD identified 73 afy of demand from existing irrigation meters, which should be able to convert all demand to recycled water. TCSD also identified potential recycled water demand for 8 afy of existing demand and 40 afy of future demand for TCSD customers with agriculture and recreation land use categories, respectively. Of the potential customers identified, two existing sites with municipal landscape irrigation demands greater than or equal to 5 afy were identified: Evers Sports Park (16 afy) and Jermin Park (5 afy). In addition, several existing large landscape irrigation sites within the District boundaries use private irrigation wells:[29]

- Templeton Unified School District (3): Templeton High School (15 afy), Templeton Middle School (5 afy), and Vineyard Elementary School (20 afy)
- SLO County Parks and Recreation (1): Templeton Park (6 afy)

The total estimated recycled water demand for the six identified potential customers is 67 afy. Note that demand estimates for sites with private wells were estimated based on irrigated acreage at 2.0 afy/ac based on aerial from Google Earth (8/23/2013).

In addition, large turfgrass irrigation for equestrian use (approximately 160 afy) occurs approximately 2 to 3 miles south of the WWTP and outside the District's service area. We assume this irrigation occurs with a private well.

Based on the number of locations of potential recycled water customers, five landscape irrigation projects (Figure 10-2) were developed to capture a range of project sizes:

- **Alt T1a:** Downtown Core Landscape Irrigation Project (26 afy)
- **Alt T1b:** Evers Sports Park Extension Project (+16 afy)
- **Alt T1c:** Vineyard Elementary School Extension Project (+20 afy)
- **Alt T1d:** Jermin Park Extension Project (+5 afy)
- **Alt T1e:** Commercial Landscape Irrigation Project (160 afy)

Water Supply Benefit

Only one of the potential irrigation customers currently uses TCSD potable water for irrigation (Evers Sports Park), one uses an onsite District well for irrigation (Jermin Park), and the rest use private onsite wells for irrigation. TCSD receives a direct water supply benefit from reuse by Evers Sports Park. The TCSD water supply benefit from reuse by sites with private wells is a

[29] TCSD provides potable water service to all customers within its boundary. Many potable water customers with large irrigation demands use their own wells for non-potable purposes.

result of recycled water offsetting pumping by agriculture and TCSD's subsequent use of this water for potable water supply.

Water Quality

Based on the information presented in Section 4.1.2, tertiary effluent from Meadowbrook WWTP would fall within slight to moderate degrees of restriction due to salinity and specific ion toxicity. The concentration of constituents identified should have minimal impact on typical landscape irrigation activities. However, sensitive turfgrass may require additional treatment or non-treatment mitigation (i.e., additional root zone flushing, adequate drainage, soil amendments, separate irrigation with existing water supply). No additional treatment beyond the addition of tertiary treatment is assumed for landscape irrigation project concepts based on the above analysis.

Project Concepts

Alt T1a: Downtown Core Landscape Irrigation Project

This project concept serves the three potential customers (Templeton High School, Templeton Middle School, and Templeton Park) in the downtown area that are all within 0.5 miles of each other. Total estimated demand is 27 afy.

Alt T1b: Evers Sports Park Extension Project

This project extends Alt T1a to Evers Sports Park (16 afy), which is approximately 0.7 miles north of Templeton Park.

Alt T1c: Vineyard Elementary School Extension Project

This project extends Alt T1a to Vineyard Elementary School (20 afy), which is approximately 2.0 miles west of the Alt T1a pipeline at Rossi Road and Vineyard Drive.

Alt T1d: Jermin Park Extension Project

This project extends Alt T1c to Jermin Park (5 afy), which is approximately 0.8 miles north of Vineyard Drive.

Alt T1e: Commercial Landscape Irrigation Project

The project concept proposes to deliver recycled water to Templeton Farms Equestrian (160 afy). The site is approximately 2.5 miles south of Meadowbrook WWTP and was identified based on the extensive irrigated turfgrass visible on aerial imagery. The site has been in operation since August 2011.

The site is assumed to use onsite wells for irrigation, but the number of wells and their locations were not determined. The customer has not been contacted as part of this study to gauge interest in recycled water use. Development of preliminary cost estimates was deemed the first step, and the option may be considered further as part of the planned Templeton CSD IWRSP.

Other Opportunities

Several irrigation meters with water use below 5 afy are located along the proposed recycled water system. These meters could be incorporated into the system based on individual assessments that compare the cost of conversion with the potable water savings.

Future residential developments within the District's service area are identified in the vicinity of the landscape irrigation projects described above. These developments could incorporate recycled water into landscape irrigation planning and be incorporated into the proposed recycled water system.

Also, Pat Mar Ranch (approximately 10 afy) is an equestrian center located approximately 0.7 miles north of Evers Sports Park and may be worth contacting if the Evers Sports Park project is implemented.

Summary

The following tables summarize the facilities and cost of each landscape irrigation project concept.

Table 10-5. TCSD Landscape Irrigation Project Concepts – Facilities

Alternative		# of Customers	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines
T1a	Downtown	3	Tertiary	0.21 mgd	0.21 MG	6 hp	2.2 mi
T1b	Evers Park	1	Tertiary	0.03 mgd	0.03 MG	3 hp	0.7 mi
T1c	Vineyard ES	1	Tertiary	0.04 mgd	0.04 MG	1 hp	1.6 mi
T1d	Jermin Park	1	Tertiary	0.01 mgd	0.01 MG	1 hp	0.8 mi
T1e	Equestrian	1	Tertiary	0.29 mgd	0.29 MG	23 hp	2.5 mi

Table 10-6. TCSD Landscape Irrigation Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
T1a	27	0.05	63	$2.46	$0.02	$6,630	+ $880
T1b	16	0.00	60	$0.89	$0.01	$4,250	+ $880
T1c	20	0.04	25	$1.75	$0.01	$6,400	+ $880
T1d	5	0.01	19	$0.84	$0.01	$12,800	+ $880
T1e	160	0.29	595	$4.28	$0.05	$2,050	+ $880

Note: Refer to Section 5.2 for the cost estimate basis and Appendix H for detailed cost estimates. Tertiary treatment unit costs are based on construction of the maximum size plant (0.67 mgd). Costs exclude grants or low-interest loans.

Implementation Considerations

Implementation considerations for landscape irrigation projects are discussed in Section 4.1, including:

- Water supply benefit
  - Properly estimating demand
  - Gaining water supply benefit
- Water quality
  - Guidelines
  - Mitigation measures

- Level of service
    - Reliability
    - Peak season supplies
    - Facilities sizing
- Treatment plant improvements
- Customer conversions
    - Estimating costs
    - Regulatory restrictions and requirements
    - New development
- Public acceptance
- Recycled water pricing

Of particular concern for the TCSD landscape irrigation project concepts are:

- Confirming demand estimates
- Gaining water supply benefits from private wells
- Conducting outreach to commercial irrigation (equestrian centers)

10.3.2 Agriculture / Vineyard

Potential Market

Agricultural land use surrounds the District's service area. Most of the agricultural land is not actively irrigated, but more than 100 acres of actively cultivated land – mostly grapevines – are located within a 1-mile radius from the WWTP. Agricultural irrigation demand can vary from 1.5 afy to 3.0 afy per acre of crops, depending on crop type, rotation, and cycles. This translates to a potential demand of 150 to 300 afy.

Water Supply Benefit

Use of recycled water by agricultural customers does not directly create a new water supply for TCSD. The TCSD water supply benefit is a result of recycled water offsetting pumping by agriculture and TCSD's subsequent use of this water for potable water supply.

Water Quality

As discussed in Section 4.2.1, treatment of 65% of effluent with RO is necessary to meet agricultural water quality objectives without implementing non-treatment alternative measures to meet these objectives. Therefore, project concepts are defined for full tertiary and partial RO treatment.

Project Concepts

Four project concepts were developed for agricultural irrigation to capture options for timing of delivery and minimum treatment requirements (Figure 10-3):

1. **Alt T2a:** Delivery over 12 hours
2. **Alt T2b:** Delivery over 12 hours with partial (65%) RO treatment
3. **Alt T2c:** Delivery over 24 hours

Project Concepts

Alt T2a – Agricultural Irrigation Delivery over 12-hours

This project concept could deliver up to 0.52 mgd (580 afy) of tertiary effluent from Meadowbrook WWTP to agricultural customers over a 12-hour duration. An approximate demand of 150 afy to 300 was estimated above. Agricultural customers could receive recycled water at any time, but operational experience on other agricultural reuse projects suggests that customers prefer to receive water during the day for multiple reasons, including planned staff presence and ability to observe any issues with irrigation.

Alt T2b – Agricultural Irrigation Delivery over 12-hours with Partial RO

This project concept is identical to Alt T2a with the addition of RO treatment of 65% of effluent to lower salinity and nitrogen to more acceptable concentrations for some crops. This project concept could deliver up to 0.46 mgd (510 afy) of blended tertiary and RO effluent from Meadowbrook WWTP to agricultural customers over a 12-hour duration.

As discussed in Section 10.2.5, concentrate disposal is assumed to consist of evaporation ponds and solids handling. Approximately 0.8 acres of ponds are necessary for evaporation of 0.05 mgd (60 afy) of concentrate from the RO process.

Alt T2c – Agricultural Irrigation Delivery over 24-hours

This project concept would deliver tertiary effluent to agricultural customers over a 24-hour duration. Delivery could occur into a water supply pond or directly into the local irrigation system. Spreading deliveries over 24 hours instead of 12 hours allows for smaller storage, pumps, and pipes, thus reducing project cost. This option depends on the availability of onsite ponds for onsite storage and/or growers' willingness to use water during the night.

Summary

The following tables summarize the facilities and cost of each agricultural reuse project concept.

Table 10-7. TCSD Agricultural Reuse Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Storage Tank(s)	Pump Station(s)	Pipelines	Evaporation Ponds
T2a	Tertiary	0.46 mgd	0.46 MG	12 hp	1.9 mi	--
T2b	Tertiary with 40% RO	0.53 mgd 0.34 mgd	0.53 MG	12 hp	1.9 mi	1.0 ac
T2c	Tertiary	0.46 mgd	0.46 MG	6 hp	1.9 mi	--

Table 10-8. TCSD Agricultural Reuse Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
T2a	260	0.46	640	$4.09	$0.05	$1,200	+ $880
T2b	260	0.46	640	$5.89	$0.12	$1,950	+ $880
T2c	260	0.46	320	$3.80	$0.04	$1,100	+ $880

Note: Refer to Section 5.2 for the cost estimate basis and Appendix H for detailed cost estimates. Tertiary treatment unit costs are based on construction of the maximum size plant (0.67 mgd). Costs exclude grants or low-interest loans.

Implementation Considerations

Implementation considerations for agricultural irrigation projects are discussed in Section 4.2, including:

- Delivered water quality
    - Guidelines
    - Management measures
    - Concentrate Management
- System design
    - Storage
    - Facilities sizing
- Water supply benefit
- Recycled water pricing
- Market acceptance

Of particular concern for the TCSD agricultural irrigation project concepts is:

- Conducting an agricultural reuse survey to estimate demand properly

10.3.3 Groundwater Recharge

Potential Market

Groundwater recharge of recycled water has the potential to reuse all future effluent from Meadowbrook WWTP – up to 0.42 mgd (470 afy) of the assumed available 0.52 mgd (580 afy) after accounting for concentrate losses. Two methods of GWR are considered within the area: 1) surface spreading (with percolation basins), and 2) injection (with injection wells). Both methods will recharge the Paso Robles formation, which is the primary municipal groundwater supply.

Water Quality

As discussed in Section 4.5.1, groundwater recharge projects are regulated by both DDW and RWQCB. DDW regulations are intended to protect public health and are defined in the final GWR Regulations. The RWQCB or DDW would issue a permit based on the final GWR Regulations and requirements consistent with Basin Plan, Salt and Nutrient Management Plan, and State policies. Based on this understanding, the following requirements will form the basis for GWR projects in the NCMA:

- For all GWR projects, meet Basin Plan's groundwater quality objectives for TDS, chloride, and nitrogen for the applicable groundwater basin.
- For all GWR projects, meet TDS, chloride, and nitrogen loading limits to be determined in a SNMP for the applicable groundwater basin.
- For surface spreading projects, a minimum of tertiary treatment is required.
- For surface spreading projects, the RWC – the percentage of blend water (i.e., water other than recycled water) required for reducing TOC concentrations to 0.5 mg/L.
- For injection projects, full AWT is required.

As shown in (Table 10-3), TDS, chloride, sodium, and nitrogen concentrations need to be reduced by approximately 65% to meet groundwater quality objectives. Therefore, application of RO to 65% of tertiary effluent is assumed as minimum treatment requirements for a GWR via surface spreading project. This assumes that more restrictive objectives or loading limits are not found in the NCMA SNMP.

Full AWT effluent should not have any issue meeting RWQCB requirements and, in fact, will likely improve groundwater quality. Application of full AWT to all effluent should remove the need for blending for surface spreading projects. Also, the water quality improvement could be considered as part of a mitigation measure project in the SNMP.

Project Concepts

In total, three GWR projects were defined from the Meadowbrook WWTP (Figure 10-4):

- GWR via Surface Spreading
  - **Alt T3a:** Partial (65%) RO (530 afy after brine losses)
  - **Alt T3b:** Full AWT (500 afy after brine losses)
- **Alt T3c:** GWR via injection (Full AWT) (500 afy after brine losses)

<u>Blend Water</u>

As discussed in the Section 3.1.2, the final GWR Regulations specify how to derive the maximum RWC. For surface spreading using tertiary effluent, the initial RWC is limited to 20%[30] unless an alternative RWC is approved by DDW that can achieve a TOC of 0.5 mg/L. An RWC of 50% or higher can be reached depending on soil aquifer treatment (SAT) performance or if BDOC is used for derivation of the RWC. SAT performance must be demonstrated during project operations so the higher maximum RWC of 50% or higher could only be achieved after several years of operations and monitoring.

The application of RO to 60% of effluent, as proposed for Alternative S3a, should result in an initial RWC above 20%. For the purposes of this report, an ultimate RWC of 50% is assumed. As a result, Alternative S3a includes costs to provide an equal amount of blend water as recycled water to meet 50/50 blend (or 1:1 blend).

For surface spreading using AWT effluent, DDW could approve an initial RWC up to 100%. For groundwater injection projects, which must apply AWT, the initial RWC could be as high as 100%. In both cases that AWT is applied, a 100% RWC could be achieved a few years operations start if an initial RWC of 100% is not approved by DDW. Therefore, the GWR projects proposed that apply AWT are assumed to have a RWC of 100%. As a result, costs associated with providing blend water during the period to achieve an RWC of 100% are not included.

<u>GWR via Surface Spreading</u>

GWR via surface spreading will recharge the Paso Robles Formation if the recharge occurs over the gravel zones along the western side of the subunit. Recharge is restricted to this area since the other areas would recharge above the confined portion of the Paso Robles Formation and, therefore, would not provide a water supply benefit.

Project implementation will require the following facilities:

[30] An RWC of 20% translates to 4 af of blend water recharged for every 1 af of recycled water. Recycled water is 1 af of a total of 5 af. (1/5 = 20%).

- Treatment (tertiary effluent storage, RO or AWT)
- Recycled Water Conveyance facilities (pump station, pipelines)
- Blend Water Conveyance facilities (pump station, pipelines) (only for Alt T3a)
- Recharge basins
- Concentrate disposal

The level of treatment necessary to implement the project is a tradeoff between the various regulatory requirements – particularly blend water supplies. Two levels of treatment are defined:

- RO of 65% of flow to meet minimum water quality requirements
- Full AWT to potentially eliminate the need for blend supplies

Based on these treatment plans, up to 530 afy (0.47 mgd) could be recharged based on RO treatment of 65% of tertiary effluent, and up to 500 afy (0.45 mgd) of full AWT effluent could be recharged.

Conveyance facilities are sized to convey the average annual volume at a constant rate for 24 hours per day over 365 days per year. Recharge basins are sized to recharge the average annual volume at a constant rate for 24 hours per day over 365 days per year. Land for the basins must be purchased as well. For Alt T3a, the conveyance facilities (pump station, pipelines, recharge basins) are sized to convey both recycled water and untreated Nacimiento water from the WWTP to the recharge basins.

As discussed in Section 10.2.5, concentrate disposal is assumed to consist of evaporation ponds and solids handling. Approximately 1.2 acres of ponds are necessary for evaporation of 0.08 mgd (90 afy) of concentrate from the RO process.

<u>GWR via Injection</u>

GWR via injection (Alt T3) would inject highly treated recycled water into the deep aquifer to replenish the basin. Up to 470 afy (0.42 mgd) of full AWT effluent could be recharged. Full AWT effluent should address all DDW and RWQCB requirements. The final Regulations may allow a new GWR via injection project to start without any blend water requirements if certain criteria are met. The project concept assumes one well is necessary to inject up to 470 afy (0.42 mgd or 290 gpm on a year-round basis).

The injection is assumed to be located in the vicinity of the existing pumping depression, which is roughly between TCSD's Fortini and Graff wells. Extraction of recharged water would rely on existing municipal wells that have scaled back production due to declining groundwater levels.

<u>Summary</u>

The following tables summarize the facilities and cost of each groundwater recharge project concept.

Table 10-9. TCSD Groundwater Recharge Project Concepts – Facilities

Alt	Level of Treatment	Treatment Capacity	Recharge Basins / Injection Wells	Pump Station(s)	Pipelines
T3a[1]	Tertiary with 65% RO	0.53 mgd 0.34 mgd	3.6 ac[1]	30 hp[1]	3.3 mi[1]
T3b	Full AWT	0.53 mgd	1.7 ac	9 hp	3.3 mi
T3c	Full AWT	0.53 mgd	1 Well	6 hp	4.2 mi

Note:

1. Alt T3a conveyance facilities (pump station, pipelines, recharge basins) are sized to convey both recycled water and untreated Nacimiento water from the WWTP to the recharge basins. The alternative also includes approximately 4,000 LF of pipe to bring Nacimiento water to the conveyance facilities at the WWTP.

Table 10-10. TCSD Groundwater Recharge Project Concepts – Demands and Costs

Alt	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
	Annual Average (afy)	Peak Day (mgd)	Peak Flow (gpm)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
T3a	530	0.47	308	$10.91	$0.33	$1,960	+ $440
T3b	500	0.45	291	$12.34	$0.39	$2,390	--
T3c	500	0.45	291	$16.44	$0.42	$2,980	--

Note: Refer to Section 5.2 for the cost estimate basis and Appendix H for detailed cost estimates. Tertiary treatment unit costs are based on construction of the maximum size plant (0.67 mgd). Costs exclude grants or low-interest loans. The cost of blend water purchase for Alt T3a is excluded pending further investigation into cost allocation. Similarly, the project yield excludes blend water recharge yield.

Implementation Considerations

Implementation considerations for groundwater recharge projects are discussed in Section 4.5, including:

- Confidence in receipt of the water supply benefit
- Risk of stricter treatment requirements in the future
- Additional permits
- Public acceptance

In addition, TCSD has the opportunity to use the injection facilities to recharge Nacimiento water. This option will be considered in TCSD's IWRSP to be developed in 2015.

10.3.4 Feed and Fodder

This project entails irrigating "feed and fodder" crops (e.g., alfalfa, wheat, and grain sorghum) with WWTP effluent on the properties adjacent to the southwest side of the WWTP. The district previously disposed of effluent via irrigation but now prefers percolation. The District could lease the land or conduct irrigation itself.

Disposal of approximately 0.53 mgd (600 afy) of future effluent would require approximately 150 acres based on an average of 4.0 afy/ac for alfalfa irrigation. Approximately 30 acres of public facilities are located southeast of the plant. Another 30 acres, which are eventually planned for residential development, are located north of the plant. Based on 4.0 afy/ac, the existing 30 acres could only accommodate an average of 0.1 mgd (120 afy).

The project has low capital costs (approximately $3,000/acre) because:

- No WWTP upgrade is needed to comply with recycled water requirements for this type of crop irrigation.
- The new facilities mainly consist of irrigation piping.
- A small pump station may not be needed if gravity pressure is not sufficient.
- A small amount of revenue ($100/acre) from a lease or crop sales is possible.

The primary drawback of the project is that it creates no new water supply and instead is a disposal method.

According to HMM (2012), the District has existing spray fields that were designed into the Meadowbrook WWTP with an estimated capacity of 0.03 mgd. Although the delivery piping has been installed, the fields need to be fitted with equipment.

The project concept requires minimal investment and can be implemented relatively quickly (in a few months). Consequently, feed and fodder reuse is likely the best option for disposal beyond Selby Ponds until the recharge capacity of Selby Ponds is better known – as long as the limited disposal capacity of approximately 0.1 mgd is sufficient.

10.4 Recycled Water Summary

Templeton CSD is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges and is planning to divert district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the sewer diversion in addition to untreated Nacimiento water, so reuse opportunities are being explored. Most reuse options will require an upgrade to tertiary treatment. Eleven recycled water project concepts were defined for Templeton CSD.

10.4.1 Project Concepts Summary

The demand and cost for each TCSD project concept is summarized in Table 10-11 and the unit costs are presented in Figure 10-1. Tertiary treatment upgrade is assumed for all projects, so the upgrade cost is separated from the core project cost. Treatment processes beyond tertiary filtration, such as RO and full AWT, are included in the core project cost.

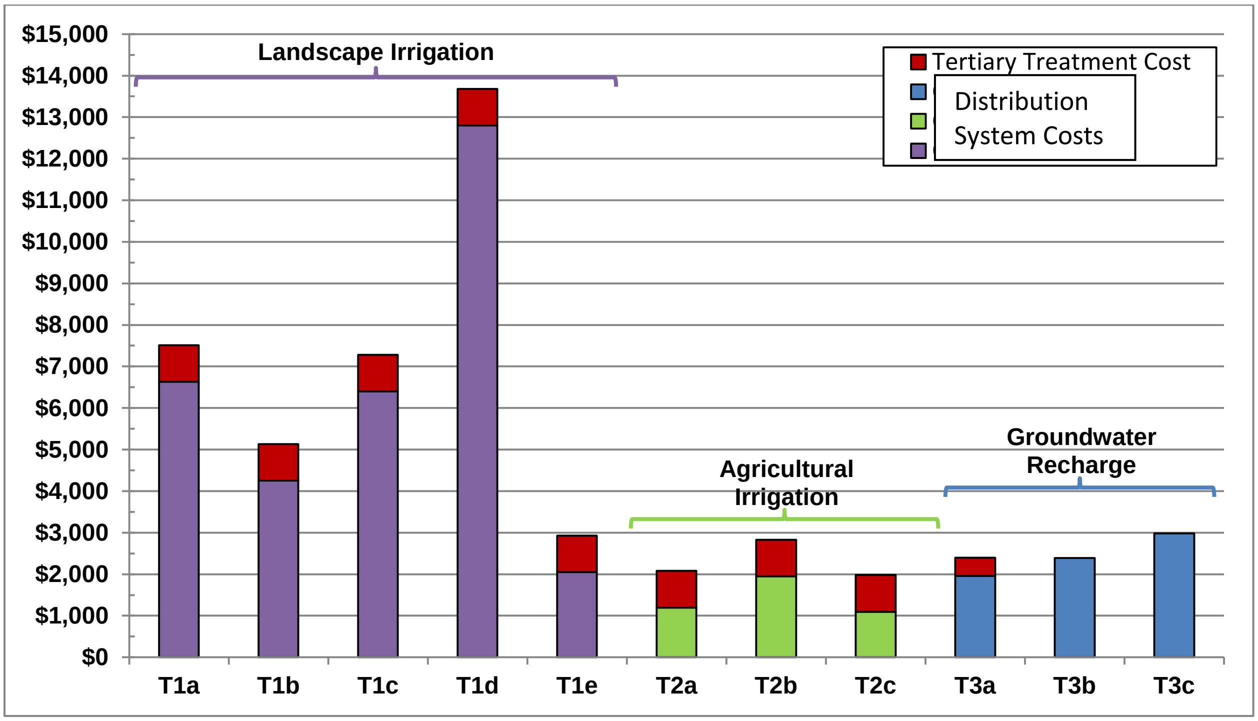
Table 10-11. Summary of TCSD Project Concepts

Alt	Level of Treatment	Demand Estimates			Cost Estimates Excluding Tertiary Treatment			Additional Unit Cost of Tertiary Treatment ($/AF)
		Annual Average (afy)	Capital Cost ($M)	Annual O&M Cost ($M)	Capital Cost ($M)	Annual O&M Cost ($M)	Unit Cost ($/AF)	
Landscape Irrigation Project Concepts								
T1a	Tertiary	27	0.05	63	$2.46	$0.02	$6,630	+ $880
T1b	Tertiary	16	0.00	60	$0.89	$0.01	$4,250	+ $880
T1c	Tertiary	20	0.04	25	$1.75	$0.01	$6,400	+ $880
T1d	Tertiary	5	0.01	19	$0.84	$0.01	$12,800	+ $880
T1e	Tertiary	160	0.29	595	$4.28	$0.05	$2,050	+ $880
Agricultural Reuse Project Concepts								
T2a	Tertiary	260	0.46	640	$4.09	$0.05	$1,200	+ $880
T2b	65% RO	260	0.46	640	$5.89	$0.12	$1,950	+ $880
T2c	Tertiary	260	0.46	320	$3.80	$0.04	$1,100	+ $880
Groundwater Recharge Project Concepts								
T3a	65% RO	530	0.47	308	$10.91	$0.33	$1,960	+ $440
T3b	Full AWT	500	0.45	291	$12.34	$0.39	$2,390	--
T3c	Full AWT	500	0.45	291	$16.44	$0.42	$2,980	--

Note: Refer to Section 5.2 for the cost estimate basis and Appendix H for detailed cost estimates. Tertiary treatment unit costs are based on construction of the maximum size plant (0.67 mgd). Costs exclude grants or low-interest loans. The cost of blend water purchase for Alt T3a is excluded pending further investigation into cost allocation. Similarly, the project yield excludes blend water recharge yield.

Templeton CSD Recycled Water Project Concepts	
Landscape Irrigation Project Concepts	Agricultural Irrigation Project Concepts
T1a. Downtown Core Landscape Irrigation Project	T2a. Direct delivery over 12 hours each day (Tertiary)
T1b. Evers Sports Park Extension Project	T2b. T2b with 40% RO
T1c. Vineyard Elementary School Extension Project	T2c. Direct delivery over 24 hours each day (Tertiary)
T1d. Jermin Park Extension Project	Groundwater Recharge Project Concepts
T1e. Commercial Landscape Irrigation (Equestrian Center) Project	T3a. GWR via surface spreading (60% RO)
	T3b. GWR via surface spreading (Full AWT)
	T3c. GWR via injection (Full AWT)

Figure 10-1: Unit Costs of TCSD Project Concepts ($/AF)



AFY	27	16	20	5	160	260	260	260	530	500	500

Note: Costs exclude grants or low-interest loans. Refer to Section 5.2 for cost assumptions.

10.4.2 Opportunities and Constraints

Based on the project concepts development process, preliminary TCSD recycled water opportunities and constraints include the following:

- Maximizing percolation at the Selby Ponds is the favored use of Meadowbrook WWTP effluent.
- Significant increases to effluent flows are dependent on a combination of septic tank conversions, build-out growth, and diversions from the East Side Force Main and Lift Station Project.
- Potential for reuse of up to 0.2 mgd of effluent without treatment upgrades for feed and fodder irrigation but the reuse would not offset potable water demand.
- Most reuse opportunities from Meadowbrook WWTP will require at least an upgrade to tertiary treatment.

- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or regulations for specific types of reuse (e.g., groundwater recharge).
- Landscape irrigation projects have high unit costs due to limited demand in proximity to the WWTP.
- Commercial landscape irrigation (i.e., equestrian farm) has moderate unit costs due to moderate demand.
- Agricultural irrigation has moderate unit costs due to moderate demand in proximity to the Meadowbrook WWTP but a proper market assessment was not conducted.

10.4.3 Recommendations

TCSD plans to incorporate feasible projects into the District's planned Integrated Water Resources Strategic Plan and must be able to adjust reuse needs based on future percolation performance of the Selby Ponds and actual increases to future flows. Therefore, TCSD should:

- Continue investigation into improving recharge capacity at Selby Ponds through WWTP improvements as well as upgrades and improvements to the ponds.
- Considers water supply benefits and impacts to discharge capacity of continued recharge of Nacimiento water in the Selby Ponds.
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.
- Incorporate potential commercial and agricultural irrigation opportunities into the forthcoming Integrated Water Resources Strategic Plan.
- Refine feed and fodder disposal option as a temporary disposal alternative until Selby Pond recharge capacity is better known.
- If Selby Ponds cannot recharge all effluent, refine agricultural irrigation and commercial irrigation options.
- Survey private agricultural and large turfgrass operations in the vicinity of the WWTP for their interest in recycled water use and water quality requirements combined with the ability for TCSD to use a similar amount of groundwater currently being used by the entity.

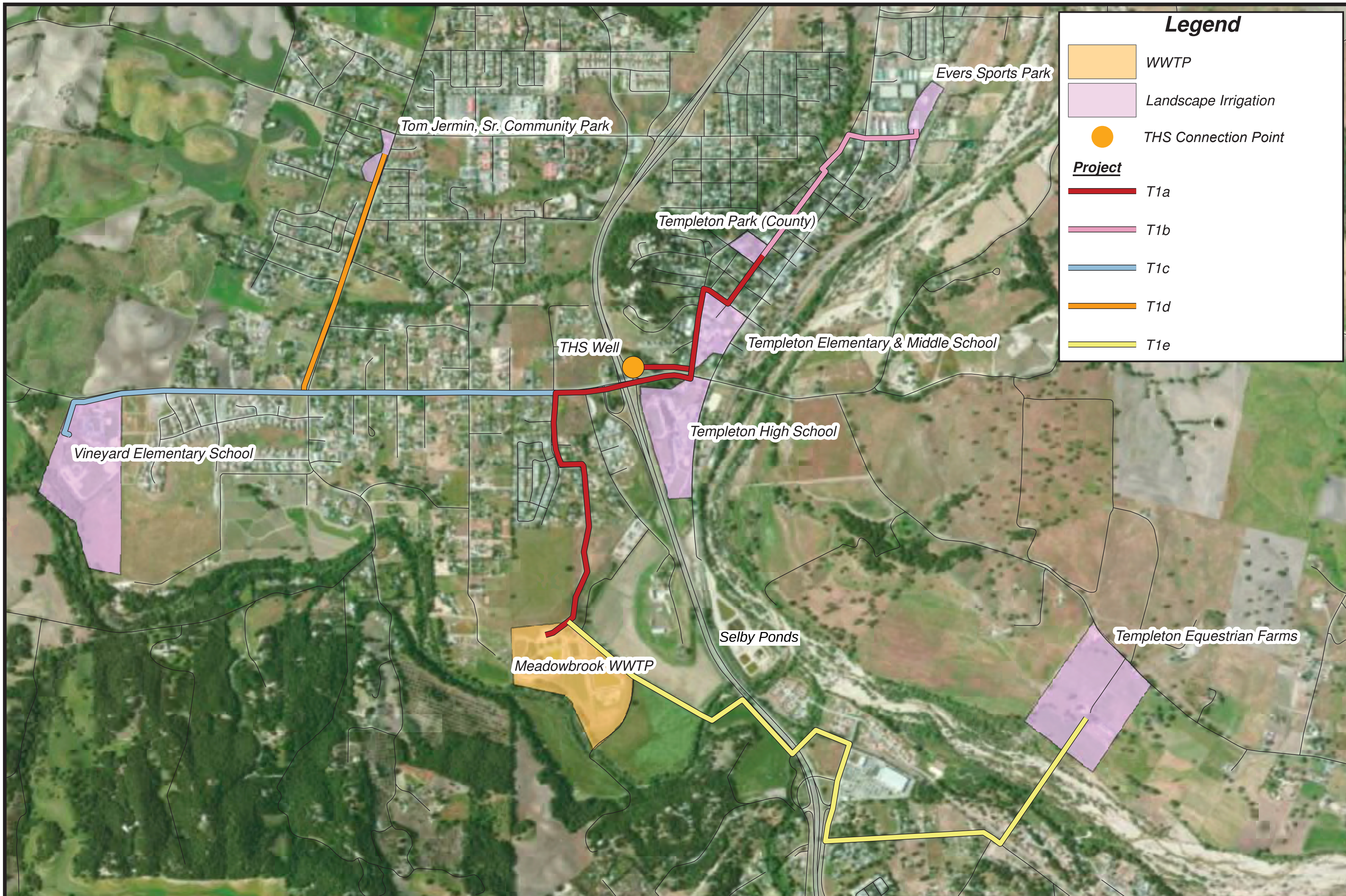


Figure 10-2: Potential Landscape Irrigation Project Concepts - TCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

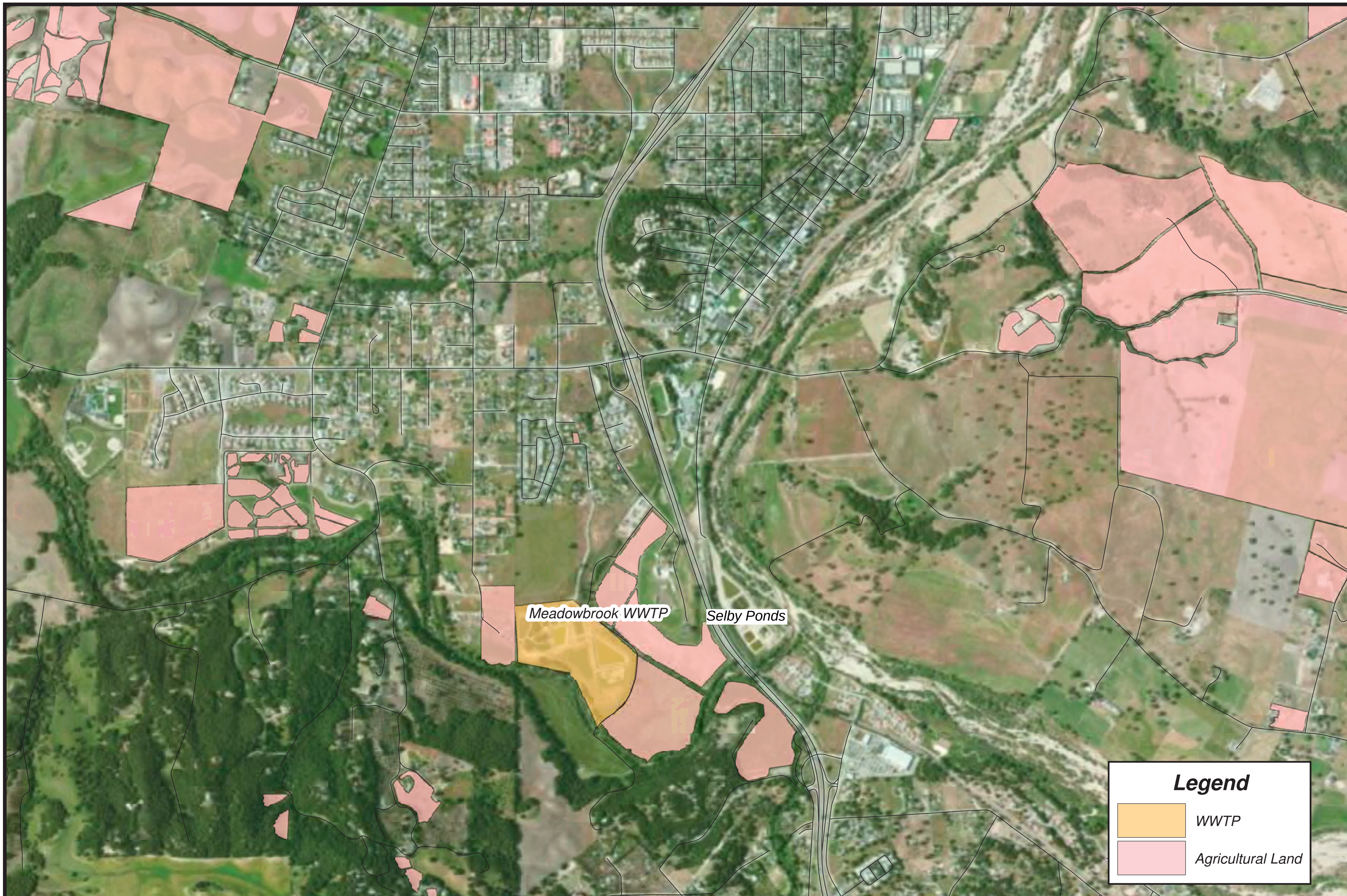


Figure 10-3: Agricultural Land in Vicinity of Meadowbrook WWTP

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

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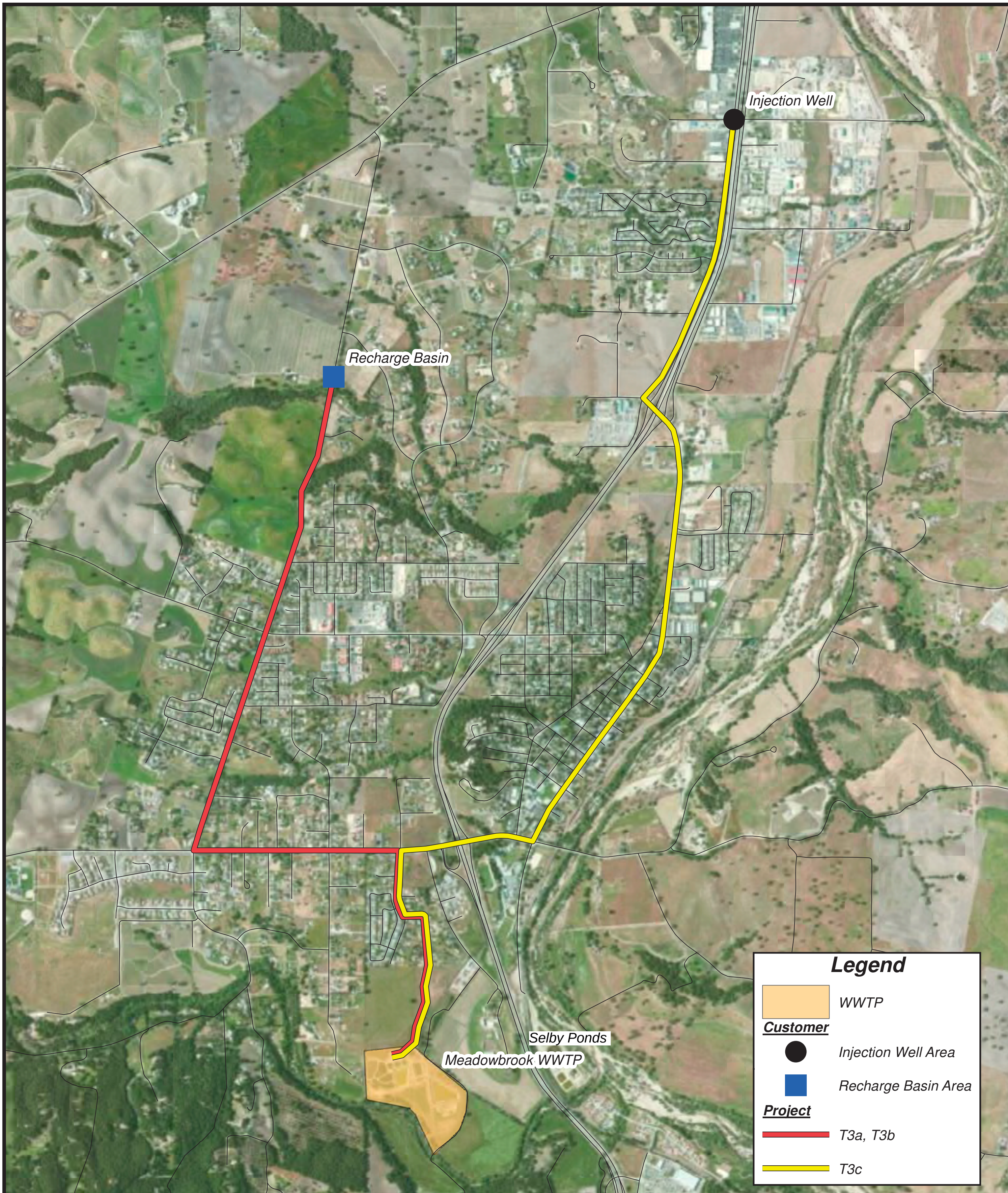

Figure 10-4: Potential Groundwater Recharge Projects - TCSD

San Luis Obispo County
Regional Recycled Water Strategic Plan
FINAL NOVEMBER 2014

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11. FUNDING AND FINANCING OPTIONS

Securing adequate funding for recycled water program planning and implementation is one of the biggest challenges facing regional recycled water supply efforts. Successful implementation requires both capital costs as well as ongoing funding to support continued administration, operation, maintenance, and replacement.

Utilities typically use some combination of internal funding (rates, fees, and assessments), grant funding (State or Federal), and debt funding (public or private sources) to pay for recycled water project capital costs. O&M costs are typically paid for by internal funds. Grant funds should not be used for O&M costs (and most grant programs explicitly prohibit this practice).

The following sections outline approaches to funding and financing recycled water projects followed by identifying various funding sources and their associated requirements. The funding and financing sections include:

- Local Funding
- Debt Financing
- Grant Funding

11.1 Funding and Financing Approach

This section discusses common considerations when defining a project funding strategy:

- Recycled Water Rates
- Project Phasing
- Monetary Incentives
- Non-Monetary Incentives
- Institutional Options
- Funding Constraints

11.1.1 Recycled Water Rates

Several approaches can be taken to set recycled water rates:

- Set for full cost recovery (capital and O&M) or less than full recovery
- Set the same as potable water rates or as a percentage of potable water rates
- Set to meet debt financing payments
- Subsidize by avoided effluent disposal costs
- Vary by level of service, such as pressure or water quality
- Vary based on customer
    - o Some industrial customers may be willing to pay higher than potable rates to ensure reliable water supply (if water quality requirements are met).
    - o Customers that are not part of a potable water system, such as agricultural customers using groundwater, may require rates to be set at the cost of existing or future supplies, which are typically less than potable water rates.

California Water Code 13580.7 limits recycled water rates to the estimated reasonable cost of providing the service. The cost of a new recycled water system is typically higher than the existing cost of water supplies. Existing water system costs are inherently lower than costs for any new system since existing systems rely of previous investments in lower cost supplies. If the need for recycled water is primarily driven by water supply needs instead of effluent disposal, the cost of recycled water should be competitive with alternative water supplies. Additionally, potable water funding mechanisms and rates should account for the marginal cost of adding water supplies in the future. In this case, the recycled water system can be priced relative to potable water rates.

Recycled water rates are commonly lower than potable water rates to promote customer conversion. The discount acknowledges a lower level of service. The Water Reuse Rates and Charges, Survey Results (AWWA, 2008) showed that most rates range from 50 percent to 100 percent of potable with a median rate of 80 percent. This excludes settings where the purpose of reuse is wastewater disposal since many of these situations involve free or low rates for wastewater. This also excludes agricultural reuse settings where reuse is driven by a water supply need but recycled water customers were never part of a municipal water system.

11.1.2 <u>Project Phasing</u>

Projects can be phased to reduce initial capital costs and to plan for growth in demand and/or customers over time. Initial phase(s) can support technical and/or financial feasibility and initial operational results, such as proven reliability or water quality, and may convince some customers to convert. If a project is phased, the funding strategy must plan for future increases to capital, O&M, and replacement costs.

11.1.3 <u>Monetary Incentives</u>

Incentive programs are typically implemented by agencies to assist and encourage possible users to connect to the non-potable system. These incentives typically include some level of financial incentives, such as recycled water rates lower than potable rates and non-monetary incentives, such as level of service provisions during drought conditions. Most recycled water projects include a recycled water mandatory use ordinance for a specific area within which recycled water must be used for particular applications. However, successful project implementation usually requires both a carrot (financial incentives) and a stick (use ordinance).

The most common financial incentive for use of recycled water is setting the rate lower than the potable water rate. A lower rate provides an immediate incentive for existing customers to switch, and for new development to choose recycled water instead of potable water.

Use of recycled water includes initial and periodic costs for the customer beyond those that potable water customers normally require. Examples of these costs include:

- Development permit review
- On-site retrofits and signage
- Increased O&M costs for soil amendments (for irrigation)
- Annual cross connection testing
- On-site supervisor training

One way to increase the attractiveness for customers to convert to recycled water is to cover all or some of these costs. A common approach is for the lead agency to either pay for all costs without reimbursement from the customer, or to pay for all costs and recover the funds through a slightly higher recycled water rate. By these methods the customer does not have any increased monthly costs until the retrofit funds are recouped.

11.1.4 Non-Monetary Incentives

Recycled water use provides several non-monetary incentives for customers, such as water supply reliability and positive community image. Recycled water supply is generally not affected by hydrologic conditions, so potential water shortages in dry years should not impact the customer. In addition, converting to recycled water carries a positive economic value by projecting the recycled water customer as "green" to the community. Public education and information programs recognizing the benefits of using recycled water for the community would typically be necessary to enhance the role of this incentive.

11.1.5 Institutional Options

There are typically several entities that manage water and wastewater services in regional areas, and this number increases when groundwater basins are considered. As a result, agreements between stakeholders are necessary to develop a regional project so that the project partners can claim project benefits and implement a recycled water project.

A common approach is for one agency to take the lead on a project in partnership with other participating entities. An alternative to this approach is the formation of a joint powers authority (JPA), where two or more public entities join to share power common to all signatories, to lead implementation of projects. A special district may be best in some circumstances, such as the one currently being considered for management of the Paso Robles Groundwater Basin, as these districts receive powers delegated by State.

11.1.6 Funding Constraints

A recent report by the Public Policy Institute of California entitled Paying for Water in California (March 2014)[31] addresses the challenges of funding water and wastewater projects in California:

> *A series of constitutional reforms adopted by the state's voters, starting with the landmark Proposition 13 (1978) and followed by Proposition 218 (1996) and Proposition 26 (2010), have made it increasingly difficult for local water agencies to raise funds from local ratepayers, and they have also set up higher hurdles for new local and state taxes to support this sector. Meanwhile, budget constraints have curtailed the largesse of the federal government, an important financial partner in times past. Since 2000, the state has stepped in with some supplemental funding, thanks to voter approval of six general obligation (GO) water-oriented bonds, totaling nearly $20 billion.*
>
> *Because the water sector has historically relied heavily on locally generated revenues, the constitutional changes described here [Proposition 13, 218, and 26] have profoundly altered the landscape of funding options. Property tax revenues, which were traditionally a mainstay of local infrastructure budgets, are now in scarce supply. Moreover, there is still considerable uncertainty about which types of charges may be adopted as fees and which must be enacted as taxes. Direct voter approval - often at the high bar of a two-thirds supermajority - is required for any charge that now qualifies as a tax, and voters must also directly approve many fees. The reforms have also limited the state's ability to raise funds for water services.*

[31] www.ppic.org/content/pubs/report/R_314EHR.pdf

The restrictions put in place by these reforms are reflected in the funding options discussed in this section; however, case law is evolving for the more recent propositions. For example, in Bighorn-Desert View Water Agency v. Virjil in 2006, the California Supreme Court ruled that water rates fall under Proposition 218. Currently, Proposition 26 lawsuits are just starting to make their way through the court system.

11.2 Local Funding

Although grants and loans are available for the planning and implementation of recycled water programs, these grant and loan programs typically require a local funding source to satisfy the cost match requirements. Additionally, local funding is necessary for O&M costs. Thus, a secure local funding mechanism is required for the planning, implementation, operations and maintenance of a recycled water program.

Internal funding is revenue generated from customers that can be saved up over time to fund initial capital costs, used to pay back loans, or cover ongoing O&M and future replacement costs. In addition to recycled water rates (discussed in Section 11.1.1), common internal funding methods include:

- Existing water or wastewater customer rates or fees
- Basin management fees
- Impact or connections fees for development
- Large customer(s)
- Other public agency funding mechanisms (general funds, enterprise funds, property tax, sales tax)

Existing Water / Wastewater Rates

Numerous water rates and an increasing number of sewer rates are tiered to discourage excessive water use. The higher tier(s) should be priced at the marginal cost of a new water supply. Water and sewer rate revenue from the higher tier(s) could be applied towards recycled water.

Basin Management Fees

Many over-drafted groundwater basins with managing agencies charge fees to pump groundwater. These fees are intended to support basin management, such as groundwater level, groundwater quality monitoring, or new water supplies for the basin. Pumping fees are a common funding source for recycled water in these basins.

Impact / Connections Fees

A popular source of funds for new water supplies, such as recycled water, is from developers. Payments from developers include connection fees, which are charged to new developments for the right to connect to the water and wastewater system. Connection fees associated with new developments would help cover the cost of developing the available capacity necessary to serve growth, and to construct recycled water facilities (transmission main, storage, and pumping). Fees could also be used to transfer existing potable users to non-potable systems such as metering and retrofits.

Additionally, developers are generally required to construct water, wastewater, and stormwater infrastructure as a condition of development. Developers may also be required to fund recycled water infrastructure outside of the development, such as transmission pipelines or treatment.

Large Customer(s)

Finally, some systems have been funded by a single or several large customers that value the reliability of recycled water, or were part of water supply offsets. For example, the California Public Utilities Commission prefers that new power plants use recycled water for cooling towers if economically feasible. As a result, several new power plants have funded the initial portions of recycled water systems. If surplus recycled water was still available, the recycled water purveyors were then able to expand the system to municipal customers.

Other Public Agency Funding Mechanisms

Public agencies have several potential funding mechanisms to choose from, such as general funds, enterprise funds, property tax, and sales tax. The methods used by individual agencies, however, are typically limited. These funding mechanisms are generally used to compile funds for 'pay-as-you-go' funding or debt funding. Debt funding is discussed further in the following section.

11.3 Debt Funding

Using existing funds for capital payments reduces the net overall costs of capital facilities by avoiding the cost of interest payments on debt funds and arranging financing. However, public agencies rarely have the amount of funds on hand that is necessary to pay for a new recycled water system. Recycled water projects tend to be capital intensive due to the need for construction of new distribution and/or treatment systems. The advantage of debt funding is the availability of a large sum, initially with payback, extended over many years. The long-term payback period matches well with the anticipated long-term revenues from customers. However, the cost of borrowing funds can become a significant portion of a system's payback cost.

Debt funding options for recycled water projects generally consist of either low interest loans through public programs, or private bonds from the open market. The SWRCB Clean Water State Revolving Fund Program (CWSRF) is the most popular source of low interest loans for recycled water projects. Revenue bonds and general obligation bonds are the most popular form of private debt. Public and private debt options are discussed further in the following sections.

11.3.1 Public Loan Opportunities

State loans for recycled water program planning and implementation may be available through various programs. No Federal loan programs were identified. The discussion below provides information on these loan opportunities, including:

- SWRCB Clean Water State Revolving Fund Program (CWSRF)
- California Infrastructure and Economic Development Bank (I-Bank)
- DWR New Local Water Supply Construction Loans
- SWRCB Seawater Intrusion Control Program

SWRCB Clean Water State Revolving Fund (CWSRF)[32]

The SWRCB provides financing for a wide variety of projects including wastewater treatment plants, sewer collectors and interceptors, combined sewers, septic to sewer conversions, storm water reduction and treatment, and water reclamation projects. Funding options are available to public agencies, as well as non-profit organizations and Native American tribes, for up to $50

[32] www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/

million per year. There is no application deadline, and CWSRF applications are accepted continuously.

The standard financing term is up to 20 years; however, 30 year financing is available for small, disadvantaged communities and regionalization projects like those included in this report. The interest rate is set at half the most recent General Obligation Bond Rate at time of funding approval. The interest rate from the latest bond sale date (October 22, 2013) is 2.1%. Limited grant funding may also be available for some projects. There is no maximum funding limit for this program.

California Infrastructure and Economic Development Bank (I-Bank)[33]

The California Infrastructure and Economic Development Bank, also known as I-Bank, was created in 1994 to finance public infrastructure and private development that promote a healthy climate for jobs, contribute to a strong economy and improve the quality of life in California communities. One I-Bank program is the Infrastructure State Revolving Fund (ISRF) Program.

The ISRF Program provides low-cost, subsidized financing to public agencies for a variety of infrastructure projects. I-Bank funding is available in amounts ranging from $50,000 to $25,000,000, with loan terms of up to 30 years. Interest rates are set on a monthly basis.

The interest rate is based on a combination of the Interest Rate Benchmark and Interest Rate Adjustments. The Interest Rate Benchmark is based on the Thompson's Municipal Market Data Index. Generally, Interest Rate Adjustments will cause the interest rate on loans to be below the Interest Rate Benchmark. Interest Rate Adjustments are based on several factors, and follow the ISRF Program Interest Rate Setting Methodology, which is available on the I-Bank website. The bank charges a one-time origination fee of 0.85% of the financing amount or $10,000, whichever is greater.

Eligible project categories include city streets, county highways, state highways, drainage, water supply and flood control, educational facilities, environmental mitigation measures, parks and recreational facilities, port facilities, public transit, sewage collection and treatment, solid waste collection and disposal, water treatment and distribution, defense conversion, public safety facilities, and power and communications facilities.

The I-Bank uses a two-part application process: a Preliminary Application followed by a loan application. Preliminary applications are accepted on a continuous basis. Applicants with successful preliminary applications will be invited to submit a financing application. Financing requests are considered at monthly I-Bank's Board of Directors meetings.

DWR New Local Water Supply Construction Loans[34]

The Water Conservation Bond Law of 1988 authorizes DWR to provide loans to local public agencies for development of local water supply projects. Eligible projects include canals, dams, reservoirs, desalination facilities, groundwater extraction facilities, or other construction or improvements that will remedy existing water supply problems. Loans for construction projects can be provided for up to $5 million, with an interest rate equal to those of the general obligation bonds sold to finance the program. Applications can be submitted on a continuous basis.

[33] ibank.ca.gov/infrastructure_loans.htm
[34] www.water.ca.gov/grantsloans/prop82/

SWRCB Seawater Intrusion Control Program[35]

The SWRCB Seawater Intrusion Control (SWIC) Program provides low-interest loans to local agencies for the design and construction of publicly owned facilities necessary to protect groundwater quality in basins threatened by seawater intrusion. Eligible projects must meet all of the following conditions:

- The project is necessary to protect groundwater;
- The project is within a basin subject to a groundwater management plan;
- The project is threatened by seawater intrusion in an area where restrictions on groundwater pumping, a physical solution, or both, are necessary to prevent destruction or injury to groundwater quality;
- The project is cost-effective if providing a water supply substitute; and
- The project complies with applicable water quality standards, policies, and plans.

Eligible projects may include substitution of groundwater pumping with local surface supplies, such as recycled water. The SWRCB must approve a Facilities Plan and the project's plans and specifications.

Eligible projects will be funded on a first-come-first served basis. Each applicant is limited to $2.5 million. Loan terms are no longer than 20 years and at an interest rate of one-half of the interest rate paid by the State on the most recent sale of State general obligation bonds. The interest rate is similar to the rate for Clean Water SRF.

11.3.2 Private Debt

Many types of private debt are available on the open market. The three most common types of private debt funding used for recycled water projects are:

- General obligation bonds
- Revenue bonds
- Certificates of participation

General Obligation Bonds

General obligation bonds are backed by the full faith and credit of the issuer based on the pledge of the issuer to use its taxing authority to guarantee repayment. These bonds have lower risk than other private debt methods due to the guarantee from taxing authority that results in lower interest rates and financing arrangement costs. However, these bonds require approval by two-thirds of voters.

Repayment could be met by the entity's general fund, which is likely primarily funded by property taxes, or from non-general (or enterprise) fund sources, such as water rates or developer fees.

Revenue bonds

Revenue bonds are repaid by a specific revenue stream of the issuer. These bonds have slightly higher interest rates than general obligation bonds due to higher perceived risk from limited sources of repayment funds. The higher risk results in additional funding requirements. Typically, revenue bonds require development of a debt reserve fund (usually equal to one year of debt service) and setting rates to support the net operating income plus an additional 10 to 25

[35] www.waterboards.ca.gov/water_issues/programs/grants_loans/swic.shtml

percent for debt service coverage. Use of these bonds based on revenue strictly from the recycled water system requires customer agreements with conditions to provide revenue reliability, such as minimum use requirements.

Revenue bonds require the approval of a majority vote.

Certificates of Participation

Certificates of participation are a form of lease-purchase financing that share similar features with revenue bonds, but do not require an election and sometimes do not have a reserve requirement. Additionally, more than one revenue source can be used for repayment. Interest rates are typically slightly higher than revenue bonds, and issuance costs can be higher. Certificates of participation are common in the financial markets and are attractive due to election avoidance and additional repayment funding flexibility.

11.4 Grant Funding Opportunities

Potential State and Federal grant funding for recycled water program planning and implementation may be available through various programs. The discussion below provides information on these funding opportunities, including:

- SWRCB Water Recycling Funding Program
- DWR Proposition 84 IRWM Funding
- USBR WaterSMART Grant Programs
- HUD Community Development Block Grant (CDBG) Program
- USDA Rural Development Water and Waste Disposal Program
- Proposed California 2014 Water Bond

11.4.1 SWRCB Water Recycling Funding Program

The mission of the Water Recycling Funding Program (WRFP) [36] is to promote the beneficial use of treated municipal wastewater (water recycling) in order to augment fresh water supplies in California by providing technical and financial assistance to agencies and other stakeholders in support of water recycling projects and research. The SWRCB WRFP is a long-term program operated by the SWRCB that offers grants and low-interest loans for the planning, design, and construction of water recycling facilities.

Grants are provided for facilities planning studies to determine the feasibility of using recycled water to offset the use of fresh/potable water from state and/or local supplies. Planning grants are limited to 50 percent of eligible costs, up to $75,000. Construction grants are limited to 25 percent of project costs, up to $5,000,000. Only public agencies are eligible. The WRFP receives funding from various sources, including Proposition 50 and the State Revolving Fund. Due to the varying funding sources, preferences for funding and funding availability can vary.

11.4.2 Proposition 84 IRWM Funding

DWR offers grants for projects that assist local public agencies to meet the long-term water needs of the State, including the development and delivery of recycled water. Proposition 84[37] allocated $1 billion to IRWM planning and implementation grants; of this amount, $52 million was earmarked for the Central Coast Funding Area. The Central Coast Funding Area includes

36 www.waterboards.ca.gov/water_issues/programs/grants_loans/water_recycling/
37 www.water.ca.gov/irwm/grants/

the San Luis Obispo County region as well as five other IRWM regions: Santa Cruz, Pajaro River, Greater Monterey County, Monterey Peninsula, and Santa Barbara County. The $52 million will be awarded through multiple funding cycles. Approximately $19.7 million remains available for the Central Coast Funding Area after accounting for grant awards already authorized.

Planning Grants

DWR conducted the first competitive planning grant funding cycle in 2011. The San Luis Obispo IRWM region opted not to submit a grant application for funding at that time. DWR conducted the second competitive planning grant funding cycle in 2012. The San Luis Obispo IRWM region submitted to this cycle and was awarded a $1 million planning grant for updating the IRWM Plan to meet new standards, and to address priority planning needs such as funding for the RRWSP. Additional planning funds will be unavailable through the Proposition 84 IRWM Program.

Implementation Grants

DWR conducted the first competitive implementation grant funding cycle in 2011. The San Luis Obispo IRWM region submitted an implementation grant application seeking $11.6 million for the Los Osos Community Wastewater Project, Flood Control Zone 1/1A 1st Year Vegetation and Sediment Management, and the Nipomo Waterline Intertie Project. DWR made a partial award of $10.4 million and the projects have all begun implementation.

DWR conducted the second competitive implementation grant funding cycle in 2013. The San Luis Obispo IRWM region submitted an implementation grant application seeking $7.6 million. Unfortunately, the San Luis Obispo IRWM application was not recommended for funding.

DWR is currently finalizing the Expedited Drought Grant Solicitation, with applications expected to be due in July 2014 and awards announcements expected in September 2014. The SLO IRWM region plans to submit five projects, including the San Simeon Small Scale Recycled Water Project, for a total request of $9.65 million.

The fourth and final round of implementation grants under Proposition 84, referred to as Round 3, is anticipated in 2015 and 2016, as shown in Table 11-1. Approximately $19.7 million is available for the Central Coast Funding Area between the Expedited Drought Grant Solicitation and Round 3 implementation grants.

Table 11-1. Proposition 84 Round 3 IRWM Implementation Grant Schedule

Draft Program Guidelines and Proposal Solicitation Package	Spring 2015
Final Program Guidelines and Proposal Solicitation Package	Summer 2015
Implementation Grant Applications Due	Fall 2015
Draft Recommendations Announcement	Winter 2016
Final Awards Announcement	Spring 2016

Source: www.water.ca.gov/irwm/grants/docs/Index/Revised-Schedule_040314.pdf (dated 4/3/2014; accessed on 5/22/2014)

The San Luis Obispo IRWM region will be submitting an implementation grant application. To be considered for inclusion in the implementation grant application, eligible projects must be part of an IRWM Plan. The San Luis Obispo IRWM region is currently updating the IRWM Plan and conducted a process for characterizing, soliciting, and prioritizing new projects for inclusion in the IRWM Plan update and implementation grant consideration. Sponsors of each of the projects included in this report should participate in the Updated Plan solicitation, review, and prioritization process regardless of readiness. Participation maintains funding eligibility from Proposition 84 IRWM funding and other funding programs.

11.4.3 USBR WaterSMART Grant Programs

The United States Bureau of Reclamation (USBR) WaterSMART Grants[38] are intended to fund the planning or construction cost of local projects that improve water conservation and management. Through this program, federal funding is provided to irrigation and water districts located in the western US. Funding opportunities and requirements vary depending on available program funding. Generally, USBR will fund up to 50% of a project subject to individual program maximum grant limits. Existing grant programs include:

- Water and Energy Efficiency Grants: Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered species, or facilitate water markets. Grants are limited to $1 million and up to 50% of project cost.
- Title XVI Water Reclamation and Reuse: For planning studies and the construction of water recycling projects in partnership with local governmental entities. Construction grants are limited to $4,000,000 and up to 25% of construction costs.
- Advanced Water Treatment Grants: Encourage pilot and demonstration projects that address technical, economic and environmental viability of treating and using brackish groundwater, seawater, impaired waters or otherwise create new water supplies within a specific locale. The last round of project awards was announced in July 2011 and new funding opportunities have not been announced.

The amount of available funds for WaterSmart Grants is subject to annual Federal fiscal year appropriations. The Water and Energy Efficiency and Title XVI Water Reclamation and Reuse grant programs received funding for Federal FY 2013/2014. Applications for funding from each program were due in January 2014 and awards are planned for announcement in June 2014. A second round of funding through Title XVI was announced in March 2014 and applications for funding for recycled water feasibility studies were due in May 2014. Advanced Water Treatment Grant funding was not included in Federal FY 2013/2014.

11.4.4 HUD Community Development Block Grant Program[39]

The U.S. Department of Housing and Urban Development (HUD) offers Community Development Block Grants (CDBG) administered by the California Department of Housing and Community Development Program. The grants provide funds to cities and counties with a program emphasis on creating or retaining jobs for low-income workers in rural communities. Activities potentially include housing rehabilitation and public improvements, which may involve water and wastewater projects as well as feasibility studies. Each CDBG allocation sets funding award limits in their annual Notice of Funding Availability (NOFA), typically $1,500,000. NOFAs are scheduled for release in January of each year.

Eligible applicants include counties with fewer than 200,000 residents in unincorporated areas and cities with fewer than 50,000 residents that do not participate in the HUD CDBG entitlement program.

San Luis Obispo County has approximately 276,000 residents (2013 US Census Bureau estimate), including incorporated areas and less than 200,000 residents in unincorporated areas; however, the county is listed as ineligible for funding in in Appendix A of the 2014 NOFA.

[38] www.usbr.gov/WaterSMART/grants.html
[39] www.hcd.ca.gov/fa/cdbg/

All cities within San Luis Obispo County have a population of less than 50,000 (Arroyo Grande, Atascadero, Grover Beach, Morro Bay, Paso Robles, Pismo Beach, and San Luis Obispo); however, only Grover Beach and Pismo Beach are listed in Appendix A of the 2014 NOFA. Both of the eligible cities are located in the Northern Cities sub-region in the RRWSP.

11.4.5 USDA Rural Development Water and Waste Disposal Program

The United States Department of Agriculture (USDA) Water and Waste Disposal Program provides financial assistance in the form of grants and loans for the development and rehabilitation of water, wastewater, and storm drain systems within rural communities. Funds may be used for costs associated with planning, design, and construction of new or existing water, wastewater, and storm drain systems. Eligible projects include storage, distribution systems, and water source development. There are no funding limits, but the average project size is between $3 and $5 million. Projects must benefit cities, towns, public bodies, and census-designated places with a population less than 10,000 persons. The intent of the program is to improve rural economic development and improve public health and safety.

Communities within the study area with less than 10,000 persons include:

- Oceano (Census Designated Place)
- Pismo Beach
- Templeton (Census Designated Place)
- Note that Morro Bay's population of 10,234 in 2010 was just above 10,000

There are some systems that qualify for grant funding; however, grant funding availability is limited. This loan program is based on repayment ability. These loans are calculated on similar systems rates, median household income, financial status of the system, and outstanding indebtedness. The term is limited to the life expectancy of the system's project, which may be up to the maximum of 40 years.

11.4.6 California Proposition 1 - Water Bond

California Proposition 1, the Water Bond, is on the November 2014 ballot as a legislatively referred bond act. The measure, upon voter approval, would enact the Water Quality, Supply and Infrastructure Improvement Act of 2014. The act authorizes 7.12 billion in general obligation bonds plus $425 million of unspent bond funds for a total of $7.545 billion for state water supply infrastructure projects. The bond funds are broken down into the following water supply groups and sub-groups:

- Regional Water Reliability $810M
    - Integrated regional water management $510M
    - Stormwater capture $200M
    - Water conservation $100M
- Safe Drinking Water $520M
    - Small Community Wastewater Program $260M
    - Drinking water public infrastructure $260M
- Water Recycling $725M
- Groundwater Sustainability $900M
    - Prevent and reduce groundwater contaminants $800M
    - Provide sustainable groundwater management planning and implementation $100M

- Watershed Protection, Watershed Ecosystem Restoration, State Settlements $1.495B
  - Conservancies $327.5M
  - Wildlife Conservation Board (restoration of flows) $200M
  - Department of Fish and Wildlife (out of delta) $285M
  - Department of Fish and Wildlife (in delta with constraints) $87.5M
  - State settlement obligations including CVPIA $475M
  - Rivers and creeks $120M
- Storage $2.7B
- Statewide Flood Management $395M
  - Statewide flood management projects and activities $100M
  - Delta levee subvention programs, delta flood protection projects $295M

11.5 Summary of Grant and Loan Opportunities

Grant and loan opportunities are summarized in Table 11-2.

Table 11-2. Summary of Grant and Loan Opportunities for Recycled Water Projects

Program	Brief Description	Key Funding Conditions
State Grant Programs		
SWRCB Water Recycling Funding Program	Grants and low-interest loans for the planning, design and construction of water recycling facilities. Low-interest loans are included in the SWRCB Clean Water SRF Program	Planning Max: $75,000, 50% of total cost Construction Grant Max: $5 million, 25% of total cost
DWR Prop 84 IRWM	Projects to assist local public agencies to meet long-term water management needs of the State	Approximately $19.7 million is available to the Central Coast Funding Area for the final 2 rounds of funding
2014 California Water Bond	Approximately $7.55 billion proposed for a range of water supply categories	$725 million specifically allocated for recycled water
Federal Grant Programs		
USBR WaterSMART Grants	Fund the planning or construction cost local projects that improve water conservation and management.	
Water and Energy Efficiency	Projects should seek to conserve and use water more efficiently, increase the use of renewable energy, protect endangered species, or facilitate water markets.	Max: $1 million, 50% of project cost
Title XVI Water Reclamation and Reuse	For planning and construction of congressionally authorized Title XVI Water Reclamation and Reuse Facilities	Max: $20 million, 25% of project cost
Advanced Water Treatment Project	Provide funds for pilot and demonstration projects to accelerate the adoption and use of AWT technologies in order to increase water supply and provide for long term water sustainability.	Max: $600,000

Program	Brief Description	Key Funding Conditions
HUD Community Development Block Grant	For feasibility study, final plans and specs, site acquisition, construction, and grant administration costs Projects must “principally” benefit low income persons/households	Typically $1.5 million Jurisdictions set type of financing and terms (grants vs. loans)
USDA Rural Development Water and Waste Disposal Program	Provide additional security for commercial lenders that finance wastewater, storm drainage, and solid waste systems Projects must benefit cities, towns, public bodies, and census-designated places with a population less than 10,000 persons.	Payments: based on repayment ability. Term: up to 40 years.
Public Loan Programs		
SWRCB Clean Water SRF	Low interest financing for wastewater treatment facilities Limited amount of principal forgiveness for DACs	2.1% rate as of May 2014 20-year or 30-year term Up to $50 million
I-Bank Infrastructure SRF	Provide low interest financing for construction and/or repair of publicly owned water supply, treatment and distribution systems, and drainage and flood control facilities	Rates are based on borrower rating, repayment source(s), and subsidies Up to $25 million
DWR New Local Water Supply Construction Loans	Provide loans for development of local water supply projects	4.0% rate as of May 2014 Up to $5 million
SWRCB Seawater Intrusion Control Program	Provide construction loans to projects that prevent the destruction of groundwater quality due to seawater intrusion Funded on a first-come-first served basis.	2.1% rate as of May 2014 20-year term Up to $2.5 million
Private Loan Options		
General Obligation Bonds	Typically lower interest rate than other private debt options Typically paid back by general or non-general fund sources (i.e., enterprise fund) Requires approval by two-thirds of voters	
Revenue Bonds	Typically higher interest rate than general obligation bonds Repaid with a specific revenue stream Requires approval of a majority of voters	
Certificates of Participation	A form of lease-purchase financing Typically higher interest rate than revenue bonds Can be repaid from multiple sources Does not require an election	

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12. BENEFICIARIES ANALYSIS

This chapter presents the tools to conduct a beneficiaries analysis for recycled water projects in the region. First the analysis framework is presented, and then specific recycled water benefits and associated beneficiaries are presented. The chapter concludes with a summary of the region's disadvantaged communities (DAC) as defined by Proposition 84.

12.1 Beneficiaries Analysis Framework

Conducting a beneficiaries analysis includes three primary steps:

- Define project benefits qualitatively and, if possible, quantitatively
- Assign beneficiaries
- Define monetary value to benefits where possible

12.1.1 IRWM Proposition 84 Guidance

The framework applied for the RRWSP follows those spelled out in the IRWM Proposition 84 Round 2 Implementation Grant Proposal Solicitation Package (Round 2 PSP) (DWR, November 2012). The following are excerpts from the Round 2 PSP that cover common potential benefits, monetized benefit guidelines, and common non-monetized benefits.

Common types of benefits are (per Exhibit D of the Round 2 PSP):

- **Water Supply Benefits:** Include avoided water supply purchase costs, including those for environmental purposes, avoided costs of water supply projects, avoided water shortage costs, avoided operations and maintenance costs, or water revenue from water sales to another purveyor or third party. Only one of these can be claimed for each unit of water supply benefit.
- **Water Quality Benefits:** May include reduced costs of protecting, restoring, or enhancing beneficial uses, avoided water quality project costs; avoided water treatment costs; avoided wastewater treatment costs; and water supply benefits caused by water quality improvements (if not already captured as a water supply benefit), and willingness to pay for water quality improvements for drinking water, impaired water bodies and sensitive habitats.
- **Ecosystem Improvement Benefits:** Includes habitat restoration, protection, or preservation, and enhancement of native fish and wildlife enhancement. Benefits measures for ecosystem improvement could include avoided costs, alternative cost of the same habitat improvement, and willingness to pay for recreation, aesthetics, or special-status species.
- **Recreation and Public Access Benefits:** Should be documented on a with-and-without-project basis. With- and without-project conditions could include the types and quality of recreational activities, amount of use such as visitor days in each activity, and value per unit of use such as unit day values.
- **Power Cost Savings and Power Production Benefits:** Should be based on market value of power. Document the quantity and the unit value of the power saved or produced. Include information on when the savings or production would occur (time of year, time of day), change in capacity, or other factors that influence the cost savings or production benefit.
- **Other Benefits:** In general, cost savings or willingness to pay for goods and services.

Avoided costs represent a benefit that can be monetized. *Avoided costs are costs that occur in the without-project condition that, with the proposed project, are no longer expected. Avoided costs may include, for example, other water supply costs, water treatment costs, salinity damage costs, energy, labor or management costs, or cost savings because other actions or projects are delayed, cancelled, or reduced in size. These avoided costs are counted as benefits (Exhibit D of the Round 2 PSP).*

Monetized benefits should follow these guidelines and assumptions (per Exhibit D of the Round 2 PSP):

- *Consistency:* The economic analysis must be completed for the entire project and must be consistent with other data and information provided in the project.
- *Without-Project and With-Project Comparison:* The economic analysis should be based on a comparison of expected conditions without- and with-project over the period of analysis.
- *Period of Analysis:* The economic analysis will be based on a project life cycle specified by the applicant, which shall include the construction period and operational life.
- *Economic Cost:* Any costs associated with the project, regardless of who bears the cost and regardless of the funding source is considered an economic cost. Opportunity costs should be included, but sunk costs should be excluded.
- *Sunk Costs:* Sunk costs are costs spent in the past that have no salvage value; therefore, they cannot be recovered and should not be counted.
- *Opportunity Costs:* Opportunity cost is the benefit that a resource could provide in the without-project condition and should be counted. For example, land already purchased for use in a project could be used for other purposes; therefore, a reasonable estimate of the market value of that land should be included as a cost.
- *Discount Rate:* Because costs and benefits are evaluated over the life of the project, they must be discounted to reflect the value of money over time. All applicants must use a 6% discount rate.
- *Dollar Value Base Year:* All costs and benefits will be expressed in current year dollars. When using economic data from past years, costs should be escalated to account for inflation.

Non-monetized benefits consist of descriptions of applicable social, environmental stewardship, and sustainability benefits that may result from the implementation of a project. Non-monetized benefits include, but are not limited to (per Exhibit D of the Round 2 PSP):

- Community/Social Benefits, including
  - Education and technology
  - Recreation and public access
  - Conflict avoidance and resolution
  - Public health and safety
- Environmental Stewardship Benefits, including
  - Enhancement, preservation, or restoration of native aquatic or riparian habitat
  - Improvement or prevention of water quality degradation
  - Reduction of harmful emissions
- Sustainability Benefits, including
  - Improve long-term management of California Groundwater Resources

- Reduce demand on Delta
- Promoting energy savings and renewable energy
- Improve water supply reliability
- Adding to overall system resilience and promoting more robust infrastructure

12.1.2 Lifecycle Analysis

It is important that the selection of an engineering alternative is not based solely on the lowest initial or capital cost, but also considers all future costs over the useful life of all projects in that alternative. Lifecycle costs analysis is a standard technique used in engineering economic analyses for comparing cost-effectiveness of alternatives. It reflects both capital and variable costs over the useful life of the alternatives. It reflects not only future inflation, but the time value of money. Costs of the various alternatives can be compared by using the calculated unit lifecycle cost for each alternatives, which is the present value of the capital and variable costs over the planning period divided by the project yield over the planning period. The following cost components must be considered when water supply costs:

- Initial capital cost
- Annual capital payback cost (if borrowed)
- Annual operation and maintenance costs
- Periodic capital replacement costs

In addition to costs, the calculation is dependent on a number of factors that can vary depending on the situation:

- Planning period
- Interest rate
- Payback period
- Discount rate
- Inflation / escalation rate
- Useful life of facilities
- Salvage value

Annual payment costs for projects in the RRWSP assumed an interest rate of 5% and payment period of 30 years. As discussed in Chapter 11, various rates and payment periods are available depending on the project funding mechanism. Project financing is an important consideration when evaluating and comparing project costs.

A lifecycle cost analysis was not conducted for the projects included in the RRWSP due to the lack of projects with sufficient detail. However, the analysis is recommended when comparing project alternatives.

12.2 RRWSP Beneficiaries Analysis

Benefits of recycled water projects are dependent on the type of recycled water project and the benefits from avoiding impacts to the ‘no project’ water supply and discharge alternative. This section presents benefits and avoided costs and impacts from using recycled water. The benefits and avoided costs and impacts specific to an individual recycled water project are specific to the type of reuse and local water supply conditions.

12.2.1 *Benefits from Recycled Water Use*

The benefits of recycled water use vary based on the type of use. The primary benefits apply to the recycled water user and the local water supplier while secondary benefits apply to a broader group of beneficiaries. Table 12-1 provides a high level summary of potential benefits from recycled water use and their beneficiaries.

Table 12-1: Benefits from Recycled Water Use

Benefits	Beneficiary
General Benefits of All Recycled Water Use	
Avoided capital and O&M costs of alternative water supply	See Section 12.2.2
New water source to either reduce demand for existing water supplies or to offset or delay the need to obtain additional potable water supplies.	Water Supplier / Customer
Avoided water shortage costs	
Revenue from recycled water sales	
Improved water supply reliability; drought-resistant water supply	
Locally-controlled water supply	
Diversifies water supply portfolio	
Enables conserving higher-quality water for appropriate uses	Regional Water Users
Putting treated effluent to its highest beneficial use	
Provide an alternative for disposal of wastewater (if applicable)	Wastewater Utility / Customer
Reduce discharge of excess nutrients into surface waters (if applicable)	
Benefits Specific to Landscape Irrigation[1]	
Exemption from municipal drought-related irrigation restrictions	Landscape Irrigation Customer
Provide nutrients for landscape plants (if applicable)	
Agricultural Irrigation[1]	
Provide nutrients for crops	Agricultural Irrigation Customer
Ability to plant perennial crops with lower risk of drought water costs	
Industrial Reuse[1]	
Water quality consistency (if potable water supply source temporally changes)	Industrial Customer
Rate subsidies	
Avoided on-site treatment	

Benefits	Beneficiary
Groundwater Recharge[1]	
Decreased cost of groundwater pumping due to rising groundwater table	Groundwater Basin Users
Reduced groundwater overdraft	
Reduced risk of land subsidence and potential permanent loss of basin capacity	Groundwater Basin Users and Overlying Residents
Reduced potential for seawater intrusion (if applicable)	Coastal Groundwater Basin Users
Surface Water Augmentation[1]	
Avoided costs of raw surface water releases for ecosystem improvement	Managing Agency / Ratepayers
Restoration, protection, or preservation of beneficial uses	General Public and Environment
Enhancement of native fish and wildlife enhancement	
Recreation and public access	General Public

Notes:

1. Specific benefits are in addition to the general benefits identified at the beginning of the table and avoided costs and impacts discussed in Section 12.2.2.

12.2.2 Avoided Costs and Impacts from Recycled Water Use

The water supply that is "avoided" by recycled water use depends on the local water supply situation. Across the California coast, the primary potential new water supply is desalination. In fact, desalination is also a potential new water "supply" for inland communities through the use of water exchanges. For example, Las Vegas has considered paying for a desalination plant in Southern California and using similar amounts of Colorado River water locally in place of the water being transported for use in Southern California. A similar approach can be taken with a variety of water exchanges regionally and across the state.

Instead of avoiding desalination, local recycled water projects may instead avoid the existing use of groundwater or imported water, such as from the State Water Project. The benefits of avoiding use of theses supplies varies based on the type of supply. The primary benefit of the alternative water supply's avoided cost mainly applies to the water supplier while secondary benefits apply to a broader group of beneficiaries. Table 12-2 provides a high level summary of potential avoided costs and impacts from recycled water use and their beneficiaries.

Table 12-2: Avoided Cost and Impacts from Recycled Water Use

Avoided Costs and Impacts	Beneficiary
Desalination	
Avoided capital, O&M, and replacement costs	Water Supplier / Customer
Reduced energy use and associated greenhouse gas emissions	Region, State, and World
Avoided potential marine impacts of water intakes and brine discharges	General Public and Environment
State Water Project	
Avoided cost of SWP water purchases	Water Supplier / Customer
Avoided water treatment plant construction or expansion	
Reduced energy use and associated greenhouse gas emissions	Region, State, and World
Reduced reliance on highly variant supply	Water Supplier / Customer
Reduced stress on SWP facilities and the Bay-Delta	SWP Users Bay-Delta
Reduced introduction of salts into the region	Water Users impacted by irrigated use or WWTP discharges
Groundwater	
Avoided costs of groundwater pumping, including for electricity (pumping), treatment, and well maintenance	Water Supplier / Customer
Avoided cost of new groundwater well(s) (if applicable)	
Avoided additional costs of groundwater pumping and/or well modifications due to declining groundwater table	Groundwater Basin Users
Reduced groundwater overdraft	
Reduced risk of land subsidence and potential permanent loss of basin capacity	Groundwater Basin Users & Residents
Reduced potential for seawater intrusion	Coastal Groundwater Basin Users

12.2.3 Monetized Benefits from Recycled Water Use

As discussed in the previous section, the water supply that is “avoided” by recycled water use depends on the local water supply situation. General avoided costs for desalination, SWP, and groundwater are presented in this section; however, costs are also specific to the local setting. For this reason, evaluation of alternative water supplies must be conducted prior to implementation of recycled water project to contribute towards the consideration or justification of a reuse project.

Desalination

As discussed previously, desalination of ocean water is the most likely new water supply for the region other than conservation, marginal gains from existing groundwater and surface water supplies, and recycled water. As shown in Table 12-3, the cost of desalination is higher than many of the recycled water projects included in the RRWSP. As with most infrastructure projects, the cost of desalination varies depending a variety of factors, including (WateReuse Association, 2012):

- Plant size due to economies of scale (construction cost of $14 million per mgd for 0.5 mgd to $6 million per mgd for 100 mgd)
- Selection of intake and concentrate discharge
- Feed and finished water quality
- Distribution infrastructure
- Permitting and regulatory issues
- Environmental mitigation
- Project delivery mechanism
- Cost of land and power
- Unit membrane costs

Advances in desalination technology (primarily membranes and energy recovery) have helped reduce the cost of desalination over the years. However, the high energy requirements result in high O&M costs and high risk associated with rising electricity prices.

Table 12-3: Example Desalination Unit Costs

Reference	Unit Cost[1]
South San Luis Obispo County Desalination Funding Study (Wallace, October 2008)[2]	$3,300 to $3,900 per AF
Evaluation of Desalination as a Source of Supplemental Water, Administrative Draft, Technical Memorandum 2 (Boyle, September 2007)[3]	$3,000 per AF
Key Issues for Seawater Desalination in California: Cost and Financing (Pacific Institute, November 2012)[4]	$2,000 to $3,100 per AF
Evaluation of Seawater Desalination Projects prepared for Monterey Peninsula Regional Water Authority (SPI, 2012)[5]	$2,500 to $3,400 per AF

Notes:

1. Unit costs from each reference are escalated to May 2014 based on California Construction Cost Index (CCCI). Financing assumptions applied by each reference are not reconciled. CCCI: www.documents.dgs.ca.gov/resd/pmb/ccci/cccitable.pdf
2. For 2,300 AFY (2 mgd) and 1,550 AFY (1.4 mgd) projects implemented in one phase. Phasing of the projects increases costs.
3. For 6,300 AFY (5.6 mgd) project implemented in one phase. Phasing of the project increases costs.
4. Considers projects up to 50 mgd.
5. Considered projects from 5 to 8 mgd.

Groundwater

Recycled water has the potential to offset existing municipal groundwater pumping and agricultural pumping. The cost to supply groundwater depends on several factors:

- Need for treatment based on groundwater quality and end use quality requirements
- Location of well relative to distribution system
- Depth to groundwater and cost of power
- Level of well maintenance

Municipal groundwater costs for the San Diego region were estimated to range from $410 to $1,200 per af. Costs accounted only for disinfection on the low end to demineralization on the high end (Equinox, 2010). Agricultural pumping for the Watsonville area was estimated to range from $300 to $330 per af with groundwater at an average of 80 feet below ground surface (Carollo, 2011b). The agricultural estimate noted that “individual unit costs will vary from the values presented due to economies of scale, individual capital costs, and methodology of calculation.”

A realistic estimate of agricultural groundwater pumping cost is essential to develop any of the agricultural reuse projects described in the RRWSP.

12.2.4 Other Considerations

Besides costs, there are several quantitative and qualitative factors to consider when comparing project alternatives.

- Energy Intensity
- Legal / Regulatory
- Technical
- Health / Safety
- Social Acceptance
- Environment
- Availability
- Reliability

These factors were not applied to comparisons in the RRWSP but are recommended for consideration when comparing project alternatives.

12.3 Disadvantaged Communities

For the purposes of Proposition 84 funding, PRC §75005(g) defines a disadvantaged community (DAC) as a community with a median household income less than 80% of the Statewide average. The IRWM Region has four designated DACs:

- City of San Luis Obispo
- Community of Oceano
- Community of San Miguel
- Community of San Simeon

In addition, Proposition 84 includes multiple DAC funding and participation requirements specific to implementation grant funding (per the Exhibit D of the Round 2 PSP):

To meet the DAC Program Preference, in addition to demonstrating that a project area is serving a DAC, the applicant must also show that a project meets a "critical water supply or water quality need" of a DAC. Critical water supply need or critical water quality need means there is a severe threat to the health and safety of the DAC.

12.3.1 City of San Luis Obispo

The City of San Luis Obispo's Recycled Water Distribution System Expansion project is included in the Final IRWM Project list "due to increased recycled water use in a DAC with the benefit of reducing groundwater pumping in a constrained groundwater basin" (SLO County IRWMP Update). However, the City has not identified a critical water supply need so the project remains a lower priority than projects for communities with critical conditions.

12.3.2 Community of Oceano

Oceano CSD is the only DAC included in the detailed project evaluation portion of the RRWSP as a member of SSLOCSD. Several potential SSLOCSD recycled water projects are identified but several obstacles must be overcome to implement a successful recycled water project. (Refer to Section 13.1.4 for discussion of SSLOCSD opportunities and obstacles).

Oceano CSD has several water supply and flood control projects included on the IRWM project list but no recycled water projects at this time. One of the projects, NCMA Groundwater Basin Model, would support recycled water project implementation in the future. Also, the District has not identified a critical water supply need so their projects remain a lower priority than projects for communities with critical conditions.

12.3.3 Community of San Miguel

The San Miguel Critical Water System Improvements project is included in the Final IRWM Project list "due to the DAC need for critical water system improvements" (SLO County IRWMP Update). The project does not have a recycled water component.

12.3.4 Community of San Simeon

San Simeon CSD has three projects on the IRWM project list: Water System Improvements, Small Scale Recycled Water Project, and Wastewater Treatment Facility Upgrade. The four phases of the Small Scale Recycled Water Project were described in Section 0. The District has identified critical water supply needs. Related to these needs, the Small Scale Recycled Water Project – Distribution System project, which is the second phase of a four phase recycled water program, was selected in May 2014 for inclusion in the SLO Region IRWM Prop 84 Expedited Drought Grant Application. The application is expected to be submitted in July 2014, award announcements are expected in September 2014, and project construction would start in 2015 if sufficient funding is received.

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13. OPPORTUNITIES, CONSTRAINTS, AND RECOMMENDATIONS

Ultimately, recycled water is one of many water resources options for the region. As presented in the RRWSP, there are several potential recycled water projects across the region that can provide cost effective benefits. A number of factors must be addressed to successfully implement a cost effective recycled water project, including water supply needs, recycled water supply and demand, acceptable economics, and protection of public health. Local conditions across the region result in a range of recycled water project opportunities and constraints. There are also opportunities and constraints that apply across the region. This chapter discusses these opportunities and constraints and outlines potential recommendations to move recycled water projects forward on a local and regional level.

13.1 Sub-Regional Opportunities, Constraints, and Recommendations

This section addresses recycled water drivers, opportunities, constraints, and recommendations for each sub-region.

13.1.1 Morro Bay

The City of Morro Bay is currently conducting a planning effort to define and site a new water reclamation facility (WRF). One key goal of the new facility is to produce tertiary effluent for reuse. As of February 2014, The City Council is scheduled to decide on a site in August 2014 and plans to have the new WRF online by February 2019.

There are a range of recycled water opportunities in and around the city, including landscape irrigation, agricultural irrigation, and groundwater recharge / streamflow augmentation. The city wants to maximize reuse from the new WRF. However, implementation of each type of potential reuse is subject to constraints, and feasible recycled water options are ultimately dependent on the site selected for the new WRF.

Next Steps

- Decide on a location for the new water reclamation facility
- Refine recycled water study completed in 2011
- Pursue reuse opportunities specific to the WRF location
- Work cooperatively with the agricultural community and other potential customers to develop a recycled water distribution system
- Incorporate recycled water planning into salt and nutrient management planning

13.1.2 Nipomo CSD

NCSD has two WWTPs (Southland WWTF and Blacklake WWTP) and both currently maximize reuse. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. Southland WWTF is percolated into the underlying groundwater basin, and these flows are included in the NMMA water balance. Reuse of Southland WWTF effluent for landscape irrigation in strategic locations, such as offsetting pumping in groundwater depressions, could provide benefits to NCSD but would not necessarily provide new water. Also, Southland WWTF would need a tertiary treatment upgrade or an equivalent soil aquifer treatment and pumping system.

Opportunities and Constraints

Potential landscape irrigation, agricultural irrigation, and groundwater recharge projects from Southland WWTF were explored in the RRWSP. However, the projects were not cost effective

($10,000+/af) primarily because NCSD would only receive a 10% water supply benefit for every unit of recycled water use and no water supply benefit from recharge. In addition, NCSD recycled water opportunities and constraints include:

- Limited opportunity for direct offset of NCSD potable water use since largest potential customers pump water from their own irrigation well
- Substantial agricultural demand exists in proximity to the Southland WWTF
- Southland WWTF will require an upgrade to tertiary filtration or pumping after percolation to implement a recycled water project
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) resulting in additional costs for treatment and concentrate management

Based on this assessment, a water supply benefit will not drive a NCSD recycled water project. However, recycled water projects could be driven by the need for alternative disposal methods in the future based on potentially stricter waste discharge requirements from the RWQCB.

Next Steps

- Continue to monitor potential mounding of effluent recharge at the Southland WWTF and, if mounding is realized, pursue reuse opportunities
- Work with SSLOCSD representatives on potential cross-basin reuse projects
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

13.1.3 <u>Northern Cities – Pismo Beach</u>

The Pismo Beach WWTP currently discharges approximately 1.1 mgd (1,230 afy) of disinfected secondary effluent through the joint Pismo Beach / SSLOCSD ocean outfall. Nine landscape irrigation project concepts from the Pismo Beach WWTP were defined. In addition, use of Pismo Beach WWTP effluent in combination with SSLOCSD effluent for larger, regional projects, such as agricultural reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation are discussed under SSLOCSD in Section 13.1.4.

Opportunities and Constraints

Based on findings from the project concepts development process, preliminary recycled water opportunities and constraints for Pismo Beach include:

- Maximizing reuse will require more types of uses than just existing landscape irrigation.
- Approximately 130 afy of landscape irrigation demand is located within 0.5 mile of the WWTP, which offers promising reuse opportunities. However, demand estimates for several key potential customers must be confirmed before proceeding much further with planning.
- Tertiary treatment upgrades for small treatment plant commonly have high unit costs due to the lack of scale and could result in high project unit costs for service to customers close to the WWTP.
- There is potential for a high volume of recycled water use from new development if approved by the City.
- Pismo State Beach Golf Course is not Pismo Beach potable water customer so their water supply benefit must be achieved through groundwater exchange.

- Most landscape irrigation customers have relatively low demands and are spread across the city, which causes service to these customers have high unit costs.
- Use of Pismo Beach effluent for agricultural irrigation is potentially the most cost-effective reuse project as long as the Pismo Beach receives a water supply benefit. Agricultural irrigation is included in the SSLOCSD section.
- Use of Pismo Beach effluent for groundwater recharge is a viable option and is included in the SSLOCSD section.

The City is in the process of obtaining abandoned oil pipelines with the intent to consider their use for conveyance of recycled water. This option could potentially reduce distribution infrastructure costs and make more landscape irrigation projects cost effective. This concept will be evaluated as part of the City's Recycled Water Facilities Plan, which is currently being prepared and is expected to be completed in early 2015.

Next Steps

- Complete Recycled Water Facilities Plan that is in progress in consultation with regional stakeholders and the SWRCB.
- Complete investigation that is in progress into the ability to use abandoned oil lines for recycled water conveyance. The RRWSP did not consider this option and its application could make non-potable reuse cost effective for the City.
- Confirm demand estimates for cost effective projects
- Explore alternative tertiary treatment method geared toward relatively small flows (i.e. 0.1 to 0.3 mgd)
- Evaluate the cost to retrofit Pismo Beach State Golf Course and the ability for the city to receive groundwater benefits
- Refine potential projects to develop a phased recycled water program
- Continue discussions with new development (if approved by the City) regarding recycled water demand and funding
- Consider use of the existing outfall as a recycled water conveyance facility (but only if 100% tertiary treatment conversion is planned)
- Compare costs of viable projects with alternative water supplies
- Continue to participate in discussions with regional SSLOCSD projects that could put Pismo Beach effluent to beneficial use and confirm the ability of the City to receive a water supply benefit
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

13.1.4 Northern Cities – SSLOCSD

The SSLOCSD WWTP currently discharges approximately 2.6 mgd of disinfected secondary effluent through a joint ocean outfall (shared with Pismo Beach). Approximately 1.1 mgd of disinfected secondary effluent from Pismo Beach WWTP is discharged through the same ocean outfall. SSLOCSD has the largest volume of effluent considered in the RRWSP and the largest opportunities for large-scale reuse; however, landscape irrigation projects are expensive ($3,000+/af) and the more cost effective reuse opportunities – agricultural irrigation, industrial reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation – will require institutional, legal, outreach, and financial planning to be feasible.

Overall, the amount of reuse for landscape irrigation is limited by the demand, while supply limits the amount of agricultural irrigation during the peak demand season (summer). Groundwater recharge and reservoir augmentation are limited by supply. Stream augmentation could be limited by supply or demand depending on future regulatory scenarios related to the volume of flow required at different points in the creek in the Habitat Conservation Plan.

Opportunities and Constraints

Based on the project concepts development process, SSLOCSD recycled water opportunities and constraints include the following:

- Reuse from SSLOCSD WWTP will require upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or discharge regulations for specific types of reuse (e.g., stream augmentation or indirect potable reuse).
- Landscape irrigation projects have the highest unit costs due to limited demand in proximity to the SSLOCSD WWTP.
- Agricultural irrigation projects have the lowest unit costs due to substantial agricultural demand in proximity to the SSLOCSD WWTP.
- GWR and stream augmentation projects have moderate unit costs and include a range of costs primarily due to the level of treatment assumed for each project
- GWR regulations limit the potential for cost effective projects due to the need for blend water.
- GWR and stream augmentation projects offer the highest volume of reuse.
- Industrial reuse has moderate unit costs and could potentially be combined with agricultural reuse since the industrial pipeline has the same alignment as the primary agricultural pipeline.

Next Steps

<u>General</u>

- Complete planned treatment plant improvements and re-evaluate facilities needed to implement tertiary treatment upgrade.
- Track regulatory drivers and their impacts on reuse opportunities from SSLOCSD WWTP, including:
    - RWQCB Waste Discharge Requirements (NPDES Permit)
    - NOAA Habitat Conservation Plan
    - California Coastal Commission Coastal Development Permit
    - Flood Protection / SWRCB Statewide General WDRs for Sanitary Sewer Systems, Water Quality Order No. 2006-0003
- Address institutional issues and potential funding mechanisms for regional projects
    - Discuss cost sharing of projects between water and wastewater agencies or water/sewer funds.
    - Discuss operations and management of the project
    - Discuss the logistics and legal basis for groundwater exchanges.
    - Coordinate with Pismo Beach reuse plans to identify the most cost effective reuse projects for the NCMA.

  - Develop project concepts sufficiently to position for grant funding opportunities
  - Initiate discussions with member agencies about project funding between the water supply entities (Arroyo Grande, Grover Beach, and Oceano CSD) and SSLOCSD.
  - Investigate funding mechanisms for regional projects that benefit NCMA pumpers in addition to SSLOCSD and its member agencies.
  - Discuss support for use of SSLOCSD recycled water in the NMMA and the related ability to receive water supply benefits in the NCMA.
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

Nipomo Mesa Golf Courses

- Confirm demand estimates that account for future growth
- Address issues associated with use of NCMA effluent in the NMMA.

Agricultural Irrigation

- Initiate planning for agricultural reuse program to enable a project to be developed within 10 years.
- Conduct outreach to agricultural operations in the area determine willingness to use recycled water in the future and obstacles to implementation.
- Set up a pilot study potentially in conjunction with Cal Poly[40] similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source for a pilot project.

Industrial Reuse

- Discuss reuse options with Phillips 66 refinery.
- Address issues associated with use of NCMA effluent in the NMMA.

Groundwater Recharge / Seawater Intrusion Barrier

- Further investigate the water supply benefits of implementing a small groundwater recharge project at the Soto Sports Complex Stormwater basins. Considering combining this project with a non-potable project. Determine if the close proximity of potable water wells to the recharge basins is a fatal flaw.
- Further investigate NCMA groundwater basin, potentially with a groundwater model, to identify surface recharge locations, inland injection locations, and coastal injection locations. Define the benefits of these projects to the basin, particularly the prevention of seawater intrusion.
- Determine benefits of and need for a seawater intrusion barrier (via direct injection or in-lieu reuse) and groundwater levels that would necessitate its use. Determine the value of groundwater protected from seawater intrusion.

Streamflow Augmentation

- Continue to track developments in Arroyo Grande Creek flow requirements / restrictions.
- Track new and potential surface water discharge regulations.

[40] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org

13.1.5 Templeton CSD

Templeton CSD is currently maximizing the water supply benefits of its Meadowbrook WWTP discharges through augmentation of Salinas River underflow. The district plans to implement a project to increase discharges from the Meadowbrook WWTP by diverting district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the sewer diversion as well as untreated Nacimiento water. In addition, recycled water opportunities are being explored. Eleven recycled water project concepts were defined for Templeton CSD. Most reuse options will require an upgrade to tertiary treatment.

Opportunities and Constraints

Based on the project concepts development process, TCSD recycled water opportunities and constraints include the following:

- Maximizing percolation at the Selby Ponds is the preferred use of Meadowbrook WWTP effluent.
- Significant increases to effluent flows are dependent on a combination of septic tank conversions, build-out growth, and diversions from the East Side Force Main and Lift Station Project.
- Potential for reuse of up to 0.2 mgd of effluent without treatment upgrades for feed and fodder irrigation but the reuse would not offset potable water demand.
- Most reuse opportunities from Meadowbrook WWTP will require at least an upgrade to tertiary treatment.
- Additional treatment may be needed to meet water quality requirements of specific customers (e.g., agriculture) or regulations for specific types of reuse (e.g., GWR).
- Landscape irrigation projects have high unit costs due to limited demand in proximity to the WWTP.
- Commercial landscape irrigation (i.e., equestrian farm) has moderate unit costs due to moderate demand.
- Agricultural irrigation has moderate unit costs due to moderate demand in proximity to the Meadowbrook WWTP but a proper market assessment was not conducted.

Next Steps

TCSD plans to incorporate feasible projects into the District's planned Integrated Water Resources Strategic Plan and must be able to adjust reuse needs b on future percolation performance of the Selby Ponds and actual increases to future flows. Therefore, TCSD should:

- Incorporate commercial and agricultural irrigation into the forthcoming Integrated Water Resources Strategic Plan.
- Continue investigation into improving recharge capacity at Selby Ponds through WWTP improvements as well as upgrades and improvements to the ponds.
- Considers water supply benefits and impacts to discharge capacity of continued recharge of Nacimiento water in the Selby Ponds.
- Refine feed and fodder disposal option as a temporary disposal alternative until Selby Pond recharge capacity is better known.
- If Selby Ponds cannot recharge all effluent, refine agricultural irrigation and commercial irrigation options.

- Survey private agricultural and large turfgrass operations in the vicinity of the WWTP for their interest in recycled water use combined with the ability for TCSD to use a similar amount of groundwater currently being used by the entity.
- Incorporate salt and nutrient management planning into water, wastewater, and recycled water planning.

13.1.6 Other Potential Recycled Water Projects

North County Sub-Region

The following are summaries of the other potential recycled water projects in the North County sub-region but were not evaluated in the RRWSP:

- **City of Atascadero:** The City currently reuses non-potable discharges at Chalk Mountain Golf Course and is currently preparing a Wastewater Collection System and Treatment Plant Master Plan update that is evaluating reuse at local parks and Atascadero Lake but no projects were defined at the time the RRWSP was prepared.
- **Heritage Ranch CSD:** HRCSD currently discharges effluent that eventually enters an unnamed tributary to the Nacimiento River. The district is considering construction of a spray irrigation site for effluent disposal management.
- **City of Paso Robles:** The City is currently upgrading its WWTP to an advanced secondary (nutrient removal) process and has begun preliminary design of filtration and disinfection processes that are necessary to produce tertiary quality recycled water. The City recently adopted a Recycled Water Master Plan that identifies areas in east Paso Robles where recycled water may be used to offset pumping from the Paso Robles Groundwater Basin. Also, a major vineyard owner has expressed interest in purchasing recycled water for in-lieu recharge of the Paso Robles Groundwater Basin.
- **San Miguel CSD:** No recycled water plans were identified for San Miguel CSD beyond continued percolation to Salinas River alluvium.

North Coast Sub-Region

The following are summaries of the other potential recycled water projects in the North County sub-region but were not evaluated in the RRWSP:

- **California Men's Colony:** CMC currently reuses tertiary effluent at Dairy Creek Golf Course and helps to maintain a continuous flow rate of 0.75 cfs in Chorro Creek. CMC is also a regional site considered by the City of Morro Bay and Cayucos CSD for treatment of their wastewater.
- **Cambria CSD:** CCSD's effluent discharges serve as a barrier to seawater intrusion. CCSD is currently pursuing an indirect reuse project involving extraction and treatment brackish groundwater near the effluent percolation ponds and is considering future non-potable reuse options.
- **Los Osos WWTP:** The new water reclamation plant started construction in 2014 and startup is planned for 2016. Reuse will occur via agricultural irrigation, landscape irrigation, and discharge to leach fields. The volume to each type of use is currently being defined through potential customer outreach.
- **San Simeon CSD:** The district installed a 36,000 gpd tertiary filtration system in 2013. Current reuse is via hauling by truck for irrigation of commercial properties. The district has plans to construct a distribution system in phases as funds become available.

In addition, the North Coast sub-region priorities included (IRWMP Section E.5.1):

- Conduct sub-region study on maximum use of recycled water.
- Seek agency cooperation in regionalizing drinking water, recycled water for irrigation, and wastewater.
- Initiate inner- and inter-watershed discussions on conservation and reuse options.

South County Sub-Region

The following are summaries of the other potential recycled water projects in the South County sub-region but were not evaluated in the RRWSP:

- **Avila Beach CSD:** No future recycled water plans at this time.
- **Rural Water Company:** All effluent is currently reused at the Cypress Ridge Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.
- **City of San Luis Obispo:** The City is currently updating its Recycled Water Master Plan to develop plans to expand the system from existing use of 180 afy. There is also a possibility of recycled water sales to agricultural customers on the edge of the city limits.
- **Woodlands Mutual Water Company:** All effluent is currently reused at the Monarch Dunes Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.

13.2 Regional Opportunities, Constraints, and Recommendations

The project concepts considered in the RRSWP revealed several recycled water opportunities across the region as well as substantial obstacles to implementation of successful projects. All the reuse projects considered in the RRWSP are technically feasible and some are cost effective but barriers remain to successful project implementation. As shown in the previous section, each sub-region has specific opportunities and constraints that drive the need for recycled water. This section addresses recycled water drivers, opportunities, constraints, and recommendations from a regional perspective.

13.2.1 Regional Opportunities

Of the approximately 18.3 mgd (20,300 afy) of existing wastewater effluent, approximately 6,200 afy of ocean / coastal discharges represent the largest potential water supply without any existing water supply benefits, as shown in Table 13-1. An exception is the portion of Cambria CSD’s percolated effluent that provides a barrier to seawater intrusion.

Of the approximately 18.3 mgd (20,300 afy) of existing wastewater effluent, approximately 14,100 afy of inland discharges represents opportunities depending on the setting. Of the inland discharges:

- Approximately 800 afy is reused as part of seven planned reuse projects.
- Approximately 800 afy are accounted for in groundwater rights (Templeton CSD and Nipomo CSD).
- Approximately 2,300 afy is used to meet minimum flow requirements (City of San Luis Obispo / San Luis Obispo Creek and California Men’s Colony / Chorro Creek)
- The balance of inland discharges (10,200 afy) may provide water supply benefits to downstream watershed or groundwater basin users but may not provide full water supply benefits to the region. The exact benefits from each existing discharge are specific the

individual discharge setting and require clarification to define benefits of individual recycled water projects.

Table 13-1. Summary of Existing Effluent Discharges

Agency / WWTP	Existing Effluent		Existing Reuse	Inland Discharge	Ocean / Coastal Discharge
North County Sub-Region					
City of Atascadero	1.0 mgd	1,100 afy	300 afy	800 afy	--
Heritage Ranch CSD	0.2 mgd	230 afy	--	230 afy	--
City of Paso Robles	3.0 mgd	3,300 afy	--	3,300 afy	--
San Miguel CSD	0.1 mgd	130 afy	--	130 afy	--
TCSD Meadowbrook WWTP[1]	0.15 mgd	170 afy	--	170 afy[2]	--
North Coast Sub-Region					
California Men's Colony	1.2 mgd	1,340 afy	200 afy[3]	1,140 afy[3]	--
Cambria CSD	0.5 mgd	540 afy	--[4]	540 afy	--
Cayucos CSD	0.25 mgd	275 afy	--	--	275 afy
Los Osos WWTP[5]	1.2 mgd	1,340 afy	--	1,340 afy	--
Morro Bay	0.87 mgd	975 afy	--	--	975 afy
San Simeon CSD	0.07 mgd	80 afy	--[6]	--	80 afy
South County Sub-Region					
Avila Beach CSD	0.05 mgd	50 afy	--	--	50 afy
NCSD Blacklake WWTP	0.05 mgd	50 afy	50 afy	--	--
NCSD Southland WWTF	0.6 mgd	640 afy	--	640 afy[7]	--
Pismo Beach	1.1 mgd	1,230 afy	--	--	1,230 afy
Rural Water Company	0.05 mgd	50 afy	50 afy	--	--
City of San Luis Obispo[8]	3.2 mgd	3,600 afy	180 afy	3,420 afy[8]	--
San Miguelito MWC	0.15 mgd	170 afy	--	--	170 afy
SSLOCSD WWTP	2.6 mgd	2,910 afy	--	--	2,910 afy
Woodland MWC	0.05 mgd	50 afy	50 afy	--	--
Total	**16.4 mgd**	**18,230 afy**	**830 afy**	**11,710 afy**	**5,690 afy**

Notes:
1. Templeton CSD is considering diverting existing sewer flows that go to the Paso Robles WWTP (approximately 0.22 mgd) and conveying the flow for treatment at the TCSD Meadowbrook WWTP.
2. Templeton CSD retrieves the percolated water at downstream wells.
3. Must maintain a minimum discharge of 0.75 cfs (0.5 mgd; 540 afy) to Chorro Creek.
4. Percolated effluent serves as a barrier to slow the seaward migration of subterranean fresh water.
5. Currently under construction and start of operations planned for 2016.
6. Trucking of recycled water for irrigation started in 2014.
7. Percolated water is accounted for in the Nipomo Mesa Management Area groundwater balance.
8. Must maintain a minimum discharge of 2.5 cfs (1.6 mgd; 1,800 afy) to San Luis Obispo Creek.

In addition, several policy mechanisms are available to support reuse. Two of the most prominent opportunities are

- California Water Code Section 13551
- Mandatory Use Ordinances

California Water Code Section 13551

California Water Code (CWC) Section 13551 states that "*A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550*." CWC Section 13550 states:

> *"The Legislature hereby finds and declares that the use of potable domestic water for non-potable uses… is a waste or an unreasonable use of the water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available which meets all of the following conditions…*
>
> *"(a) The source of reclaimed water is of adequate quality for such use and is available for such use…*
>
> *"(b) Such reclaimed water may be furnished to such greenbelt areas at a reasonable cost for facilities for such delivery…*
>
> *"(c) After concurrence with the State Department of Health Services, the use of reclaimed water from the proposed source will not be detrimental to public health.*
>
> *"(d) Such use of reclaimed water will not adversely affect downstream water rights, will not degrade water quality, and is determined not be injurious to plant life, fish, and wildlife."*

Under the proper conditions, the CWC requirements can help to implement a recycled water project.

Mandatory Use Ordinance

A mandatory use ordinance is a local law adopted by a retail water purveyor requiring the use of recycled water in place of another source of water. Enforcement of mandatory use policies typically meet the conditions defined in CWC Section 13550, which was presented in the previous section. A mandatory use ordinance is typically required by the State to receive grant or loan funding. According to the SWRCB Water Recycling Funding Program Guidelines, the ordinance should contain the following elements:

- Specification of the types of use of water for which recycled water must be used.
- Specification of the conditions under which recycled water must be used or new development must be plumbed for future recycled water use.
- Procedures for determining the water users required to either convert to recycled water service or be plumbed to accept recycled water upon new water service.
- Procedures to provide notice to potential users that they are subject to the ordinance and specifications that the notice include information about the project, the responsibilities of the users under the ordinance, the price of the recycled water, and a description of the onsite retrofit facilities' requirements.
- Procedures for request by the users for a waiver.
- Penalties for noncompliance with the ordinance.

A mandatory use ordinance is a beneficial policy to have in place to support recycled water project implementation.

13.2.2 Regional Constraints

The most common drivers for recycled water projects across the State are:

- Need for new large water supply
- Occurrence of significant seawater intrusion
- Wastewater discharge restrictions

Portions of these drivers are present across the region but not to the degree to support significant recycled water investments. These drivers may increase in the future and would improve the opportunity for reuse projects. Each driver is discussed further here.

Large Water Supply Need

The need for a new, local, and reliable water supply is the primary driver for recycled water projects in the region. The need is present when considered across multiple water suppliers, particularly when considering the 2014 drought conditions; however, the individual agencies currently lack the need for a new, *large* water supply.

Recycled water projects typically have strong economies of scale since the two largest components – treatment and pipelines – have economies of scale. Several potentially viable large (1,000+ afy) recycled water projects were identified but the need for this volume of new water by the individual sponsoring agency has not been demonstrated. A few small, cost effective (< 100 afy) recycled water projects were defined and showed some viability until the cost of small-scale treatment is included. This is the region-wide dilemma for recycled water and requires municipal, agricultural, and other large water users to coordinate efforts.

On the other hand, desalination is the other primary potential large, new source of water for the county and studies of potential desalination plants in the County[41] resulted in water supply unit costs ranging from $3,000/af to $3,900/af. In addition, desalination raises non-monetary concerns, such as impact to the marine setting and energy intensity. Most recycled water project concepts in the RRWSP are more cost effective and potentially have less environmental impacts than desalination.

Also, the maximum recycled water rate for willing agricultural customers is the cost of current water supplies, which is roughly the avoided cost of groundwater pumping. Agricultural reuse project concepts are some of the most cost effective projects in the region but the full cost of recycled water is significantly higher than groundwater. As a result, successful agricultural reuse projects require creative funding and financing plans. One notable potential benefit of agricultural reuse in the coastal areas is the reduction in potential for seawater intrusion and the associated costs to desalinate groundwater or replace the supply.

Occurrence of Significant Seawater Intrusion

The NCMA and NMMA have reduced pumping in recent years to avoid seawater intrusion and, on a smaller scale, Morro Bay, San Simeon, and Cambria have managed pumping to avoid seawater intrusion. To date, their efforts appear to be effective and there does not appear to be a need for a new seawater intrusion barrier. However, seawater intrusion conditions may change that could necessitate the need for a new barrier. Recycled water could be recharged

[41] South San Luis Obispo County Desalination Funding Study (Wallace, October 2008); Evaluation of Desalination as a Source of Supplemental Water, Administrative Draft, Technical Memorandum 2 (Boyle, September 2007)

via percolation or injection to create a barrier or could provide in-lieu supplies to groundwater pumpers overlying the coastal area threatened by seawater intrusion.

Wastewater Discharge Restrictions

Treatment plant upgrades can be a significant project cost, especially the initial phases, and most plants to date have not been required to upgrade to tertiary effluent. The cost to meet NPDES discharge requirements is generally attributed to wastewater rates and additional costs to produce recycled water are attributed to the recycled water system. Placing the full cost of tertiary treatment plant upgrades with the benefitting recycled water project reduces the potential for a cost effective recycled water project in most cases. However, the future direction of wastewater discharge requirements is likely towards more stringent discharge limits and may require WWTP upgrades that would benefit reuse.

13.2.3 Regional Obstacles and Recommendations

Table 13-2 summarizes recycled water obstacles from a regional perspective and recommendations to address these obstacles. The table is followed by a review of regional opportunities, constraints, and recommendations for specific types of reuse projects.

Table 13-2. Regional Recycled Water Obstacles and Recommendations

Obstacle	Recommendation
Leadership / Advocate	
Water supply projects can take many years (and election cycles) to implement from concept to operations and, as a result, many are put on hold from political and/or staff turnover. Recycled water projects can also take just as long and can cause additional political or staff concerns due to public misunderstanding or misleading information. Therefore, most successful large recycled water projects include respected scientific, public health, environmental, and political advocates to move the project forward by being able to champion the project benefits, help gain the public's trust, and assist to mitigate opposition.	- Identify recycled water champions in multiple fields - scientific, public health, environmental, and political - to support projects. - Support and facilitate regional projects with costs and benefits spread across diverse entities. - Advocate for highest and best use of existing potable water.
Cost	
Recycled water projects costs may be too high in comparison to existing and alternative water supplies to gain support.	- Identify new water supply needs based on existing water quantity, quality, or reliability. - Establish specific need for reuse (if appropriate) as part of an integrated water resources plan. - Complete advance project planning and/or preliminary design for future funding for pilot projects, WWTP upgrades, and delivery systems. - In the future, reconsider feasible projects that may not be cost effective at this time, as the value of recycled water to municipalities grows as limits and reliability of existing sources are strained further.
Cost of treatment plant upgrades to tertiary treatment is an obstacle. Further tightening of discharge requirements will help support reuse as funds are committed to treatment plant upgrades.	- Plan for tertiary treatment upgrades in WWTP facility plans. - Identify funding sources other than recycled water projects for WWTP upgrades.
Brine disposal in the inland setting is a major hurdle for reuse (and any other salt management efforts).	- Incorporate recycled water planning into salt and nutrient management planning to identify the best management measures.
Benefits	
Reuse has clear benefits but many of the benefits are distributed across all water users. Most cost effective opportunities provide water supply benefits beyond the municipalities producing the recycled water.	- Grant funding can help address the contradiction between the lead agency / primary funding source and project beneficiaries. - Advocate for grant funding of recycled water projects in areas attempting to reduce dependence on local groundwater to improve project economic viability.
Legal	
Existing groundwater users do not have a mechanism to transfer their groundwater rights in exchange for use of alternative water supplies as is the case in most adjudicated groundwater basins.	- Start discussions with all groundwater basin pumpers to develop a mechanism to exchange groundwater rights for use of alternatives water supplies.

Obstacle	Recommendation
Financing	
Reliance on a single or low number of customers can cause payback issues if the demand is overestimated or the customer may not exist in the future.	- Confirm recycled water demand estimates and costs to convert each potential recycled water customer. - Get customer commitments prior to start of design and construction to properly design facilities and ensure revenue for loan payments.
Institutional	
Recycled water projects are often times positioned to provide regional benefits that face the challenges of bringing multiple sub-regional political entities together with diverse goals.	- Leverage existing sub-regional water planning groups, such as NCMA and NMMA, to identify key stakeholders and gain support.
Water and wastewater are handled by separate agencies in some areas, causing cost sharing / allocation issues.	- Define water and wastewater benefits of recycled water projects to support cost allocation.
Public Acceptance	
Recycled water projects, particularly involving potable reuse, require thorough, planned public outreach efforts; however, these efforts tend to be underfunded and reactionary instead of proactive, all-embracing, and well-timed.	- Make sure to include funding for initial and ongoing public outreach specific to the targeted groups.
Regulatory	
Recycled water project implementation is tied to compliance with regulations and policies to protect surface water and groundwater that may present obstacles in terms such as requiring treatment upgrades or making certain types of reuse projects infeasible.	- Evaluate project feasibility based on applicable regulations and policies. - Move forward with salt and nutrient planning in all basins where reuse is being considered and incorporate recycled water plans into the effort. - Track new regulations and policies for impacts on water recycling.
Policies	
Mandatory use and other similar policies are not in place in most jurisdictions.	- Any jurisdiction implementing a recycled water project should adopt a mandatory use ordinance to demonstrate political support and to be eligible for most grant funds or low-interest loans. - Have developers include 'purple pipe' in new developments within a reasonable distance from the WWTP or planned distribution system. If the development is large enough and recycled water demand high enough, have developers include water reclamation plants in the development. - Consider applying California Water Code (CWC) 13551[42] provisions if necessary.

[42] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

Landscape Irrigation

Urban landscape irrigation represents the second most common type of reuse across California after agricultural irrigation. It tends to be the first use for recycled water for most urban areas since opportunities for agriculture irrigation are limited in these settings. As a result of decades of project operations, implementation of landscape irrigation projects is generally straightforward and involves the least obstacles – with the exception of cost.

There is limited opportunity for cost effective landscape irrigation in the region for a combination of reasons:

- There is a limited amount of large landscape areas due to long-standing water conservation measures taken.
- Most of the existing large landscape areas are golf courses and most of these use at least some recycled water or non-potable groundwater. (Although significant volumes of potable water are used at these courses too to meet irrigation demand and flush salts).
- Potential large landscape areas identified in the RRWSP are too far from existing WWTPs and/or demands are too small for cost effective distribution to the sites.
- The small opportunities that exist require WWTP upgrades to tertiary treatment, which generally have high unit costs on a small scale.

Several potential landscape irrigation projects are identified in the RRWSP. The cost effective projects are close to the WWTP and/or include a golf course that uses large volumes of potable water. Implementation of the smaller projects is probably more feasible due to the total cost as long as the tertiary treatment portion of the cost can be managed. In addition, successful implementation of small recycled water projects could spur support for expansion in the future.

Agricultural Irrigation

Of the types of recycled water projects evaluated in the RRWSP, agricultural reuse has the most potential across the region. Agricultural water use represents approximately 75% of total water use across the region. Agricultural reuse is advantageous because of the relatively high demand in concentrated areas combined with proximity to the existing WWTPs. Also, agricultural reuse represents matching water quality to use thus freeing potable water for potable uses. Finally, agricultural reuse in coastal locations can serve as a seawater intrusion barrier.

There are many hurdles to successful agricultural reuse projects in the region:

- Recycled water producers realizing a water supply benefit. The benefit can be realized if the agricultural customer agrees to reduce pumping from potable groundwater aquifer(s) by the amount of recycled water used.
- Providing recycled water at a competitive price to existing agricultural water supplies. Recycled water can be sold to agricultural customers at or below their current cost of water supply (primarily groundwater at up to $300/af) but the revenue from recycled water sales would most likely not cover the cost of the recycled water project on its own. To economically justify such a project, the avoided cost of new water supply acquisition must be considered as well as the potable water revenue received from the new potable supply.
- Gaining willing agricultural customers of recycled water due to real and perceived issues.

- Identifying or creating a lead agency with the capability and authority to develop, construct, and operate a regional project.

Agricultural reuse offers one of the best opportunities for recycled water use in the region while also having several obstacles to overcome. Considering this, the region can start to take efforts to address the obstacles by starting discussions on governance, water supply benefits, and recycled water pricing. In addition, steps can be taken to address grower concerns over recycled water use so that these issues can be resolved while the other non-customer issues are addressed. Recommended next steps include:

- Reach out to agricultural interests to determine steps necessary to gain willing customers.
- Conduct technical studies considering specific recycled water quality, soil conditions, and crops.
- If deemed beneficial, follow technical studies with pilot studies, potentially set in conjunction with Cal Poly[43], similar to the Paso Robles Recycled Water Demonstration Garden. Identify funding source(s) for a pilot project.
- Conduct educational tours of existing agricultural reuse projects in Northern, Central, and Southern California.
- Leverage the agricultural resources of the local Resource and Conservation Districts during outreach and implementation.
- Consider application of CWC Section 13551[44] to gain agricultural customers based on the availability of recycled water of adequate quality and at a reasonable cost. (Refer to Section 13.2.1 for further discussion).

Groundwater Recharge

Groundwater recharge with recycled water has some potential opportunities across the region, but geological constraints and treatment requirements cause most projects to be too expensive. The two primary areas considered for recharge – Northern Cities Management Area and Paso Robles Groundwater Basin – have limited areas where water recharged from the surface can reach the potable water aquifers. Injection is needed where surface recharge locations are lacking and injection requires the additional costs of injection wells and advanced treatment (beyond tertiary) of recycled water.

Use of recycled water to prevent seawater intrusion barrier along the coast is an option worthy of further consideration. Other than cost, the primary obstacles to GWR with recycled water are:

- Better understanding of potential groundwater basin recharge locations and storage potential.
- Definition of benefits other than a new water supply, such as preventing seawater intrusion and/or subsidence.
- Receipt of water supply benefits by project sponsors or sharing of costs across all basin beneficiaries.
- For use of tertiary recycled water, significant volumes of dilution water would be required for a GWR project to meet regulations.

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[43] California Polytechnic State University San Luis Obispo, Irrigation Training & Research Center; www.itrc.org

[44] CWC Section 13551: "A person or public agency…shall not use water from any source of quality suitable for potable domestic use for non-potable uses… if suitable recycled water is available as provided in Section 13550."

- Basins may not have sufficient assimilative capacity to apply recycled water unless additional treatment is provided.

Streamflow Augmentation

Streamflow augmentation is an attractive reuse option since many streams now have minimum flow requirements for habitat and/or wildlife preservation. For example, offsetting Lopez Dam releases to Arroyo Grande Creek or increasing stream flow in other portions of the region to allow for pumping would create new water supplies.

However, the largest obstacles to implementation of these projects are surface water discharge regulations. Existing surface water discharge regulations add significant treatment costs and anticipated future regulations would require even higher levels of treatment with associated costs.

To assess streamflow augmentation options in the future:

- Fully assess flow and water quality requirements and restrictions in in Arroyo Grande Creek and other potential sites across the region.
- Track surface water discharge regulations and their implications for streamflow augmentation.

13.3 Climate Change

IRWM Plan Section P addresses climate change as a component of regional planning and implementation of water resources management projects and programs. The projected changes in climate metrics by 2050 under the medium warming scenario include (IRWM Plan Section P.7):

- Increased winter precipitation and decreased spring and summer precipitation
- Increased winter runoff and decreased spring and summer runoff
- Increased maximum and minimum temperatures
- Decreased evapotranspiration during the winter and increased evapotranspiration during the spring, summer, and fall

IRWM Plan Section P.10 summarizes the climate change vulnerability assessment, which is an evaluation of climate change vulnerabilities in the region as they relate to the region's water resources. Table 13-3 presents ways that recycled water could be part of potential adaptation strategies.

Table 13-3: Sub-Region Climate Change Vulnerabilities and Recycled Water

Vulnerability Rating Categories	Rating	Potential Ways Recycled Water Can Support Adaptation Strategies
North Coast Sub-Region		
Inadequate Storage Capacity	1	Recycled water can help replace lost water supplies due to decreased capture of precipitation and runoff in surface storage and groundwater aquifers, particularly during the dry season. Recycled water can be used to replenish groundwater aquifers.
Saltwater Intrusion and Coastal Inundation	1	Recycled water can be used to reduce saltwater intrusion by replenishing coastal groundwater aquifers, offsetting pumping along coastal groundwater aquifers, or discharging to surface waters to increase downstream flows.
Ecosystems and Habitat	2	Recycled water may be able to reduce higher water temperatures if the water is cooled prior to discharge.
Water Quality	2	Recycled water can help reduce saltwater intrusion (per above category). Recycled water can reduce water higher constituent concentrations by increasing base flows in streams and rivers and increasing groundwater elevations.
Water Demand	3	Recycled water can help to meet increased outdoor water demands and reduced environmental water flows.
Flooding	3	Recycled water cannot help with flooding.
North County Sub-Region		
Water Supply	1	Recycled water can provide a new water supply for the area through direct use of recycled water or indirect use via groundwater recharge.
Water Demand	1	Recycled water can help to meet increased agricultural water demands and reduced environmental water flows.
Water Quality	2	Recycled water can reduce water higher constituent concentrations by increasing base flows in streams and rivers and increasing groundwater elevations.
Ecosystems and Habitat	2	Recycled water may be able to reduce higher water temperatures if the water is cooled prior to discharge.
Flooding	3	Recycled water cannot help with flooding.
South County Sub-Region		
Decreased Water Supply	1	Recycled water can provide a new water supply for the area through direct use or indirect use via groundwater recharge, offset streamflow discharges, or reservoir augmentation.
Coastal Inundation	1	Recycled water cannot help with coastal inundation.
Water Demand	2	Recycled water can help to meet increased outdoor water demands and reduced environmental water flows.
Water Quality	2	Recycled water can help reduce saltwater intrusion (per above category). Recycled water can reduce water higher constituent concentrations by increasing base flows in streams and rivers and increasing groundwater elevations.
Ecosystems and Habitat	2	Recycled water may be able to reduce higher water temperatures if the water is cooled prior to discharge.
Flooding	3	Recycled water cannot help with flooding.

Notes:

1. Priority Rating 1: significant vulnerabilities that have far-reaching impacts, are very likely to occur, have a willingness to pay and can be addressed through well-defined near-term projects where/when feasible.
2. Priority Rating 2: significant vulnerabilities with a high adaptive capacity and can be addressed through specific projects and planning studies and/or monitoring programs where/when feasible.
3. Priority Rating 3: less than significant vulnerabilities for consideration in future long-term projects and planning studies and/or monitoring programs where/when feasible.

13.4 Potential Recycled Water Projects

This section provides a succinct summary of potential recycled water opportunities across the region. Agencies without opportunities are excluded from the list. Each opportunity is discussed further within the report.

North County Sub-Region

- **City of Atascadero:** The City is evaluating reuse at local parks and Atascadero Lake but no projects were defined at the time the RRWSP was prepared.
- **City of Paso Robles:** The City recently adopted a Recycled Water Master Plan that identifies areas in east Paso Robles where recycled water may be used to offset pumping from the Paso Robles Groundwater Basin. Also, a major vineyard owner has expressed interest in purchasing recycled water for in-lieu recharge of the Paso Robles Groundwater Basin. There may also be an opportunity for a regional groundwater recharge project in the Paso Robles Groundwater Basin.
- **Templeton CSD:** The District plans to implement a project to increase discharges from the Meadowbrook WWTP by diverting district sewer flows from Paso Robles WWTP to Meadowbrook WWTP. TCSD is evaluating the percolation capacity of the existing Selby Ponds to handle the proposed flow from the sewer diversion as well as untreated Nacimiento water. Recycled water opportunities are being explored in case percolation capacity is not realized.

North Coast Sub-Region

- **California Men's Colony:** CMC is also a regional site considered by the City of Morro Bay and Cayucos CSD for treatment of their wastewater. Reuse of these flows would be an integral part of site selection.
- **Cambria CSD:** Cambria CSD is currently pursuing an indirect reuse project involving extraction and treatment brackish groundwater near the effluent percolation ponds and is considering future non-potable reuse options.
- **Cayucos CSD:** Cayucos CSD selection of a new wastewater treatment plant site is pending selection of a site by the City of Morro Bay. CMC is Cayucos CSD's preferred site. Reuse opportunities will be dependent on the site selected.
- **Los Osos WWTP:** Startup is planned for the new water reclamation plant in 2016. Reuse will occur via agricultural irrigation, landscape irrigation, and discharge to leach fields. The volume to each type of use is currently being defined through potential customer outreach.
- **City of Morro Bay:** Potential reuse opportunities depend on the site selected for a new water reclamation plant and include landscape irrigation, agricultural irrigation, groundwater recharge, and stream augmentation.
- **San Simeon CSD:** Current reuse is via hauling by truck for irrigation of commercial properties. The district has plans to construct a distribution system in phases as funds become available.

South County Sub-Region

- **City of Pismo Beach:** Potential reuse opportunities identified in this report focused on landscape irrigation. There are also opportunities for agricultural irrigation, groundwater recharge, and stream augmentation in coordination with SSLOCSD.

- **Rural Water Company:** All effluent is currently reused at the Cypress Ridge Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.
- **City of San Luis Obispo:** The City is currently updating its Recycled Water Master Plan to develop plans to expand the system from existing use of 180 afy. There is also a possibility of recycled water sales to agricultural customers on the edge of the city limits.
- **SSLOCSD:** Potential reuse opportunities identified in this report include landscape irrigation, agricultural irrigation, industrial reuse, groundwater recharge, and stream augmentation.
- **Woodlands Mutual Water Company:** All effluent is currently reused at the Monarch Dunes Golf Course and capacity remains to reuse more effluent at the course as flows to the plant increase.

13.5 Concluding Remarks

The best opportunities for reuse – agriculture and groundwater recharge – align with the region's water resources profile: agriculture comprises approximately 75% of total water use and groundwater represents approximately 90% of water supplies. However, institutional and other implementation issues arise when attempting to allocate costs and realize benefits for agriculture and GWR projects because recycled water is produced by public agencies but beneficiaries extend beyond the municipalities.

Recycled water offers one of the region's best options for new water supplies, especially when compared with the cost and environmental impacts of desalination. However, many recycled water projects are more expensive than additional conservation or fully realizing the relatively recent investments in surface water projects. Additionally, water supply conditions and the associated need for recycled water vary by individual agency while recycled water projects require regional scale to achieve significant water supply benefits and acceptable costs due to economies of scale.

The 2014 drought conditions have highlighted the benefits of developing a local, reliable water supply for municipalities as well as agricultural and industrial water users. In particular, the sustainability of and long-term impacts from groundwater overdraft have increased interest in recycled water For example, some growers in the Morro Valley have expressed the desire to the City of Morro Bay to develop recycled water for agricultural reuse. The full cost of recycled water appears to be too high for many areas at this time, but will become more competitive in the future as other options become more expensive, the value of local supplies increases, and successful grant funding helps to subsidize local costs.

In the meantime, the region should take the initial steps outlined in the RRWSP to address hurdles to implementation of feasible recycled water projects so that projects can be implemented promptly when appropriate and provide minimal initial investment in projects to position them for grant funding.

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TECHNICAL APPENDICES

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APPENDIX A: Previous Recycled Water Reports Review TM

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DATE:	April 16, 2014
SUBJECT:	**Summary of Previously Completed Recycled Water Reports**

Table of Contents

1. Introduction

The purpose of this technical memorandum (TM) is to summarize previous reports that address recycled water and involve agencies participating in the Regional Recycled Water Strategic Plan (RRWSP). The participating agencies are:

- Templeton Community Services District (TCSD)
- City of Morro Bay
- City of Pismo Beach
- South San Luis Obispo County Sanitation District (SSLOCSD)
    - City of Grover Beach
    - Oceano Community Services District (OCSD)
    - City of Arroyo Grande
- Nipomo Community Services District (NCSD)

2. Regional - SLO County Master Water Report

This section includes excerpts from the SLO County Master Water Report (Carollo, 2012).

The following are excerpts about recycled water from the SLO County Master Water Report, Appendix C – Water Supply Inventory and Assessment – Water Supply, Demand, and Water Quality:

Water Recycling

There are several purveyors and agencies that recycle municipal wastewater in the County. Details of each purveyor or sanitary agency's recycled water program are discussed in detail in the corresponding sections later in this chapter. Recycled water qualities range from secondary quality (as defined by Title 22 CCR) to the highest level of treatment, tertiary 2.2 quality for unrestricted use. The most established water recycling program in the County is that of the City of San Luis Obispo. The City currently delivers 135 AFY to nearby golf courses, schools and commercial establishments, with expectations of augmenting up to 1,000 AFY of potable water with recycled water for irrigation. The City also must maintain discharge to San Luis Obispo Creek, and this flow amounts to approximately 1,800 AFY. Other water recycling projects in the County include:

- *Nipomo CSD (Blacklake WWTP, Southland WWTP)*
- *California Men's Colony (Dairy Creek Golf Course)*
- *Templeton CSD (Meadowbrook WWTP)*
- *City of Atascadero WRF (Chalk Mountain Golf Course)*
- *Rural Water Company (Cypress Ridge Golf Course)*
- *Woodlands MWC (Monarch Dunes Golf Course)*

Water Recycling Studies and Potential Future Recycling Projects. Numerous agencies have undertaken recycled water feasibility studies, to determine the viability of developing recycled water projects. Such agencies include, but may not be limited to:

- *San Simeon CSD*
- *Cambria CSD*

- *City of Morro Bay/Cayucos Joint WWTP*
- *City of Paso Robles*
- *South San Luis Obispo County Sanitation District (SSLOCSD) WWTP*
- *City of Pismo Beach*
- *Avila Beach CSD/Port San Luis*
- *Los Osos CSD*

3. Templeton Community Services District

Templeton CSD recently issued a Water and Wastewater Master Plans Update (TCSD, October 2013) and is in the process of evaluating Meadowbrook WWTP processes to improve effluent quality. TCSD has not completed a recycled water study but has provided preliminary customer information collected during preparation of the 2013 Master Plan Update to develop project concepts.

Information from the master plan update and conversations with TCSD regarding the WWTP investigation forms the basis of this section and supported RRWSP project development to TCSD.

Other reports with relevant information that are not included in this TM are:

- Wastewater Change Petition WW-65 – Order Approving Change in Point of Discharge, Purpose of Use, and Place of Use (SWRCB, 2012)
- Water Master Plan (Wallace, 2005)
- Wastewater Master Plan (Wallace, 2005)

TCSD has two wastewater tributary areas. One area (approximately 0.15 mgd) flows to Meadowbrook WWTP, which is owned and operated by TCSD, and the other area (approximately 0.22 mgd) flows to the Paso Robles WWTP under an agreement with the City of Paso Robles. Both flows eventually enter the Salinas River. The Meadowbrook WWTP effluent is discharged into rapid infiltration basins at the Selby Percolation Pond Site (Selby Ponds). The treated wastewater percolates into the Salinas River underflow. TCSD captures the amount of water percolated less a conveyance loss at TCSD municipal wells located downstream. The Paso Robles WWTP discharges approximately 3.0 mgd, including 0.22 mgd from TCSD, directly to the Salinas River.

In August 2012, TCSD received approval from the State Water Resources Control Board (SWRCB) to divert sewer flows currently treated at the Paso Robles WWTP to the Meadowbrook WWTP. The Meadowbrook WWTP has a permitted capacity to treat 0.6 mgd and discharge to the Selby Ponds. Flows would remain within permitted capacity with the addition of 0.22 mgd of diverted flow. TCSD also retains the right to capture for municipal purposes the amount of water percolated less a conveyance loss.

The East Side Force Main and Lift Station Project was recommended in the recent Master Plan Update. The diversion requires construction of new conveyance infrastructure, including a new pump station and approximately 12,000 LF of pipeline.

4. Morro Bay

This section includes a summary of Morro Bay recycled water planning efforts as well as excerpts from the most recent report addressing Morro Bay recycled water use:

- Recycled Water Feasibility Study (Dudek, April 2012)

Other reports with relevant information that are not included in this TM are:

- Alternatives Site Evaluation – Phase 2: Fine Screening Analysis (Dudek, Nov 2011)
- Alternatives Site Evaluation – Phase 1: Rough Screening Analysis (Dudek, Nov 2011)
- 2010 UWMP (CH2MHill, June 2011)
- Ashurst Well Field Nitrate Study, Chorro Valley (Cleath-Harris, 2009)
- Morro Bay/Cayucos WWTP Permit (CC RWQCB, 2008)
- Morro Basin Nitrate Study (Cleath, 2007)

4.1 Summary

The City of Morro Bay is currently conducting a planning effort to identify a new water reclamation facility. The effort became necessary after the California Coastal Commission voted in January 2013 to deny the Coastal Development Permit for construction of an upgraded wastewater treatment plant at its existing location. The existing plant upgrade was the recommended project from the Alternative Site Evaluation completed in 2011.

The site selected for the new water reclamation facility and the associated treatment processes identified will determine the potential for reuse by Morro Bay because of proximity to and water quality limits of potential customers / types of reuse. The 2012 Recycled Water Feasibility Study narrowed the viable potential reuse projects to:

- Non-potable reuse within the City of Morro Bay and Morro Bay Golf Course
- Agricultural irrigation
- Chorro Creek stream enhancement

The current planning effort is expected to be complete by mid-2014 and the next steps for Morro Bay recycled water will be better understood at this time.

4.2 2012 Recycled Water Feasibility Study

The following are the conclusions from the 2012 Recycled Water Feasibility Study (based on the recommendations to upgrade the existing facility):

1. *The potential to offset potable water used for irrigation within the study area is low since less than 20% of the potable supply is used for irrigation purposes and that use is predominantly attributed to residential landscape irrigation which is challenging and expensive to serve with recycled water.*
2. *Any inland discharge within the Morro Valley Groundwater Basin or the Chorro Valley Groundwater Basin will require the development of a Salt and Nutrient Management Plan. The Chorro Basin has objectives relevant to this Study, as defined in the Basin plan, of 500 mg/L for direct recharge, 1,000 mg/L for stream discharge, and nitrogen limits of 10 mg/L. Considering the historic groundwater characteristics in both MVGB and CVGB, even lower salt and nitrogen limits should be expected, indicating the need for advanced water treatment. MBCSD should be prepared to implement demineralization for TDS (and nitrate) control if a recycled water project is pursued.*

3. *Agricultural irrigation offers the largest potential use at an estimated 500 AFY. However, requirements for high quality water (i.e., TDS < 300 mg/L and Cl- < 110 mg/L) results in high production costs, pricing the recycled water out of the competition with other available sources, namely private groundwater wells. Furthermore, discussions with the farmers along the Highway 41 agriculture corridor indicate that although they are interested in the availability of water, the price will be a major factor in participating in a recycled water program. Since the areas of irrigated lands lie outside the sphere of influence of the City of Morro Bay there could be legal and regulatory hurdles to developing this program.*
4. *A landscape irrigation reuse project within [the City of Morro Bay], focused on users in close proximity to the WWTP would not be economically feasible in comparison to alternative water supply options. Costs estimated in this Study exceed the competitive price of alternative water supplies partly due to the assumption that reverse osmosis would be required to meet anticipated Morro Valley Groundwater Basin objectives. If demineralization was determined unnecessary for landscape irrigation near the coast (i.e., no direct impact to potable water beneficial use), then the recycled water production cost would be reduced by nearly 20% to approximately $2,600/AFY.*
5. *A direct reuse program within the Cayucos area is not feasible at this time because the length of conveyance pipelines between the WWTP and Cayucos area. The Morro Bay Cayucos Cemetery is the largest potential user in the area and currently has entitlements to Whale Rock Reservoir that meet its current and future demand, such that there is no real incentive for participation in a recycled water program.*
6. *The feasibility of implementing a Groundwater Recharge Reuse Project (GRRP) is limited due to the physical constraints of the CVGB and MVGB which consist of thin alluvial aquifers that offer only seasonal storage capacity during drier periods. Additionally, the required California Department of Public Health (CDPH) well spacing between injection wells and potable wells may preclude siting a GRRP in either basin. The regulations governing GRRP are in draft form now, but are expected to be adopted soon. The regulations dictate the use of advanced water treatment, at least reverse osmosis and also advanced oxidation in certain circumstances. The cost of advanced water treatment increases the cost of GRRP beyond other options for local source development.*
7. *A stream enhancement project at Chorro Creek could be implemented to maintain a baseline creek discharge of 1.4 cfs, allowing withdrawal of the City's full allocation even during dry seasons. The cost of this project is expected to range between $1,000/AFY and $1,500/AFY if the City were able to extract its full 1,143 AFY allocation. However, considering the City's priority to maximize deliveries of SWP, to offset already committed fixed costs of $2 million per year, it is unlikely that the benefit of additional CVGB withdrawals would compare to the probable project cost.*

5. Pismo Beach

This section includes a summary of Pismo Beach recycled water planning efforts as well as excerpts from recent reports addressing Pismo Beach recycled water use, including:

- City of Pismo Beach 2010 Urban Water Management Plan (Carollo, September 2011)
- Incremental Reclaimed Water Study in The City of Pismo Beach (RRM, March 2008)

- City of Pismo Beach Water Reuse Study (Carollo, May 2007)

5.1 Summary

Pismo Beach completed recycled water planning studies in 2007. Since 2007, recycled water plans have been continually refined as related planning efforts progressed, including the Spanish Springs development, Incremental Reclaimed Water Study (RRM, 2008), and Arroyo Grande Recycled Water Distribution System Conceptual Plan from Pismo Beach WWTP TM (Wallace, 2010). The most recent documentation of Pismo Beach recycled water plans is the Pismo Beach 2010 UWMP (Carollo, 2011).

The 2010 UWMP identified several components to a future system:

- Upgrade the Pismo Beach WWTP to tertiary treatment and disinfection
- Construct distribution system to Price Canyon development for landscape and agricultural irrigation reuse (approximately 340 AFY)
- Construction distribution system to existing Pismo Beach sites for landscape irrigation reuse (approximately 330 AFY)
- Use remaining recycled water (700 in 2015 to 1,300 AFY in 2035) for indirect potable reuse from groundwater recharge via surface spreading or injection to increase groundwater supplies. This project could also be used to prevent seawater intrusion.

Implementation of the initial non-potable reuse system was contingent on implementation of the Spanish Springs development / Price Canyon Specific Plan. The development proposed to fund the WWTP upgrades and the distribution from the WWTP to the development. As of September 2013, a decision by the City Council on approval of the development is delayed until September 2014. Therefore, the next steps for Pismo Beach recycled water are being re-evaluated.

5.2 2010 Urban Water Management Plan

The following are excerpts about recycled water from the 2010 UWMP:

Recycled Water (Section 3.3.2)

In addition to encouraging water conservation practices and implementing conservation measures, the City is particularly motivated to reduce potable water consumption by implementing an extensive recycled water program. Motivated primarily by the water planning efforts of the Price Canyon development, the City recognizes the importance of utilizing recycled water as a valuable resource that will help ensure adequate water supply over the short- and long-term planning period. The City's planned investment in a recycled water program represents the City's commitment to sustainable and responsible water resources planning.

Since the City intends to apply recycled water use to follow the Price Canyon Specific Plan (Specific Plan) implementation, the City may begin regional planning efforts regarding recycled water within the next five years. According to the Specific Plan, recycled water use to offset State Water used for landscape irrigation and groundwater used for irrigation is a key component of the development in Price Canyon. Therefore, progress on implementation of the Specific Plan must coincide with available of recycled water supplies to the Planning Area.

The City has already completed several preliminary studies regarding recycled water opportunities (described in Chapter 4). With these opportunities identified, the City will continue to manage its recycled water planning efforts alongside Specific Plan development. Additional facility planning documents will need to be prepared to fully understand the extent to which the City's recycled water program may be utilized. Nonetheless, the City is committed to employ *recycled water as a beneficial resource to protect and reduce consumption of its potable water resources.*

Projected Recycled Water Use (Section 4.6.5)

The City has prepared several important documents analyzing potential uses of recycled water, including a Water Reuse Study (Carollo Engineers, 2007) and an Incremental Reclaimed Wastewater Study (RRM, 2008). In addition, the City has prepared a Wastewater Collection System Master Plan (Carollo Engineers, 2000) and a Sewer System Master Plan (Carollo Engineers, 2007). As such, the City has developed a detailed and specific understanding of the potential for implementation of recycled water in the community.

The City's 2007 Water Reuse Study identified potential users of recycled water and corresponding demands of recycled water in the community. Table 4.12 describes the potential uses of recycled water.

The Water Reuse Study proposed a two-phase implementation schedule of recycled water upgrades and conveyance system installation. In Phase 1, it was recommended that the Pismo Beach Sports Complex (adjacent to the WWTP) be connected to a recycled water pipeline. The irrigation demand of that sports complex alone is 15.5 AFY (2007 estimate). In Phase 2, it was recommended that the future development project in Price Canyon be connected to the recycled water system.

Since the City intends to apply recycled water use to follow the Specific Plan implementation, the City may begin regional facility planning efforts regarding recycled water within the next five years. Since use of recycled water for landscape and agricultural irrigation is a key component of the Price Canyon development, progress on implementation of the Specific Plan should coincide with availability of recycled water supplies.

Uses of recycled water for the applications listed in Table 4.12 are entirely dependent on the implementation schedule of WWTP upgrade and construction of a recycled water distribution system. Some of the values included in Table 4.12 are for example purposes only, since actual land area estimates for recycled water application have not yet been finalized. Therefore, the values listed are estimated volumes, and were determined assuming gradual implementation of recycled water use in the City. For example, application of recycled water for landscape and commercial irrigation was estimated for each year assuming gradual implementation of 25, 50, 75, and 100 percent of the total projected irrigation volumes over the course of 15 years, starting in the year 2015. In general, the values listed for the year 2035 are ultimate projected recycled water uses, at which point the City may have achieved buildout within its current City limits and substantial growth within the Price Canyon Planning Area.

Total potential recycled water volumes are the same as treated wastewater volumes that meet Title 22 standards (Table 4.9). The City would like to use all of its WWTP effluent for beneficial use within the City.

Limitations for Recycled Water Use (Section 4.6.6)

The City intends to utilize recycled water as a long-term resource to offset potable water use for irrigation, as well as for use in a groundwater recharge and recovery program. Future usage of recycled water is entirely dependent on implementation of the Specific Plan and coinciding implementation of a recycled water delivery system to appropriate locations within the City limits *and Planning Area. Though there is no existing implementation timeline, this is not considered a limiting factor for recycled water implementation because of the City's intentions for long-term resource planning with recycled water.*

However, one primary limitation does exist that may affect the ability of recycled water to be used for certain applications. The City has identified several locations in its wastewater collection system known as "salt hot spots," where seawater may be infiltrating the conveyance pipelines. When seawater infiltrates into the wastewater flows, the salt concentration (measured by total dissolved solids and by electrical conductivity) in WWTP effluent consequently increases. Currently, the salt content of the WWTP effluent exceeds values that are considered suitable for irrigation, and are higher than desirable for use with groundwater recharge.

To mitigate the seawater intrusion into wastewater conveyance system, the City may consider systematic rehabilitation of the low-lying sewers near the Pacific Ocean where salt hot spots occur. In doing so, the City would reduce the salt concentration in wastewater flows to make it more saleable for irrigation and recharge. In addition, influent wastewater flows would be reduced, which would reduce treatment and disposal costs. The City may investigate grant opportunities to assist with future sewer system rehabilitation projects.

Encouraging Recycled Water Use (Section 4.6.7)

Use of recycled water to offset potable water supply is a critical aspect of water resources planning for future development projects and SOI expansion. As such, the City will need to develop a plan for encouraging recycled water use for potential customers. By encouraging recycled water use, the City will establish contracted recycled water users and ensure the long-term conservation of potable water resources.

To encourage use of recycled water, the City may hold educational workshops to inform and involve stakeholders, including developers and business owners in the proposed Price Canyon Planning Area. The City has and will continue to work closely with stakeholders to evaluate recycled water program alternatives and establish long-term contractors for recycled water applications. The City may hold visioning and educational workshops to identify and address stakeholder concerns, to determine stakeholder values and challenges, and to develop public support of recycled water use.

The City will determine the specific methods to encourage use of recycled water as development and implementation of the Specific Plan continues. The City does not currently have developed plans to offer financial incentives or other activities to encourage recycled water use (Table 4.13).

Recycled Water Use Optimization Plan (Section 4.6.8)

The City is motivated to utilize recycled water resources to the maximum extent possible. To do so, the City will consider a variety of applications of recycled water that will optimize use of potable and non-potable water resources.

A primary application of recycled water will be for landscape and agricultural irrigation within the current City limits as well as the new development areas of Price Canyon and LRDM. For existing parks, landscapes, and recreational areas, installation of new recycled water infrastructure will be beneficial in preserving potable water resources, but may be an expensive endeavor depending on location and accessibility of potential reuse locations. The new developments, however, provide the City with the opportunity to incorporate recycled water extensively within the plumbing structure of the community. Utilization of recycled water for *residential, commercial, agricultural, and other landscape irrigation would directly result in hundreds if not thousands of additional acre-feet of potable water available for other required uses, or drought protection, in the City.*

Another potential application of recycled water is groundwater recharge, with the potential dual purpose of sea water intrusion barrier. There may be an opportunity in the future for the City to deliver a portion of its recycled water to recharge basins located in the Grover Beach area. Recharge basins serve to not only enhance groundwater volume for later use, but help protect groundwater resources from water quality impacts by encouraging healthy recharge rates. In addition, as discussed in Sections 4.2.3 and 4.2.4, seawater intrusion is a prevalent issue that has threatened the City's groundwater resources in the past. Within the last few years, the City and surrounding communities have taken measures such as reduced pumping to minimize the potential negative impacts of seawater intrusion. An additional measure that the City may consider to is injection of recycled water into the groundwater aquifers, thereby enhancing availability of groundwater supplies as well as protecting the resource.

Recycled Water (Section 4.7.2)

As described in Section 4.6, the City intends to develop an extensive recycled water program to offset potable water use in the Price Canyon Planning Area, particularly for agricultural irrigation and some residential irrigation. Use of recycled water will require a WWTP upgrade to provide tertiary treatment and disinfection, installation of delivery lines and a pumping station, and seasonal storage for agricultural application. The City is committed to developing a comprehensive and widespread recycled water system that will ultimately reduce stress and reliance on groundwater resources. The projected supply from recycled water is anticipated to start at about 1,450 AFY in 2015, but will be based on treated wastewater volumes and potential WWTP upgrade capacities. The City intends to perform its WWTP upgrades and begin installation of recycled water delivery lines simultaneously with the beginning phases of Specific Plan implementation. Implementation of recycled water use in the Planning Area will serve as a primary alternative irrigation water source during peak seasonal demand, and will offset potable groundwater used for irrigation.

Groundwater Recharge and Recovery (Section 4.7.3)

Once recycled water becomes available for use, the City may consider implementation of a Groundwater Recharge and Recovery Program (GRRP) to augment groundwater supplies. One application of the GRRP may be in association with the Price Canyon development, to enhance groundwater available for private agricultural application. The City may also consider recharge utilizing groundwater percolation basins in the Grover Beach area, closer to its municipal well fields and adjudicated aquifer. Any type of GRRP implemented in this area may also serve a dual purpose as seawater intrusion barrier, which will further protect the City's municipal groundwater resources.

Table 4.14 provides a summary of the future water supply projects for the City. In the case of recycled water and GRRP, the values listed below are hypothetical volumes for example purposes. Actual availability of recycled water for these applications will depend on WWTP upgrades, wastewater flow rates, installation of a "purple pipe" delivery system, and securing of recycled water customers or recharge locations.

5.3 City of Pismo Beach Water Reuse Study

The following are excerpts about recycled water from the 2007 Water Reuse Study:

Conclusions (Chapter 4)

The City of Pismo Beach has sufficient water supply to meet the ultimate build-out needs within the existing City limits. The purpose of this study is to evaluate potential uses of recycled water and the costs associated with providing this service.

The City of Pismo Beach is considering the use of recycled water for irrigation purposes to reduce potable water demand and initiated a recycled water feasibility study to identify potential reuse customers, required wastewater treatment plant upgrades and planning level costs for project implementation.

This feasibility study identified twenty-eight potential reuse customers with the assistance of City staff and site maps. Following conversations with City staff, three of the original sites were deemed impractical for recycled water use. Conceptual city-wide pipe routes were identified for the remaining twenty-five customers. Analysis of these five conceptual layouts revealed far higher costs for connection to recycled water than irrigation with potable water.

Therefore, it was decided that should the City of Pismo Beach wish to pursue use of recycled water for irrigation, localized smaller scale projects should be considered. Two phases were identified as part of the localized recycled water projects.

In the first phase, it is recommended that the Pismo Beach Sports Complex immediately adjacent to the wastewater treatment plant (WWTP) be connected to a recycled water system. This reuse connection requires a 0.15 mgd tertiary filtration upgrade at the plant and connection of the site with a 4-inch 900-foot pipeline. The total estimated cost for the plant reuse upgrades and connection is approximately $2.1 million. The annualized cost for this phase is approximately $137,000 with an average cost per residential/commercial connection of approximately $483, assuming 4,400 connections (i.e., existing residential or commercial wastewater connection).

In the second phase, it is recommended that the new development to the Price Canyon Annexation be connected to recycled water. In order to meet the irrigation demands at this site, the WWTP plant would need to provide tertiary treatment to all of its average flow. The estimated cost for upgrades to the plant and connection of the site to recycled water is approximately $3.28 million. The annualized cost is $3,567 with a cost per connection of approximately $745. Table 4.1 summarizes the costs associated with each phase and provides a summary of annualized costs and cost per connection.

It is also recommended that the City of Pismo Beach consider a reuse ordinance that requires all new developments to consider the use of recycled water for irrigation of common areas and possibly residential irrigation as currently in effect in the City of Windsor's El Dorado and Orange Counties. Incorporation of dual plumbing systems in new developments will then lay the foundation for future use of recycled water at a lower cost and provide alternative mechanisms of potable water conservation. In addition, the City could consider embarking on a public awareness campaign to promote the use of more environmentally friendly water systems. This campaign could help reduce the high chloride concentration of the recycled water.

6. SSLOCSD

This section includes a summary of SSLOCSD recycled water planning efforts as well as an excerpt from the San Luis Obispo County Master Water Plan for SSLOCSD and excerpts from:

- Water Recycling Update Report (Wallace, January 2009)

Other reports with relevant information that are not included in this TM are:

- Water Recycling Progress Report, 2001

6.1 Summary

SSLOCSD completed a recycled water planning study in 2009 (Wallace). In 2010, Arroyo Grande completed a complementary study - Recycled Water Distribution System Conceptual Plan from SSLOCSD WWTP TM (Wallace, 2010). SSLOCSD's current efforts are focused on improving existing system processes to improve effluent quality.

Substantial reuse from SSLOCSD WWTP will require upgrade to tertiary treatment. The 2009 study addressed this upgrade and identified several viable projects:

- Agricultural irrigation
- Stream augmentation (Arroyo Grande Creek)
- Groundwater recharge

Landscape irrigation within SSLOCSD service area was evaluated as part of the study but deemed to not be cost effective. In addition, several steps were identified to substantiate the feasibility of the viable projects. Currently, SSLOCSD is not pursuing implementation of recycled water projects but does consider reuse part of future operations and is considering future tertiary upgrades as part of the current WWTP improvement efforts.

6.2 San Luis Obispo County Master Water Plan

The following are excerpts about recycled water from the San Luis Obispo County Master Water Plan:

SSLOCSD

SSLOCSD Recycled Water Feasibility Study Update. In 2001, the SSLOCSD conducted a recycled water feasibility study, with the assistance of State SRF grant funds. The South San Luis Obispo County Sanitation District (SSLOCSD) provides wastewater services to the Cities of Arroyo Grande and Grover Beach, the community of Oceano, and a small amount of unincorporated County territory.

Presently the SSLOCSD facility has a wastewater treatment capacity of 5.0 MGD (5,600 AFY). The treatment facility currently processes 2.8 MGD (3,136 AF/YR) of wastewater from the service area. Additionally, the City of Pismo Beach shares the use of the effluent outfall line discharging approximately 1.2 MGD in addition to the District's flow. The City of Pismo Beach wastewater plant has a permitted capacity of 1.75 mgd. The updated study, completed in 2008, included "traditional" alternatives to irrigate turf and landscaping with secondary (where allowed) and tertiary effluent. Brief summaries of these additional alternatives are as indicated in the following paragraphs. A summary of costs is presented in Table 2.2 (taken from the Recycled Water Feasibility Study Report in its entirety).

<u>*Stream flow augmentation.*</u> *Tertiary recycled water would be piped to just below*

Lopez Dam, and discharged to Arroyo Grande Creek, thus "freeing up" possibly 4,200 AFY water that must otherwise be released from Lopez Dam for environmental stream flow. Due to projected high chloride levels, the alternative would likely require reverse osmosis treatment or other means of reducing overall TDS and chloride levels.

Agricultural Irrigation. There are approximately 3,000 acres of agricultural land in production, within 3 miles of the SSLOCSD WWTP. Upgrading the plant to produce tertiary 2.2 effluent, and using the recycled water for crop irrigation could utilize most if not all of the effluent produced at the WWTP. Such a project, similar to any large scale recycling project, requires a significant amount of planning, public education and outreach in order to be successful.

Groundwater Recharge/Indirect Potable Reuse. The study evaluated possible well sites that could be used to re-inject highly treated recycled water in the groundwater basin, in compliance with CDPH groundwater regulations. Such water, after adequate residence time, and meeting the total organic carbon requirements, could be withdrawn from the aquifer thus increasing the well production currently limited in the Five Cities area.

Table 2.2 – Summary of Costs, SSLOCSD Recycled Water Alternatives

Alternative	Capital Cost ($)[a,b]	Cost ($/AFY)[c]
1-1. Turf Irrigation in SSLOCSD service area south of Hwy 101	$16,000,000	$11,600
1-2. Turf Iffigation, SSLOCSD and expanding north of Hwy 101	$19,000,000	$12,000
2. Direct Crop Agricultural Irrigation	$23,000,000	$1,200 to $1,400[d]
3-1. Stream Augmentation/ Tertiary Effluent	$15,000,000	$4,200
3-1. Stream Augmentation/ MF-RO Process Water	$30,000,000	$1,500 to $1,700[d]
4. Indirect Potable Reuse	$38,000,000	$1,700 to $2,000[d]

6.3 SSLOCSD Water Recycling Update Report

The following are excerpts about recycled water from the 2009 Water Recycling Update Report:

Proposed Project Description

The recommended "project" and course of action for the City of Arroyo Grande and Grover Beach to endeavor, is a recycled water project that will augment potable water supplies in an amount up to 2,300 AFY (or more, in later years), thus augmenting current potable water shortfalls anticipated for existing build-out water demands. It is evident from the Chapter 6 evaluation that turf irrigation alone, is not economically viable, nor does it achieve the required water supply goals. Incidental turf irrigation that may be "convenient" to implement, in conjunction with the recommended recycled water project or projects, should still be considered. Stream augmentation in Arroyo Grande Creek could be viable, but there are uncertainties with environmental and regulatory issues, and possibly emerging contaminants such as endocrine disrupters.

It is recommended that the Cities of Arroyo Grande and Grover Beach pursue a joint project that will provide up to 2,300 AFY recycled water to offset current potable water groundwater withdrawals from the local aquifer. Although beyond the scope of this study, it may also be *prudent to discuss such projects with the City of Pismo Beach, and possibly other water agencies in this area, to band together to consider a regional recycled water project. An economically attractive project can be accomplished by the City of Arroyo Grande and Grover Beach alone. However, any joint efforts with other local agencies can further enhance the economic viability of such a project, and can position the project proponent more favorably with grant funding agencies (see Title XVI discussion that follows). A full-scale direct agricultural irrigation project, possibly in combination with an indirect potable water (groundwater recharge) project, is cost-favorable when compared to other potable water supplies (local, or imported) in the region.*

For the purposes of considering a full-scale agricultural irrigation and indirect potable water program, to include local crop irrigation, aquifer recharge, seawater barrier protection, it is recommended that a plant upgrade at the SSLOCSD WWTP include a microfiltration plant (following secondary treatment), reverse osmosis demineralization, and advanced oxidation process (AOP) by ultraviolet light. This process train, similar to that of the Orange County Groundwater Replenishment Plant, would allow the most flexibility with the recycled water project, allowing regulation of the degree of RO treatment to enhance water quality for crop irrigation, and maximizing RO treatment to benefit direct injection or recharge to the aquifer (with the minimum requirements for detention and blending with the aquifer water). This plant would be capable of providing superior quality water for direct crop irrigation (thus helping "sell" the recycled water program to area growers), and will allow the flexibility to blend the highly treated water with tertiary water for a high quality blend of product water that will still be of equal or better quality than local groundwater.

Project costs were presented in Chapter 6. *Based on a review of alternatives, a full-scale direct crop irrigation program using recycled water from the SSLOCSD WWTP, can be implemented for $1,200 to $1,400 per AF. A full-scale indirect potable reuse (IPR) project can be implemented for $1,800 to $2,000 per AF. Funding opportunities are likely to become more and more favorable in the coming months, as California strives to develop additional recycled water projects state-wide.*

Near-Term Recommendations

The following recommendations should be considered:

- *Conduct additional feasibility studies to address hydrogeologic issues relative to aquifer recharge. This study is needed to define the locations suitable for injection or spreading basins, and to consider well locations for possible seawater barrier protection. The costs for this study could be covered under Title XVI grant funding, or possibly State CSWRF grant program.*
- *Begin the process of requesting Title XVI federal funding by formulating a project description, and letter of interest. Title XVI can provide funds for 50% of feasibility study costs, and overall 25% grant funds for the project as a whole. Prepare a recycled water feasibility study report, which essentially is this report modified to conform to Title XVI requirements. It is expected this additional effort would be minimal.*
- *Develop a conceptual design for the recycling plant and distribution system, including at a minimum, the alternative for direct crop irrigation. If the hydrogeologic assessment proves favorable, and if desired by the Agencies, include aquifer recharge for indirect potable reuse.*

- *Begin developing a public outreach/education program/plan, to solicit input from the community, local water purveyors, local growers, and environmental interest groups such as the Surfriders Foundation.*
- *Coordinate with Regional and State Boards, and develop the project description in sufficient detail to secure a spot on the State-wide priority list for State low interest (SRF) funding. Such loan funding can then supplement potential grant monies received by the Federal Government.*

7. Arroyo Grande

This section includes a summary of Arroyo Grande recycled water planning efforts as well as excerpts from:

- City of Arroyo Grande 2010 Urban Water Management Plan (January 2012)
- Recycled Water Distribution System Conceptual Plan - SSLOCSD WWTP TM and Recycled Water Distribution System Conceptual Plan - Pismo Beach WWTP TM (Wallace Group, June 2010)

Note that Arroyo Grande is a member of the SSLOCSD and, therefore, the city is an important part of SSLOCSD reuse opportunities.

7.1 Summary

Arroyo Grande completed two recycled water planning studies in 2010 (Wallace) evaluating reuse options within the city from two proximate WWTPs. The SSLCOSD WWTP study built upon the 2009 SSLOCSD Water Recycling Update Report (Wallace). The studies evaluated reuse with and without WWTP tertiary upgrades. Use of existing effluent from either WWTP limited reuse to one or two customers. The tertiary upgrade expanded the non-potable reuse potential but neither study identified cost effective non-potable reuse projects from either WWTP.

The city's most recent statement on recycled water are in the 2010 UWMP, which states that recycled water is currently not cost effective but pursuit of grant funding could make a project cost effective. Even if reuse within city limits is not cost effective, Arroyo Grande is also supportive of regional reuse.

7.2 2010 Urban Water Management Plan

The following are excerpts about recycled water from 2010 UWMP:

Supplemental Water Sources (Section 3.4)

The City has completed multiple studies of potential supplemental water supply sources including an extension of the Nacimiento Pipeline, desalination, and recycled water. Based on the results of these studies, an extension of the Nacimiento Pipeline and desalination are not feasible or cost-effective at this time or within the timeline of this UWMP. Based on the recycled water studies, the City determined recycled water is not currently cost-effective. The City plans to pursue grant funding to make recycled water cost-effective as described in Section 6.16. In order to meet total projected water use, as well as offset potential future water shortages due to drought or disaster, the City is considering the following supplemental water supplies.

Potential Recycled Water Demands (Section 6.16.2)

South San Luis Obispo County Sanitation District (SSLOCSD) Opportunities

The June 2010 SSLOCSD WWTP Technical Memorandum listed previously identified and evaluated recycled water opportunities for the City. One near-term opportunity outlined in the report was to use Disinfected Secondary-23 Recycled Water (Secondary-23) effluent to irrigate the Arroyo Grande Cemetery and Caltrans median along Highway 101. The amount of water that could be saved annually from using Secondary-23 effluent on the Cemetery and Caltrans median is 41.9 AFY and 15.7 AFY respectively. However, while Caltrans prefers to use nonpotable water for landscaping, current policy allows only tertiary treated water for irrigation. Future negotiations will commence to determine if Caltrans can accept SSLOCSD Secondary-23 water.

Also discussed in the study was the potential for future recycled water use if the SSLOCSD WWTP were upgraded to provide tertiary treatment. By providing tertiary treatment, recycled water use would no longer be limited to cemeteries, restricted access golf courses, freeway landscaping and other uses with limited human interaction. Tertiary treated recycled water that complies with Title 22 requirements could be applied to public parks, playgrounds, schoolyards, direct use on food crops, and other uses. The potential demand for tertiary treated recycled water within the City's water service area is 189.7 AFY. The potential sites would include parks, schools, a sports complex, and a K-Mart Center (8).

The City could collaborate with the SSLOCSD and other interested NCMA agencies to use secondary effluent for median and cemetery irrigation as described above, and/or participate in a broader recycled water program if SSLOCSD were to upgrade to tertiary treatment. If SSLOCSD were to upgrade its facility to provide tertiary treatment, the timing and extent of the treatment requirements should be considered concurrently with the development of a recycled water program.

City of Pismo Beach Wastewater Treatment Plant Opportunities

The City of Pismo Beach UWMP states that the City of Pismo Beach is "committed to employ recycled water as a beneficial resource to protect and reduce consumption of its potable water resources" and that "the City may begin regional planning efforts regarding recycled water within the next five years" (34). The City of Pismo Beach plans to upgrade its WWTP to provide an anticipated recycled water supply of 1,558 AFY in 2015 (34). This supply is an estimate and has not been finalized, but provides an idea of the amount of recycled water that could be available. The City of Pismo Beach UWMP describes that the recycled water not used for irrigation near the WWTP and in the Price Canyon development area "may be applied towards groundwater recharge operations" (34). The Pismo Beach WWTP outfall pipeline passes relatively close by the City. If the City of Pismo Beach were to produce excess recycled water, the City could utilize the recycled water for irrigation demand, and/or work with interested NCMA agencies to apply the recycled water for groundwater recharge within the NCMA.

Summary of Potential and Projected Recycled Water Uses and Quantities

Table 6-10 provides a summary of potential recycled water including the estimated tertiary demand discussed in the SSLOCSD Opportunities section as well as an estimated potential from the City of Pismo Beach. Potential recycled water from SSLOCSD is assumed to equal a maximum amount of recycled water use based on average annual demands from 2007-2009 for potable water from customer use types that can accept recycled water. Potential sources of recycled water from the City of Pismo Beach are assumed to equal the amount of recycled *water identified in the Groundwater Recharge line item of Table 4.12 of the City of Pismo Beach 2010 UWMP.*

Participation in a Regional Recycled Water Program

The City is committed to participating in a regional effort to utilize recycled water, and will continue to participate in a dialogue between regional agencies interested in a recycled water program (including but not necessarily limited to the NCMA agencies). Ultimately, the City envisions working with those agencies to conceptualize, prioritize, fund and implement a preferred set of regional recycled water projects that benefit the City, as well as the NCMA as a whole.

7.3 Recycled Water Distribution System Conceptual Plans

The following are excerpts about recycled water from the Recycled Water Distribution System Conceptual Plans:

Introduction

The City of Arroyo Grande (City) requested a focused analysis to identify and evaluate project opportunities for a recycled water distribution system to provide irrigation water to existing potable water customers. The City of Arroyo Grande has identified the need for approximately 750 acre-feet per year (AFY) of new water supply and/or reduced potable water demand to meet the City's build-out water demands. This analysis focused on the following method of supplying irrigation water:

1. *Connect to a future recycled water distribution system that provides Secondary-23 recycled water from the City of Pismo Beach wastewater treatment plant.*
2. *Provide secondary treated recycled water from the existing SSLOCSD treatment plant.*
3. *Connect to a future recycled water distribution system that provides recycled water from the existing SSLOCSD treatment plant.*
4. *Provide reclaimed stormwater from an onsite collection and distribution system, similar to the City's Soto Sports Complex stormwater irrigation system.*

Recommendations

Project recommendations are based on the City's near-term goal of decreasing potable water consumption by a minimum of 100 AFY in the next five years and the long-term goal to augment potable water supply by 750 AFY to meet build-out demands. Near-term recommendations are based on the assumption that the Cities of Arroyo Grande and Pismo Beach will implement a tertiary recycled water project in the future. A secondary recycled water alternative as a stand-alone project is not economically viable. Project recommendations are based on annualized project cost in terms of cost per acre foot of recycled water, and potential to expand to future recycled water customers. It is recommended that the Cities of Pismo Beach and Arroyo Grande pursue the following near-term projects:

- *Enter into an agreement, to construct and implement a recycled water distribution system to deliver Secondary-23 recycled water for irrigation purposed, from the City of Pismo Beach Treatment Plant to Arroyo Grande, within the next 5 years.*
- *Start a public awareness and education program, to promote the use of recycled water for suitable purposes as a means of maintaining water supply stability in the region.*

- *Pursue inspection and testing of the abandoned Conoco Phillips pipeline in 4th Street and Grand Avenue, and if suitable for water delivery, prepare a cost analysis to determine if purchase of this pipeline would result in cost savings compared to constructing a new pipeline. Dependent on alignment chosen, this pipeline may not be utilized for the Secondary-23 distribution system, but may be used in the future to expand the recycled water distribution system for tertiary service.*

Upgrading the City of Pismo Beach treatment plant to provide tertiary treated effluent would allow for a significantly increased recycled water delivery volume, most likely resulting in a much lower project cost in terms of cost per acre foot delivered. In addition, implementing a distribution system for tertiary treated water would avoid design considerations for a secondary system to be constructed and converted to tertiary in the future.

<u>*Long Term Projects*</u>

It is recommended that the City of Arroyo Grande, in coordination with the City of Grover Beach and the City of Pismo Beach, consider pursuit of the following long-term projects:

- *In conjunction with the City of Pismo Beach, upgrade the City of Pismo Beach WWTP to provide tertiary 2.2 recycled water, and expand the landscape irrigation system to serve landscape customers in the Cities of Arroyo Grande, Grover Beach and Pismo Beach.*

8. Grover Beach

This section presents a summary of Grover Beach recycled water planning efforts as well as:

- Grover Beach 2010 Urban Water Management Plan (June 2011)

Note that Grover Beach is a member of the SSLOCSD and, therefore, the city is an important part of SSLOCSD reuse opportunities.

8.1 Summary

Grover Beach participated in the Arroyo Grande Recycled Water Distribution System Conceptual Plans (Wallace, 2010) and SSLOCSD Water Recycling Update Report (Wallace, 2009). As discussed in the previous sections, the studies identified cost effective non-potable reuse projects within the city from either WWTP.

The city's most recent statement on recycled water are in the 2010 UWMP, which states that recycled water is currently not cost effective but that pursuit of a large agricultural reuse project may be feasible.

8.2 2010 Urban Water Management Plan

The following are excerpts about recycled water from the 2010 UWMP:

Recycled Water (page 11)

The City of Grover Beach does not currently use recycled water as a primary water source. The completed feasibility study mentioned under Water Sources (Supply) in this report indicates the possible use of this option to help recharge Arroyo Grande Creek. The Water Recycling Conceptual Plan was updated in June 2010 by Wallace Group for the SSLOCSD and is summarized in the next paragraphs as applicable to the City of Grover Beach.

<u>*SSLOCSD WWTP*</u>

In 2008, a comprehensive study (update to 2001 recycled water feasibility study) was prepared to evaluate the feasibility of various recycled water applications including turf irrigation, stream augmentation/environmental demand, indirect potable reuse/groundwater recharge, and agricultural irrigation. The market assessment covered turf irrigation predominantly in the City of Arroyo Grande and Grover Beach areas and focused on agricultural irrigation potential in Oceano. In 2009, a supplemental study was conducted to evaluate the feasibility of a focused secondary effluent reuse project to irrigate a local City of Arroyo Grande cemetery and freeway median landscaping. The study reviewed options to serve these secondary reuse sites from the SSLOCSD WWTP and/or the City of Pismo Beach WWTP.

It was estimated that a turf irrigation program alone would cost on the order of $8,000 per AF (on a life cycle basis), and up. Stream augmentation in Arroyo Grande Creek was expensive, and infeasible due to environmental/permitting constraints, and water quality issues that would require the addition of a reverse osmosis treatment system to comply with instream chlorides and TDS quality. Indirect potable reuse/groundwater recharge was estimated to be expensive, and may have considerable hurdles with public perception, and complex permitting to meet California Department of Public Health requirements. Of the various alternatives considered, one alternative appears to be viable for future implementation if done on a large scale. This would be the implementation of a large-scale tertiary recycled water program for crop irrigation in the nearby Oceano area. This program would be modeled after the successful program in Monterey County. This program cost was still estimated to be quite expensive at $4,900 per AF; however, if implemented in phases over time, the project could prove to be viable.

9. Oceano CSD

Note that Oceano CSD is a member of the SSLOCSD and, therefore, the district is an important part of SSLOCSD reuse opportunities.

10. NCSD

This section presents a summary of Nipomo CSD recycled water planning efforts as well as excerpts from:

- Nipomo CSD 2010 Urban Water Management Plan (WSC, June 2011)
- Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, January 2009)
- Nipomo Mesa Management Area (NMMA) – 2012 Annual Report (NMMA Technical Group, April 2013)

Other reports with relevant information that are not included in this TM are:

- Supplemental Water Alternatives Evaluation Committee – Alternative Evaluation Draft Final Report (February 26, 2013)
- Southland WWTP WDR Permit (CCRWRCB, 2012)
- Southland WWTP Master Plan, Amendment #1 (AECOM, August 2010)
- Southland WWTP Master Plan (AECOM, January 2009)
- Water and Sewer Master Plan Update (Cannon, 2007)

10.1 Summary

Nipomo CSD completed a recycled water study for the Southland WWTP in 2009 as part of the larger master planning and design effort to upgrade the WWTP. The district is currently preparing an updated master plan for the Blacklake WWTP. Both plants currently maximize reuse. Blacklake WWTP effluent is reused for irrigation at Blacklake Golf Course. Southland WWTP is percolated into the underlying groundwater basin and these flows are included in the Nipomo Mesa Management Area water balance.

The 2009 study identified potential direct non-potable reuse opportunities at district parks and regional golf courses with two additional treatment step options: 1) add tertiary treatment; and 2) pump percolated water with soil aquifer treatment credit. The potential Southland WWTP reuse projects have not been pursued due to the existing benefits of effluent percolation.

10.2 2010 Urban Water Management Plan

The following are excerpts about recycled water from the 2010 UWMP (WSC, 2011):

Recycled Water Use Optimization (Section 6.5)

The alternatives for recycling or discharging the treated water from the Southland WWTF were analyzed in AECOM's Preliminary Screening Evaluation of Southland Wastewater Treatment Facility Disposal Alternatives, 2009 and irrigation was evaluated as part of the Evaluation of Supplemental Water Alternatives study conducted by Boyle Engineering Corporation in 2007. The study determined the use of recycled water as a substitute for irrigating with well water resulted in a small decrease in the net water extracted from the groundwater basin. Use of recycled water to augment the aquifer was also studied. This alternative resulted in no increase in supply to the District. The District does plan to eventually carry out tertiary treatment and is analyzing tertiary treatment as part of the EIR for Southland WWTF currently being developed.

Implementation of the Recycled Water Plan (Section 8.2)

The Recycled Water Plan included in this UWMP is being implemented as planned. The current use of recycled water is the furthest extent to which the District will pursue recycled water uses at this time. The District conducted an Evaluation of Southland WWTF Disposal Alternatives and concluded it was not economically feasible to increase the use of recycled water at this time (22). However, tertiary treatment is currently being analyzed in the Southland WWTF EIR.

10.3 Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives

The following are excerpts about recycled water from the Preliminary Screening Evaluation of Southland WWTF Disposal Alternatives (AECOM, 2009):

Reuse and Disposal Alternatives (Section 4)

There are two general categories of end-use options for treated wastewater: reuse and disposal. Reuse refers to using the treated wastewater for another beneficial use. Examples of this include landscape and agricultural irrigation, water supply for impoundments (fish hatcheries or recreational lakes), water supply for industrial and commercial cooling towers and air conditioning, groundwater recharge, dust control on roads and streets, decorative fountains, and many others. Disposal refers to discarding the treated wastewater without the intention of using it again. The most common methods of effluent disposal are discharging to water bodies and land application via percolation or sprayfields.

Four approaches are considered viable for reuse or disposal of treated wastewater from the Southland Wastewater Treatment Facility (WWTF):

- *Percolation with basins is the simplest approach from a regulatory perspective and is the existing method of disposal. Treated wastewater percolates from basins into the ground, eventually finding its way to groundwater aquifers. Treatment standards and monitoring requirements are set by the Regional Water Quality Control Board (RWQCB) to protect groundwater resources.*
- *Percolation with a subsurface system involves percolation below ground surface instead of through open ponds. Instead, either perforated pipes or a subsurface chamber with a permeable bottom is built to receive the treated wastewater, and hold it as it percolates. RWQCB regulates this disposal method.*
- *Irrigation with recycled water involves treating the wastewater to required standards, followed by delivery to the intended customer for irrigation of landscape or agricultural products. Treatment standards are set by the California Department of Public Health (CDPH) and the RWQCB and depend on the irrigated product and potential for public contact.*
- *Groundwater recharge also involves additional treatment, plus requirements for dilution water and groundwater monitoring. Regulatory requirements are more stringent than for the other approaches. The recycled water can be re-introduced through percolation, or via direct injection into the receiving aquifer. Due to the need for dilution water or a high level of treatment (such as reverse osmosis) this alternative is not considered feasible. However, groundwater recharge can increase a water purveyor's ability to withdraw water from an adjudicated basin or to withdraw water in excess of their water rights, if they have permit limitations.*

Previous Studies (Section 5)

The use of recycled water for irrigation was analyzed as part of the Evaluation of Supplemental Water Alternatives study conducted by Boyle in 2007. As part of that study a preliminary water budget was analyzed to estimate the impact of this approach on groundwater resources. Those results indicated that using recycled water as a substitute for irrigating with well water resulted in a very small decrease in the net water extracted from groundwater resources.

Additionally, use of recycled water to recharge the aquifer was also studied. This alternative would result in no increase in "supply" to the District under the terms of the legal settlement. Southland WWTF discharge was included in the groundwater budget that has been presented during litigation involving the Santa Maria Valley Groundwater Basin aquifers. (i.e., WWTF groundwater recharge is already considered as "return flows" to the aquifer).

The Water and Sewer Master Plan Update and Evaluation of Supplemental Water Alternatives identified possible routes and general locations for pipelines, percolation facilities, and irrigation areas that would most directly.

Conclusions and Recommendations (Section 9)

This screening memorandum is presented to help identify alternatives with "fatal flaws", and assist the District determine which alternatives to investigate further. It is not a comprehensive analysis of disposal alternatives; rather the study relied on existing information and identified areas that needed further study. The analysis revealed several information gaps.

During the course of further investigation, the District may discover prohibitive issues with one or more of the alternatives. The following alternatives are recommended for further investigation based on the analysis contained herein.

Infiltration Alternatives

- *Alternative 1: Infiltration at the Pasquini Property*
- *Alternative 4: Infiltration at the Kaminaka Property*

Irrigation Alternatives

- *Alternative 5B: Irrigation of landscape (Blacklake, Woodlands, the Community Park, and others) with percolation at Southland and pumping to users*
- *Alternative 8B: Irrigation of agricultural lands near Southland WWTF, with percolation at Southland and pumping to users*

10.4 Nipomo Mesa Management Area – 2012 Annual Report

The following are excerpts about recycled water from the NMMA 2012 Annual Report (NMMA Technical Group, 2013):

Wastewater Discharge and Reuse (Section 3.1.10)

Five wastewater treatment facilities (WWTF) discharge treated effluent within the NMMA: the Southland Wastewater Facility (Southland WWTF), the Blacklake Reclamation Facility (Blacklake WWTF), Rural Water Company's Cypress Ridge Wastewater Facility (Cypress Ridge WWTF), the Woodlands Mutual Water Company Wastewater Reclamation Facility (Woodlands WWTF). The Golden State Water Company iron and manganese removal treatment facilities at La Serena and Osage groundwater production wells discharge filter backwash to percolation ponds. The total wastewater discharge in the NMMA was 798 AF for calendar year 2012 (Table 3-7).

Table 3-7. 2012 Wastewater Volumes

WWTF	Influent (AFY)	Effluent (AFY)	Reuse
Southland	727	639	Infiltration
Blacklake	61.9	52	Irrigation
Cypress Ridge	69.2	50	Irrigation
Woodlands	Not Reported	52	Irrigation
La Serena	Not Applicable	5	Infiltration
Osage	Not Applicable	2	Infiltration
Total		**800**	

Recycled Water (Section 4.1.2)

Wastewater effluent from the golf course developments at Blacklake Village, Cypress Ridge, and Woodlands is recycled and utilized for golf course irrigation. The amount of recycled water used in calendar year 2012 for irrigation at Blacklake Village, Cypress Ridge and Woodlands are 52 AF, 50 AF, and 52 AF, respectively (see Section 3.1.10 Wastewater Discharge and Reuse).

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Appendix B: Recycled Water Regulatory, Permitting, and Legal Requirements TM

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TECHNICAL MEMORANDUM

August 25, 2014

To: Rob Morrow, Cannon

From: Margaret H. Nellor, P.E., Nellor Environmental Associates, Inc.

Project: **County of San Luis Obispo Regional Recycled Water Strategic Master Plan**

Subject: **Regulatory, Permitting, and Legal Requirements for Recycled Water**

1. Introduction

The Regional Recycled Water Strategic Plan (RRWSP) is one of the components of an update to the San Luis Obispo Region Integrated Regional Water Management (IRWM) Plan that is being funded pursuant to a Round 2 IRWM Regional Planning Grant from the California Department of Water Resources. Multiple agencies are working together to complete the studies to investigate the feasibility of implementing recycled water programs within their services areas to diversify their water supply portfolios, reduce reliance on surface water, eliminate discharge of treated wastewater to the ocean, and reduce conflicts associated with limited regional water sources. The participating agencies are:

- Templeton Community Services District (TCSD).
- City of Morro Bay.
- City of Pismo Beach.
- South San Luis Obispo County Sanitation District (SSLOCSD)
    - City of Grover Beach.
    - Oceano Community Services District (OCSD).
    - City of Arroyo Grande.
- Nipomo Community Services District (NCSD).

This Technical Memorandum (TM) identifies the regulatory, permitting, and legal requirements for implementing non-potable and potable water reuse projects. Surface water discharge requirements, which could be more stringent, are addressed in a separate TM[1].

This TM is organized into the following sections:

- Overview of Legal and Regulatory Requirements for Water Reuse.
- California Division of Drinking Water Non-Potable Reuse Regulations.
- California Division of Drinking Water Groundwater Replenishment Regulations.
- Status of California Division of Drinking Water Recycled Water Criteria for Surface Water Augmentation.
- State Water Resources Control Board Policies.
- Regional Water Quality Control Board Requirements.
- Permitting Water Reuse Projects.
- Acronyms.

[1] Regulatory and Permitting Requirements for Discharge to Surface Waters TM.

2. Overview of Legal and Regulatory Requirements for Water Reuse

The use of recycled water (potable and non-potable) is regulated under the Clean Water Act when applicable (when a project involves a discharge to a Water of the U.S.), the Safe Drinking Water Act, and several State laws, regulations, and policies, with different responsibilities assigned to the State Water Resources Control Board (SWRCB), the nine Regional Water Quality Control Boards (RWQCBs), and the SWRCB Division of Drinking Water (DDW), formerly the California Department of Public Health (CDPH).[2]

The California Water Code (CWC) and Health and Safety Code (H&SC) contain California's statutes that regulate the use of water and the protection of water quality, public health, water recycling, and water rights. The key statutes that are relevant to water recycling are presented in **Table 1**. A complete compendium is available on the DDW website.[3]

Table 1. Key California Statutes for Protection of Water Quality and Public Health

Code	Purpose
Water Rights	
CWC section 1210-1212	Requires that prior to making any change in the point of discharge, place of use, or purpose of treated wastewater, approval must be obtained from the SWRCB.
Recycled Water Definitions	
CWC sections 13050, 13512, 13576, 13577, 13350, and 13552-13554	Recycled water is defined in the CWC as water, which as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and therefore considered a valuable resource.
CWC sections 13561	Defines direct potable reuse, and indirect potable reuse for groundwater recharge (GWR) and surface water augmentation.
Water Quality	
CWC section 13170	Authorizes the SWRCB to adopt State policies for water quality control.
CWC sections 13240-42	Authorizes RWQCB to adopt Water Quality Control Plans (Basin Plans) that assign beneficial uses for surface waters and groundwaters, and contain numeric and narrative water quality objectives that must provide reasonable protection of the beneficial uses of the groundwater. One of the factors that must be considered when establishing water quality objectives is the need to develop and use recycled water. Basin Plans must include a program of implementation for achieving the water quality objectives. For the RRWSP study area, the Central Coast RWQCB's Basin Plan applies.[4]
H&SC sections 116270 et seq.	This is the California Safe Drinking Water Act that authorizes primary and secondary maximum contaminant levels (MCLs) as included in the California Code of Regulations, Title 17 – Public Health, Chapter 5, Subchapter 1, Group 4 – Drinking Water Supplies, sections 7583 through 7630.[5]
H&SC section 116455	Requires public water systems to take certain actions if drinking water exceeds Notification Levels (NLs). NLs are health-based advisory levels established by the DDW for chemicals in drinking water that lack MCLs. When chemicals are

[2] Effective July 1, 2014, the California Department of Public Health Drinking Water Program (including recycled water responsibilities) was transferred to the SWRCB and named the Division of Drinking Water.
[3] See http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/RWregulations_20140618.pdf (accessed 8/25/14).
[4] See http://www.waterboards.ca.gov/rwqcb3/publications_forms/publications/basin_plan/ (accessed 2/18/14).
[5] See http://www.cdph.ca.gov/certlic/drinkingwater/Pages/default.aspx (accessed 2/18/14).

Code	Purpose
	found at concentrations greater than their NLs, certain requirements and recommendations apply.[6]
Recycled Water Permits	
CWC sections 13260, 13263, 13269, 13523.1	Dischargers proposing to discharge waste that could affect the quality of waters of the state must file a report of waste discharge to the RWQCB. After receiving this report, the RWQCB can issue specific or general Waste Discharge Requirements (WDRs) and/or Water Recycling Requirements (WRRs) that reasonably protects all beneficial uses and that implement any relevant water quality control plans and policies. The Central Coast RWQCB has not issued general recycling permits. The RWQCB can also issue a Master Reclamation Permit, which is a WDR that covers multiple non-potable reuse applications and requires periodic site inspections and adoption of rules and regulations for recycled water use. A RWQCB may require a discharger to provide monitoring program reports or conduct studies.
CWC section 13263.7	For compliance with permit limits, the release or discharge of recycled water suitable for direct potable reuse or surface water augmentation may be determined at the point where the recycled water enters the conveyance facility but prior to co-mingling with any raw water and consent for the discharge is obtained from the owner of the conveyance facility.
CWC section 13552.5	Authorizes the SWRCB to adopt General Waste Discharge Requirements for Landscape Irrigation Uses of Municipal Recycled Water to streamline tertiary disinfected recycled water use. The General Permit was adopted in 2009; in 2014 the SWRCB adopted a new General Permit that supersedes this permit and covers all non-potable reuse applications (see **Section 6.1**.[7]
H&SC section 116551	The DDW cannot issue a permit to a public water system or amend an existing permit for the use of a reservoir as a source of supply that is directly augmented with recycled water unless DDW (1) performs an engineering evaluation that evaluates the proposed treatment technology and finds that the technology will ensure that the recycled water meets MCLs and poses no significant threat to public health; and (2) holds at least three public hearings in the area where the recycled water is proposed to be used or supplied for human consumption.
H&SC section 116271	Effective July 1, 2014 transfers the CDPH Drinking Water Program to the SWRCB, including water reclamation and direct and indirect potable reuse; creates the Deputy Director of the new SWRCB DDW.
CWC section 13528.5	Effective July 1, 2014, the SWRCB may carry out the duties and authority granted to a RWQCB pursuant to Chapter 7 of the CWC (Water Reclamation sections 13500 – 13557, which include issuing potable reuse permits).
Recycled Water Regulations	
CWC sections 13500-13529.4; H&SC 116800 et seq.	Requires DDW to establish uniform statewide recycling criteria. DDW has developed these criteria for non-potable reuse and GWR and they are codified in Title 22 of the California Code of Regulations; regulations for cross connections are codified in Title 17. Additional information on non-potable reuse regulations is presented in **Section 3**. More detailed information on the GWR Regulations is presented in **Section 4**.
CWC section 13540	Prohibits the use of any waste well that extends into a water-bearing stratum that is, or could be, used as a water supply for domestic purposes; injection

[6] See http://www.cdph.ca.gov/certlic/drinkingwater/Pages/NotificationLevels.aspx (accessed 8/25/14).
[7] See http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2014/wqo2014_0090_dwq_revised.pdf (accessed 8/25/14).

Code	Purpose
	wells or vadose zone wells used for recharge are part of this category (injection wells or vadose zone wells are considered waste wells under the CWC). An exception can be provided if (1) the RWQCB finds that water quality considerations do not preclude controlled recharge by direct injection, and (2) DDW finds, following a public hearing, that the proposed recharge will not degrade groundwater quality as a source of domestic water supply. This section of the CWC also allows DDW to make and enforce regulations pertaining replenishment of recycled water using injection wells.
CWC sections 13522.5 and 13523	Requires any person who proposes to recycle or to use recycled water to file an Engineering Report with the RWQCB on the proposed use. After receiving the report, and consulting with and receiving recommendations from DDW, and any necessary evidentiary hearing, the RWQCB must issue a permit (WDRs and/or WRRs) for the use.
CWC sections 13562-13563	Requires DDW to adopt uniform water recycling criteria for GWR by June 30, 2013 as emergency regulations, and for surface water augmentation by December 31, 2016; and requires DDW to investigate the feasibility of developing criteria for direct potable reuse and to provide a final report on that investigation to the Legislature by December 31, 2016. By February 14, 2015, DDW must convene an expert panel to advise DDW on water recycling criteria for surface water augmentation and the feasibility of direct potable reuse. More detailed information on the GWR Regulations is presented in **Section 4**.

3. California Division of Drinking Water

3.1. DDW Non-potable Reuse Regulations

The non-potable reuse criteria in Title 22 establish levels of treatment and use area requirements for irrigation, recreational impoundments, cooling water, and other uses, such as toilet flushing, commercial car washing, laundries, and decorative fountains, as well as use area requirements. Regulations pertaining to backflow prevention are codified in Title 17. A compendium of applicable regulations is available on the DDW website.[8] In general, the higher the degree of public contact with recycled water, the higher the level of treatment required as shown in **Table 2**. The uses highlighted in Table 2 represent some of the non-potable applications being considered by the RRWSP participants to illustrate the *minimum* level of treatment that would be required.

Table 2. Summary of Title 22 Criteria for Non-potable Reuse

Type of Recycled Water	Treatment	Summary of Approved Uses[1]
Disinfected Tertiary Recycled Water	Oxidation, filtration[2], disinfection[3,4,5]	***Irrigation***: food crops (including root crops, where the edible portion contacts recycled water), parks and playgrounds, school yards, residential landscaping, unrestricted access golf courses; ***Impoundments:*** non-restricted recreational impoundments; ***Industrial:*** industrial or commercial cooling or air conditioning (use cooling tower, evaporative condenser, or spray), industrial process water that may come into contact with workers; ***Other:*** flushing toilets and urinals, priming drain traps, structural fire fighting, decorative fountains, commercial laundries, consolidation of backfill around potable water pipelines, artificial snow making for commercial outdoor use, commercial car washes (no public contact with washing), all uses for lower levels of recycled water treatment
Disinfected Secondary-2.2 Recycled Water	Oxidation, disinfection[5]	***Irrigation***: food crops (where the edible portion is above ground and not contacted by recycled water); ***Impoundments:*** restricted recreational impoundments; ***Other:*** fish hatcheries with public access, all uses for lower levels of recycled water treatment
Disinfected Secondary-23 Recycled Water	Oxidation, disinfection[6]	***Irrigation:*** cemeteries, freeway landscaping, restricted access golf courses, ornamental nursery stock and sod farms (unrestricted access), pasture for animals producing milk for human consumption, any nonedible vegetation (controlled access), orchards and vineyards (edible portion)[7]; ***Impoundments:*** landscape impoundments (without fountains); ***Industrial:*** industrial or commercial cooling or air conditioning (that does not use cooling tower, evaporative condenser, or spray), industrial boiler feed, industrial process water that will not come into contact with workers; ***Other:*** nonstructural fire fighting, backfill consolidation around non-potable piping, soil compaction, mixing concrete, dust control on roads and streets, cleaning roads, sidewalks and outdoor work areas, all uses for lower levels of recycled water treatment
Undisinfected Secondary Recycled Water	Oxidation	***Irrigation:*** orchards (no recycled water contact with edible portion)[7], vineyards (no recycled water contact with edible portion)[7], non food-bearing trees, fodder and fiber crops for animals not producing milk for human consumption, seed crops not eaten by humans, food crops that must undergo commercial processing, ornamental nursery stock and sod farms where no irrigation occurs 14 days prior to harvesting, sale, or allowing public access; ***Other:*** flushing sanitary sewers.

1. The uses highlighted in the table represent some of the non-potable applications being considered by the RRWSP participants to illustrate the *minimum* level of treatment that would be required.

[8] See http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Lawbook/RWregulations_20140618.pdf (accessed 8/25/14).

2. For granular media filtration, can meet an average of 2 Nephelometric Turbidity Units (NTU) with a 23-hour period, 5 NTU more than 5% of the time within a 24-hour period, and 10 NTU at any time. For membrane filtration, can meet 0.2 NTU more than 5% of the time within a 24-hour period and 0.5 NTU at any time.
3. Disinfection using chlorine that provides a CT (chlorine residual x modal contact time) of at least 450 milligram-minutes per liter with a modal contact time of 90 minutes or a disinfection process than inactivates 5-logs of virus.
4. Coagulation is not needed if the filter effluent turbidity is less than 2 NTU, the influent turbidity to the filters is continuously measured, the influent turbidity to the filters never exceeds 5 NTU for more than 15 minutes or 10 NTU at any time.
5. 7-day median total coliform is less than 2.2 Most Probable Number (MPN)/100 milliliters (mL) and the total coliform is less than 23 MPN/100 mL in more than one sample in any 30-day period.
6. 7-day median total coliform is less than 23 MPN/100 mL and the total coliform is less than 240 MPN/100 mL in more than one sample in any 30-day period.
7. In 2003, at the request of the California Department of Health Services (now the DDW) Food and Drug Branch (FDB), the Division of Drinking Water and Environmental Management and FDB sent a memo to all of the RWQCBs regarding permit conditions for existing and proposed recycled water projects involving vineyard and orchard crops. Both groups believed the use of undisinfected secondary recycled water represented a health threat, particularly during harvesting, and recommended that recycled water used to irrigate vineyards and orchards meet at a minimum Disinfected Secondary-2.2 Recycled Water. Any future changes to the Title 22 non-potable reuse regulations are expected to codify this requirement.

3.1.1. Review of California Agricultural Water Recycling Criteria

An expert panel, consisting of nine nationally recognized experts, reviewed California's Water Recycling Criteria for use in agricultural irrigation. The expert panel's 2012 report reviews the use of water recycling for agricultural purposes, including food crop production, in order to address whether the use of recycled water, produced in conformance with California's Water Recycling Criteria, has been protective of public health.[9] The key conclusions were:

- Current agricultural practices that are consistent with the Water Recycling Criteria do not measurably increase public health risk, and that modifying the standards to make them more restrictive will not measurably improve public health.
- The turbidity requirements specified in the Water Recycling Criteria for wastewater that has received media filtration are adequate.
- Coliforms are still an appropriate indicator of disinfection performance.
- Regarding plant uptake of pathogens, there are no definitive links to any outbreaks or sporadic illness associated with the irrigation of California produce with recycled wastewater, nor with recycled water used extensively in Florida for irrigation.

3.2. Groundwater Replenishment Regulations

Prior to June 18, 2014, the Water Recycling Criteria (Title 22 of the California Code of Regulations) included narrative requirements for planned GWR projects. The regulations stated that recycled water "shall be at all times of a quality that fully protects public health" and that DDW recommendations will be made on "an individual case basis" and "will be based on all relevant aspects of each project, including the following factors: treatment provided; effluent quality and quantity; spreading area operations; soil characteristics; hydrogeology; residence time; and distance to withdrawal."

[9] NWRI. 2012. *Review of California's Water Recycling Criteria for Agricultural Irrigation: Recommendations of an NWRI Independent Advisory Panel*. Fountain Valley, CA. Available at: http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/NWRI_AgPanelReportforCDPHFINAL-09-2012.pdf (accessed 2/18/14).

Since 1976, DDW issued numerous draft versions of more detailed GWR regulations that served as guidance for the six permitted GWR projects in California.[10] Final GWR regulations were adopted and went into effect June 18, 2014. The GWR Regulations are organized by type of project: (1) surface application (surface spreading) and (2) subsurface application (injection or vadose zone wells).

GWR projects originally considered by RRWSP participants were evaluated under the August 2008 Draft GWR Regulations. There have been a number of substantive changes made in the final GWR Regulations that provide more flexibility for project implementation:

- For GWR subsurface applications projects that use advanced treatment of recycled water, the initial recycled water contribution (RWC) could be as high as 100% (as compared to 50% in the 2008 Draft GWR Regulations). The RWC is defined as:
    - RWC = recycled water applied at the GWR Project ÷ (Recycled water + Credited dilution water) based on a 120-month period; and
    - RWC = 0.5 mg/L ÷ TOC_{max}; this is based on a 20-week running average.
- The derivation of the allowable RWC under the final GWR Regulations uses a longer averaging period (120 months versus 60 months), which can allow for a higher RWC for surface spreading projects that must use diluent water since it has the potential to factor in wet periods for a longer time period. It also provides for more operational flexibility and substantially reduces or eliminates the probability that the RWC will be exceeded even when dilution water (diluent) water volumes are highly variable from year to year.
- For GWR surface spreading projects that use tertiary recycled water, the RWC for the first year is limited to 20% unless treatment prior to surface application can achieve a TOC = 0.5 mg/L based on a 20-week running average. However, there is greater flexibility to move to higher RWCs if TOC requirements can be met concomitant with the desired RWC. Dilution water is still a necessary component for surface application projects that use tertiary recycled water.
- For GWR projects that use advanced treatment, it may be possible to start off at higher RWCs than 20% pending DDW approval.
- The process to progress from the initial RWC to higher RWCs has been streamlined for both surface and subsurface application projects, eliminating requirements in the 2008 GWR Draft Regulations for expert panel review and demonstrations of recycled water percentages in monitoring wells.
- Criteria have been established for the reverse osmosis (RO) and advanced oxidation (AOP) unit processes that are part of AWT, thereby eliminating uncertainty for design.
- The 6-month minimum underground residence time for recycled water pathogen control for surface and subsurface application projects has been eliminated and replaced by specific pathogen log reduction requirements for treatment. For a GWR project that uses tertiary effluent, a 6-month retention time would still be necessary to help achieve the stipulated virus reduction. The required residence time is also a function of the new response retention time (RRT), the time recycled water must remain underground to respond to treatment failures.
- The recycled water nitrogen requirements are less stringent in the final GWR regulations(10 mg/L as Nitrogen (N) versus 5 mg/L as N).

[10] ***Montebello Forebay GWR Project*** (surface spreading of tertiary recycled water, stormwater, untreated Colorado River water and State Project water (imported water) with plans to increase recycled water by 2017/18); ***Chino Basin GWR Project*** (surface spreading of tertiary recycled water and stormwater); ***Alamitos Gap Seawater Intrusion Barrier*** (injection of advanced treated (AWT) recycled water and treated imported water; by 2014/15 will use 100% AWT recycled water); ***West Coast Basin Seawater Intrusion Barrier*** (injection of 100% AWT recycled water in 2013); ***Dominguez Gap Seawater Intrusion Barrier*** (injection of AWT recycled water and treated imported water; plans for 100% AWT recycled water by 2017/18; ***Groundwater Replenishment System (GWRS)*** (injection and surface spreading of 100% AWT recycled water with plans for expansion in 2015).

- The final GWR Regulations allow for alternatives to TOC for establishing a project's RWC. The use of biodegradable organic carbon (BDOC) has been reviewed and sanctioned by a DDW convened expert panel.[11] The TOC approach has a limiting effect on the RWC calculation inasmuch as there may be some recalcitrant TOC that is primarily derived from the drinking water source that ultimately becomes wastewater. Thus, it is expected that by using BDOC in lieu of TOC the RWC would be higher. This of particular significance for surface spreading projects that do not subject the entire recycled water applied to AWT.

The key provisions for the GWR Regulations are presented in **Table 3**, including some of the new or modified provisions that create new challenges depending on how the regulations are interpreted.

Table 3. June 2014 Final GWR Regulations

<table>
<tr><th></th><th>Surface Application</th><th>Subsurface Application</th></tr>
<tr><td>Source Control</td><td colspan="2">Must administer a comprehensive source control program to prevent undesirable chemicals from entering raw wastewater. The source control program must include: (1) an assessment of the fate of DDW and RWQCB-specified contaminants through the wastewater and recycled water treatment systems; (2) provisions for contaminant source investigations and contaminant monitoring that focus on DDW and RWQCB-specified contaminants; (3) an outreach program to industrial, commercial, and residential communities; and (4) an up-to-date inventory of contaminants.
Note: If the agency that administers the source control program is different than the agency producing or distributing the recycled water, DDW will require an agreement between the agencies to ensure the source control requirements are met.</td></tr>
<tr><td>Boundaries Restricting Construction of Drinking Water Wells</td><td colspan="2">Project proponents must establish (1) a "zone of controlled potable well construction," which represents the greatest of the horizontal and vertical distances reflecting the retention times required for pathogen control or for response retention time; and (2) a "secondary boundary" representing a zone of potential controlled potable well construction that may be beyond the zone of controlled potable well construction thereby requiring additional study.
Note: Since it is not fully understood how the secondary boundary will be established, it will have to be negotiated with DDW; this requirement may lead to more restrictions on well development and required studies and more impacts in areas with numerous production wells and/or the desire to develop new wells to capture recharge water.</td></tr>
<tr><td>Emergency Response Plan</td><td colspan="2">A project sponsor must develop and be willing to implement a DDW-approved plan for an alternative source of potable water supply or treatment at a drinking water well if a GWR project causes the well to no longer be safe for drinking purposes.</td></tr>
<tr><td>Adequate Managerial and Technical Capability</td><td colspan="2">A project sponsor must demonstrate that it possess adequate managerial and technical capability to comply with the regulations.
Note: DDW has indicated that project sponsors can use the drinking water Technical Managerial and Financial Assessment to demonstrate compliance with this requirement.</td></tr>
<tr><td>Pathogen Control</td><td>- Must meet Title 22 disinfected tertiary effluent requirements.
- The treatment system must achieve a 12-log enteric virus reduction, a 10-log Giardia cyst reduction, and a 10-log Cryptosporidium oocyst reduction using at least 3 treatment barriers.
- For each pathogen, a separate treatment process can only be credited up to a 6-log reduction and at least 3 processes must each</td><td>- The treatment system must achieve a 12-log enteric virus reduction, a 10-log Giardia cyst reduction, and a 10-log Cryptosporidium oocyst reduction using at least 3 treatment barriers.
- For each pathogen, a separate treatment process can only be credited up to a 6-log reduction and at least 3 processes must each achieve no less than 1.0-log reduction.
- Retention time[a] credit for virus of 1-log/month; must be validated by an added or intrinsic tracer</td></tr>
</table>

[11] See http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/NWRI_BDOCFinalPanelReport-09-26-2012.pdf (accessed 8/25/14). The DDW has indicated that it would like to see an established project propose and implement BDOC as a TOC surrogate before it considers including BDOC in any future amendments to the GWR Regulations.

	Surface Application	Subsurface Application
	achieve no less than 1.0-log reduction. - Retention time[a] credit for virus of 1-log/month; must be validated by an added or intrinsic tracer approved by DDW. *Giardia/Cryptosporidium* Credit: If a project meets meet Title 22 disinfected tertiary effluent requirements <u>or</u> provides advanced treatment for the entire flow <u>and</u> 6 months retention underground, a project will be credited with 10-log *Giardia* cyst reduction and 10-log *Cryptosporidium* oocyst reduction. *Note: Meeting Title 22 450 CT disinfected tertiary requirements does not guarantee a 5-log virus reduction credit; will require project sponsors to have further discussion or demonstration with DDW.*	approved by DDW.
Nitrogen Control	Total N must be less than 10 mg/L as N in recycled water or recharge water before or after application.	
Regulated Chemicals Control	Recycled Water: must meet all primary MCLs, with the exception of nitrogen compounds; for disinfection byproducts, for surface application projects, compliance can be determined in the recycled water or the recharge water before or after surface application and for subsurface application projects in the recycled water or recharge water; for secondary MCLs, compliance can be determined in recycled water or recharge water. *Note: For surface spreading projects, compliance with the color secondary MCL can be problematic for tertiary recycled water it may be possible to receive approval for compliance after surface application under the Alternatives Section, which would address this issue.* Diluent Water: must meet primary <u>and</u> secondary MCLs based on upper limit if not historically used for recharge (except for secondary MCLs for color, turbidity, and odor). *Note: For surface spreading projects, compliance with other secondary MCLs for diluent water will be an issue in establishing credit for stormwater; it may be possible to receive approval for compliance after surface application under the Alternatives Section, which would address this issue.*	
NLs	Recycled Water: the regulations include actions to be taken if an NL is exceeded in the recycled water or recharge water after application (excluding the effects of dilution), including additional monitoring. Diluent Water: Must ensure that diluent water does not exceed an NL and have a plan in place on actions to be taken if exceed an NL for credit prior to the operation of a project, diluent water must meet NLs. *Note: With regard to implementation, DDW has noted that the evaluation of NLs can occur in recharge water (after SAT); and the regulatory language is purposefully flexible in determining credits as part of a monitoring plan proposed by the project sponsor. A chronic exceedance of an NL would be an issue for establishing diluent water credit, while an occasional exceedance would not be an issue.*	
TOC	Surface application: TOC_{max} = 0.5 mg/L ÷ RWC in undiluted recycled water prior to application or within the zone of percolation, diluted percolated recycled water with the value adjusted to negate diluent water, or the undiluted recycled water prior to application amended using a SAT factor. *Note: For surface application projects, treatment must consider the level of TOC to be achieved or a TOC alternative approved by DDW.*	Recycled water TOC = 0.5 mg/L. *Note: All recycled water must undergo advanced treatment – see advanced treatment criteria.*

<table>
<tr><th></th><th>Surface Application</th><th>Subsurface Application</th></tr>
<tr><td>Initial RWC</td><td>- Up to 20% unless an alternative initial RWC is approved by DDW based on: (1) the review of the engineering report and (2) information obtained as a result of the public hearing and (3) the project sponsor demonstrates that the treatment processes preceding SAT can reliably achieve a TOC 20-week running average no greater than 0.5 mg/L
- The RWC averaging period is 120 months.
- TOC is sampled in undiluted recycled water after treatment or undiluted recycled water in the “zone of percolation.”
Note: A surface spreading project must start at a 20% RWC unless DDW has approved a higher RWC and advanced treatment is provided to meet a TOC concentration of 0.5 mg/L.</td><td>- To be determined by CDPH (does not preclude starting at 100%).
- The RWC averaging period is 120 months.
Note: A subsurface application project has the possibility of starting at a 100% RWC if approved by DDW.</td></tr>
<tr><td>Increased RWC</td><td>Sequential incremental increases ≥ 50% and ≥ 75% allowed if:
- The TOC 20-week average for prior 52 weeks = 0.5 mg/L ÷ $RWC_{proposed\ max}$.
- The increase is approved by DDW and authorized in the project permit.</td><td>Increases allowed if:
- The TOC 20-week average for prior 52 weeks = 0.5 mg/L.
- The increase is approved by DDW and authorized in the project permit.</td></tr>
<tr><td>Advanced Treatment Criteria</td><td colspan="2">RO:
- Each membrane element must achieve a minimum sodium chloride (NaCl) rejection ≥ 99.0% and an average (nominal) NaCl rejection ≥ 99.2% using ASTM Method D4194-03 (2008), using the following substitute test conditions: (1) tests are operated at a recovery ≥ 15%; (2) NaCl rejection is based on 3 or more successive measurements; (3) influent pH between 6.5 and 8.0; and (4) influent NaCl concentration ≤ 2,000 mg/L.
- During the 20 weeks of full-scale operation, the membrane produces a permeate having no more than 5% of the sample results having TOC > 0.25 mg/L based on weekly monitoring.
AOP – there are two options:
- Option 1 - Conduct an occurrence study that identifies 9 indicators representing 9 functional groups, with 0.5-log removals for 7 of the indicators and 0.3-log removals for 2 of the indicators; establish at least one surrogate or operational parameter that reflects the removal of at least 5 of the 9 indicators (one of the surrogates must be monitored continuously); confirm the results using a study via challenge or spiking tests.
- Option 2 - Conduct testing that includes challenge or spiking tests to demonstrate that the AOP process removes 0.5-log of 1,4-dioxane; establish surrogate or operational parameters that reflect whether the 0.5-log reduction of 1,4-dioxane is attained, and one of the surrogates can be monitored continuously.</td></tr>
<tr><td>Application of Advanced Treatment</td><td>Advanced treatment is only needed for that portion of recycled water needed to meet the TOC/RWC requirements desired by the project sponsor.</td><td>Applied to the full recycled water volume.</td></tr>
<tr><td>SAT Performance</td><td>- Monitor recycled water or recharge water before and after recharge for 3 indicator constituents of emerging concern (CECs) with reductions < 90% triggering investigation. If a project sponsor demonstrates there are not 3 indicator compounds available and suitable for indicating a 90% reduction, a project sponsor may utilize an indicator compound that achieves a reduction less than 90%</td><td>None.</td></tr>
</table>

<table>
<tr><th></th><th>Surface Application</th><th>Subsurface Application</th></tr>
<tr><td></td><td>pending DDW approval of the compound and reduction criteria.

- Project sponsors must conduct a DDW approved CEC occurrence study prior to operation and then every 5 years.</td><td></td></tr>
<tr><td>RRT</td><td colspan="2">- RRT is the time recycled water must be retained underground to identify any treatment failure and implement actions so that inadequately treated recycled water does not enter a potable water system, including the plan to provide an alternative water supply or treatment.
- The minimum RRT is 2 months, but must be justified by the project sponsor.
- The RRT must be validated using an added tracer or a DDW approved intrinsic tracer.</td></tr>
<tr><td>Project Planning</td><td colspan="2">
<table>
<tr><th>Method used to estimate the retention time to the nearest downgradient drinking water well</th><th>Virus Log Reduction Credit per Month</th></tr>
<tr><td>Tracer study using added tracer (first 10% of the peak tracer unit value reaches the downgradient endpoint)</td><td>1.0 log</td></tr>
<tr><td>Tracer study utilizing an intrinsic tracer (first 10% of the peak tracer unit value reaches the downgradient endpoint)</td><td>0.67 logs</td></tr>
<tr><td>Numerical modeling consisting of calibrated finite element or finite difference models using validated and verified computer codes used for simulating groundwater flow</td><td>0.50 logs</td></tr>
<tr><td>Analytical modeling using existing academically-accepted equations such as Darcy's Law to estimate groundwater flow conditions based on simplifying aquifer assumptions</td><td>0.25 logs</td></tr>
<tr><th>Method used to estimate RRT</th><th>Response Time Credit per Month</th></tr>
<tr><td>Tracer study using added tracer (first 10% of the peak tracer unit value reaches the downgradient endpoint)</td><td>1 month</td></tr>
<tr><td>Tracer study utilizing an intrinsic tracer first 10% of the peak tracer unit value reaches the downgradient endpoint)</td><td>0.67 months</td></tr>
<tr><td>Numerical modeling consisting of calibrated finite element or finite difference models using validated and verified computer codes used for simulating groundwater flow.</td><td>0.5 months</td></tr>
<tr><td>Analytical modeling using existing academically-accepted equations such as Darcy's Law to estimate groundwater flow conditions based on simplifying aquifer assumptions.</td><td>0.25 months</td></tr>
</table>
</td></tr>
<tr><td>Alternatives</td><td colspan="2">Allowed for all provisions in the regulations if:
- The project sponsor has demonstrated that the alternative provides the same level of public health protection.
- The alternative has been approved by DDW.
- If required by DDW or RWQCB, the project sponsor will conduct a public hearing.
- An expert panel must review the alternative <u>unless</u> otherwise specified by DDW.</td></tr>
<tr><td>Engineering Report</td><td colspan="2">The project sponsor must submit an Engineering Report to DDW and RWQCB that indicates how a GWR project will comply with all regulations and includes a contingency plan to insure that no untreated or inadequately treated water will be used. The report must be approved by DDW.</td></tr>
</table>

a. The retention time represents the difference from when the water with the tracer is to when either 2% of the initially introduced tracer concentration has reached the downgradient monitoring point, or 10% of the peak tracer unit value is observed at the downgradient monitoring point. With DDW approval, an intrinsic tracer may be used in lieu of an added tracer with no more credit provided than 0.67-log per month.

3.3. Recycled Water Criteria for Surface Water Augmentation

Surface water augmentation is defined in statute as the planned placement of recycled water into a surface water reservoir used as a source of domestic drinking water supply. DDW has developed an internal draft of its surface water augmentation regulations that has been presented to the Expert Panel to Advise on Developing Uniform Recycling Criteria for Indirect Potable Reuse via Surface Water Augmentation and on the Feasibility of Developing Such Criteria for Direct Potable Reuse (Expert Panel). It is not yet available for informal or formal public review. Senate Bills 322 and 918 require DDW, in consultation with the SWRCB, to investigate and report to the Legislature by the end of December 2016 on the feasibility of developing uniform criteria for direct potable reuse (DPR) and reservoir augmentation with the assistance of an Expert Panel[12] and Advisory Group.[13] The Expert Panel will:

- Assess what, if any, additional areas of research are needed to be able to establish uniform water recycling criteria for DPR;
- Advise DDW on public health issues and scientific and technical matters regarding development of uniform water recycling criteria for IPR through surface water augmentation; and
- Advise DDW on public health issues and scientific and technical matters regarding the feasibility of developing uniform water recycling criteria for DPR.

Since the regulatory criteria are not yet available (adoption due by December 31, 2016), approval of any reservoir augmentation project by DDW would be made on a case-by-case basis.

Some information on what the criteria might look like is available from the City of San Diego's proposed San Vicente Reservoir Augmentation Project. In March 2012, the City of San Diego submitted a proposal to DDW to obtain concept approval from DDW for the proposed project, which would supplement the roughly 240,000 acre-foot San Vicente Reservoir with up to 15,000 acre-feet per year of purified (e.g., advanced treated) recycled water from the North City Water Reclamation Plant. The City has conducted a number of studies over the past 20 years in support of the proposed project, including the Water Purification Demonstration Project completed in 2012 with oversight provided by an NWRI expert panel. The City initiated discussions with DDW in 2008 regarding potential requirements for the proposed project and submitted a proposal in March 2012 to DDW. The key elements of the proposal included:

- An enhanced wastewater source control program modeled after the Orange County Sanitation District's program for the Orange County Water District's Groundwater Replenishment Project.
- Modifications to the North City Water Reclamation Plant such as flow equalization and full nitrification for secondary treatment.
- Advanced treatment for the entire flow stream using RO and advanced oxidation to meet DDW requirements; establishing critical control points monitoring; and establishing measures to identify and validate treatment malfunctions and divert advanced treated recycled water in approximately 10 hours (this is the approximate retention time in the conveyance pipeline to the reservoir).
- Reservoir requirements including a 12-month hydraulic retention time; minimum dilution of advanced treated recycled water with ambient reservoir water of 100:1; discharge above the thermocline and withdrawal of reservoir water below the thermocline (when present).
- Water from the reservoir to be treated at a full conventional water treatment plant prior to distribution as potable water.
- Ability to take the reservoir offline as a source of supply to the municipal water system within 24 hours.

In September 2012, DDW issued a letter to the City approving the San Vicente Reservoir Augmentation Concept and concluded that "the project, as conceived, when properly designed, constructed, and

[12] See http://www.cdph.ca.gov/certlic/drinkingwater/Pages/RW_SWA_DPRexpertpanel.aspx (accessed 8/25/14).
[13] See http://www.cdph.ca.gov/certlic/drinkingwater/Pages/RW_DPR_advisorygroup.aspx (accessed 8/25/14).

operated, will not compromise the quality of water derived from the San Vicente Reservoir."[14] DDW would still need to approve the design, operations and response plans, and water quality monitoring plan.

Any discharge to a surface water that is a water of the U.S. and has assigned beneficial uses in the RWQCB Basin, such as the San Vicente Reservoir, would be subject to a National Pollutant Discharge Elimination System permit. Additional information on RWQCB requirements for surface water discharges is presented in a separate technical memorandum.

[14] CDPH, letter to Roger Bailey and Marci Steirer, regarding "City of San Diego San Vicente Reservoir Augmentation Concept," September 7, 2012.

4. State Water Resources Control Board Policies

There are two policies of particular importance with respect to GWR projects for protection of water quality and human health: (1) anti-degradation policies, and (2) the Recycled Water Policy.

4.1. Anti-degradation Policies

California's anti-degradation policies are found in Resolution 68-16, Policy with Respect to Maintaining Higher Quality Waters in California, and Resolution 88-63, Sources of Drinking Water Policy.[15] These resolutions are binding on all State agencies. They apply to both surface waters and groundwaters, protect both existing and potential uses, and are incorporated into RWQCB Basin Plans.

4.1.1. Resolution 68-16 (Anti-degradation Policy)

The Anti-degradation Policy requires that existing high water quality be maintained to the maximum extent possible, but allows lowering of water quality if the change is "consistent with maximum benefit to the people of the state, will not unreasonably effect present and anticipated use of such water (including drinking), and will not result in water quality less than prescribed in policies." The Anti-degradation Policy also stipulates that any discharge to existing high quality waters will be required to "meet waste discharge requirements which will result in the best practicable treatment or control of the discharge to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

4.1.2. Resolution 88-63 (Sources of Drinking Water Policy)

The Sources of Drinking Water Policy designates the municipal and domestic supply (MUN) beneficial use for all surface waters and groundwater except for those: (1) with total dissolved solids (TDS) exceeding 3,000 milligrams per liter (mg/L), (2) with contamination that cannot reasonably be treated for domestic use, (3) where there is insufficient water supply, (4) in systems designed for wastewater collection or conveying or holding agricultural drainage, or (5) regulated as a geothermal energy producing source. Resolution 88-63 addresses only designation of water as drinking water source; it does not establish objectives for constituents that threaten source waters designated as MUN.

4.2. Recycled Water Policy

The Recycled Water Policy was adopted by the SWRCB on February 3, 2009 and became effective in May 14, 2009. It was subsequently amended in January 22, 2013 with regard to CEC monitoring with an effective date of April 25, 2013. The Policy was a critical step in creating uniformity in how RWQCBs were individually interpreting and implementing Resolution 68-16 for water recycling projects, including landscape irrigation projects and GWR projects. The critical provisions in the Policy are discussed in the following subsections.

4.2.1. Salt Nutrient Management Plans

The Recycled Water Policy requires Salt Nutrient Management Plans (SNMPs) to be developed for every groundwater basin/sub-basin by May 2014 (May 2016 with a RWQCB-approved extension). The SNMP must identify salt and nutrient sources; identify basin/sub-basin assimilative capacity and loading estimates (including GWR projects and landscape irrigation projects using recycled water); and evaluate the fate and transport of salts and nutrients. The SNMP must include implementation measures to manage salt and nutrient loadings in the basin on a sustainable basis and an anti-degradation analysis demonstrating that all recycling projects identified in the plan will collectively satisfy the requirements of Resolution No. 68-16. The SNMP must also include an appropriate cost effective network of monitoring locations to determine if salts, nutrients and other constituents of concern (as identified in the SNMPs) are consistent with applicable water quality objectives.

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[15] See http://www.swrcb.ca.gov/plans_policies/ (accessed 8/25/14).

4.2.2. Landscape Irrigation Projects

The Recycled Water Policy establishes requirements for control of Incidental runoff of recycled water from irrigation areas, such as unintended minimal over-spray from sprinklers. These requirements include the implementation of an operations and maintenance plan; proper design and aim of sprinklers; discontinuing irrigation during precipitation events; and management of storage ponds to prevent overflow. The Recycled Water Policy also contains provisions for streamlined permitting of landscape irrigation projects including:

- Application of recycled water at agronomic rates.
- Site supervisor training.
- Periodic inspections.
- Use of smart controllers.
- Appropriate use of fertilizers.

Landscape irrigation projects that meet the streamlining criteria will not be required to perform groundwater monitoring unless required to do so as part of an SNMP.

4.2.3. RWQCB Groundwater Requirements

The Recycled Water Policy does not limit the authority of a RWQCB to include more stringent requirements for GWR projects to protect designated beneficial uses of groundwater, *provided* that any proposed limitations for the protection of public health may only be imposed following consultation with DDW. The Recycled Water Policy also does not limit the authority of a RWQCB to impose additional requirements for a proposed GWR project that has a substantial adverse effect on the fate and transport of a contaminant plume (for example those caused by industrial contamination or gas stations), or changes the geochemistry of an aquifer thereby causing the dissolution of naturally occuring constituents, such as arsenic, from the geologic formation into groundwater. This provision requires additional assessment of impacts of a GWR project on areas of contamination in a basin and/or if the quality of the water used for recharge (for example low salinity) causes constituents, such as naturally occurring arsenic, to become mobile and impact groundwater.

4.2.4. Anti-degradation and Assimilative Capacity

Assimilative capacity is typically defined as the difference between the ambient groundwater concentration and the concomitant groundwater quality objective. In accordance with the Recycled Water Policy, two assimilative capacity thresholds were established for GWR. A GWR project that utilizes less than 10% of the available assimilative capacity in a groundwater basin/sub-basin (or multiple projects utilizing less than 20% of the available assimilative capacity in a groundwater basin/sub-basin) must conduct an anti-degradation analysis verifying the use of the assimilative capacity. In the event a project or multiple projects utilize more than the fraction of the assimilative capacity (e.g., 10% or 20%), then the project proponent must conduct a RWQCB-deemed acceptable anti-degradation analysis. Some SNMPs use these assimilative capacity values as thresholds for evaluating impacts of salt and nutrient loadings and implementation measures.

A landscape irrigation project that meets the Recycled Water Policy streamlining criteria, which is within a groundwater basin with an approved SNMP, may be approved by a RWQCB without further anti-degradation analysis if the project is consistent with the SNMP. A landscape irrigation project that meets the streamlining criteria, which is within a groundwater basin preparing an SNMP, may be approved by a RWQCB by demonstrating using a salt/nutrient mass balance or equivalent analysis that the project uses less than 10% of the available assimilative capacity or less than 20% of the available assimilative capacity for multiple projects.

4.2.5. CECs

As part of the Recycled Water Policy, a Science Advisory Panel was formed to identify a list of CECs for monitoring in recycled water used for GWR and landscape irrigation. The Panel completed its report in June 2010 and recommended monitoring selected health-based and treatment performance indicator CECs and surrogates for GWR projects.[16] The Panel concluded that CEC monitoring was unnecessary for landscape irrigation. The GWR monitoring recommendations were directed at surface spreading using tertiary recycled water (specifically monitoring recycled water and groundwater) and injection projects using RO and AOP (specifically monitoring recycled water).

The Recycled Water Policy was amended by the SWRCB on January 22, 2013 to include the CEC monitoring program and the Office of Administrative Law approved the Amendment on April 25, 2013. The Amendment provides the final list of specific CECs and monitoring frequencies for GWR projects (see **Table 4**), and procedures for evaluating the data and responding to the results. The requirements for GWR projects will be incorporated into the permits for existing GWR projects, and will be included as requirements for all future projects. As part of the final GWR Regulations, DDW has its own CEC requirements and monitoring locations that must be met in addition to the Recycled Water Policy requirements. The next update of CEC monitoring by a SWRCB expert panel will occur in 2015.

Table 4. SWRCB Recycled Water Policy CECs to be Monitored for GWR Projects

Constituent[1]	Constituent Group	Relevance/ Indicator Type	Reporting Limit (µg/L)[2]
Surface Application			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health	0.002
Triclosan	Antimicrobial	Health	0.05
Gemfibrozil	Pharmaceutical	Performance	0.01
Iopromide	Pharmaceutical	Performance	0.05
N,N-Diethyl-meta-toluamide (DEET)	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1
Subsurface Application			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health & Performance	0.002
Triclosan	Antimicrobial	Health	0.05
DEET	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1

1. Monitoring frequency is quarterly for the initial assessment phase; semi-annually for the baseline phase; and semi-annually to annually for the standard operation phase; CECs can be removed or monitoring can increase based on the results.
2. µg/L – microgram per liter.

[16] Anderson, P., Denslow, N., Drewes, J.E., Olivieri, A., Schlenk, D., Snyder, S. (2010) *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water: Final Report*, Sacramento, CA. Available at: http://ftp.sccwrp.org/pub/download/DOCUMENTS/CECpanel/CECMonitoringInCARecycledWater_FinalReport.pdf (accessed 8/25/14).

5. Central Coast Regional Water Quality Control Board Requirements

The Central Coast RWQCB is responsible for regulating recycled water discharges to groundwater, which are subject to state water quality regulations and statutes.

5.1. Basin Plan

WDRs issued by the Central Coast RWQCB are required to implement applicable State water quality control policies and plans, including water quality objectives and implementation policies established in the Basin Plan.[17] The Basin Plan designates beneficial uses and groundwater quality objectives on a sub-basin basis. Groundwater in the RRWSP study area is suitable for agricultural water supply, MUN, and industrial use. The Basin Plan has general narrative groundwater objectives for taste and odor; MUN groundwater criteria for bacteria and primary and secondary MCLs; narrative agricultural supply groundwater objectives to protect beneficial uses and soil productivity; and sub-basin specific numeric objectives for TDS, chloride, sulfate, boron, sodium, and nitrogen (Table 3-8). "Discharges" to groundwater (including GWR projects) must be of sufficient quality to not impact beneficial uses.

[17] See http://www.waterboards.ca.gov/rwqcb3/publications_forms/publications/basin_plan/.

6. Permitting Water Reuse Projects

6.1. SWRCB General Permit

On June 3, 2014, the SWRCB adopted Order WQ 2014-0090-DWQ General Waste Discharge Requirements for Recycled Water (General Permit). The General Order provides statewide authorization of all of Title 22 uses of recycled water by Producers, Distributors, and Users except GWR and is intended to streamline project permitting. To obtain coverage under the General Order, an applicant must have an approved Engineering Report and submit a Notice of Intent to the RWQCB within its jurisdiction. Producers, Distributors, or Users of recycled water covered under existing permits may elect to continue or expand coverage under the existing permits or apply for coverage under the General Order. If a RWQCB determines that a recycled water project could result in one or more of the following, the project would be subject to an individual permit issued by the RWQCB.

- The proposed project would result in water quality degradation.
- The proposed method of recycled water storage could cause degradation or contribute to pollution or nuisance.
- The proposed project does not implement mitigation measures adopted in a site-specific California Environmental Quality Act document.
- The proposed use of recycled water is not consistent with a Total Maximum Daily Load waste load allocation or implementation plan.

The proposed use of recycled water is not consistent with Basin Plan provisions for implementing an SNMP.

6.2. Individual Non-potable Reuse Projects

For WDRs or WRRs, project sponsors are required to submit an Engineering Report to DDW and RWQCB, and a Report of Waste Discharge to the RWQCB. In issuing the permit, the RWQCB is required to consult with DDW, and any reclamation requirements included in a permit must conform with Title 22. The RWQCBs have the option of issuing a Master Reclamation Permit in lieu of individual WRRs for a project involving multiple uses. The Master Permit can be issued to a recycled water supplier or distributor or both. Prior to making any change in the point of surface water discharge, place of use or purpose of use of treated wastewater (such as water reclamation), the owner of the wastewater treatment plant must obtain approval from the SWRCB in accordance with CWC sections 1210-1212 (addressing water rights). Additional information on the procedures and agreements in place between DDW, the SWRCB, and RWQCBs related to permitting can be found in the Memorandum of Agreement.[18] Now that DDW is part of the SWRCB, it is not clear if and how the Memorandum of Agreement will be modified or utilized.

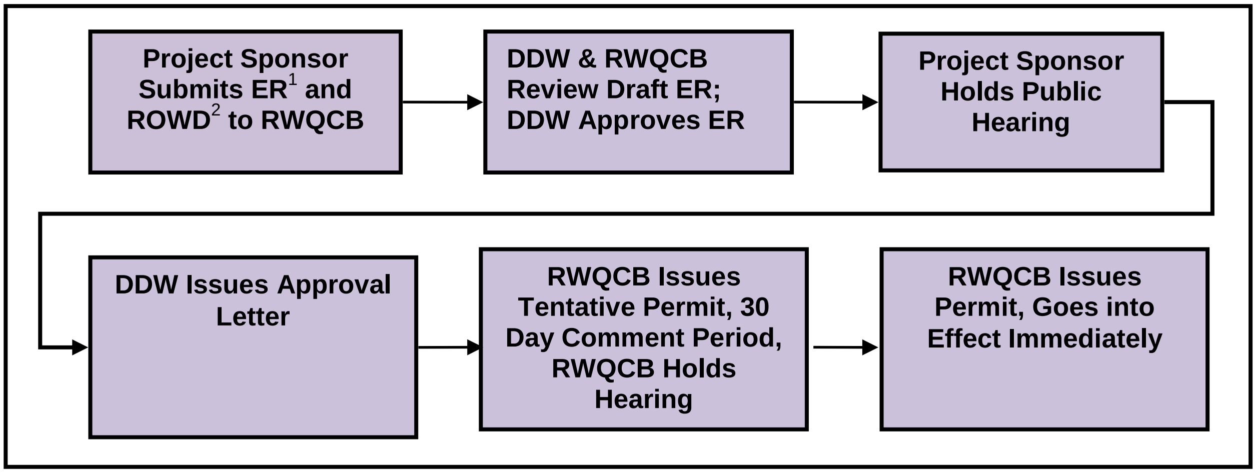
Effective July 1, 2014, the DDW as part of the SWRCB has the authority to issue WDRs and WRRs. As the transition proceeds during Fiscal Year 2014/15, more information will be available on how permitting responsibilities will be handled by DDW and RWQCBs.

6.3. Groundwater Recharge Projects

The current (or potentially interim) process for project approval and permitting of GWR projects is depicted in **Figure 1**. The RWQCB would issue the permit based on requirements consistent with the GWR Regulations, Basin Plans, SNMPs, and State policies. The type of permit (WDR and/or WRR) issued depends on how and where the recycled water is "discharged".

[18] See http://www.cdph.ca.gov/certlic/drinkingwater/Documents/Recharge/MemorandumofAgreement.pdf (accessed 8/25/14).

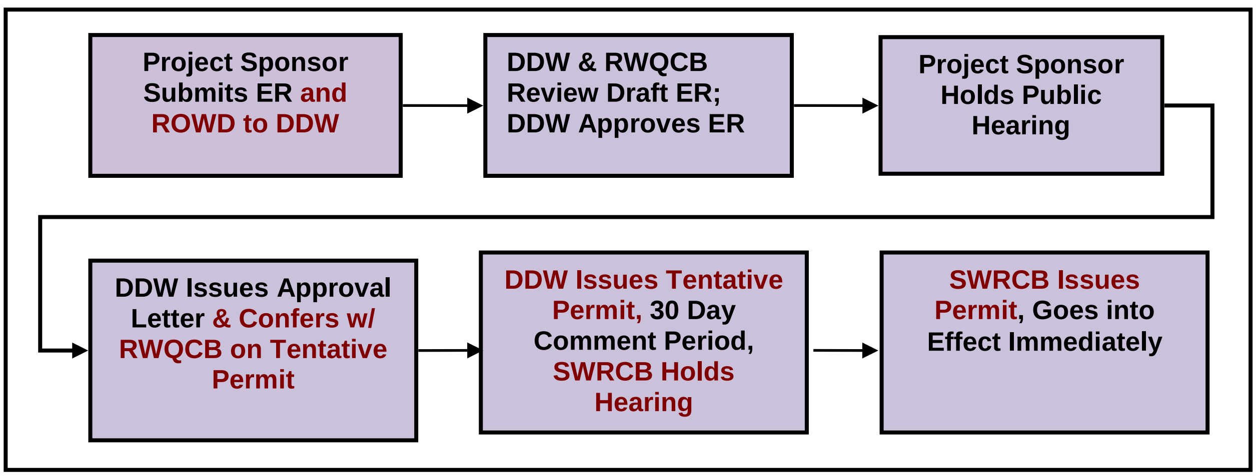
Figure 1. Current Regulatory Process for GWR Projects Using Recycled Water



1. ER – Engineering Report.
2. ROWD – Report of Waste Discharge.

If DDW becomes the permitting authority for GWR projects, the possible approval and permitting process may follow the steps shown in **Figure 2**.

Figure 2. Potential Regulatory Process for GWR Projects Using Recycled Water



6.4. Federal Requirements for Groundwater Recharge Projects

At this time there are no Federal permitting requirements for surface GWR projects; however, the U.S. Environmental Protection Agency's (USEPA's) underground injection control (UIC) program does apply, but has no permitting consequences. The UIC program has categorized injection wells into five classes, only one of which (Class V) applies to GWR projects. Under the existing Federal regulations, Class V injection wells are "authorized by rule" which means they do not require a Federal permit if they do not endanger underground sources of drinking water and comply with other UIC program requirements. For California, U.S EPA Region 9 is the permitting administrator for Class V wells. Any injection project planned in California must meet the State Sources of Drinking Water Policy and therefore a Federal permit would not be necessary. All Class V injection well owners in California are required to submit information to USEPA Region 9 on the well for USEPA's inventory.[19]

[19] http://www.epa.gov/region9/water/groundwater/uic-classv.html, and http://www.epa.gov/region9/water/groundwater/injection-wells-register.html (accessed 8/25/14).

7. Acronyms

AOP	Advanced oxidation
AWT	Advanced water treatment
BDOC	Biodegradable Organic Carbon
CDPH	California Department of Public Health
CECs	Constituents of emerging concern
CWC	California Water Code
CDP	California Department of Public Health
DEET	N,N-diethyl-meta-toluamide
DDW	Division of Drinking Water
DWP	Drinking Water Program
ER	Engineering Report
FDB	Food and Drug Branch
GWR	Groundwater recharge
GWRS	Groundwater Replenishment System
H&SC	Health and Safety Code
IRWM	Integrated Regional Water Management
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
mL	Milliliters
MPN	Most Probable Number
MUN	Municipal and Domestic Supply
N	Nitrogen
NaCl	Sodium chloride
NCSD	Nipomo Community Services District
NDMA	N-nitrosodimethylamine
NTU	Nephelometric Turbidity Units
NWRI	National Water Research Institute
OCSD	Oceano Community Services District
RO	Reverse osmosis
RWQCB	Regional Water Quality Control Board
RRWSP	Regional Recycled Water Strategic Plan
SSLOCSD	South San Luis Obispo County Sanitation District
SNMP	Salt Nutrient Management Plan
SRF	State Revolving Fund
SWRCB	State Water Resources Control Board
TCSD	Templeton Community Services District
TDS	Total Dissolved Solids
TM	Technical Memorandum
UIC	Underground Injection Control
USEPA	U.S. Environmental Protection Agency
µg/L	Microgram per liter
WDR	Waste Discharge Requirements
WRR	Water Recycling Requirements

Appendix C: Regulatory, Permitting, and Legal Requirements for Surface Water Discharges TM

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Nellor Environmental Associates, Inc., DBE, WBE
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Austin, TX 78731
512.374.9330

DRAFT TECHNICAL MEMORANDUM

August 25, 2014

To: Rob Morrow, Cannon

From: Margaret H. Nellor, P.E., Nellor Environmental Associates, Inc.

Project: **San Luis Obispo County Regional Recycled Water Strategic Plan**

Subject: **Regulatory and Permitting Requirements for Discharge to Surface Waters**

1. Introduction

The Regional Recycled Water Strategic Plan (RRWSP) is one of the components of an update to the San Luis Obispo Region Integrated Regional Water Management (IRWM) Plan that is being funded pursuant to a Round 2 IRWM Regional Planning Grant from the California Department of Water Resources. Multiple agencies are working together to complete the studies to investigate the feasibility of implementing recycled water programs within their services areas to diversify their water supply portfolios, reduce reliance on surface water, eliminate discharge of treated wastewater to the ocean, and reduce conflicts associated with limited regional water sources. The participating agencies are:

- Templeton Community Services District (TCSD).
- City of Morro Bay.
- City of Pismo Beach.
- South San Luis Obispo County Sanitation District (SSLOCSD): City of Grover Beach; Oceano Community Services District (OCSD); City of Arroyo Grande.
- Nipomo Community Services District (NCSD).

This technical memorandum (TM) identifies the regulatory and permitting requirements for the discharge of SSLOCSD and the City of Pismo Beach wastewater for stream augmentation of Arroyo Grande Creek (AGC) to offset estimated stream discharge requirements imposed on the San Luis Obispo County Flood Control District for protection of environmental resources in the creek. The TM also identifies the regulatory and permitting requirements for the discharge of recycled water to augment Lopez Lake as a supplemental source of water for the Lopez Project to support its water supply, recreational, and habitat protection uses. Water recycling requirements for surface water augmentation are presented in a separate TM[1]. This TM is organized into the following sections:

1. Overview of Previous Work for Surface Augmentation of Arroyo Grande.
2. Overview of the Lopez Project.
3. Surface Water Discharge Requirements.
4. Future Anticipated Surface Water Discharge Requirements.
5. Permit Challenges for Surface Water Augmentation
6. Future State Policies That May Impact Surface Water Discharges
7. Summary
8. References.
9. Acronyms.

[1] Appendix B - Regulatory, Permitting, and Legal Requirements for Recycled Water TM.

2. Overview of Previous Work for Surface Augmentation of Arroyo Grande Creek

2.1. South San Luis Obispo County Sanitation District and Pismo Beach Wastewater Treatment Plants

The SSLOCSD receives wastewater from Arroyo Grande, Grover Beach, and Oceano and currently operates a 5.0 million gallon per day (mgd) (5,600 acre-feet per year (AFY)) wastewater treatment facility (WTF) that provides primary clarification, trickling filters, secondary clarification, disinfection using chlorine, and dechlorination. The effluent currently meets the State Water Resources Control Board's (SWRCB's) Division of Drinking Water (DDW)[2] requirements for disinfected secondary - 23 recycled water.[3] Effluent is discharged to the ocean using an outfall/diffuser system jointly owned with the City of Pismo Beach. In addition, approximately 325,000 gallons of brine wastes from water softener regeneration companies is mixed with the final treated wastewater prior to ocean discharge. The discharge is regulated by the Central Coast Regional Water Quality Control Board (RWQCB) under a National Pollutant Discharge Elimination (NPDES) permit (Order No. R3-2009-046).

The City of Pismo Beach operates a wastewater treatment plant with a design capacity of 1.9 mgd that provides extended aeration using oxidation ditches, secondary clarification, chlorine disinfection, and dechlorination capability. As noted above, the treated wastewater is discharged to the ocean via the SSLOCSD/Pismo Beach outfall. The discharge is regulated by the RWQCB under an NPDES permit (Order No. R3-2009-047).

Annual average existing and projected (2035) treated wastewater flows are presented in **Table 1**.

Table 1. SSLOCSD and Pismo Beach Wastewater Flows

	Existing Flow		Projected Flow (2035)	
SSLOCSD	2.6 mgd	2,910 AFY	3.5 mgd	3,910 AFY
Pismo Beach	1.1 mgd	1,230 AFY	1.8 mgd	2,020 AFY

2.2. 2009 Water Recycling Update Report - Stream Augmentation Alternative

The study conducted by Wallace (2009) evaluated a number of alternatives for SSLOCSD's existing and future WTF.[4] One alternative considered was the discharge of wastewater, which was treated to meet Title 22 disinfected tertiary levels[5], to AGC, to "offset" the estimated required stream discharge imposed on the San Luis Obispo County Flood Control and Water Conservation District Zone 3 (County) for protection of environmental resources in the creek. Per the County, a minimum flow of approximately 4,300 AFY is released from Lopez Dam for protection of wildlife and fish habitat in AGC (see **Section 3**). From 2006 through 2010, the annual downstream releases to AGC have ranged from 3,105 AFY to 4,913 AFY (County, 2012).

The study by Wallace (2009) assessed allowable offset volumes to meet surface water quality objectives for AGC based on the Central Coast Water Quality Control Plan (Basin Plan) water quality objectives for

[2] Formerly the California Department of Public Health (CDPH). Effective July 1, 2014, the CDPH Drinking Water Program was moved to the SWRCB and became the Division of Drinking Water, with responsibilities for recycled water regulation and permitting.

[3] The 7-day median total coliform < 23 Most Probable Number (MPN)/100 milliliters (mL) and the total coliform is less than 240 MPN/100 mL in more than one sample in any 30-day period.

[4] Wallace Group (2009) *Water Recycling Update Report*. Prepared for the South San Luis Obispo County Sanitation District.

[5] For granular media filtration, the effluent can meet an average of 2 Nephelometric Turbidity Units (NTU) with a 23-hour period, 5 NTU more than 5% of the time within a 24-hour period, and 10 NTU at any time. For membrane filtration, can meet 0.2 NTU more than 5% of the time within a 24-hour period and 0.5 NTU at any time. Disinfection using chlorine that provides a CT (chlorine residual x modal contact time) of at least 450 milligram-minutes per liter with a modal contact time of 90 minutes *or* a disinfection process than inactivates 5-logs of virus.

two constituents: total dissolved solids (TDS) and chloride. Table 3-7 in Wallace (2009) provided some water quality data based on a composite sample collected in December 2008; the data with associated Basin Plan surface water quality objectives are shown in **Table 2**.

Table 2. SSLOCSD Water Quality and AGC Water Quality Objectives

Parameter	Value[1]	Basin Plan Surface Water Quality Objective[2]
Boron, mg/L	0.29	0.2
Chloride, mg/L	230	50
TDS, mg/L	855	800
Sodium, mg/L	160	50

1. From Table 3-7 (Wallace, 2009); 24-hour composite sample collected December 17, 2008.
2. Basin Plan Table 3-7.

For the analysis, Wallace (2009) assumed the TDS concentration for SSLOCSD's wastewater to be 850 mg/L. Based on this value and the corresponding surface water quality objective, and using a mass balance calculation to maintain the 800 mg/L TDS concentration in AGC, a discharge of 3,800 AFY of tertiary wastewater could be introduced as an offset the required release from Lopez Dam. Using the same method for chloride, Wallace (2009) estimated that only 1,000 AFY of tertiary wastewater could be discharged without further treatment (such as reverse osmosis) to reduce TDS and chloride concentrations.

Section 4 of the TM provides an overview of other water quality requirements necessary to meet the stream augmentation alternative not addressed by Wallace (2009).

3. Overview of the Lopez Project

The “Lopez Project” is a water delivery system operated by the County that consists of Lopez Lake and the Lopez Terminal Reservoir, each with an outlet structure. A 3-mile long gravity line interconnects the lake and reservoir. The Terminal Reservoir supplies raw water to the Lopez Water Treatment Plant (6 mgd design capacity) that delivers potable water to the communities of Oceano, Grover Beach, Pismo Beach, Arroyo Grande, Avila Beach Community Services District/Port San Luis Harbor, and County Service Areas. Water from Lopez Reservoir is also released to AGC.

Lopez Lake is used for municipal water supply, agricultural water supply, recreational activities including boating, water skiing, fishing, and habitat for fish and wildlife, including downstream releases to AGC.

The sources of water to Lopez Lake are Vasquez Creek, Lopez Creek, Wittenberg Creek, AGC, and Clapboard Canyon Creek. The lake has a maximum surface area of approximately 974 acres and a storage capacity of 49,200 AF (County, 2012). The Terminal Reservoir watershed is comprised of 424 acres immediately adjacent to Lopez Lake Water Treatment Plant that is located approximately 12 miles northeast of the City of Arroyo Grande. The reservoir has a maximum capacity of 844 AF of water. The only significant inflow to Terminal Reservoir is the influent line from Lopez Lake.

The Terminal Reservoir provides 30 to 45 days of detention time; no information is available on the retention time for Lopez Lake (County, 2012).

Public access to Lopez Lake is controlled and routed through the main gate of the park. The Lopez Terminal Reservoir is fenced and posted. No public access is allowed to the Terminal Reservoir.

In conformance with the Endangered Species Act, the County has prepared at a draft Habitat Conservation Plan (HCP) with work still underway. The purpose of the HCP for the Lopez Project is to minimize and mitigate impacts of the County’s normal operations on steelhead trout and red-legged frogs in AGC (Wallace Group, 2011). Until the HCP is approved, the District has agreed to maintain a minimum downstream release to AGC from the Lopez Reservoir of approximately 4,300 AFY (County, 2005).

From 2006 through 2010, the annual release from the pipeline diversion to Terminal Reservoir has ranged from 3,728 acre-feet per year (AFY) to 4,913 AFY (County, 2012). From 2006 through 2010, the annual downstream releases to AGC have ranged from 3,105 AFY to 4,913 AFY. Evaporation has ranged from 1,459 AFY to 2,416 AFY during 2006 to 2010.

To date, recycled water as a source to augment Lopez Lake has not been formally evaluated (Wallace Group, 2011).

4. Surface Water Discharge Requirements

The discharge of a waste to a water of the United States (U.S.) is regulated under the Clean Water Act (CWA) and California Water Code (CWC and applicable regulations) and subject to an NPDES permit for discharge into an inland surface water based on all applicable water quality objectives in the Central Coast Water Quality Control Plan (Basin Plan), water quality criteria in the California Toxics Rule (CTR), and implementation measures for the CTR in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP).

4.1. Basin Plan

NPDES permits issued by the Central Coast RWQCB are required to implement applicable State water quality control policies and plans, including water quality objectives and implementation policies established in the Basin Plan.[6] The Basin Plan designates beneficial uses and water quality objectives for surface water and groundwater.

4.1.1. Beneficial Uses of Arroyo Grande Creek and Lopez Lake

The present and potential beneficial uses for AGC (downstream) and Lopez Lake as defined in the Basin Plan are shown in **Table 3**.

Table 3. Basin Plan Beneficial Uses for AGC and Lopez Lake

Beneficial Use	AGC	Lopez Lake[1]
Municipal and Domestic Supply (MUN)	✔	✔
Agricultural Supply (AGR)	✔	✔
Industrial Process Supply (PROC)	✔	✔
Industrial Service Supply (IND)	✔	✔
Groundwater Recharge (GWR)	✔	✔
Water Contract Recreation (REC-1)	✔	✔
Non-water Contact Recreation (REC-2)	✔	✔
Wildlife Habitat (WILD)	✔	✔
Cold Fresh Water Habitat (COLD)	✔	✔
Migration of Aquatic Organisms (MIGR)	✔	
Rare, Threatened, or Endangered Species (RARE)	✔	✔
Spawning, Reproduction, and/or Early Development (SPWN)	✔	✔
Commercial and Sport Fishing (COMM)	✔	✔
Warm Fresh Water Habitat (WARM)		✔
Freshwater Replenishment (FRSH)		✔
Navigation (NAV)		✔

1. The Basin Plan shows Lopez Lake as Lopez "Reservoir." Since no public access is allowed to the Terminal Reservoir, we will assume that the designated uses shown are for Lopez Lake where surface water augmentation would occur.

The GWR beneficial use designation implies that any discharge to AGC or Lopez Lake will recharge (e.g., percolate into) groundwater. As such, a discharge to these surface waters cannot adversely impact any groundwater beneficial uses and concomitant water quality objectives. Groundwater in the RRWSP study area is suitable for AGR, MUN, and industrial use.

[6] See http://www.waterboards.ca.gov/rwqcb3/publications_forms/publications/basin_plan/ (accessed 8/25/14).

4.1.2. Basin Plan Surface Water Objectives for Arroyo Grande Creek and Lopez Lake

Surface water objectives in the Basin Plan that are applicable to AGC and Lopez Lake include water quality objectives that apply to all inland waters and specific water quality objectives that apply to AGC or underlying groundwater. The State Anti-degradation Policy also applies.

Resolution 68-16 (Anti-degradation Policy)

The Basin Plan specifically cites the Anti-degradation Policy. This Policy requires that existing high water quality be maintained to the maximum extent possible, but allows lowering of water quality if the change is "consistent with maximum benefit to the people of the state, will not unreasonably effect present and anticipated use of such water (including drinking), and will not result in water quality less than prescribed in policies." The Anti-degradation Policy also stipulates that any discharge to existing high quality waters will be required to "meet waste discharge requirements which will result in the best practicable treatment or control of the discharge to ensure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

For some discharge permits, the RWQCB (2007) has stated that "because the 'antidegradation' resolution is necessarily vague, regulations, policies, and our Basin Plan were developed to further define how the 'antidegradation' resolution's would be met. In addition, Staff applied best professional judgment to the proposed Order. Among professional considerations are standard professional practices, commonly available technology, and site-specific hydrologic and water quality conditions."

Inland Surface Water Objectives

Narrative or numeric objectives have been established that are applicable to all inland surface waters for: color; taste and odor; floating material; suspended material; settleable material; oil and grease; biostimulatory substances[7]; sediment; turbidity; dissolved oxygen; temperature[8]; toxicity[9]; pesticides[10]; other organics[11]; and radioactivity.

Specific water quality objectives have been applied to AGC for TDS (800 milligram per liter (mg/L)), chloride (50 mg/L), sulfate (200 mg/L), boron (0.2 mg/L), and sodium (50 mg/L) (Table 3-7).

The key beneficial uses[12] and applicable water quality objectives that are likely to impact receiving water limits for discharge of tertiary wastewater are: MUN, AGR, COLD, GWR, and any of the other aquatic life uses.

- For MUN, numeric objectives have been established for surface water for pH; primary and secondary maximum contaminant levels (MCLs) (Tables 3-1 and 3-2); and phenol (1 µg/L).
- For AGR, numeric objectives have been established for surface water for pH; dissolved oxygen; metals, nitrogen, and fluoride (Table 3-4); and narrative objectives for chemicals that are interpreted such that the University of California Agricultural Extension Service guidelines are applied as permit limits (for salinity, sodium, nitrogen, permeability, and pH (Table 3-3)).

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[7] Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

[8] As specified in the *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California*.

[9] The discharge of waste shall not cause concentrations of unionized ammonia to exceed 0.25 mg/L (as nitrogen) in receiving waters.

[10] Total Identifiable Pesticides shall not be present at detectable levels.

[11] Methylene Blue Activated Substances 0.2 mg/L, Phenols 0.1 mg/L, and Polychlorinated byphenyls 0.3 micrograms per liter (µg/L).

[12] Aquatic life criteria in the Basin Plan (Table 3-5) are not discussed because they are less stringent than the applicable CTR criteria.

- For COLD, numeric surface water objectives have been established for pH, dissolved oxygen, and metals. For temperature, the objective restricts an increase above natural receiving water temperature to 5 degrees Fahrenheit (F).
- For GWR, the discharge cannot cause the groundwater to exceed Basin Plan objectives. The Basin Plan has general narrative groundwater objectives for taste and odor; MUN groundwater criteria for bacteria and primary and secondary MCLs; narrative agricultural supply groundwater objectives to protect beneficial uses and soil productivity. For the Estero sub-basin and AGC area, there are specific numeric objectives for TDS, chloride, sulfate, boron, sodium, and nitrogen (Table 3-8).

4.2. California Toxics Rule and SIP

In 2000, the U.S. Environmental Protection Agency (USEPA) adopted the CTR that included aquatic life criteria for 23 priority pollutants and human health criteria for 57 priority pollutants. The freshwater criteria are expressed as (1) Criteria Maximum Concentrations (CMCs) that are equal to the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without a deleterious effect; and (2) as Criteria Continuous Concentrations (CCCs) that are equal to the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without a deleterious effect. The CCC criteria are more stringent than the CMC criteria.

The CTR human health criteria are based on exposure to a pollutant that occurs through the ingestion of water and contaminated fish and shellfish. In calculating the criteria, the underlying exposure assumptions are (1) the consumption of 2 liters per day of water at the criteria concentration and the consumption of 6.5 grams per day of fish and shellfish contaminated at a level equal to the criteria concentration but multiplied by a bioconcentration factor (water and organisms criteria); and (2) the consumption of 6.5 grams per day of fish and shellfish contaminated at a level equal to the criteria concentration but multiplied by a bioconcentration factor (organism only criteria). The CTR human health criteria protect the general population at an incremental cancer risk level of one in a million (10^{-6}) based on USEPA's Integrated Risk Information System as of October 1996. The water and organism criteria, which apply to MUN and REC-1, are more stringent than the organism only criteria, which apply to REC-2.

In adopting criteria in the CTR, the USEPA in some cases included the National Toxics Rule (NTR) criteria and in others updated some of the CWA section 304(a) recommended criteria based on new or revised reference doses and cancer potency factors and updated aquatic life toxicity data sets.

In the same year, the SWRCB adopted implementation procedures for the CTR through the SIP. The SIP was amended in 2005. The CTR criteria and SIP are applicable to discharges of wastewater to all inland surface waters and enclosed bays and estuaries of California, except where existing State objectives have been previously adopted and are more restrictive, where site-specific objectives have been adopted by the State and approved by USEPA, or where 1992 NTR federal criteria already are in place.

The SIP includes procedures to determine which priority pollutants need effluent limitations (e.g., reasonable potential analysis); methods to calculate water quality-based effluent limitations (this includes statistical equations that adjust CTR criteria for effluent variability and for averaging periods and exceedance frequencies of the criteria/objectives); and policies regarding mixing zones, metals translators, monitoring, pollution prevention, reporting levels for determining compliance, and whole effluent toxicity control. Using the SIP, permit limits are established for those CTR constituents that have the reasonable potential to cause or contribute to an excursion above any applicable criteria including consideration of a mixing zone (e.g., dilution factor). *It is unlikely that the RWQCB would allow a mixing zone for AGC.* The SIP also allows the SWRCB to grant an exception to complying with priority pollutant criteria in situations where site-specific conditions in individual water bodies or watersheds differ sufficiently from statewide conditions, the exception will not compromise protection of beneficial uses, and the public interest will be served.

4.3. Impaired Waters and Total Maximum Daily Loads

Surface waters that do not meet water quality standards are placed on the CWA section 303(d) list of impaired waters, and the RWQCB must complete a Total Maximum Daily Load (TMDL) for each listing. The TMDL is a calculation of the maximum amount of a pollutant from point and non point sources that a water body can receive and still meet water quality standards with a margin of safety. The TMDL and implementation plan are incorporated into the Basin Plan as amendments. The wasteload allocations established in TMDLs are translated into NPDES permit limits to ensure that compliance with the discharge limits will allow the water body to attain standards.

The 2010 USEPA approved 303(d) list for California includes impairment of AGC for bacteria.[13] This listing and subsequent wasteload allocation in a TMDL would not impact a wastewater discharge that meets Title 22 disinfection requirements for tertiary or secondary-treated recycled water. The 2010 USEPA approved 303(d) list for California does not include Lake Lopez on the list for any impairment.

Any future 303(d) listings for other pollutants in AGC or any pollutants for Lopez Lake could impact a discharge. In particular, the Ninth Circuit Court of Appeals decision regarding a new discharge to an impaired water (Friends of Pinto Creek vs. USEPA) interprets 40 Code of Federal Regulations (CFR) part 122.4(i). This is USEPA's rule governing new sources and new dischargers to impaired waters. The court's decision could severely limit a discharger's ability to obtain an NPDES permit for a new discharge if the water is impaired and/or a wasteload allocation for the new discharge has not been addressed in a TMDL.

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[13] See http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml (accessed 8/25/14).

5. Permit Challenges for Surface Water Augmentation

As discussed in the Regulatory, Permitting, and Legal Requirements for Recycled Water TM, the recycled water used for reservoir augmentation is expected to have undergone advanced water treatment, including reverse osmosis (RO) and advanced oxidation (AOP). However, there are a number of permitting challenges under the CTR/SIP and Basin Plan, and which might require additional treatment beyond what is deemed typical advanced water treatment for recycled water for a discharge to Lopez Lake.

5.1. CTR and SIP

There are a number of priority pollutants with extremely stringent CTR human health criteria (water and organisms) that will be difficult to meet at the end-of-pipe even using full advanced treatment (RO/AOP). Examples of some these pollutants include three disinfection byproducts:

- N-nitrosodimethylamine (NDMA) – 0.69 nanograms per liter (ng/L)
- Chlorodibromomethane (CDBM) – 0.401 µg/L
- Dichlorobromomethane (DCBM) – 0.56 µg/L

Unless a mixing zone is granted, the criteria must be met end-or-pipe. The allowance of mixing zones is discretionary and is determined on a discharge-by-discharge (and pollutant-by-pollutant) basis by the RWQCB. For completely mixed discharges, the amount of receiving water available to dilute the effluent is determined by calculating the dilution ratio (i.e., the critical receiving water flow divided by the effluent flow). For incompletely mixed discharges, an independent mixing zone study must be conducted and the dilution factor approved by the RWQCB (this would be the case for Lopez Lake). In addition, the mixing zone must be as small as practicable. The permit limit would be derived based on the allowed dilution credit.

If a mixing zone is not allowed, to meet these criteria end-of-pipe would likely require additional advanced treatment processes beyond RO and AOP. Removal of CDBM and DCBM would likely require air stripping[14] or biologically activated carbon, and removal of NDMA would require additional ultraviolet irradiation (UV) to achieve photolysis. NDMA is a disinfection byproduct formed during chloramination.

Unlike the NPDES permit for the City of San Luis Obispo that does not include an MUN-based limit for NDMA (see **Section 5.3**), reasonable potential for a permit limit will have been established for NDMA for a reservoir water augmentation project since DDW will require low-level sensitive analytical methods to be used.[15]

USEPA has adopted amendments to 40 CFR 136 whereby NPDES permit applicants must use “sufficiently sensitive” analytical test methods when completing an NPDES permit application and the RWQCB must prescribe that only “sufficiently sensitive” methods can be used for analyses of pollutants under an NPDES permit.[16] It is not clear how this will legally impact implementation of the SIP in California, which

[14] Because CDBM and DCBM will be formed during the advanced treatment process if chlorine is present, the method being pursued by the City of San Luis Obispo for complying with its MUN-based CDBM and DCBM limits using alternative disinfectants will not be feasible.

[15] Most NPDES dischargers in the State have not detected NDMA in effluents because they are using 40 CFR part 136 analytical Methods 625 or 1625 that specify a detection limit of 50 µg/L. This detection level is not sensitive enough to detect NDMA in most priority pollutant effluent scans to trigger reasonable potential. Agencies that practice potable water reuse utilize more sensitive NDMA analytical methods with reporting levels at 0.0001 µg/L for comparison to the DDW Notification Level (0.01 µg/L); however, under the SIP, dischargers are not required to use a more sensitive analytical method unless they agree to use the method.

[16] Federal Register, Vol. 79, No. 160, Tuesday August 19, 2014.

has established Minimum Levels (MLs) that must be achieved for monitoring under NPDES permits (SIP Appendix 4). In addition, SIP Section 2.4.3 allows for reporting levels not in Appendix 4 to be included in a permit, including when the discharger and RWQCB agree to include a test method that is more sensitive than those in 40 CFR 136 or when a discharger agrees to use a reporting level lower than the ML. In these cases, the discharger must agree to the use of the more sensitive method; the RWQCB does not prescribe the use of the more sensitive method.

5.2. Basin Plan

Compliance with Basin Plan objectives may also present compliance challenges. Membrane treatment will likely be required to meet the TDS and chloride surface water quality objectives established specifically for AGC (Wallace, 2009).

Both ACG and Lopez Lake have COLD designations that could lead to effluent limits for temperature to meet the narrative temperature objectives, thereby requiring additional treatment, such as cooling towers or chillers, or the application of a best management practice, such as providing shade trees, to meet permit requirements.

5.3. Comparison with San Luis Obispo Stream Discharge

One example of a surface water discharge that has faced some of these permitting challenges is the NPDES permit (Order No. R3-2002-0043) issued for the City of San Luis Obispo's (City's) Water Reclamation Facility. Wastewater is discharged to San Luis Obispo Creek, which has a number of beneficial uses similar to AGC: MUN, AGR, GWR, REC-1, REC-2, WILD, COLD, MIGR, SPWN, COMM. Treatment consists of wet weather flow equalization, primary treatment, biofiltration, secondary settling, nitrification by activated sludge, final settling, dual media filtration, chlorination/dechlorination, and cooling.

Specific compliance challenges in meeting Basin Plan requirements included the temperature water quality objective, which required the installation of evaporative cooling towers.

For the CTR, compliance challenges included two of the trihalomethanes (THMs): CDBM and DCBM. The reasonable potential analysis showed that the City's effluent exceeded the CTR criteria for both constituents. The RWQCB CDBM and DCBM permit limits were not achievable by the existing treatment system or through source control. In 2005, the permit was amended to include both interim and final permit limits (see **Table 4**), a time schedule to comply with the final permit limits (by March 2010), and submittal of a THM reduction evaluation. The interim limits reflected what could be achieved using existing treatment.

Table 4. City CDBM and DCBM Effluent Limits

	Interim Limit µg/L	Final Limit µg/L	
	Instantaneous Max	Instantaneous Max	Monthly Average
CDBM	42	0.8	0.4
DCBM	27	1.1	0.6

The City's THM study looked at a number of disinfection alternatives to meet the final effluent limits (chloramination, ultraviolet disinfection, peracetic acid, and chlorine dioxide). The study found that chlorine dioxide was the preferred alternative for disinfection. A follow-up pilot study was conducted to evaluate the feasibility of using chlorine dioxide in place of sodium hypochlorite. In March 2010, the RWQCB issued a Time Schedule Order (Order No. R3-2010-0013) that granted the City until March 31, 2015 to meet the final effluent limits.

Discussion is continuing with the RWQCB regarding treatment alternatives and compliance deadlines as part of the ongoing NPDES permit renewal. *Note: compliance with the CTR criteria-based final permit limits will require reductions in THM concentration of greater than 99% to 97%. The use of chlorine dioxide will certainly lower THM formation; however, it remains to be seen if switching to an alternative disinfection method will achieve compliance.*

Not yet a compliance issue, but something that may be addressed in the City's permit renewal, is the CTR human health criterion for NDMA. Most NPDES dischargers in the State have not detected NDMA in effluents because they are using 40 CFR part 136 analytical Methods 625 or 1625 that specify a detection limit of 50 µg/L. This detection level is not sensitive enough to detect NDMA in most priority pollutant effluent scans to trigger reasonable potential. Agencies that practice potable water reuse utilize more sensitive NDMA analytical methods with reporting levels at 0.0001 µg/L for comparison to the DDW Notification Level (0.01 µg/L); however, under the SIP, dischargers are not required to use a more sensitive analytical method unless they agree to use the method. As noted in Section 5.1, the new amendments to 40 CFR 136 requiring "sufficiently sensitive" analytical methods may or may not force all surface water dischargers to use a more sensitive method for NDMA.

6. Future State Policies That May Impact Surface Water Discharges

Future State policies that may impact surface water discharge project include:

- Proposed Policy for Toxicity Assessment and Control
- Proposed Policy for Nutrients for Inland Surface Waters
- Statewide Mercury Water Quality Objectives
- Constituents of Emerging Concern

6.1. Proposed Policy for Toxicity Assessment and Control

The SWRCB has prepared a draft Policy for Toxicity Assessment and Control (Toxicity Policy) that proposes numeric toxicity objectives, a standardized method of data analysis, corresponding monitoring and reporting requirements, and provisions for compliance determination.[17] The Toxicity Policy is being developed to address the lack of a statewide consistent approach among the RWQCBs to toxicity controls and monitoring. The Toxicity Policy will apply statewide to inland surface waters and enclosed bays and estuaries. The SWRCB released a draft Toxicity Policy in 2011 and a revised draft in June 2012; the Policy is expected to be adopted in 2015. The revised draft establishes/requires:

- Statewide daily maximum and median monthly numeric limits for chronic toxicity.
- Use of the Test of Significant Toxicity (TST) to assess the whole effluent toxicity measurements of wastewater effects on specific test organisms' abilities to survive and grow. The TST compares the organism response in the in-stream waste concentration to a percentage of the response in the control. The TST utilizes a restated null hypothesis that assumes an effluent is not bioequivalent to the control (i.e., *the effluent is presumed to be toxic*). The TST uses a fixed false positive (β) rate of 0.05 and a test-specific false negative rate (α). Results obtained from the TST are reported as either a "pass" or "fail."
- Numeric (instead of narrative) statewide objectives for chronic and acute toxicity. An in-stream waste concentration exhibiting an effect level at or above 0.25 of the control would demonstrate chronic toxicity, and acute toxicity would be confirmed at or above an effect level of 0.20.
- Reasonable potential for including a toxicity limit in a permit is based on (1) a discharge with a flow greater than 1 mgd and (2) the results of at least four, single-concentration toxicity tests, after which the TST approach is used to determine the results. The data from each test resulting in a "pass" must be used in another formula that calculates the percent effect of the test organisms (and determines the most sensitive test species) by comparing the mean effect level at the in-stream waste concentration to a 10% mean effect threshold. Regardless of the initial outcome of the toxicity tests, reasonable potential to cause or contribute to acute or chronic toxicity is demonstrated when a test sample exhibits a mean effect above the 10% threshold.
- Statewide monthly toxicity monitoring of once per month for facilities that discharge more than 1 mgd. Dischargers that exceed their applicable effluent limitations would be in violation and would be required to implement an accelerated monitoring schedule.
- Provides RWQCB discretion on inclusion of acute toxicity numeric limits in permits and whether to allow for dilution.

The SWRCB has received substantive comments on the revised draft Toxicity Policy. When adopted it will supersede Section 4 of the SIP.

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[17] See http://www.swrcb.ca.gov/water_issues/programs/state_implementation_policy/tx_ass_cntrl.shtml (accessed 8/25/14).

6.2. Proposed Policy for Nutrients for Inland Surface Waters

The SWRCB has initiated the process to develop a Nutrient Policy for inland surface waters, excluding inland bays and estuaries.[18] The SWRCB intends to develop narrative nutrient objectives, with guidance on how to translate the narrative objectives into numeric permit limits. This guidance, could include the Nutrient Numeric Endpoint framework that establishes numeric endpoints based on the response of a water body to nutrient over-enrichment (such as algal biomass, dissolved oxygen, etc.).

The SWRCB held a California Environmental Quality Act Scoping meeting in October 2011 and has developed a workplan for development of the objectives. The SWRCB has also formed a Stakeholder Advisory Group, a Regulatory Advisory Group, and a Science Panel. A public draft of the Nutrient Policy is expected in 20115; the adoption date is not known. Original discussions with SWRCB staff indicated the proposed nitrogen and phosphorus objectives could result in very low permit limits that might require additional treatment for surface water dischargers.

6.3. Proposed Statewide Methymercury Objective

The SWRCB is developing an amendment to the SIP to include water quality objectives for methylmercury and mercury control programs to protect humans and wildlife that consume locally caught fish.[19] The objectives will likely be expressed as a methylmercury concentration in fish tissue. They will apply to California's inland surface waters, enclosed bays, and estuaries. The SWRCB intends for RWQCBs to convert a fish tissue-based objective into effluent limits. Depending on the objective adopted and the effluent limitation approach utilized, the methylmercury permit limit could be very low. However, studies conducted by the National Association of Clean Water Agencies using clean sampling methods and sensitive analytical methods have shown that methymercury is present at very low (ng/L) level concentrations in wastewater.

6.4. USEPA Revisions to Human Health Criteria

The USEPA has updated its national recommended water quality criteria for human health for 94 chemical pollutants to reflect the latest scientific information and USEPA policies, including updated fish consumption rates. Once finalized, the USEPA water quality criteria provide recommendations to states and tribes authorized to establish water quality standards under the CWA. For human health criteria that are predominantly based on fish consumption exposure, the new criteria are more stringent than the criteria in the CTR based on the use of revised fish consumption rates and relative source contribution factors. If the CTR were to be amended (or the SWRCB elected to adopt its own water quality based on the revised human health criteria), this would impact surface water discharge limits.

6.5. Constituents of Emerging Concern

Constituents of Emerging Concern (CECs) are generally chemicals for which there are no established water quality standards. These chemicals may be present in waters at very low concentrations and are now detected as the result of more sensitive analytical methods. CECs include several types of chemicals such as pesticides, pharmaceuticals and ingredients in personal care products, veterinary medicines, and endocrine disruptors.

The SWRCB is working on developing a CEC monitoring framework for surface water discharges. In 2012, the Southern California Coastal Water Research Project with the David and Lucile Packard Foundation

[18] See http://www.swrcb.ca.gov/plans_policies/nutrients.shtml (accessed 8/25/14).
[19] See http://www.swrcb.ca.gov/water_issues/programs/mercury/ (accessed 8/25/14).

released a report by an expert panel (SCCWRP, 2012) that provides the State with recommendations on appropriate monitoring and management strategies for CECs to limit the impact of CECs on oceans, estuaries and coastal wetlands, and freshwater ecosystems. The recommendations were presented to the SWRCB in October 2012. To vet the recommendations from the expert panel, SCCWRP is developing a pilot study for regions within the State. The Plan will address:

- Monitoring requirements - which CECs to monitor in various matrices, scenarios, and candidate watersheds/water bodies, where and how often to monitor, etc.
- Special studies to evaluate cutting edge technology.
- Quality assurance/quality control guidelines.

7. Summary

Surface water augmentation of AGC or Lopez Lake using treated wastewater would be subject to an National Pollutant Discharge Elimination System (NPDES) permit for discharge into an inland surface water. Effluent permit requirements would be based on:

- All applicable water quality standards (beneficial uses, water quality objectives to protect the uses, and anti-degradation policies) in the Central Coast Water Quality Control Plan (Basin Plan),
- Water quality criteria in the California Toxics Rule (CTR) for protection of aquatic life and human health, and
- Implementation measures for the CTR in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP).

Crucial beneficial uses that would drive treatment requirements beyond the tertiary level for a discharge into inland surface waters to meet either Basin Plan objectives or CTR criteria without a mixing zone include Municipal and Domestic Supply (MUN) and Cold Fresh Water Habitat (COLD) as presented below. In addition, the Basin Plan has established specific surface water quality objectives for total dissolved solids (TDS) and chloride that would necessitate the use of membrane treatment such as reverse osmosis (RO) or ultrafiltration.

- MUN:
  - CTR criteria for N-nitrosodimethylamine (NDMA) – 0.69 nanograms per liter (ng/L); treatment – reverse osmosis (RO) and additional ultraviolet (UV) photolysis as part of advanced oxidation (AOP).
  - CTR criteria for chlorodibromomethane (CDBM) – 0.401 µg/L; treatment – air stripping or use of substitute disinfectants for chlorine.
  - CTR criteria for dichlorobromomethane (DCBM) – 0.56 µg/L; treatment – air stripping or use of substitute disinfectants for chlorine.
- COLD: Narrative Basin Plan temperature objective; treatment – cooling towers, chillers, or best management practices to control temperature.

Potential future discharge restrictions could occur as a result of:

- The surface water being included on the Clean Water Act (CWA) 303(d) list of impaired waters. The Ninth Circuit Court of Appeals decision regarding Friends of Pinto Creek versus the U.S. Environmental Protection Agency (USEPA) could limit a discharger's ability to obtain an NPDEs permit for a new discharge if the water is impaired or a wasteload allocation has not been addressed in a Total Maximum Daily Load (TMDL). At present only AGC is on the 303(d) list for bacteria; Lopez Lake is not listed. The ACG listing should not be an issue if the effluent meets Title 22 disinfection requirements. However, any new listings for ACG or Lopez Lake could potentially have ramifications for obtaining a permit.
- New permit limits based on any TMDL wasteload allocations based on future 303(d) listings.
- Chronic toxicity limits based on the future California Toxicity Assessment and Control Policy to be proposed in 2015.
- Permit limits for nitrogen, phosphorus, and other nutrient related parameters based on the future California Nutrient Policy for Inland Surface Waters to be proposed in 2015.
- Amendments to the CTR criteria or adoption by the SWRCB of revised human health criteria that will be lower than the criteria in the CTR.
- Permit limits for methymercury based on the forthcoming statewide objective for inland surface waters, enclosed bays, and estuaries.

8. References

County of San Luis Obispo Department of Public Works (County), 2005, *2004 Water Quality Report Zone 3 - Lopez Project*, April 2005.

County of San Luis Obispo Department of Public Works, 2012, *Lopez Lake and Terminal Reservoir Watershed Sanitary Survey Update – 2010*, March 2012.

RWQCB, 2007, Staff Report for Regular Meeting of May 11, 2007, *Revision of Waste Discharge Requirements for Templeton Community Services District, Meadowbrook Wastewater Facilities, San Luis Obispo County, Order No. R3-2007-0029*.

Southern California Coastal Water Research Project (SCCWRP), 2012, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems: Recommendations of a Science Advisory Panel*, Costa Mesa, CA.

Wallace Group, 2009, *Water Recycling Update Report*, January 2009.

Wallace Group, 2011, *County of San Luis Obispo – Zone 3; Lopez Reservoir Urban Water Management Plan Update 2010*, June 2011.

9. Acronyms

AF	Acre-feet
AFY	Acre-feet per year
AGC	Arroyo Grande Creek
AGR	Agricultural Supply
AOP	Advanced oxidation
CCC	Criteria Continuous Concentration
CDBM	Chlorodibromomethane
CDPH	California Department of Public Health
CECs	Constituents of emerging concern
CFR	Code of Federal Regulations
CMC	Criteria Maximum Concentration
COLD	Cold Fresh Water Habitat
COMM	Commercial and Sport Fishing
CTR	California Toxics Rule
CWA	Clean Water Act
CWC	California Water Code
DCBM	Dichlorobromomethane
DDW	Division of Drinking Water
F	Fahrenheit
FRSH	Freshwater Replenishment
GWR	Groundwater recharge
HCP	Habitat Conservation Plan
IND	Industrial Service Supply
IRWM	Integrated Regional Water Management
MCL	Maximum Contaminant Level
mgd	Million gallons per day
mg/L	Milligram per liter
MIGR	Migration of Aquatic Organisms
mL	Milliliters
MPN	Most Probable Number
MUN	Municipal and Domestic Supply
NAV	Navigation
ng/L	Nanograms per liter
NCSD	Nipomo Community Services District
NDMA	N-nitrosodimethylamine
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Units
OCSD	Oceano Community Services District
PROC	Industrial Process Supply
RARE	Rare, Threatened, or Endangered Species
REC-1	Water Contract Recreation
REC-2	Non-water Contact Recreation
RO	Reverse osmosis
RWQCB	Regional Water Quality Control Board
RRWSP	Regional Recycled Water Strategic Plan
SIP	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
SPWN	Spawning, Reproduction, and/or Early Development

SSLOCSD	South San Luis Obispo County Sanitation District
SWRCB	State Water Resources Control Board
TCSD	Templeton Community Services District
TDS	Total dissolved solids
THMs	Trihalomethanes
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TST	Test of Significant Toxicity
µg/L	Microgram per liter
U.S.	United States
USEPA	U.S. Environmental Protection Agency
UV	Ultraviolet
WARM	Warm Fresh Water Habitat
WILD	Wildlife Habitat
WTF	Wastewater treatment facility

Appendix D: Nipomo CSD Project Concepts

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Unit Cost Basis

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
CAPITAL COSTS	*(May 2014 dollars)*				
Treatment					
TCSD - High Rate Filtration System (0.67 MGD)	$2,580,000	LS	HMM, 2012	Jan 2012	
SSLOCSD - Tertiary Filtration & Disinfection	$1,100,000	mgd	Wallace, 2009	Dec 2008	for 3.0 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$7,500,000	mgd	Carollo, 2007	Jan 2007	for 0.15 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$1,100,000	mgd	Carollo, 2007	Jan 2007	for 1.6 MGD
NCSD - Tertiary Filtration & Disinfection	$1,230,000	mgd	AECOM, 2009	Nov 2008	for 1.67 MGD
Tertiary Filtration & Disinfection	$1,400,000	mgd			Consolidation of references
Reverse Osmosis	$2,000,000	mgd	Dudek, 2012	Sep 2011	
Full Advanced Water Treatment (AWT) (MF/RO/A	$6,000,000	mgd	RMC, 2012	Jan 2011	
Conveyance					
Pipe Diameter (in)					
4	$110	LF			
6	$130	LF			
8	$150	LF			
10	$170	LF			
12	$190	LF			
16	$220	LF			
18	$250	LF			
Pipe Installation Factors					
Trenchless - Directional	2.0				
Trenchless - Jack & Bore	1.5				
Unpaved Areas	0.75				
Pump Station / Booster Station	*Refer to formula*		Sanks, 2008	2012	$=2*10^(0.7583*log(Q_p)+3.1951) Q_p = Peak Flow
Storage (Aboveground)	$1,500,000	MG			

Recharge Pond Construction	$15,000	ac	Means		
Evaporation Pond Construction w/ Liner	$80,000	ac	Means		Liner @ $1.5/SF
Land Purchase	$200,000	ac	Loopnet		For agricultural land
Injection Wells	$1,500,000	EA	RMC, 2012		
Landscape Irrigation Customer Conversion	$15,000	EA			
O&M COSTS					
Treatment - Tertiary Filtration	$150,000	mgd	Dudek, 2012	Sep 2011	
Treatment - RO	$200,000	mgd	RMC, 2012	Jan 2011	
Treatment - Full AWT (MF/RO/AOP)	$600,000	mgd			
Pipeline	1%				
Storage	1%				
Pump Stations	5%				
Injection Wells	2%				
Recharge Basins	$5,000	ac			
Pump/Motor Efficiency	75%				
Electricity	$0.13				
FINANCING COSTS / ASSUMPTIONS					
Interest Rate	5%				
Term (years)	30				
Contingencies / Soft Costs					
Construction Contingency	30%				
Engineering/Admin/CM/etc.	30%				
For Potable Reuse & Stream Augmentation	40%				

California Construction Cost Index (CCCI) www.documents.dgs.ca.gov/resd/pmb/ccci/cccitable.pdf

The California Construction Cost index is developed based upon Building Cost Index (BCI) cost indices for San Francisco and Los Angeles produced by Engineering News Record (ENR).

Reference	Month	CCI
RRWSP	**May 2014**	**5957**
Morro Bay (Dudek, 2012)	Sep 2012	5777
Templeton CSD (HMM, 2012)	Jan 2012	5683
SSLOCSD (Wallace, 2009)	Dec 2008	5322
Nipomo CSD (AECOM, 2009)	Nov 2008	5375
Pismo Beach (Carollo, 2007)	Jan 2007	4869

References
AECOM, 2009
Carollo, 2007
Dudek, 2012
HHM, 2012
RMC, 2012
Sanks, 2008
Wallace, 2009
Wallace, 2010

Summary of NCSD Potential Projects

Alt #	N1	N2	N3
PROJECT	**Nipomo Regional Park**	**Extension to Blacklake Golf Course**	**Extension to Monarch Dunes Golf Course**
Max Supply	1.7 MGD 1,904 AFY	1.7 MGD 1,904 AFY	1.7 MGD 1,904 AFY
Demand			
Average	0.0 MGD **51 AFY**	0.5 MGD **551 AFY**	0.8 MGD **951 AFY**
Peak Day	0.1 MGD	1.0 MGD	1.7 MGD
Peak Hour	0.3 MGD 190 GPM	1.2 MGD 810 GPM	1.9 MGD 1,306 GPM
Capital Costs			
RO or AWT	$ -	$ -	$ -
Pipeline	$ 1,625,000	$ 5,580,000	$ 6,495,000
Storage	$ 137,000	$ 1,476,000	$ 2,548,000
Pump Station	$ 170,000	$ 500,000	$ 720,000
Customer Conversions	$ 15,000	$ 30,000	$ 45,000
Construction Subtotal	*$ 1,947,000*	*$ 7,586,000*	*$ 9,808,000*
Construction Contingency	$ 584,000	$ 2,276,000	$ 2,942,000
Construction Total	*$ 2,531,000*	*$ 9,862,000*	*$ 12,750,000*
Implementation Costs	$ 759,000	$ 2,959,000	$ 3,825,000
Total Capital Cost	**$ 3,290,000**	**$ 12,821,000**	**$ 16,575,000**
O&M Costs			
RO or AWT	$ -	$ -	$ -
Pipeline	$ 17,000	$ 56,000	$ 65,000
Storage	$ 2,000	$ 15,000	$ 26,000
Pump Station			
Maintenance	$ 9,000	$ 25,000	$ 36,000
Power	$ 2,000	$ 20,000	$ 34,000
Total O&M Cost	**$ 30,000**	**$ 116,000**	**$ 161,000**
Annual Cost Method	*Based on Project Yield*		
Annual Capital Payment	$ 214,000	$ 834,000	$ 1,078,000
Annual O&M	$ 30,000	$ 116,000	$ 161,000
Total Annual Cost	**$ 244,000**	**$ 950,000**	**$ 1,239,000**
Annual Yield (AFY)	51	551	951
Unit Cost ($/AF)	**$4,790**	**$1,730**	**$1,310**
Annual Cost Method	*Based on Actual Water Supply Benefit*		
Water Supply Benefit (AFY)	5	55	95
Unit Cost ($/AF)	**$47,800**	**$17,200**	**$13,000**

Project Concepts with Tertiary Treatment (Cost Scaled to 1.7 mgd Plant)

Tertiary Trmt Capital Cost	$ 189,300	$ 2,044,800	$ 3,529,300
Capital Cost (from above)	$ 3,290,000	$ 12,821,000	$ 16,575,000
Total Capital Cost	**$ 3,479,300**	**$ 14,865,800**	**$ 20,104,300**
Tertiary Trmt O&M Cost	$ 13,700	$ 147,600	$ 254,700
O&M Cost (from above)	$ 30,000	$ 116,000	$ 161,000
Total O&M Cost	**$ 43,700**	**$ 263,600**	**$ 415,700**
Annual Cost Method	*Based on Project Yield*		
Annual Capital Payment	$ 226,000	$ 967,000	$ 1,308,000
Annual O&M	$ 43,700	$ 263,600	$ 415,700
Total Annual Cost	**$ 269,700**	**$ 1,230,600**	**$ 1,723,700**
Annual Yield (AFY)	51	551	951
Unit Cost ($/AF)	**$5,290**	**$2,230**	**$1,810**
Annual Cost Method	*Based on Actual Water Supply Benefit*		
Water Supply Benefit (AFY)	5	55	95
Unit Cost ($/AF)	**$52,900**	**$22,300**	**$18,100**

Location: Nipomo CSD

Demands

#	Customer	Annual AFY	Peak Day Factor	Peak Day GPD	Peak Hour Factor	Peak Hour GPM
1	Nipomo Regional Park	51	2.0	91,060	3.0	190
2	Blacklake Golf Course	500	2.0	892,742	1.0	620
3	Monarch Dune Golf Course (Woodlands)	400	2.0	714,194	1.0	496
		951		**1,697,996**		**1,306**

Peaking Factors (Columns F & H) should be adjusted from default value if applicable

1 Based on billing records

2 900,000 gpd during the irrigation season; 180 days of 'irrigation season';

3 2009 AECOM Report: 300 - 400 afy but notes that WW generation currently lower than planned. What if it increases with build out?
2007 Boyle Report: 425 afy of groundwater based on EIR

Title	***Southland WWTF Master Plan***
	Nipomo CSD
Author	*AECOM*
Date	*Jan 2009*
ENR Date	*Nov 2008*

mgd, Peak Daily Flow	3.34
mgd, Max Monthly Flow	1.82
mgd, Average Annual Flow	1.67
AFY @ 100% Reuse	1,870
AFY @ 50% Reuse	935

	ENR CCI
11/08	*5375*
05/14	*5957*
	110.8%

Teriary Filtration							
Parkson Dynasand					**Original**		**Escalated**
Coagulation & Mixing System	LS	$	100,000	1	$100,000		$111,000
Pumping System	LS	$	200,000	1	$200,000		$222,000
Filter Module	EA	$	54,400	12	$652,800		$723,000
Air Compressors	EA	$	23,400	2	$46,800		$52,000
Concrete	CY	$	1,100	270	$297,000		$329,000
Ladders, handrails, grates	LS	$	80,000	1	$80,000		$89,000
Instrumentation & Controls	LS	$	50,000	1	$50,000		$55,000
Subtotal					**$1,426,600**		**$1,581,000**
Sitework				10%	$142,660		$158,100
Piping				10%	$142,660		$158,100
Electrical				10%	$142,660		$158,100
Engineering/Admin				20%	$285,320		
S/T					**$2,139,900**	**S/T**	**$2,055,300**
					per gpd		***$1.23***
						30%	$616,600
						S/T	**$2,671,900**
Contingency				30%	$641,970	30%	$801,600
Total					**$2,781,870**	**Total**	**$3,473,500**
					per gpd		***$2.08***

	Original		Escalated	$/mgd
Expand Percolation Ponds	$1,446,000		$1,603,000	$0.96
Extraction Wells	$400,000		$444,000	$0.27
		S/T	**$2,047,000**	$1.23

Tertiary Treatment via Percolation and Pumping

			Original		Escalated
Extraction Wells	LS	1	$400,000		$443,000
Subtotal			**$400,000**		**$443,000**
Engineering/Admin	25%		$100,000		
S/T			$500,000	**S/T**	**$443,000**
			per gpd		***$0.27***
				30%	$132,900
				S/T	**$575,900**
Contingency	25%		$125,000	30%	$172,770
Total			**$625,000**	**Total**	**$748,670**
			per gpd		***$0.45***

Disinfection

Chlorine Contact Basin					Original		Escalated
Concrete Basins (2)	CY	$	1,100	352	$387,200		$429,000
Chlorine Feed System / Tank	LS	$	380,000	1	$380,000		$421,000
Instrumentation & Controls	LS	$	100,000	1	$100,000		$111,000
Subtotal					**$867,200**		**$961,000**
Sitework				10%	$86,720		$96,100
Piping				15%	$130,080		$144,150
Electrical				10%	$86,720		$96,100
Engineering/Admin				20%	$173,440		
S/T					$1,344,160	**S/T**	**$1,297,350**
					per gpd		***$0.78***
						30%	$389,205
						S/T	**$1,686,555**
Contingency				30%	$403,248	30%	$505,967
Total					**$1,747,408**	**Total**	**$2,192,522**
					per gpd		***$1.31***

AREA	**Nipomo CSD**					
PROJECT	**NCSD Tertiary Treatment Upgrade**					
SUPPLY	**Source**	Southland WWTF				
	Available	Existing	0.8	MGD	890	AFY
		Future	1.7	MGD	1,900	AFY

Date
09/17/14

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							*$ 2,091,000*
	Tertiary Filtration & Disinfection			1.70	MGD	$1,230,000	$ 2,091,000
						Construction Subtotal	**$ 2,091,000**
				Construction Contingency		30%	$ 627,000
						Construction Total	$ 2,718,000
				Implementation Costs		30%	$ 815,000
						Total Capital Cost	**$ 3,533,000**
O&M Costs							
Treatment	Tertiary			1.70	MGD	$150,000	$ 255,000
						Total O&M Cost	**$ 255,000**
Unit Cost - Annual Cost Method							
						Annual Capital Payment	$ 230,000
						Annual O&M	$ 255,000
						Total Annual Cost	**$ 485,000**
						Annual Yield (AFY)	1,900
						Unit Cost ($/AF)	**$260**

AREA	**Nipomo CSD**						**Date**
PROJECT	**NCSD Tertiary Treatment via Percolation**						09/17/14
SUPPLY	**Source**	Southland WWTF					
	Available	Existing	0.8	MGD	890	AFY	
		Future	1.70	MGD	1,900	AFY	

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Treatment								*$*	*444,000*
	Extraction Wells				1	LS	$444,000	$	444,000
							Construction Subtotal	**$**	**444,000**
					Construction Contingency		30%	$	133,000
							Construction Total	$	577,000
					Implementation Costs		40%	$	231,000
							Total Capital Cost	**$**	**808,000**
O&M Costs									
Wells									
	Maintenance				$ 444,000		2%	$	9,000
	Power	75%	1181	gpm	50	FT			
				Total:	129,880	kW-hr	$0.13	$	17,000
							Total O&M Cost	**$**	**26,000**
Unit Cost - Annual Cost Method									
							Annual Capital Payment	$	53,000
							Annual O&M	$	26,000
							Total Annual Cost	**$**	**79,000**
							Annual Yield (AFY)		1,900
							Unit Cost ($/AF)		**$50**

AREA	**Nipomo CSD**					
PROJECT	**N1 - Nipomo Regional Park**					
SUPPLY	**Source**	Southland WWTF				
	Available	Existing	0.8	MGD	896	AFY
		Future	1.70	MGD	1,904	AFY
DEMAND	**Average**	0.05	MGD		51	AFY
	Peak Day	0.09	MGD			
	Peak Hour	0.27	MGD		190	GPM

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	6	in	12,500	LF	1.0		$130	$ 1,625,000
Storage								
	@ WWTP				0.1	MG	$1,500,000	$ 137,000
Pump Station								
	@ WWTP (System)		190	gpm	200	FT	refer to	
			75%	eff	7.2	HP	formula	$ 170,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 1,947,000**
					Construction Contingency		30%	$ 584,000
							Construction Total	$ 2,531,000
					Implementation Costs		30%	$ 759,000
							Total Capital Cost	**$ 3,290,000**
O&M Costs								
Pipeline					$ 1,625,000		1%	$ 17,000
Storage					$ 137,000		1%	$ 2,000
Pump Station								
	Maintenance				$ 170,000		5%	$ 9,000
	Power	75%	32	gpm	200	FT		
				Total:	13,916	kW-hr	$0.13	$ 2,000
							Total O&M Cost	**$ 30,000**
Unit Cost - Annual Cost Method								
							Annual Capital Payment	$ 214,000
							Annual O&M	$ 30,000
							Total Annual Cost	**$ 244,000**
							Annual Yield (AFY)	51
							Unit Cost ($/AF)	**$4,790**

AREA	**NCSD**					**Date**
PROJECT	**N2 - Nipomo Park and Blacklake Golf Course**					09/17/14
SUPPLY	**Source**	Southland WWTF				
	Available	Existing	0.8 MGD	896	AFY	
		Future	1.70 MGD	1,904	AFY	
DEMAND	**Average**	0.5	MGD	551	AFY	
	Peak Day	1.0	MGD			
	Peak Hour	1.2	MGD	810	GPM	

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	8	in	22,000	LF	1.0		$150	$ 3,300,000
	12	in	12,000	LF	1.0		$190	$ 2,280,000
Storage								
	@ WWTP				1.0	MG	$1,500,000	$ 1,476,000
Pump Station								
	@ WWTP (System)		810	gpm	200	FT	refer to	
			75%	eff	30.7	HP	formula	$ 500,000
Customer Conversions					2	EA	$15,000	$ 30,000
							Construction Subtotal	**$ 7,586,000**
					Construction Contingency		30%	$ 2,276,000
							Construction Total	$ 9,862,000
					Implementation Costs		30%	$ 2,959,000
							Total Capital Cost	**$ 12,821,000**
O&M Costs								
Pipeline					$ 5,580,000		1%	$ 56,000
Storage					$ 1,476,000		1%	$ 15,000
Pump Station								
	Maintenance				$ 500,000		5%	$ 25,000
	Power	75%	342	gpm	200	FT		
				Total:	150,345	kW-hr	$0.13	$ 20,000
							Total O&M Cost	**$ 116,000**
Unit Cost - Annual Cost Method								
							Annual Capital Payment	**$ 834,000**
							Annual O&M	$ 116,000
							Total Annual Cost	**$ 950,000**
							Annual Yield (AFY)	551
							Unit Cost ($/AF)	**$1,730**

AREA	**Nipomo CSD**					
PROJECT	**N3 - Maximum Project**					
SUPPLY	**Source**	Southland WWTF				
	Available	Existing	0.8	MGD	896	AFY
		Future	1.70	MGD	1,904	AFY
DEMAND	**Average**	0.8	MGD		951	AFY
	Peak Day	1.7	MGD			
	Peak Hour	1.9	MGD		1,306	GPM

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	8	in	25,700	LF	1.0		$150	$ 3,855,000
	16	in	12,000	LF	1.0		$220	$ 2,640,000
Storage								
	@ WWTP				1.7	MG	$1,500,000	$ 2,548,000
Pump Station								
	@ WWTP (System)		1,306	gpm	200	FT	refer to	
			75%	eff	49.5	HP	formula	$ 720,000
Customer Conversions					3	EA	$15,000	$ 45,000
							Construction Subtotal	**$ 9,808,000**
					Construction Contingency		30%	$ 2,942,000
							Construction Total	$ 12,750,000
					Implementation Costs		30%	$ 3,825,000
							Total Capital Cost	**$ 16,575,000**
O&M Costs								
Pipeline					$ 6,495,000		1%	$ 65,000
Storage					$ 2,548,000		1%	$ 26,000
Pump Station								
	Maintenance				$ 720,000		5%	$ 36,000
	Power	75%	590	gpm	200	FT		
				Total:	259,488	kW-hr	$0.13	$ 34,000
							Total O&M Cost	**$ 161,000**
Unit Cost - Annual Cost Method								
							Annual Capital Payment	**$ 1,078,000**
							Annual O&M	$ 161,000
							Total Annual Cost	**$ 1,239,000**
							Annual Yield (AFY)	951
							Unit Cost ($/AF)	**$1,310**

Appendix E: Pismo Beach Project Concepts

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Unit Cost Basis

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
CAPITAL COSTS	*(in May 2014 dollars)*				
Treatment					
TCSD - High Rate Filtration System (0.67 MGD)	$2,580,000	LS	HMM, 2012	Jan 2012	
SSLOCSD - Tertiary Filtration & Disinfection	$1,100,000	mgd	Wallace, 2009	Dec 2008	for 3.0 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$8,300,000	mgd	Carollo, 2007	Jan 2007	for 0.15 MGD w/o redundancy
	$9,900,000	mgd	Carollo, 2007	Jan 2007	for 0.15 MGD w/ redundancy
	$1,200,000	mgd	Carollo, 2007	Jan 2007	for 1.6 MGD w/o redundancy
	$1,500,000	mgd	Carollo, 2007	Jan 2007	for 1.6 MGD w/ redundancy
for wet weather equalization	$3,300,000	mgd	*based on a 3x peaking factor @ $1/gal*		
NCSD - Tertiary Filtration & Disinfection	$1,600,000	mgd	AECOM, 2009	Nov 2008	for 1.67 MGD
Tertiary Filtration & Disinfection	$1,400,000	mgd			Consolidation of references
Reverse Osmosis	$2,000,000	mgd	Dudek, 2012	Sep 2011	
Full Advanced Water Treatment (AWT) (MF/RO/AOP)	$6,000,000	mgd	RMC, 2012	Jan 2011	
Conveyance					
Pipe Dia. (in)					
4	$110	LF			
6	$130	LF			
8	$150	LF			
10	$170	LF			
12	$190	LF			
16	$220	LF			
18	$250	LF			
Pipe Installation Factors					
Trenchless - Directional	2.0				
Trenchless - Jack & Bore	1.5				
Unpaved Areas	0.75				
Pump Station / Booster Station	*Refer to formula*		Sanks, 2008	2012	$\$=2*10^{(0.7583*\log(Q_p)+3.1951)}$

					Q_p = Peak Flow
Storage (Aboveground)	$1,500,000	MG			
Recharge Pond Construction	$15,000	ac	Means		
Evaporation Pond Construction w/ Liner	$80,000	ac	Means		Liner @ $1.5/SF
Land Purchase	$200,000	ac	Loopnet		For agricultural land
Injection Wells	$1,500,000	EA	RMC, 2012		
Landscape Irrigation Customer Conversion	$15,000	EA			
O&M COSTS					
Treatment - Tertiary Filtration	$150,000	mgd	Dudek, 2012	Sep 2011	
Treatment - RO	$200,000	mgd	RMC, 2012	Jan 2011	
Treatment - Full AWT (MF/RO/AOP)	$600,000	mgd			
Pipeline	1%				
Storage	1%				
Pump Stations	5%				
Injection Wells	2%				
Recharge Basins	$5,000	ac			
Pump/Motor Efficiency	75%				
Electricity	$0.13				
FINANCING COSTS / ASSUMPTIONS					
Interest Rate	5%				
Term (years)	30				
Contingencies / Soft Costs					
Construction Contingency	30%				
Engineering/Admin/CM/etc.	30%				
For Potable Reuse & Stream Augmentation	40%				

California Construction Cost Index (CCCI) www.documents.dgs.ca.gov/resd/pmb/ccci/cccitable.pdf

The California Construction Cost index is developed based upon Building Cost Index (BCI) cost indices for San Francisco and Los Angeles produced by Engineering News Record (ENR).

Reference	Month	CCI
RRWSP	**May 2014**	**5957**
Morro Bay (Dudek, 2012)	Sep 2012	5777
Templeton CSD (HMM, 2012)	Jan 2012	5683
SSLOCSD (Wallace, 2009)	Dec 2008	5322
Nipomo CSD (AECOM, 2009)	Nov 2008	5375
Pismo Beach (Carollo, 2007)	Jan 2007	4869

Summary of Pismo Beach WWTP Potential Projects

Alt #	PB1				PB2				PB3				PB4			
PROJECT	Pismo Beach Sports Complex				Middle School, Caltrans				Price House Historic Park				Highland Park & Arroyo Grande			
Max Supply	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY
Demand																
Average	0.01	MGD	**16**	**AFY**	0.08	MGD	**89**	**AFY**	0.02	MGD	**28**	**AFY**	0.02	MGD	**26**	**AFY**
Peak Day	0.03	MGD			0.16	MGD			0.05	MGD			0.05	MGD		
Peak Hour	0.08	MGD	58	GPM	0.26	MGD	180	GPM	0.15	MGD	104	GPM	0.14	MGD	97	GPM
Capital Costs																
RO or AWT	$ -				$ -				$ -				$ -			
Pipeline	$ 50,000				$ 508,000				$ 229,000				$ 1,534,000			
Storage	$ 42,000				$ 239,000				$ 75,000				$ 70,000			
Pump Station	$ 70,000				$ 160,000				$ 110,000				$ 100,000			
Customer Conversions	$ 15,000				$ 45,000				$ 15,000				$ 105,000			
Construction Subtotal	$ 177,000				$ 952,000				$ 429,000				$ 1,809,000			
Construction Contingency	$ 53,000				$ 286,000				$ 129,000				$ 543,000			
Construction Total	$ 230,000				$ 1,238,000				$ 558,000				$ 2,352,000			
Implementation Costs	$ 69,000				$ 371,000				$ 167,000				$ 706,000			
Total Capital Cost	**$ 299,000**				**$ 1,609,000**				**$ 725,000**				**$ 3,058,000**			
O&M Costs																
RO or AWT	$ -				$ -				$ -				$ -			
Pipeline	$ 1,000				$ 6,000				$ 3,000				$ 16,000			
Storage	$ 1,000				$ 3,000				$ 1,000				$ 1,000			
Pump Station																
Maintenance	$ 4,000				$ 8,000				$ 6,000				$ 5,000			
Power	$ 1,000				$ 6,000				$ 1,000				$ 2,000			
Total O&M Cost	**$ 7,000**				**$ 23,000**				**$ 11,000**				**$ 24,000**			
Annual Cost Method																
Annual Capital Payment	$ 19,000				$ 105,000				$ 47,000				$ 199,000			
Annual O&M	$ 7,000				$ 23,000				$ 11,000				$ 24,000			
Total Annual Cost	$ 26,000				$ 128,000				$ 58,000				$ 223,000			
Annual Yield (AFY)	16				89				28				26			
Unit Cost ($/AF)	**$1,680**				**$1,440**				**$2,080**				**$8,550**			
Project Concepts with Tertiary Treatment Costs Included																
Tertiary Trmt Capital Cost	$ 40,000				$ 229,800				$ 72,000				$ 67,400			
Capital Cost (from above)	$ 299,000				$ 1,609,000				$ 725,000				$ 3,058,000			
Total Capital Cost	**$ 339,000**				**$ 1,838,800**				**$ 797,000**				**$ 3,125,400**			
Tertiary Trmt O&M Cost	$ 2,500				$ 14,600				$ 4,600				$ 4,300			
O&M Cost (from above)	$ 7,000				$ 23,000				$ 11,000				$ 24,000			
Total O&M Cost	**$ 9,500**				**$ 37,600**				**$ 15,600**				**$ 28,300**			
Annual Cost Method																
Annual Capital Payment	$ 22,000				$ 120,000				$ 52,000				$ 203,000			
Annual O&M	$ 9,500				$ 37,600				$ 15,600				$ 28,300			
Total Annual Cost	**$ 31,500**				**$ 157,600**				**$ 67,600**				**$ 231,300**			
Annual Yield (AFY)	16				89				28				26			
Unit Cost ($/AF)	**$2,030**				**$1,770**				**$2,420**				**$8,860**			

Summary of Pismo Beach WWTP Potential Projects

Alt #	**PB5**				**PB6**				**PB7**				**PB8**			
PROJECT	**Pismo State Beach Golf Course**				**Dinosaur Caves**				**Palisades Park**				**Pismo State Beach G.C. *from Outfall***			
Max Supply	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY	1.8	MGD	2,016	AFY
Demand																
Average	0.08	MGD	**86**	**AFY**	0.04	MGD	**47**	**AFY**	0.06	MGD	**62**	**AFY**	0.07	MGD	**77**	**AFY**
Peak Day	0.15	MGD			0.08	MGD			0.11	MGD			0.14	MGD		
Peak Hour	0.46	MGD	319	GPM	0.25	MGD	175	GPM	0.33	MGD	232	GPM	0.41	MGD	285	GPM

	PB5		PB6		PB7		PB8	
Capital Costs								
RO or AWT	$	-	$	-	$	-	$	452,000
Pipeline	$	1,009,000	$	1,121,000	$	2,487,000	$	700,000
Storage	$	230,000	$	124,000	$	168,000	$	206,000
Pump Station	$	250,000	$	160,000	$	200,000	$	230,000
Customer Conversions	$	60,000	$	30,000	$	105,000	$	15,000
Construction Subtotal	$	1,549,000	$	1,435,000	$	2,960,000	$	1,588,000
Construction Contingency	$	465,000	$	431,000	$	888,000	$	476,000
Construction Total	$	2,014,000	$	1,866,000	$	3,848,000	$	2,064,000
Implementation Costs	$	604,000	$	560,000	$	1,154,000	$	619,000
Total Capital Cost	**$**	**2,618,000**	**$**	**2,426,000**	**$**	**5,002,000**	**$**	**2,683,000**
O&M Costs								
RO or AWT	$	-	$	-	$	-	$	-
Pipeline	$	11,000	$	12,000	$	25,000	$	7,000
Storage	$	3,000	$	2,000	$	2,000	$	3,000
Pump Station								
Maintenance	$	13,000	$	8,000	$	10,000	$	12,000
Power	$	4,000	$	2,000	$	3,000	$	3,000
Total O&M Cost	**$**	**31,000**	**$**	**24,000**	**$**	**40,000**	**$**	**25,000**
Annual Cost Method								
Annual Capital Payment	$	170,000	$	158,000	$	325,000	$	175,000
Annual O&M	$	31,000	$	24,000	$	40,000	$	25,000
Total Annual Cost	$	201,000	$	182,000	$	365,000	$	200,000
Annual Yield (AFY)	86		47		62		77	
Unit Cost ($/AF)	**$2,350**		**$3,880**		**$5,850**		**$2,610**	
Project Concepts with Tertiar								
Tertiary Trmt Capital Cost	$	221,300	$	118,800	$	161,100	$	198,100
Capital Cost (from above)	$	2,618,000	$	2,426,000	$	5,002,000	$	2,683,000
Total Capital Cost	**$**	**2,839,300**	**$**	**2,544,800**	**$**	**5,163,100**	**$**	**2,881,100**
Tertiary Trmt O&M Cost	$	14,000	$	7,500	$	10,200	$	12,600
O&M Cost (from above)	$	31,000	$	24,000	$	40,000	$	25,000
Total O&M Cost	**$**	**45,000**	**$**	**31,500**	**$**	**50,200**	**$**	**37,600**
Annual Cost Method								
Annual Capital Payment	$	185,000	$	166,000	$	336,000	$	187,000
Annual O&M	$	45,000	$	31,500	$	50,200	$	37,600
Total Annual Cost	**$**	**230,000**	**$**	**197,500**	**$**	**386,200**	**$**	**224,600**
Annual Yield (AFY)	86		47		62		77	
Unit Cost ($/AF)	**$2,680**		**$4,200**		**$6,190**		**$2,930**	

Summary of Pismo Beach WWTP Potential Projects

Alt #	PB9			
PROJECT	**Western Grove Beach *from Outfall***			
Max Supply	1.8	MGD	2,016	AFY
Demand				
Average	0.08	MGD	**84**	**AFY**
Peak Day	0.15	MGD		
Peak Hour	0.45	MGD	313	GPM
Capital Costs				
RO or AWT	$	495,000		
Pipeline	$	1,610,000		
Storage	$	225,000		
Pump Station	$	240,000		
Customer Conversions	$	75,000		
Construction Subtotal	$	2,570,000		
Construction Contingency	$	771,000		
Construction Total	$	3,341,000		
Implementation Costs	$	1,002,000		
Total Capital Cost	**$**	**4,343,000**		
O&M Costs				
RO or AWT	$	-		
Pipeline	$	17,000		
Storage	$	3,000		
Pump Station				
Maintenance	$	12,000		
Power	$	3,000		
Total O&M Cost	**$**	**35,000**		
Annual Cost Method				
Annual Capital Payment	$	283,000		
Annual O&M	$	35,000		
Total Annual Cost	$	318,000		
Annual Yield (AFY)	84			
Unit Cost ($/AF)	**$3,790**			
Project Concepts with Tertiar				
Tertiary Trmt Capital Cost	$	216,900		
Capital Cost (from above)	$	4,343,000		
Total Capital Cost	**$**	**4,559,900**		
Tertiary Trmt O&M Cost	$	13,800		
O&M Cost (from above)	$	35,000		
Total O&M Cost	**$**	**48,800**		
Annual Cost Method				
Annual Capital Payment	$	297,000		
Annual O&M	$	48,800		
Total Annual Cost	**$**	**345,800**		
Annual Yield (AFY)	84			
Unit Cost ($/AF)	**$4,120**			

Pismo Beach

Demands

		Annual	Peak Day		Peak Hour		Project #						
#	**Customer**	**AFY**	**Factor**	**GPD**	**Factor**	**GPM**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1	Baycliff Condos HOA	9.8	2.0	17,498	3.0	36							1
2	Boosinger Park	7.4	2.0	13,213	3.0	28		1					
3	Cal Trans (Hwy 101) Irrigation	40.5	2.0	72,312	0.0	0		1					
4	Chumash Park	0.8	2.0	1,428	3.0	3				1			
5	Dina sour Cave Park	46	2.0	82,132	3.0	171						1	
6	Eldwayen Ocean Park	4	2.0	7,142	3.0	15							1
7	Everett Estate	4.9	2.0	8,749	3.0	18							1
8	Francis Judkins MS	41.1	2.0	73,383	3.0	153		1					
9	Highland Park	8.6	2.0	15,355	3.0	32				1			
10	Ira Lease Park	3.8	2.0	6,785	3.0	14					1		
11	James Way Slopes Median	0.2	2.0	357	3.0	1				1			
12	Margo Dodd Park	1	2.0	1,785	3.0	4						1	
13	Mary Harrington Park	3.8	2.0	6,785	3.0	14					1		
14	Palisades Park	17.5	2.0	31,246	3.0	65							1
15	Pismo State Beach Golf Course	76.7	2.0	136,947	3.0	285					1		
16	Pismo Beach Sports Complex	15.5	2.0	27,675	3.0	58	1						
17	Pismo Coast Village RV Park	1.4	2.0	2,500	3.0	5					1		
18	Price House Historic Park	27.9	2.0	49,815	3.0	104			1				
19	Seacliff Park	2.9	2.0	5,178	3.0	11							
20	Shell Beach School	8.4	2.0	14,998	3.0	31							1
21	South Palisades Park/Walk	3.4	2.0	6,071	3.0	13							1
22	Spyglass Park	14.4	2.0	25,711	3.0	54							1
23	Ventana Islands Median	1	2.0	1,785	3.0	4				1			
	From AG Report												
24	Cal Trans Median (South of WW	3.5	2.0	6,249	0.0	0							
25	Five Cities Shopping Center	7.2	2.0	12,855	3.0	27				1			
26	Oak Park Shopping Center	6	2.0	10,713	3.0	22				1			
27	New Life Church	2.3	2.0	4,107	3.0	9				1			
		360				afy	16	89	28	26	86	47	62
						count	1	3	1	7	4	2	7

Notes:

Caltrans - peak hour factor of zero is due to daytime irrigation, which does not impact pipe sizing
Seacliff Park omitted from system due to distance from main and low demand

2010 AG TM referred to FS Table 2-1, which has some demands listed incorrectly. The correct values from the FS are used here.

Title	***Water Reuse Study***		
	City of Pismo Beach		
Author	*Carollo Engineers*		
Date	*May 2007*	**CCCI**	**(California Construction Cost Index)**
ENR Date	*Jan 2007*	4869	
	May 2014	5957	

	Table 3-5 & 3-6	**Original**								**Reconciled**			
		Phase 1				**Phase 2**				**Phase 1**		**Phase 2**	
				redundancy				**redundancy**			**redundancy**		**redundancy**
	MGD		0.15	0.15			1.6	1.6		0.15	0.15	1.6	1.6
	Secondary Effluent Pump Station	2 @ 0.15 mgd	$145,000	$145,000		2 @ 1.6 mgd	$200,000	$200,000	100%	$177,000	$177,000	$245,000	$245,000
	Tertiary Filtration	0.15 mgd	$117,900	$214,300		1.6 mgd	$210,500	$396,700	100%	$144,000	$262,000	$258,000	$485,000
	Recycled Water Pump Station		$145,000	$145,000		2 @ 1.6 mgd	$200,000	$200,000					
	Sitework	10%	$40,790	$50,430		10%	$61,050	$79,670	100%	$50,000	$62,000	$75,000	$97,000
	Yard Piping	15%	$61,185	$75,645		15%	$91,575	$119,505	100%	$75,000	$93,000	$112,000	$146,000
	Electrical and Instrumentation	20%	$81,580	$100,860		20%	$122,100	$159,340	50%	$50,000	$61,500	$74,500	$97,500
$300/SF	Pre-Fabricated Metal Building (E/I&C)	250 SF	$75,000	$75,000		375 SF	$112,500	$112,500	100%	$92,000	$92,000	$138,000	$138,000
	Transmission Pipeline	4" @ 900 LF	$81,429	$81,429		15" @ 2300 LF	$285,714	$285,714	100%	$100,000	$100,000	$350,000	$350,000
	Chlorine Contact Basin Modifications		$100,000	$100,000			$0	$0	100%	$122,000	$122,000	$0	$0
	Total Direct Costs		**$847,884**	**$987,664**			**$1,283,439**	**$1,553,429**		**$810,000**	**$969,500**	**$1,252,500**	**$1,558,500**
	Mobilization / Bonds	15%	$127,183	$148,150		15%	$192,516	$233,014		$122,000	$145,425	$187,875	$233,775
	Design / Estimating Contingency	30%	$254,365	$296,299		30%	$385,032	$466,029		$243,000	$290,850	$375,750	$467,550
2.5	Escalation to Mid-Point (# yrs)	5%	$109,993	$128,126	4	5%	$276,589	$334,774					
	Sales Tax	8%	$33,915	$39,507		8%	$51,338	$62,137		$65,000	$77,560	$100,000	$124,680
	Subtotal		**$1,373,340**	**$1,599,745**			**$2,188,913**	**$2,649,383**		**$1,240,000**	**$1,483,335**	**$1,916,125**	**$2,384,505**
									$/gal	***$8.3***	***$9.9***	***$1.2***	***$1.5***
	Engineering, Legal & Admin	30%	$412,002	$479,924		15%	$328,337	$397,407	30%	$372,000	$445,000	$575,000	$715,000
	Subtotal									**$1,612,000**	**$1,928,335**	**$2,491,125**	**$3,099,505**
	Construction Contingency	20%	$274,668	$319,949		20%	$437,783	$529,877	30%	$484,000	$579,000	$747,000	$930,000
	Total		**$2,060,010**	**$2,399,618**			**$2,955,033**	**$3,576,667**		**$2,096,000**	**$2,507,335**	**$3,238,125**	**$4,029,505**
									$/gal	***$14.0***	***$16.7***	***$2.0***	***$2.5***
									Annual Payment	$136,348	$163,106	$210,645	$262,125
									Annual O&M	$22,500	$22,500	$240,000	$240,000
									Total Annual Cost	**$158,848**	**$185,606**	**$450,645**	**$502,125**

AREA	**Pismo Beach**						**Date**
PROJECT	**Pismo Beach Tertiary Treatment Upgrade**						09/17/14
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,230	AFY	
		Future	1.8	MGD	2,010	AFY	

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Filtration			1.1	MGD	$1,400,000	$ 1,540,000
						Construction Subtotal	**$ 1,540,000**
				Construction Contingency		30%	$ 462,000
						Construction Total	$ 2,002,000
				Implementation Costs		30%	$ 601,000
						Total Capital Cost	**$ 2,603,000**
O&M Costs							
Treatment	Tertiary			1.1	MGD	$150,000	$ 165,000
						Total O&M Cost	**$ 165,000**
Unit Cost							
						Annual Capital Payment	$ 170,000
						Annual O&M	$ 165,000
						Total Annual Cost	**$ 335,000**
						Annual Yield (AFY)	1,230
						Unit Cost ($/AF)	**$280**

AREA	**Pismo Beach**						**Date**
PROJECT	**Pismo Beach Tertiary Treatment Upgrade (Based on 0.15 mgd)**						09/17/14
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,230	AFY	
		Future	1.8	MGD	2,010	AFY	

Item	Description	Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs								
Treatment								
	Tertiary Filtration			0.15	MGD	$8,300,000	$	1,250,000
						Construction Subtotal	**$**	**1,250,000**
				Construction Contingency		30%	$	375,000
						Construction Total	$	1,625,000
				Implementation Costs		30%	$	488,000
						Total Capital Cost	**$**	**2,113,000**
O&M Costs								
Treatment	Tertiary			0.15	MGD	$150,000	$	23,000
						Total O&M Cost	**$**	**23,000**
Unit Cost								
						Annual Capital Payment	$	138,000
						Annual O&M	$	23,000
						Total Annual Cost	**$**	**161,000**
						Annual Yield (AFY)		168
						Unit Cost ($/AF)		**$970**

AREA	**City of Pismo Beach**						
PROJECT	**PB1: Sports Complex**						
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.014	MGD		16	AFY	
	Peak Day	0.028	MGD				
	Peak Hour	0.083	MGD		58	GPM	

Date
09/17/14

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Pipeline				Factor			
4	in	450	LF	1.0		$110	$ 50,000
6	in		LF	1.0		$130	$ -
Storage							
@ WWTP				0.028	MG	$1,500,000	$ 42,000
Pump Station							
@ WWTP (System)		58	gpm	150	FT	refer to	
		75%	eff	1.6	HP	formula	$ 70,000
Customer Conversions				1	EA	$15,000	$ 15,000
						Construction Subtotal	**$ 177,000**
				Construction Contingency		30%	$ 53,000
						Construction Total	$ 230,000
				Implementation Costs		30%	$ 69,000
						Total Capital Cost	**$ 299,000**
O&M Costs							
Pipeline				$ 50,000		1%	$ 1,000
Storage				$ 42,000		1%	$ 1,000
Pump Station							
Maintenance				$ 70,000		5%	$ 4,000
Power	75%	10	gpm	150	FT		
			Total:	3,172	kW-hr	$0.13	$ 1,000
						Total O&M Cost	**$ 7,000**
Unit Costs							
						Annual Capital Payment	$ 19,000
						Annual O&M	$ 7,000
						Total Annual Cost	**$ 26,000**
						Annual Yield (AFY)	16
						Unit Cost ($/AF)	**$1,680**

							Date
AREA	**City of Pismo Beach**						
PROJECT	**PB2: Middle School**						09/17/14
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.08	MGD		89	AFY	
	Peak Day	0.16	MGD				
	Peak Hour	0.26	MGD		180	GPM	

Item		Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	4,615	LF	1.0		$110	$ 508,000
	6	in		LF	1.0		$130	$ -
Storage								
	@ WWTP				0.16	MG	$1,500,000	$ 239,000
Pump Station								
	@ WWTP (System)		180	gpm	350	FT	refer to	
			75%	eff	12.0	HP	formula	$ 160,000
Customer Conversions					3	EA	$15,000	$ 45,000
							Construction Subtotal	**$ 952,000**
					Construction Contingency		30%	$ 286,000
							Construction Total	$ 1,238,000
					Implementation Costs		30%	$ 371,000
							Total Capital Cost	**$ 1,609,000**
O&M Costs								
Pipeline					$ 508,000		1%	$ 6,000
Storage					$ 239,000		1%	$ 3,000
Pump Station								
	Maintenance				$ 160,000		5%	$ 8,000
	Power	75%	55	gpm	350	FT		
				Total:	42,498	kW-hr	$0.13	$ 6,000
							Total O&M Cost	**$ 23,000**
Unit Costs								
							Annual Capital Payment	$ 105,000
							Annual O&M	$ 23,000
							Total Annual Cost	**$ 128,000**
							Annual Yield (AFY)	89
							Unit Cost ($/AF)	**$1,440**

AREA	**City of Pismo Beach**						
PROJECT	**PB3: Price House Historic Park**						
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.02	MGD		28	AFY	
	Peak Day	0.05	MGD				
	Peak Hour	0.15	MGD		104	GPM	

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	2,075	LF	1.0		$110	$ 229,000
	6	in		LF	1.0		$130	$ -
Storage								
	@ WWTP				0.05	MG	$1,500,000	$ 75,000
Pump Station								
	@ WWTP (System)		104	gpm	200	FT	refer to	
			75%	eff	3.9	HP	formula	$ 110,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 429,000**
					Construction Contingency		30%	$ 129,000
							Construction Total	$ 558,000
					Implementation Costs		30%	$ 167,000
							Total Capital Cost	**$ 725,000**
O&M Costs								
Pipeline					$ 229,000		1%	$ 3,000
Storage					$ 75,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 110,000		5%	$ 6,000
	Power	75%	17	gpm	200	FT		
				Total:	7,613	kW-hr	$0.13	$ 1,000
							Total O&M Cost	**$ 11,000**
Unit Costs								
							Annual Capital Payment	$ 47,000
							Annual O&M	$ 11,000
							Total Annual Cost	**$ 58,000**
							Annual Yield (AFY)	28
							Unit Cost ($/AF)	**$2,080**

AREA	**City of Pismo Beach**					
PROJECT	**PB4: Highland Park & Arroyo Grande**					
SUPPLY	**Source**	Pismo Beach WWTP				
	Available	Existing	1.1	MGD	1,232	AFY
		Future	1.8	MGD	2,016	AFY
DEMAND	**Average**	0.02	MGD		26	AFY
	Peak Day	0.05	MGD			
	Peak Hour	0.14	MGD		97	GPM

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	13,940	LF	1.0		$110	$ 1,534,000
	6	in		LF	1.0		$130	$ -
Storage								
	@ WWTP				0.05	MG	$1,500,000	$ 70,000
Pump Station								
	@ WWTP (System)		97	gpm	290	FT	refer to	
			75%	eff	5.3	HP	formula	$ 100,000
Customer Conversions					7	EA	$15,000	$ 105,000
							Construction Subtotal	**$ 1,809,000**
					Construction Contingency		30%	$ 543,000
							Construction Total	$ 2,352,000
					Implementation Costs		30%	$ 706,000
							Total Capital Cost	**$ 3,058,000**
O&M Costs								
Pipeline				$	1,534,000		1%	$ 16,000
Storage				$	70,000		1%	$ 1,000
Pump Station								
	Maintenance			$	100,000		5%	$ 5,000
	Power	75%	16	gpm	290	FT		
				Total:	10,326	kW-hr	$0.13	$ 2,000
							Total O&M Cost	**$ 24,000**
Unit Costs								
							Annual Capital Payment	$ 199,000
							Annual O&M	$ 24,000
							Total Annual Cost	**$ 223,000**
							Annual Yield (AFY)	26
							Unit Cost ($/AF)	**$8,550**

AREA	**City of Pismo Beach**						
PROJECT	**PB5: Pismo State Beach Golf Course**						
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.077	MGD		86	AFY	
	Peak Day	0.15	MGD				
	Peak Hour	0.46	MGD		319	GPM	

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Pipeline					Factor				
	4-6 Upsize	in	2,650	LF	1.0		$10	$	27,000
	6	in	7,550	LF	1.0		$130	$	982,000
Storage									
	@ WWTP				0.153	MG	$1,500,000	$	230,000
Pump Station									
	@ WWTP (System)		319	gpm	200	FT	refer to		
			75%	eff	12.1	HP	formula	$	250,000
Customer Conversions					4	EA	$15,000	$	60,000
							Construction Subtotal	**$**	**1,549,000**
				Construction Contingency			30%	$	465,000
							Construction Total	$	2,014,000
				Implementation Costs			30%	$	604,000
							Total Capital Cost	**$**	**2,618,000**
O&M Costs									
Pipeline				$	1,009,000		1%	$	11,000
Storage				$	230,000		1%	$	3,000
Pump Station									
	Maintenance			$	250,000		5%	$	13,000
	Power	75%	53	gpm	200	FT			
				Total:	23,384	kW-hr	$0.13	$	4,000
							Total O&M Cost	**$**	**31,000**
Unit Costs									
							Annual Capital Payment	$	170,000
							Annual O&M	$	31,000
							Total Annual Cost	**$**	**201,000**
							Annual Yield (AFY)		86
							Unit Cost ($/AF)		**$2,350**

							Date
AREA	**City of Pismo Beach**						
PROJECT	**PB6: Dinosaur Caves**						09/17/14
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.04	MGD		47	AFY	
	Peak Day	0.08	MGD				
	Peak Hour	0.25	MGD		175	GPM	

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Pipeline					Factor				
	4	in	9,750	LF	1.0		$110	$	1,073,000
	4-6 Upsize	in	4,720	LF	1.0		$10	$	48,000
Storage									
	@ WWTP				0.08	MG	$1,500,000	$	124,000
Pump Station									
	@ WWTP (System)		175	gpm	190	FT	refer to		
			75%	eff	6.3	HP	formula	$	160,000
Customer Conversions					2	EA	$15,000	$	30,000
							Construction Subtotal	**$**	**1,435,000**
					Construction Contingency		30%	$	431,000
							Construction Total	$	1,866,000
					Implementation Costs		30%	$	560,000
							Total Capital Cost	**$**	**2,426,000**
O&M Costs									
Pipeline					$ 1,121,000		1%	$	12,000
Storage					$ 124,000		1%	$	2,000
Pump Station									
	Maintenance				$ 160,000		5%	$	8,000
	Power	75%	29	gpm	190	FT			
				Total:	11,924	kW-hr	$0.13	$	2,000
							Total O&M Cost	**$**	**24,000**
Unit Costs									
							Annual Capital Payment	$	158,000
							Annual O&M	$	24,000
							Total Annual Cost	**$**	**182,000**
							Annual Yield (AFY)		47
							Unit Cost ($/AF)		**$3,880**

AREA	**City of Pismo Beach**							**Date**
PROJECT	**PB7: Palisades Park**							09/17/14
SUPPLY	**Source**	Pismo Beach WWTP						
	Available	Existing	1.1	MGD	1,232	AFY		
		Future	1.8	MGD	2,016	AFY		
DEMAND	**Average**	0.06	MGD		62	AFY		
	Peak Day	0.11	MGD					
	Peak Hour	0.33	MGD		232	GPM		

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	21,415	LF	1.0		$110	$ 2,356,000
	4-6 Upsize	in	13,020	LF	1.0		$10	$ 131,000
Storage								
	@ WWTP				0.11	MG	$1,500,000	$ 168,000
Pump Station								
	@ WWTP (System)		232	gpm	220	FT	refer to	
			75%	eff	9.7	HP	formula	$ 200,000
Customer Conversions					7	EA	$15,000	$ 105,000
							Construction Subtotal	**$ 2,960,000**
					Construction Contingency		30%	$ 888,000
							Construction Total	$ 3,848,000
					Implementation Costs		30%	$ 1,154,000
							Total Capital Cost	**$ 5,002,000**
O&M Costs								
Pipeline					$ 2,487,000		1%	$ 25,000
Storage					$ 168,000		1%	$ 2,000
Pump Station								
	Maintenance				$ 200,000		5%	$ 10,000
	Power	75%	39	gpm	220	FT		
				Total:	18,729	kW-hr	$0.13	$ 3,000
							Total O&M Cost	**$ 40,000**
Unit Costs								
							Annual Capital Payment	$ 325,000
							Annual O&M	$ 40,000
							Total Annual Cost	**$ 365,000**
							Annual Yield (AFY)	62
							Unit Cost ($/AF)	**$5,850**

AREA	**City of Pismo Beach**						**Date**
PROJECT	**PB8: Pismo State Beach Golf Course - from Existing Outfall Line**						09/17/14
SUPPLY	**Source**	Pismo Beach WWTP					
	Available	Existing	1.1	MGD	1,232	AFY	
		Future	1.8	MGD	2,016	AFY	
DEMAND	**Average**	0.07	MGD		77	AFY	
	Peak Day	0.14	MGD				
	Peak Hour	0.41	MGD		285	GPM	

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								*$ 452,000*
	Wet Weather Equalization				0.14	MGD	$ 3,300,000	$ 452,000
Pipeline					Factor			
	6	in	5,000	LF	1.0		$130	$ 650,000
	6	in	Tap to Existing Outfall Line			LS	$50,000	$ 50,000
Storage								
	@ WWTP				0.14	MG	$1,500,000	$ 206,000
Pump Station								
	@ Site		285	gpm	200	FT	refer to	
			75%	eff	10.8	HP	formula	$ 230,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 1,588,000**
				Construction Contingency			30%	$ 476,000
							Construction Total	$ 2,064,000
				Implementation Costs			30%	$ 619,000
							Total Capital Cost	**$ 2,683,000**
O&M Costs								
Pipeline					$ 700,000		1%	$ 7,000
Storage					$ 206,000		1%	$ 3,000
Pump Station								
	Maintenance				$ 230,000		5%	$ 12,000
	Power	75%	48	gpm	200	FT		
				Total:	20,928	kW-hr	$0.13	$ 3,000
							Total O&M Cost	**$ 25,000**
Unit Costs								
							Annual Capital Payment	$ 175,000
							Annual O&M	$ 25,000
							Total Annual Cost	**$ 200,000**
							Annual Yield (AFY)	77
							Unit Cost ($/AF)	**$2,610**

AREA	**City of Pismo Beach**					
PROJECT	**PB9: Western Grover Beach - from Existing Outfall Line**					
SUPPLY	**Source**	Pismo Beach WWTP				
	Available	Existing	1.1	MGD	1,232	AFY
		Future	1.8	MGD	2,016	AFY
DEMAND	**Average**	0.08	MGD		84	AFY
	Peak Day	0.15	MGD			
	Peak Hour	0.45	MGD		313	GPM

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Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								*$ 495,000*
	Wet Weather Equalization				0.15	MGD	$ 3,300,000	$ 495,000
Pipeline					Factor			
	6	in	12,000	LF	1.0		$130	$ 1,560,000
	6	in	Tap to Existing Outfall Line			LS	$50,000	$ 50,000
Storage								
	@ WWTP				0.15	MG	$1,500,000	$ 225,000
Pump Station								
	@ Site		313	gpm	200	FT	refer to	
			75%	eff	11.8	HP	formula	$ 240,000
Customer Conversions					5	EA	$15,000	$ 75,000
							Construction Subtotal	**$ 2,570,000**
					Construction Contingency		30%	$ 771,000
							Construction Total	$ 3,341,000
					Implementation Costs		30%	$ 1,002,000
							Total Capital Cost	**$ 4,343,000**
O&M Costs								
Pipeline					$ 1,610,000		1%	$ 17,000
Storage					$ 225,000		1%	$ 3,000
Pump Station								
	Maintenance				$ 240,000		5%	$ 12,000
	Power	75%	52	gpm	200	FT		
				Total:	22,920	kW-hr	$0.13	$ 3,000
							Total O&M Cost	**$ 35,000**
Unit Costs								
							Annual Capital Payment	$ 283,000
							Annual O&M	$ 35,000
							Total Annual Cost	**$ 318,000**
							Annual Yield (AFY)	84
							Unit Cost ($/AF)	**$3,790**

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Appendix F: SSLOCSD Project Concepts

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Unit Cost Basis

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
CAPITAL COSTS	*(May 2014 dollars)*				
Treatment					
TCSD - High Rate Filtration System (0.67 MGD)	$2,580,000	LS	HMM, 2012	Jan 2012	
SSLOCSD - Tertiary Filtration & Disinfection	$1,100,000	mgd	Wallace, 2009	Dec 2008	for 3.0 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$7,500,000	mgd	Carollo, 2007	Jan 2007	for 0.15 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$1,100,000	mgd	Carollo, 2007	Jan 2007	for 1.6 MGD
NCSD - Tertiary Filtration & Disinfection	$1,600,000	mgd	AECOM, 2009	Nov 2008	for 1.67 MGD
Tertiary Filtration & Disinfection	$1,400,000	mgd			Consolidation of references
Reverse Osmosis	$2,000,000	mgd	Dudek, 2012	Sep 2011	
Full Advanced Water Treatment (AWT) (MF/RO/AOP)	$6,000,000	mgd	RMC, 2012	Jan 2011	
Conveyance					
Pipe Diameter (in)					
4	$110	LF			
6	$130	LF			
8	$150	LF			
10	$170	LF			
12	$190	LF			
16	$220	LF			
18	$250	LF			
Pipe Installation Factors					
Trenchless - Directional	2.0				
Trenchless - Jack & Bore	1.5				
Unpaved Areas	0.75				
Pump Station / Booster Station	*Refer to formula*		Sanks, 2008	2012	$\$=2*10^{\wedge}(0.7583*\log(Q_p)+3.1951)$ Q_p = Peak Flow
Storage (Aboveground)	$1,500,000	MG			

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
Recharge Pond Construction	$15,000	ac	Means		
Evaporation Pond Construction w/ Liner	$80,000	ac	Means		Liner @ $1.5/SF
Land Purchase	$200,000	ac	Loopnet		For agricultural land
Injection Wells	$1,500,000	EA	RMC, 2012		
Landscape Irrigation Customer Conversion	$15,000	EA			
Industrial Customer Conversion	$100,000	EA			
O&M COSTS					
Treatment - Tertiary Filtration	$150,000	mgd	Dudek, 2012	Sep 2011	
Treatment - RO	$200,000	mgd	RMC, 2012	Jan 2011	
Treatment - Full AWT (MF/RO/AOP)	$600,000	mgd			
Pipeline	1%				
Storage	1%				
Pump Stations	5%				
Injection Wells	2%				
Recharge Basins	$5,000	ac			
Pump/Motor Efficiency	75%				
Electricity	$0.13				
FINANCING COSTS / ASSUMPTIONS					
Interest Rate	5%				
Term (years)	30				
Annual Payment Factor based on Rate and Term	0.0651				
Contingencies / Soft Costs					
Construction Contingency	30%				
Engineering/Admin/CM/etc.	30%				
For Potable Reuse & Stream Augmentation	40%				

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
California Construction Cost Index (CCCI)			www.documents.dgs.ca.gov/resd/pmb/ccci/cccitable.pdf		

The California Construction Cost index is developed based upon Building Cost Index (BCI) cost indices for San Francisco and Los Angeles produced by Engineering News Record (ENR).

Reference	Month	CCI
RRWSP	**May 2014**	**5957**
Morro Bay (Dudek, 2012)	Sep 2012	5777
Templeton CSD (HMM, 2012)	Jan 2012	5683
SSLOCSD (Wallace, 2009)	**Dec 2008**	**5322**
Nipomo CSD (AECOM, 2009)	Nov 2008	5375
Pismo Beach (Carollo, 2007)	Jan 2007	4869

Summary of SSLOCSD WWTP Potential Projects

Project End-Use Type	**Landscape Irrigation**			
Alt #	**S1a**	**S1b**	**S1c**	**S1d**
PROJECT	**Small Project**	**Core Project**	**G-B Expansion**	**N of Hwy 101 Expansion**
Max Supply	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY
Demand				
Average	0.01 MGD **12 AFY**	0.2 MGD **202 AFY**	0.0 MGD **44 AFY**	0.0 MGD **52 AFY**
Peak Day	0.02 MGD	0.4 MGD	0.1 MGD	0.1 MGD
Peak Hour	0.04 MGD 45 GPM	0.7 MGD 503 GPM	0.3 MGD 213 GPM	0.1 MGD 192 GPM
Capital Costs				
RO or AWT	$ -	$ -	$ -	$ -
Pipeline	$ 264,000	$ 3,112,000	$ 1,147,000	$ 1,449,000
Storage	$ 33,000	$ 542,000	$ 59,000	$ 70,000
Pump Station	$ 60,000	$ 350,000	$ 180,000	$ 340,000
Customer Conversions	$ 15,000	$ 120,000	$ 75,000	$ 60,000
Construction Subtotal	*$ 372,000*	*$ 4,124,000*	*$ 1,461,000*	*$ 1,919,000*
Construction Contingency	$ 112,000	$ 1,237,000	$ 438,000	$ 576,000
Construction Total	*$ 484,000*	*$ 5,361,000*	*$ 1,899,000*	*$ 2,495,000*
Implementation Costs	$ 145,000	$ 1,608,000	$ 570,000	$ 749,000
Total Capital Cost	**$ 629,000**	**$ 6,969,000**	**$ 2,469,000**	**$ 3,244,000**
O&M Costs				
RO or AWT	$ -	$ -	$ -	$ -
Pipeline	$ 3,000	$ 32,000	$ 12,000	$ 15,000
Storage	$ 1,000	$ 6,000	$ 1,000	$ 1,000
Pump Station				
Maintenance	$ 3,000	$ 18,000	$ 9,000	$ 17,000
Power	$ 1,000	$ 11,000	$ 3,000	$ 3,000
Total O&M Cost	**$ 8,000**	**$ 67,000**	**$ 25,000**	**$ 36,000**
Annual Cost Method				
Annual Capital Payment	$ 41,000	$ 453,000	$ 161,000	$ 211,000
Annual O&M	$ 8,000	$ 67,000	$ 25,000	$ 36,000
Total Annual Cost	**$ 49,000**	**$ 520,000**	**$ 186,000**	**$ 247,000**
Annual Yield (AFY)	12	202	44	52
Unit Cost ($/AF)	**$4,090**	**$2,580**	**$4,230**	**$4,780**

Project Concepts with Tertiary Treatment Costs Included				
Tertiary Trmt Capital Cost	$ 50,700	$ 853,400	$ 185,900	$ 218,400
Capital Cost (from above)	$ 629,000	$ 6,969,000	$ 2,469,000	$ 3,244,000
Total Capital Cost	**$ 679,700**	**$ 7,822,400**	**$ 2,654,900**	**$ 3,462,400**
Tertiary Trmt O&M Cost	$ 3,200	$ 54,100	$ 11,800	$ 13,800
O&M Cost (from above)	$ 8,000	$ 67,000	$ 25,000	$ 36,000
Total O&M Cost	**$ 11,200**	**$ 121,100**	**$ 36,800**	**$ 49,800**
Annual Cost Method				
Annual Capital Payment	$ 44,000	$ 509,000	$ 173,000	$ 225,000
Annual O&M	$ 11,200	$ 121,100	$ 36,800	$ 49,800
Total Annual Cost	**$ 55,200**	**$ 630,100**	**$ 209,800**	**$ 274,800**
Annual Yield (AFY)	12	202	44	52
Unit Cost ($/AF)	**$4,600**	**$3,120**	**$4,770**	**$5,320**

Summary of SSLOCSD WWTP Potential Projects

Project End-Use Type		**Agricultural Reuse**		
Alt #	**S2e**	**S2a**	**S2b**	**S2c**
PROJECT	**Nipomo Mesa Golf Courses**	**12-hr Delivery, 100% Tertiary**	**12-hr Delivery, 40% RO**	**24-hr Delivery, 100% Tertiary**
Max Supply	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY
Demand				
Average	1.3 MGD **1,500 AFY**	1.7 MGD **1,890 AFY**	1.6 MGD **1,810 AFY**	1.7 MGD **1,890 AFY**
Peak Day	2.7 MGD	2.7 MGD	2.5 MGD	2.7 MGD
Peak Hour	2.7 MGD 1,875 GPM	5.4 MGD 3,750 GPM	5.1 MGD 3,530 GPM	2.7 MGD 1,880 GPM
Capital Costs				
RO or AWT	$ -	$ -	$ 2,160,000	$ -
Pipeline	$ 10,080,000	$ 5,539,000	$ 5,539,000	$ 4,653,000
Storage	$ 2,025,000	$ 4,050,000	$ 4,050,000	$ 2,025,000
Pump Station	$ 1,900,000	$ 1,610,000	$ 1,540,000	$ 950,000
Customer Conversions	$ -	$ -	$ -	$ -
Construction Subtotal	*$ 14,005,000*	*$ 11,199,000*	*$ 13,289,000*	*$ 7,628,000*
Construction Contingency	$ 4,202,000	$ 3,360,000	$ 3,987,000	$ 2,288,000
Construction Total	*$ 18,207,000*	*$ 14,559,000*	*$ 17,276,000*	*$ 9,916,000*
Implementation Costs	$ 5,462,000	$ 4,368,000	$ 5,183,000	$ 2,975,000
Total Capital Cost	**$ 23,669,000**	**$ 18,927,000**	**$ 22,459,000**	**$ 12,891,000**
O&M Costs				
RO or AWT	$ -	$ -	$ 216,000	$ -
Pipeline	$ 101,000	$ 56,000	$ 56,000	$ 47,000
Storage	$ 21,000	$ 41,000	$ 41,000	$ 21,000
Pump Station				
Maintenance	$ 95,000	$ 81,000	$ 77,000	$ 48,000
Power	$ 134,000	$ 68,000	$ 65,000	$ 68,000
Total O&M Cost	**$ 485,000**	**$ 246,000**	**$ 455,000**	**$ 184,000**
Annual Cost Method				
Annual Capital Payment	$ 1,540,000	$ 1,231,000	$ 1,461,000	$ 839,000
Annual O&M	$ 485,000	$ 246,000	$ 455,000	$ 184,000
Total Annual Cost	**$ 2,025,000**	**$ 1,477,000**	**$ 1,916,000**	**$ 1,023,000**
Annual Yield (AFY)	1,500	1,890	1,810	1,890
Unit Cost ($/AF)	**$1,350**	**$790**	**$1,060**	**$550**
Project Concepts with Tertia				
Tertiary Trmt Capital Cost	$ 6,388,000	$ 6,388,000	$ 6,388,000	$ 6,388,000
Capital Cost (from above)	$ 23,669,000	$ 18,927,000	$ 22,459,000	$ 12,891,000
Total Capital Cost	**$ 30,057,000**	**$ 25,315,000**	**$ 28,847,000**	**$ 19,279,000**
Tertiary Trmt O&M Cost	$ 405,000	$ 405,000	$ 405,000	$ 405,000
O&M Cost (from above)	$ 485,000	$ 246,000	$ 455,000	$ 184,000
Total O&M Cost	**$ 890,000**	**$ 651,000**	**$ 860,000**	**$ 589,000**
Annual Cost Method				
Annual Capital Payment	$ 1,955,000	$ 1,647,000	$ 1,877,000	$ 1,254,000
Annual O&M	$ 890,000	$ 651,000	$ 860,000	$ 589,000
Total Annual Cost	**$ 2,845,000**	**$ 2,298,000**	**$ 2,737,000**	**$ 1,843,000**
Annual Yield (AFY)	1,500	1,890	1,810	1,890
Unit Cost ($/AF)	**$1,900**	**$1,220**	**$1,510**	**$980**

Summary of SSLOCSD WWTP Potential Projects

Project End-Use Type		**Groundwater Recharge**		
Alt #	**S2d**	**S3a**	**S3b**	**S3c**
PROJECT	**Alt S2a with 50% of Total Demand**	**GWR via Surface Spreading @ Existing Basins (60% RO)**	**GWR via Surface Spreading @ New Basins (60% RO)**	**GWR via Surface Spreading @ New Basins (Full AWT)**
Max Supply	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY
Demand				
Average	1.1 MGD **1,200 AFY**	0.3 MGD **300 AFY**	2.5 MGD **2,760 AFY**	2.1 MGD **2,390 AFY**
Peak Day	2.1 MGD	0.3 MGD	2.5 MGD	2.1 MGD
Peak Hour	4.3 MGD 2,970 GPM	0.3 MGD 186 GPM	2.5 MGD 1,710 GPM	2.1 MGD 1,480 GPM
Capital Costs				
RO or AWT	$ 1,712,000	$ 321,429	$ 3,240,000	$ 16,200,000
Pipeline	$ 5,610,000	$ 2,055,000	$ 3,800,000	$ 3,800,000
Storage	$ 3,210,000	$ 201,000	$ 2,025,000	$ 2,025,000
Pump Station	$ 1,350,000	$ 160,000	$ 890,000	$ 790,000
Customer Conversions	$ -	$ -	$ 4,065,000	$ 1,760,000
Construction Subtotal	*$ 11,882,000*	*$ 2,737,429*	*$ 14,020,000*	*$ 24,575,000*
Construction Contingency	$ 3,565,000	$ 821,000	$ 4,206,000	$ 7,373,000
Construction Total	*$ 15,447,000*	*$ 3,558,429*	*$ 18,226,000*	*$ 31,948,000*
Implementation Costs	$ 4,634,000	$ 1,423,000	$ 7,290,000	$ 12,779,000
Total Capital Cost	**$ 20,081,000**	**$ 4,981,429**	**$ 25,516,000**	**$ 44,727,000**
O&M Costs				
RO or AWT	$ 172,000	$ 33,000	$ 324,000	$ 1,620,000
Pipeline	$ 57,000	$ -	$ 38,000	$ 38,000
Storage	$ 33,000	$ -	$ 2,025,000	$ 2,025,000
Pump Station				
Maintenance	$ 68,000	$ 8,000	$ 234,000	$ 40,000
Power	$ 43,000	$ 8,000	$ 74,000	$ 64,000
Total O&M Cost	**$ 373,000**	**$ 114,000**	**$ 1,191,000**	**$ 1,824,000**
Annual Cost Method				
Annual Capital Payment	$ 1,306,000	$ 324,000	$ 1,660,000	$ 2,910,000
Annual O&M	$ 373,000	$ 114,000	$ 1,191,000	$ 1,824,000
Total Annual Cost	**$ 1,679,000**	**$ 300**	**$ 2,851,000**	**$ 4,734,000**
Annual Yield (AFY)	1,200	300	2,760	2,390
Unit Cost ($/AF)	**$1,400**	**$1,460**	**$1,040**	**$1,990**
Project Concepts with Tertia				
Tertiary Trmt Capital Cost	$ 5,063,000	$ 633,700	$ 6,388,000	$ -
Capital Cost (from above)	$ 20,081,000	$ 4,981,429	$ 25,516,000	$ 44,727,000
Total Capital Cost	**$ 25,144,000**	**$ 5,615,129**	**$ 31,904,000**	**$ 44,727,000**
Tertiary Trmt O&M Cost	$ 321,000	$ 40,200	$ 405,000	$ -
O&M Cost (from above)	$ 373,000	$ 114,000	$ 1,191,000	$ 1,824,000
Total O&M Cost	**$ 694,000**	**$ 154,200**	**$ 1,596,000**	**$ 1,824,000**
Annual Cost Method				
Annual Capital Payment	$ 1,636,000	$ 365,000	$ 2,075,000	$ 2,910,000
Annual O&M	$ 694,000	$ 154,200	$ 1,596,000	$ 1,824,000
Total Annual Cost	**$ 2,330,000**	**$ 519,200**	**$ 3,671,000**	**$ 4,734,000**
Annual Yield (AFY)	1,200	300	2,760	2,390
Unit Cost ($/AF)	**$1,940**	**$1,730**	**$1,330**	**$1,980**

Summary of SSLOCSD WWTP Potential Projects

Project End-Use Type		Surface Water Augmentat		
Alt #	**S3d**	**S4a**	**S4b**	**S4c**
PROJECT	**GWR via Injection (Full AWT)**	**Arroyo Grande Creek Augmentation (80% RO)**	**Arroyo Grande Creek Augmentation (Full AWT)**	**Los Berros Creek Augmentation (80% RO)**
Max Supply	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY
Demand				
Average	2.1 MGD **2,390 AFY**	2.4 MGD **2,670 AFY**	2.1 MGD **2,390 AFY**	2.4 MGD **2,670 AFY**
Peak Day	2.1 MGD	2.4 MGD	2.1 MGD	2.4 MGD
Peak Hour	2.1 MGD 1,482 GPM	2.4 MGD 1,656 GPM	2.1 MGD 1,482 GPM	2.4 MGD 1,656 GPM
Capital Costs				
RO or AWT	$ 16,200,000	$ 4,320,000	$ 16,200,000	$ 4,320,000
Pipeline	$ 2,166,000	$ 12,160,000	$ 14,080,000	$ 3,520,000
Storage	$ 2,025,000	$ 1,788,000	$ 1,601,000	$ 1,788,000
Pump Station	$ 800,000	$ 870,000	$ 800,000	$ 870,000
Customer Conversions	$ 4,500,000	$ -	$ -	$ -
Construction Subtotal	*$ 25,691,000*	*$ 19,138,000*	*$ 32,681,000*	*$ 10,498,000*
Construction Contingency	$ 7,707,000	$ 5,741,000	$ 9,804,000	$ 3,149,000
Construction Total	*$ 33,398,000*	*$ 24,879,000*	*$ 42,485,000*	*$ 13,647,000*
Implementation Costs	$ 13,359,000	$ 9,952,000	$ 16,994,000	$ 5,459,000
Total Capital Cost	**$ 46,757,000**	**$ 34,831,000**	**$ 59,479,000**	**$ 19,106,000**
O&M Costs				
RO or AWT	$ 1,620,000	$ 432,000	$ 1,620,000	$ 432,000
Pipeline	$ 21,000	$ 122,000	$ 141,000	$ 36,000
Storage	$ 2,025,000	$ 18,000	$ 17,000	$ 18,000
Pump Station				
Maintenance	$ 40,000	$ 44,000	$ 40,000	$ 44,000
Power	$ 43,000	$ 180,000	$ 162,000	$ 95,000
Total O&M Cost	**$ 1,836,000**	**$ 1,201,000**	**$ 1,980,000**	**$ 1,030,000**
Annual Cost Method				
Annual Capital Payment	$ 3,042,000	$ 2,266,000	$ 3,869,000	$ 1,243,000
Annual O&M	$ 1,836,000	$ 1,201,000	$ 1,980,000	$ 1,030,000
Total Annual Cost	**$ 4,878,000**	**$ 3,467,000**	**$ 5,849,000**	**$ 2,273,000**
Annual Yield (AFY)	2,390	2,670	2,390	2,670
Unit Cost ($/AF)	**$2,050**	**$1,300**	**$2,450**	**$860**
Project Concepts with Tertia				
Tertiary Trmt Capital Cost	$ -	$ 6,388,000	$ -	$ 6,388,000
Capital Cost (from above)	$ 46,757,000	$ 34,831,000	$ 59,479,000	$ 19,106,000
Total Capital Cost	**$ 46,757,000**	**$ 41,219,000**	**$ 59,479,000**	**$ 25,494,000**
Tertiary Trmt O&M Cost	$ -	$ 405,000	$ -	$ 357,600
O&M Cost (from above)	$ 1,836,000	$ 1,201,000	$ 1,980,000	$ 1,030,000
Total O&M Cost	**$ 1,836,000**	**$ 1,606,000**	**$ 1,980,000**	**$ 1,387,600**
Annual Cost Method				
Annual Capital Payment	$ 3,042,000	$ 2,681,000	$ 3,869,000	$ 1,658,000
Annual O&M	$ 1,836,000	$ 1,606,000	$ 1,980,000	$ 1,387,600
Total Annual Cost	**$ 4,878,000**	**$ 4,287,000**	**$ 5,849,000**	**$ 3,045,600**
Annual Yield (AFY)	2,390	2,670	2,390	2,670
Unit Cost ($/AF)	**$2,040**	**$1,610**	**$2,450**	**$1,140**

Summary of SSLOCSD WWTP Potential Projects

Project End-Use Type	ion		Industrial Reuse	
Alt #	**S4d**	**S4e**	**S5a**	**S5b**
PROJECT	**Los Berros Creek Augmentation (Full AWT)**	**Reservoir Augmentation (Full AWT)**	**Tertiary Treatment**	**100% RO**
Max Supply	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY	2.7 MGD 3,024 AFY
Demand				
Average	2.1 MGD **2,390 AFY**	2.1 MGD **2,390 AFY**	1.0 MGD **1,100 AFY**	1.0 MGD **1,100 AFY**
Peak Day	2.1 MGD	2.1 MGD	1.3 MGD	1.3 MGD
Peak Hour	2.1 MGD 1,482 GPM	2.1 MGD 1,482 GPM	1.7 MGD 1,179 GPM	1.7 MGD 1,179 GPM
Capital Costs				
RO or AWT	$ 16,200,000	$ 16,200,000	$ -	$ 4,507,500
Pipeline	$ 3,520,000	$ 17,160,000	$ 7,315,000	$ 7,315,000
Storage	$ 1,601,000	$ 1,601,000	$ 1,916,000	$ 1,916,000
Pump Station	$ 800,000	$ 1,600,000	$ 670,000	$ 1,005,000
Customer Conversions	$ -	$ -	$ 100,000	$ -
Construction Subtotal	*$ 22,121,000*	*$ 36,561,000*	*$ 10,001,000*	*$ 14,893,500*
Construction Contingency	$ 6,636,000	$ 10,968,000	$ 3,000,000	$ 4,468,000
Construction Total	*$ 28,757,000*	*$ 47,529,000*	*$ 13,001,000*	*$ 19,361,500*
Implementation Costs	$ 11,503,000	$ 19,012,000	$ 3,900,000	$ 5,808,000
Total Capital Cost	**$ 40,260,000**	**$ 66,541,000**	**$ 16,901,000**	**$ 25,169,500**
O&M Costs				
RO or AWT	$ 1,620,000	$ 1,620,000	$ -	$ 301,000
Pipeline	$ 36,000	$ 172,000	$ 74,000	$ 74,000
Storage	$ 17,000	$ 17,000	$ 20,000	$ 20,000
Pump Station				
Maintenance	$ 40,000	$ 80,000	$ 34,000	$ 51,000
Power	$ 85,000	$ 128,000	$ 59,000	$ 59,000
Total O&M Cost	**$ 1,798,000**	**$ 2,145,000**	**$ 187,000**	**$ 505,000**
Annual Cost Method				
Annual Capital Payment	$ 2,619,000	$ 4,329,000	$ 1,099,000	$ 1,637,000
Annual O&M	$ 1,798,000	$ 2,145,000	$ 187,000	$ 505,000
Total Annual Cost	**$ 4,417,000**	**$ 6,474,000**	**$ 1,286,000**	**$ 2,142,000**
Annual Yield (AFY)	2,390	2,390	1,100	1,100
Unit Cost ($/AF)	**$1,850**	**$2,710**	**$1,170**	**$1,950**
Project Concepts with Tertia				
Tertiary Trmt Capital Cost	$ -	$ -	$ 3,020,800	$ 3,485,500
Capital Cost (from above)	$ 40,260,000	$ 66,541,000	$ 16,901,000	$ 25,169,500
Total Capital Cost	**$ 40,260,000**	**$ 66,541,000**	**$ 19,921,800**	**$ 28,655,000**
Tertiary Trmt O&M Cost	$ -	$ -	$ 191,500	$ 221,000
O&M Cost (from above)	$ 1,798,000	$ 2,145,000	$ 187,000	$ 505,000
Total O&M Cost	**$ 1,798,000**	**$ 2,145,000**	**$ 378,500**	**$ 726,000**
Annual Cost Method				
Annual Capital Payment	$ 2,619,000	$ 4,329,000	$ 1,296,000	$ 1,864,000
Annual O&M	$ 1,798,000	$ 2,145,000	$ 378,500	$ 726,000
Total Annual Cost	**$ 4,417,000**	**$ 6,474,000**	**$ 1,674,500**	**$ 2,590,000**
Annual Yield (AFY)	2,390	2,390	1,100	1,100
Unit Cost ($/AF)	**$1,850**	**$2,710**	**$1,520**	**$2,350**

SSLOCSD Customers & Facilities

#	Customer	Landscape Irrigation Demands: Annual AFY	Peak Day Factor	Peak Day GPD	Peak Hour Factor	Peak Hour GPM	Landscape Irrigation Projects	1a	1b	1c	1d
1	16th Street Park	6	2.0	10,713	3.0	22				1	
2	Arroyo Grande Cemetery	36	2.0	64,277	3.0	134			1		
3	Arroyo Grande High School	33	2.0	58,921	3.0	123			1		
4	Caltrans	40	2.0	71,419	0.0	0			1		
5	Costa Bella Park	2	2.0	3,571	3.0	7			1		
6	Fairgrove Elementary School	6	2.0	10,713	3.0	22			1		
7	Grover Beach Elementary School	14	2.0	24,997	3.0	52				1	
8	Grover Heights Park	12	2.0	21,426	3.0	45				1	
9	Harloe Elementary School	11	2.0	19,640	3.0	41			1		
10	K-Mart Center	5	2.0	8,927	3.0	19					1
11	Mentone Basin Park	9	2.0	16,069	3.0	33				1	
12	Mesa Middle School	8.8	2.0	15,712	3.0	33					
13	Oceano County Park	12	2.0	21,426	3.0	45		1			
14	Oceano Elementary School										
15	Ocean View Elementary School	23	2.0	41,066	3.0	86			1		
16	Ramona Gardens Park	3	2.0	5,356	3.0	11				1	
17	Rancho Grande Park	19	2.0	33,924	3.0	71					1
18	Royal Oaks Christian School	3.7	2.0	6,606	3.0	14					1
19	Soto Sports Complex	40	2.0	71,419	1.0	50			1		
20	St. Patrick School / El Camino Real Park	11	2.0	19,640	3.0	41			1		
21	Strother Park	8	2.0	14,284	3.0	30					
22	Terra de Oro Park	4	2.0	7,142	3.0	15					
23	Walmart Center	24	2.0	42,852	3.0	89					1
24	Cypress Golf Course	250	2.0	446,371	1.0	310					
		331		**590,103**		**981**	**AFY**	**12**	**202**	**44**	**52**
							GPM	45	503	164	192
							# of Customers	1	9	5	4

Notes:

Caltrans peak hour = 0 because irrigation can occur during the day

Soto Sports Complex assumes a portion of demand is met by recycled water. The balance is met by stormwater.

Golf Course and Soto Sports Complex peak hour adjusted due to presence of irrigation ponds

Other Project Demands

	Projects	Annual	Peak Day		Peak Hour	
	Agricultural Irrigation	**AFY**	**Factor**	**GPD**	**Factor**	**GPM**
2a	12-hr Delivery, 100% Tertiary	1,890	N/A	2,700,000	2.0	3,750
2b	2a with 40% RO	1,810	N/A	2,540,000	2.0	3,530
2c	2a with 24-hr Delivery	1,890	N/A	2,700,000	1.0	1,880
2d	2a but 50% of total demand	1,200	2.0	2,140,000	2.0	2,970
	Potable Reuse, Stream Augmentation					
3a	Groundwater Objective (60% RO)	2,760	1.0	2,460,000	1.0	1,710
4a	Surface Water Objective (80% RO)	2,670	1.0	2,380,000	1.0	1,650
*	100% Full AWT	2,390	1.0	2,130,000	1.0	1,480

Projects 3b, 3c, 4b to 4e

*Refer to monthly demand vs. supply graph for Ag Irrigation estimate.

MF/RO Recovery	
MF Recovery	93%
RO Recovery	85%
MF/RO Recovery	79%

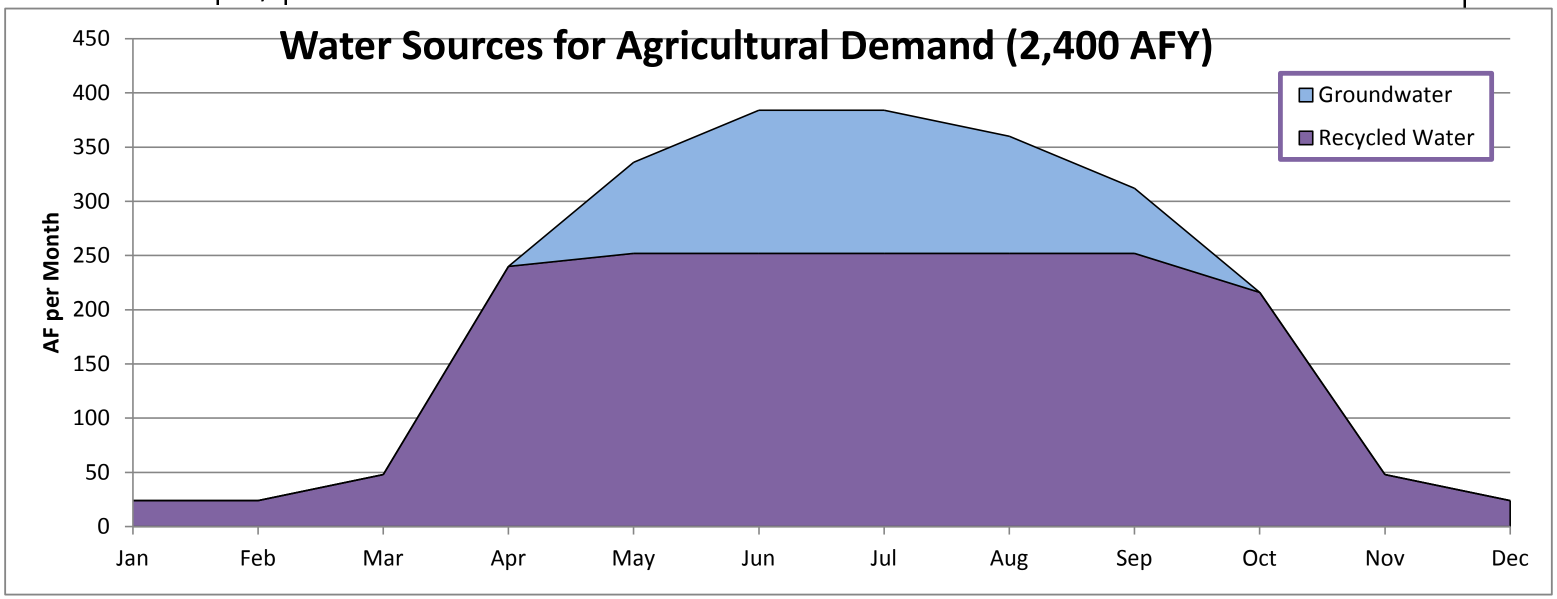
Percent RO Calculations

RO = 98% reduction in TDS, Cl	Ag Irrigation TDS		Groundwater Chloride		Surface water Chloride	
	mg/L	% Q	mg/L	% Q	mg/L	% Q
Existing / RO Bypass	850	58%	230	43%	230	21%
RO Influent		**42%**		**57%**		**79%**
RO Product	17	36%	4.6	49%	4.6	67%
Effluent Goal	500		100		50	
Design RO Influent (Rounded)		**40%**		**60%**		**80%**

Treatment Flow Calculations				
	Ag Irrigation	Groundwater	Surface water	Full AWT
	40% RO	60% RO	80% RO	100% AWT
	GPD	GPD	GPD	GPD
Maximum Flow	2,700,000	2,700,000	2,700,000	2,700,000
RO or AWT Bypass	1,620,000	1,080,000	540,000	0
RO or AWT Influent	1,080,000	1,620,000	2,160,000	2,700,000
RO or AWT Effluent	920,000	1,380,000	1,840,000	2,130,000
Brine	160,000	240,000	320,000	570,000
Total Flow with Sidestream RO	**2,540,000**	**2,460,000**	**2,380,000**	**2,130,000**
Total Flow with Sidestream RO (AFY)	**2,840**	**2,760**	**2,670**	**2,390**
Total Recycled Water Use (AFY)	**1,800**	**2,760**	**2,670**	**2,390**

*Refer to monthly demand vs. supply graph for Ag Irrigation estimate.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		
DEMAND		*Monthly Agricultural Demand assuming 2,400 AFY total demand*														
Monthly Eto %	%	1%	1%	2%	10%	14%	16%	16%	15%	13%	9%	2%	1%			
Ag Demand	afy	24	24	48	240	336	384	384	360	312	216	48	24	**2,400**	**AFY**	
Ag Demand	mgd	0.26	0.26	0.51	2.57	3.60	4.11	4.11	3.86	3.34	2.31	0.51	0.26	**2.14**	**MGD**	
SUPPLY		*Monthly Supply*														
100% Tertiary	mgd	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70			
Demand met by...		*Monthly Supplies to Meet Demands*												**MGD**	**AFY**	
Recycled Water	mgd	0.26	0.26	0.51	2.57	2.70	2.70	2.70	2.70	2.70	2.31	0.51	0.26	**1.68**	**1,884**	
Groundwater	mgd	0.00	0.00	0.00	0.00	0.90	1.41	1.41	1.16	0.64	0.00	0.00	0.00	**0.46**	**516**	
														2.14	**2,400**	
Recycled Water	afy	24	24	48	240	252	252	252	252	252	216	48	24		**1,884**	79%
Groundwater	afy	0	0	0	0	84	132	132	108	60	0	0	0		**516**	22%
															2,400	



		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		
SUPPLY - 40% RO	mgd	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54	2.54			
Demand met by...														**MGD**	**AFY**	
Recycled Water	mgd	0.26	0.26	0.51	2.54	2.54	2.54	2.54	2.54	2.54	2.31	0.51	0.26	**1.61**	**1,806**	75%
Groundwater	mgd	0.00	0.00	0.00	0.03	1.06	1.57	1.57	1.32	0.80	0.00	0.00	0.00	**0.53**	**594**	25%
														2.14	**2,400**	

SSLOCSD WWTP Cost Reconciliation

Title	***Recycled Water Update***	
Client	*SSLOCSD*	
Author	*Wallace Group*	
Date	*Jan 2009*	**CCCI**
ENR Date	*Dec 2008*	5322
	May 2014	5957

(California Construction Cost Index)

Table 6-1: Tertiary Treatment		**3.0**	mgd	
		Original		**Reconciled**
Earthwork		$47,718		$53,000
Concrete		$858,927		$961,000
Filter Equipment and Media		$715,773		$801,000
Feed Pumps		$71,577		$80,000
Disinfection System		$167,013		$187,000
Piping and Ironwork		$477,183		$534,000
Recycled Water Storage		$1,908,729		excluded
Recycled Water Pump Station		$286,308		excluded
Electrical and Instrumentation		$119,295		$134,000
Miscellaneous		$357,885		$401,000
Subtotal		**$5,010,408**	**Subtotal**	**$3,151,000**
			$/gpd	***$1.05***
Engineering, Admin	15%	$751,561	**25%**	$787,800
			Subtotal	**$3,938,800**
Contingency	30%	$1,503,122	**25%**	$984,700
Total Capital Cost		**$7,265,092**	**Total**	**$4,923,500**
	$ per gpd	***$2.42***		***$1.64***
Annual Capital				$320,000
O&M		$322,000		$360,000
Total Annual				**$680,000**

NOTE: Costs in table based on K/J 1994 report

Table 6-2: MF/RO			2.0	mgd	
	Quantity	Unit Cost	Original		Reconciled
Mobilization (5%)	5%	S/T	$500,000		$560,000
Microfiltration	2 mgd	$750,000	$1,500,000		$1,679,000
On-Site Storage / Blending	2 MG	$1	$2,000,000		$2,239,000
Reverse Osmosis	2 mgd	$2,000,000	$4,000,000		$4,477,000
UV Disinfection	2 mgd	$50,000	$100,000		$112,000
Site Piping			$200,000		$224,000
Electrical and Instrumentation			$750,000		$839,000
Process Building	7,500 SF	$200	$1,500,000		$1,679,000
Sitework	20,000 SF	$20	$400,000		$448,000
			$10,950,000	**Subtotal**	**$12,257,000**
				$/gpd	***$6.13***
Engineering, Admin				**25%**	$3,064,000
				Subtotal	**$15,321,000**
Contingency			$3,285,000	**25%**	$766,000
			$14,235,000	**Total**	**$16,087,000**
		$ per gpd	***$7.12***		***$8.04***

Appendix: MF/RO O&M

	Quantity	Unit Cost	Original		Reconciled
Power MF/RO*	3.8M kWHr	$150,000	$570,000		$638,000
Power UV	0.5M kWHr	$150,000	$75,000		$84,000
Chlorine	14,000 #/yr	$1.00	$14,000		$16,000
Lime	84,000 #/yr	$0.15	$12,600		$14,000
Labor	6,000 hr/yr	$50	$300,000		$336,000
MF Replacement (10 Yr Life)		$150,000	$150,000		$168,000
RO Replacement (24/yr)		$700	$16,800		$19,000
Miscellaneous Maintenance		1%	$109,500		$123,000
Replacement Cost		1.25%	$136,875		$153,000
**(1,650 kWHr/AF * 2,300 AFY)*			**$1,384,775**	**Subtotal**	**$1,551,000**
				$/gpd	***$0.78***
Contingency		**15%**	$207,700	**15%**	$233,000
			$1,592,475	**Total**	**$1,784,000**
		$/gpd	***$0.80***		***$0.89***
Annual Capital					$1,046,000
O&M			$1,600,000		$1,784,000
Total Annual					**$2,830,000**

San Luis Obispo County Regional Recycled Water Strategic Plan — **Date** 09/17/14

AREA	**SSLOCSD**				
PROJECT	**SSLOCSD Tertiary Treatment Upgrade**				
SUPPLY	**Source**	SSLOCSD WWTP			
Existing	SSLOCSD WWTP	2.6	MGD		
	with Pismo Beach	3.7	MGD		
	Min Flow to Outfall	(1.0)	MGD		
	Max Available	**2.7**	**MGD**	**3,024**	**AFY**
Future	SSLOCSD WWTP	3.5	MGD		
	with Pismo Beach	5.3	MGD		
	Min Flow to Outfall	(1.0)	MGD		
	Max Available	4.3	MGD	4,816	AFY

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Treatment			2.7	mgd	$1,400,000	$ 3,780,000
						Construction Subtotal	**$ 3,780,000**
				Construction Contingency		30%	$ 1,134,000
						Construction Total	**$ 4,914,000**
				Implementation Costs		30%	$ 1,474,000
						Total Capital Cost	**$ 6,388,000**
O&M Costs							
Treatment	Tertiary						
	Tertiary Treatment			2.7	mgd	$150,000	$ 405,000
						Total O&M Cost	**$ 405,000**
Unit Costs							
						Annual Capital Payment	$ 416,000
						Annual O&M	$ 405,000
						Total Annual Cost	**$ 821,000**
						Annual Yield (AFY)	3,024
						Unit Cost ($/AF)	**$280**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**						**Date**
PROJECT	**S1a - Small Landscape Irrigation**						09/17/14
SUPPLY	**Source**	SSLOCSD WWTP					
	Available	Max	2.7	MGD	3,024	AFY	
DEMAND	**Average**	0.01	MGD		12	AFY	
	Peak Day	0.02	MGD				
	Peak Hour	0.04	MGD		45	GPM	

Item	Description	Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs								
Treatment								
	Tertiary Treatment			0.02	mgd			
Pipeline				Factor				
4	in	2,400	LF	1.0		$110	$	264,000
Storage								
	@ WWTP			0.02	MG	$1,500,000	$	33,000
Pump Station								
	@ WWTP (System)	45	gpm	200	FT	refer to		
		75%	eff	1.7	HP	formula	$	60,000
Customer Conversions				1	EA	$15,000	$	15,000
						Construction Subtotal	**$**	**372,000**
			Construction Contingency			30%	$	112,000
						Construction Total	$	484,000
			Implementation Costs			30%	$	145,000
						Total Capital Cost	**$**	**629,000**
O&M Costs								
Treatment	RO				mgd	$200,000	$	-
Pipeline				$ 264,000		1%	$	3,000
Storage				$ 33,000		1%	$	1,000
Pump Station								
	Maintenance			$ 60,000		5%	$	3,000
	Power 75%	7	gpm	200	FT			
			Total:	3,274	kW-hr	$0.13	$	1,000
						Total O&M Cost	**$**	**8,000**
Unit Costs								
						Annual Capital Payment	$	41,000
						Annual O&M	$	8,000
						Total Annual Cost	**$**	**49,000**
						Annual Yield (AFY)		12
						Unit Cost ($/AF)		**$4,090**

San Luis Obispo County Regional Recycled Water Strategic Plan

							Date
AREA	**SSLOCSD**						09/17/14
PROJECT	**S1b - Core Landscape Irrigation**						
SUPPLY	**Source**	SSLOCSD WWTP					
	Available	Max	2.7	MGD	3,024	AFY	
DEMAND	**Average**	0.18	MGD		202	AFY	
	Peak Day	0.36	MGD				
	Peak Hour	0.72	MGD		503	GPM	

Item		Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment				0.36	mgd		
Pipeline					Factor			
	4	in	13,300	LF	1.0		$110	$ 1,463,000
	6	in	12,500	LF	1.0		$130	$ 1,625,000
	4-6	in	2,400	LF	1.0		$10	$ 24,000
Storage								
	@ WWTP				0.36	MG	$1,500,000	$ 542,000
Pump Station								
	@ WWTP (System)		503	gpm	300	FT	refer to	
			75%	eff	28.6	HP	formula	$ 350,000
Customer Conversions					8	EA	$15,000	$ 120,000
							Construction Subtotal	**$ 4,124,000**
				Construction Contingency			30%	$ 1,237,000
							Construction Total	$ 5,361,000
				Implementation Costs			30%	$ 1,608,000
							Total Capital Cost	**$ 6,969,000**
O&M Costs								
Treatment								
Pipeline					$ 3,112,000		1%	$ 32,000
Storage					$ 542,000		1%	$ 6,000
Pump Station								
	Maintenance				$ 350,000		5%	$ 18,000
	Power	75%	125	gpm	300	FT		
				Total:	82,676	kW-hr	$0.13	$ 11,000
							Total O&M Cost	**$ 67,000**
Unit Costs								
							Annual Capital Payment	$ 453,000
							Annual O&M	$ 67,000
							Total Annual Cost	**$ 520,000**
							Annual Yield (AFY)	202
							Unit Cost ($/AF)	**$2,580**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**							**Date**
PROJECT	**S1c - Extension to Western Grover Beach**							09/17/14
SUPPLY	**Source**	SSLOCSD WWTP						
	Available	Max	2.7	MGD	3,024	AFY		
DEMAND	**Average**	0.04	MGD		44	AFY		
	Peak Day	0.08	MGD					
	Peak Hour	0.31	MGD		213	GPM		

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment				0.08	mgd		
Pipeline					Factor			
	4	in	9,600	LF	1.0		$110	$ 1,056,000
	4-6 Upsize	in	9,100	LF	1.0		$10	$ 91,000
Storage								
	@ WWTP				0.04	MG	$1,500,000	$ 59,000
Pump Station								
	@ WWTP (System)		213	gpm	300	FT	refer to	
			75%	eff	12.1	HP	formula	$ 180,000
Customer Conversions					5	EA	$15,000	$ 75,000
							Construction Subtotal	**$ 1,461,000**
					Construction Contingency		30%	$ 438,000
							Construction Total	$ 1,899,000
					Implementation Costs		30%	$ 570,000
							Total Capital Cost	**$ 2,469,000**
O&M Costs								
Treatment								
Pipeline					$ 1,147,000		1%	$ 12,000
Storage					$ 59,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 180,000		5%	$ 9,000
	Power	75%	27	gpm	300	FT		
				Total:	18,009	kW-hr	$0.13	$ 3,000
							Total O&M Cost	**$ 25,000**
Unit Costs								
							Annual Capital Payment	$ 161,000
							Annual O&M	$ 25,000
							Total Annual Cost	**$ 186,000**
							Annual Yield (AFY)	44
							Unit Cost ($/AF)	**$4,230**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**							**Date**
PROJECT	**S1d - Extension North of Hwy 101**							09/17/14
SUPPLY	**Source**	SSLOCSD WWTP						
	Available	Max	2.7	MGD	3,024	AFY		
DEMAND	**Average**	0.05	MGD		52	AFY		
	Peak Day	0.09	MGD					
	Peak Hour	0.09	MGD		192	GPM		

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	11,400	LF	1.0		$110	$ 1,254,000
	4-6	in	19,500	LF	1.0		$10	$ 195,000
Storage								
	@ WWTP				0.05	MG	$1,500,000	$ 70,000
Pump Station								
	@ WWTP (System)		192	gpm	250	FT	refer to	
			75%	eff	9.1	HP	formula	$ 170,000
	Booster Station		192	gpm	250	FT	refer to	
	North of Hwy 101		75%	eff	9.1	HP	formula	$ 170,000
Customer Conversions					4	EA	$15,000	$ 60,000
							Construction Subtotal	**$ 1,919,000**
					Construction Contingency		30%	$ 576,000
							Construction Total	$ 2,495,000
					Implementation Costs		30%	$ 749,000
							Total Capital Cost	**$ 3,244,000**
O&M Costs								
Treatment	RO				0.00	mgd	$200,000	$ -
Pipeline					$ 1,449,000		1%	$ 15,000
Storage					$ 70,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 340,000		5%	$ 17,000
	Power	75%	32	gpm	250	FT		
				Total:	17,633	kW-hr	$0.13	$ 3,000
							Total O&M Cost	**$ 36,000**
Unit Costs								
							Annual Capital Payment	$ 211,000
							Annual O&M	$ 36,000
							Total Annual Cost	**$ 247,000**
							Annual Yield (AFY)	52
							Unit Cost ($/AF)	**$4,780**

San Luis Obispo County Regional Recycled Water Strategic Plan — **Date** 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S1e - Nipomo Mesa Golf Courses**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	1.3	MGD		1,500	AFY
	Peak Day	2.7	MGD			
	Peak Hour	2.7	MGD		1,875	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	8	in	10,000	LF	1.00		$150	$ 1,500,000
	12	in	0	LF	1.00		$190	$ -
	16	in	39,000	LF	1.00		$220	$ 8,580,000
Storage								
	@ WWTP				1.35	MG	$1,500,000	$ 2,025,000
Pump Station								
	@ WWTP (System)		1,875	gpm	200	FT	refer to	
			75%	eff	71.0	HP	formula	$ 950,000
	Cypress Ridge Booster		1,875	gpm	200	FT	refer to	
			75%	eff	71.0	HP	formula	$ 950,000
							Construction Subtotal	**$ 14,005,000**
					Construction Contingency		30%	$ 4,202,000
							Construction Total	$ 18,207,000
					Implementation Costs		30%	$ 5,462,000
							Total Capital Cost	**$ 23,669,000**
O&M Costs								
Tertiary Treatment								
Pipeline					$ 10,080,000		1%	$ 101,000
Storage					$ 2,025,000		1%	$ 21,000
Pump Station								
	Maintenance				$ 1,900,000		5%	$ 95,000
	Power	75%	930	gpm	500	FT		
				Total:	1,023,084	kW-hr	$0.13	$ 134,000
	Power	75%	930	gpm	500	FT		
				Total:	1,023,084	kW-hr	$0.13	$ 134,000
							Total O&M Cost	**$ 485,000**
Unit Costs								
							Annual Capital Payment	$ 1,540,000
							Annual O&M	$ 485,000
							Total Annual Cost	**$ 2,025,000**
							Annual Yield (AFY)	1,500
							Unit Cost ($/AF)	**$1,350**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date
09/17/14

AREA	**SSLOCSD**					
PROJECT	**S2a - Direct Agricultural Reuse (12-Hr Delivery)**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	1.7	MGD		1,890	AFY
	Peak Day	2.7	MGD			
	Peak Hour	5.4	MGD		3,750	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	18	in	9,000	LF	1.00		$250	$ 2,250,000
	16	in	6,200	LF	0.75		$220	$ 1,023,000
	12	in	15,900	LF	0.75		$190	$ 2,266,000
Storage								
	@ WWTP				2.7	MG	$1,500,000	$ 4,050,000
Pump Station								
	@ WWTP (System)		3,750	gpm	200	FT	refer to	
			75%	eff	142.0	HP	formula	$ 1,610,000
							Construction Subtotal	**$ 11,199,000**
					Construction Contingency		30%	$ 3,360,000
							Construction Total	$ 14,559,000
					Implementation Costs		30%	$ 4,368,000
							Total Capital Cost	**$ 18,927,000**
O&M Costs								
Treatment					2.7	mgd		
	Tertiary Treatment				0.0	mgd		
Pipeline					$ 5,539,000		1%	$ 56,000
Storage					$ 4,050,000		1%	$ 41,000
Pump Station								
	Maintenance				$ 1,610,000		5%	$ 81,000
	Power	75%	1,172	gpm	200	FT		
				Total:	515,635	kW-hr	$0.13	$ 68,000
							Total O&M Cost	**$ 246,000**
Unit Costs								
							Annual Capital Payment	$ 1,231,000
							Annual O&M	$ 246,000
							Total Annual Cost	**$ 1,477,000**
							Annual Yield (AFY)	1,890
							Unit Cost ($/AF)	**$790**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S2b - S2a with 40% RO**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	1.6	MGD		1,810	AFY
	Peak Day	2.5	MGD			
	Peak Hour	5.1	MGD		3,530	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment				2.7	mgd		
	RO			40%	1.1	mgd	$2,000,000	$ 2,160,000
Pipeline					Factor			
	18	in	9,000	LF	1.00		$250	$ 2,250,000
	16	in	6,200	LF	0.75		$220	$ 1,023,000
	12	in	15,900	LF	0.75		$190	$ 2,266,000
Storage								
	@ WWTP				2.7	MG	$1,500,000	$ 4,050,000
Pump Station								
	@ WWTP (System)		3,530	gpm	200	FT	refer to	
			75%	eff	133.7	HP	formula	$ 1,540,000
							Construction Subtotal	**$ 13,289,000**
					Construction Contingency		30%	$ 3,987,000
							Construction Total	$ 17,276,000
					Implementation Costs		30%	$ 5,183,000
							Total Capital Cost	**$ 22,459,000**
O&M Costs								
Treatment								
	Tertiary Treatment				2.7	mgd		
	RO				1.1	mgd	$200,000	$ 216,000
Pipeline					$ 5,539,000		1%	$ 56,000
Storage					$ 4,050,000		1%	$ 41,000
Pump Station								
	Maintenance				$ 1,540,000		5%	$ 77,000
	Power	75%	1,122	gpm	200	FT		
				Total:	493,809	kW-hr	$0.13	$ 65,000
							Total O&M Cost	**$ 455,000**
Unit Costs								
							Annual Capital Payment	$ 1,461,000
							Annual O&M	$ 455,000
							Total Annual Cost	**$ 1,916,000**
							Annual Yield (AFY)	1,810
							Unit Cost ($/AF)	**$1,060**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S2c - Direct Agricultural Reuse (24-Hour Delivery)**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	1.7	MGD		1,890	AFY
	Peak Day	2.7	MGD			
	Peak Hour	2.7	MGD		1,880	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Treatment			2.7	mgd		
Pipeline				Factor			
	8 in	15,900	LF	0.75		$150	$ 1,789,000
	12 in	6,200	LF	0.75		$190	$ 884,000
	16 in	9,000	LF	1.00		$220	$ 1,980,000
Storage							
	@ WWTP			1.35	MG	$1,500,000	$ 2,025,000
Pump Station							
	@ WWTP (System)	1,880	gpm	200	FT	refer to	
		75%	eff	71.2	HP	formula	$ 950,000
						Construction Subtotal	**$ 7,628,000**
				Construction Contingency		30%	$ 2,288,000
						Construction Total	$ 9,916,000
				Implementation Costs		30%	$ 2,975,000
						Total Capital Cost	**$ 12,891,000**
O&M Costs							
Treatment							
	Tertiary Treatment			2.7	mgd		
Pipeline				$ 4,653,000		1%	$ 47,000
Storage				$ 2,025,000		1%	$ 21,000
Pump Station							
	Maintenance			$ 950,000		5%	$ 48,000
	Power 75%	1,172	gpm	200	FT		
			Total:	515,635	kW-hr	$0.13	$ 68,000
						Total O&M Cost	**$ 184,000**
Unit Costs							
						Annual Capital Payment	$ 839,000
						Annual O&M	$ 184,000
						Total Annual Cost	**$ 1,023,000**
						Annual Yield (AFY)	1,890
						Unit Cost ($/AF)	**$550**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**							**Date**
PROJECT	**S2d - S2a with 50% of Total Ag Demand**							09/17/14
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP						
	Available	Max		2.7	MGD	3,024	AFY	
DEMAND	**Average**	1.1	MGD			1,200	AFY	
	Peak Day	2.1	MGD					
	Peak Hour	4.3	MGD			2,970	GPM	

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment				2.1	mgd		
	RO			40%	0.9	mgd	$2,000,000	$ 1,712,000
Pipeline					Factor			
	12	in	15,900	LF	0.75		$190	$ 2,266,000
	16	in	15,200	LF	1.00		$220	$ 3,344,000
Storage								
	@ WWTP				2.1	MG	$1,500,000	$ 3,210,000
Pump Station								
	@ WWTP (System)		2,970	gpm	200	FT	refer to	
			75%	eff	112.5	HP	formula	$ 1,350,000
							Construction Subtotal	**$ 11,882,000**
					Construction Contingency		30%	$ 3,565,000
							Construction Total	$ 15,447,000
					Implementation Costs		30%	$ 4,634,000
							Total Capital Cost	**$ 20,081,000**
O&M Costs								
Treatment								
	Tertiary Treatment				2.1	mgd		
	RO				0.9	mgd	$200,000	$ 172,000
Pipeline					$ 5,610,000		1%	$ 57,000
Storage					$ 3,210,000		1%	$ 33,000
Pump Station								
	Maintenance				$ 1,350,000		5%	$ 68,000
	Power	75%	744	gpm	200	FT		
				Total:	327,387	kW-hr	$0.13	$ 43,000
							Total O&M Cost	**$ 373,000**
Unit Costs								
							Annual Capital Payment	$ 1,306,000
							Annual O&M	$ 373,000
							Total Annual Cost	**$ 1,679,000**
							Annual Yield (AFY)	1,200
							Unit Cost ($/AF)	**$1,400**

San Luis Obispo County Regional Recycled Water Strategic Plan — **Date** 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S3a - GWR via Surface Spreading @ Soto Sports Complex Basins - 60% RO**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	0.3	MGD		300	AFY
	Peak Day	0.3	MGD			
	Peak Hour	0.3	MGD		186	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Treatment									
	Tertiary Treatment				0.3	mgd			
	RO			60%	0.2	mgd	$2,000,000	$	321,429
Pipeline					Factor				
	6	in	13,700	LF	1.0		$150	$	2,055,000
Storage									
	@ WWTP				0.13	MG	$1,500,000	$	201,000
Pump Station									
	@ WWTP (System)		186	gpm	150	FT	refer to		
			75%	eff	5.3	HP	formula	$	160,000
Soto Sports Complex Recharge Basins								Existing	
							Construction Subtotal	**$**	**2,737,429**
					Construction Contingency		30%	$	821,000
							Construction Total	$	3,558,429
					Implementation Costs		40%	$	1,423,000
							Total Capital Cost	**$**	**4,981,429**
O&M Costs									
Treatment	RO				0.2	mgd	$200,000	$	33,000
Pipeline					$ 2,055,000		1%	$	21,000
Storage					$ 201,000		1%	$	3,000
Pump Station									
	Maintenance				$ 160,000		5%	$	8,000
	Power	75%	186	gpm	150	FT			
				Total:	61,393	kW-hr	0.13	$	8,000
Soto Sports Complex Recharge Basins								Existing	
							Total O&M Cost	**$**	**114,000**
Unit Costs									
							Annual Capital Payment	$	324,000
							Annual O&M	$	114,000
							Total Annual Cost	**$**	**438,000**
							Annual Yield (AFY)		300
							Unit Cost ($/AF)		**$1,460**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date 09/17/14

AREA	**SSLOCSD**						
PROJECT	**S3b - GWR via Surface Spreading - New Basins - 60% RO**						
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP					
	Available	Max		2.7	MGD	3,024	AFY
DEMAND	**Average**	2.5	MGD			2,760	AFY
	Peak Day	2.5	MGD				
	Peak Hour	2.5	MGD			1,710	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment	RO			60%	1.6	mgd	$2,000,000	$ 3,240,000
Pipeline					Factor			
	12	in	20,000	LF	1.0		$190	$ 3,800,000
Storage								
	@ WWTP				1.35	MG	$1,500,000	$ 2,025,000
Pump Station								
	@ WWTP (System)		1,710	gpm	150	FT	refer to	
			75%	eff	48.6	HP	formula	$ 890,000
Recharge Basins (for Recycled Water and Blend Water)								
	Recharge Area Needs		15.1	AFD	15.1	ac	@ 1' /day	
	Land Purchase (1.25 x Recharge Area)				18.9	ac	$200,000	$ 3,781,000
	Construction				18.9	ac	$15,000	$ 284,000
							Construction Subtotal	**$ 14,020,000**
					Construction Contingency		30%	$ 4,206,000
							Construction Total	$ 18,226,000
					Implementation Costs		40%	$ 7,290,000
							Total Capital Cost	**$ 25,516,000**
O&M Costs								
Treatment	RO				1.6	mgd	$200,000	$ 324,000
Pipeline					$ 3,800,000		1%	$ 38,000
Storage					$ 2,025,000		1%	$ 21,000
Pump Station								
	Maintenance				$ 4,671,000		5%	$ 234,000
	Power	75%	1,710	gpm	150	FT		
				Total:	564,383	kW-hr	0.13	$ 74,000
Recharge Basins					18.9	ac	$5,000	$ 95,000
							Total O&M Cost	**$ 1,191,000**
Unit Costs								
							Annual Capital Payment	$ 1,660,000
							Annual O&M	$ 1,191,000
							Total Annual Cost	**$ 2,851,000**
							Annual Yield (AFY)	2,760
							Unit Cost ($/AF)	**$1,040**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**						
PROJECT	**S3c - GWR via Surface Spreading - New Basins - Full AWT**						
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP					
	Available	Max	2.7	MGD	3,024	AFY	
DEMAND	**Average**	2.1	MGD		2,390	AFY	
	Peak Day	2.1	MGD				
	Peak Hour	2.1	MGD		1,480	GPM	

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Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment	Tertiary Treatment (Not Needed)					mgd	$1,100,000	
	Full AWT (MF/RO/AOP)				2.7	mgd	$6,000,000	$ 16,200,000
Pipeline					Factor			
	12	in	20,000	LF	1.0		$190	$ 3,800,000
Storage								
	@ WWTP				1.35	MG	$1,500,000	$ 2,025,000
Pump Station								
	@ WWTP (System)		1,480	gpm	150	FT	refer to	
			75%	eff	42.0	HP	formula	$ 790,000
Recharge Basins								
	Recharge Area Needs		6.5	AFD	6.5	ac	@ 1' /day	
	Land Purchase (1.25 x Recharge Area)				8.2	ac	$200,000	$ 1,637,000
	Construction				8.2	ac	$15,000	$ 123,000
							Construction Subtotal	**$ 24,575,000**
				Construction Contingency			30%	$ 7,373,000
							Construction Total	$ 31,948,000
				Implementation Costs			40%	$ 12,779,000
							Total Capital Cost	**$ 44,727,000**
O&M Costs								
Treatment		Full AWT (MF/RO/AOP)			2.7	mgd	$600,000	$ 1,620,000
Pipeline					$ 3,800,000		1%	$ 38,000
Storage					$ 2,025,000		1%	$ 21,000
Pump Station								
	Maintenance				$ 790,000		5%	$ 40,000
	Power	75%	1480	gpm	150	FT		
				Total:	488,472	kW-hr	0.13	$ 64,000
Recharge Basins					8.2	ac	$5,000	$ 41,000
							Total O&M Cost	**$ 1,824,000**
Unit Costs								
							Annual Capital Payment	$ 2,910,000
							Annual O&M	$ 1,824,000
							Total Annual Cost	**$ 4,734,000**
							Annual Yield (AFY)	2,390
							Unit Cost ($/AF)	**$1,990**

San Luis Obispo County Regional Recycled Water Strategic Plan

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AREA	**SSLOCSD**					
PROJECT	**S3d - GW Injection**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.1	MGD		2,390	AFY
	Peak Day	2.1	MGD			
	Peak Hour	2.1	MGD		1,482	GPM

Item		Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment (Not Needed)					mgd	$1,100,000	
	Full AWT (MF/RO/AOP)				2.7	mgd	$6,000,000	$ 16,200,000
Pipeline					Factor			
	12	in	11,400	LF	1.0		$190	$ 2,166,000
Storage								
	@ WWTP				1.35	MG	$1,500,000	$ 2,025,000
Pump Station								
	@ WWTP (System)		1,482	gpm	100	FT	refer to	
			75%	eff	28.1	HP	formula	$ 800,000
Injection Wells					3	EA	$1,500,000	$ 4,500,000
							Construction Subtotal	**$ 25,691,000**
					Construction Contingency		30%	$ 7,707,000
							Construction Total	$ 33,398,000
					Implementation Costs		40%	$ 13,359,000
							Total Capital Cost	**$ 46,757,000**
O&M Costs								
Treatment		Full AWT (MF/RO/AOP)			2.7	mgd	$600,000	$ 1,620,000
Pipeline					$ 2,166,000		1%	$ 22,000
Storage					$ 2,025,000		1%	$ 21,000
Pump Station								
	Maintenance				$ 800,000		5%	$ 40,000
	Power	75%	1,482	gpm	100	FT		
				Total:	326,065	kW-hr	0.13	$ 43,000
Injection Wells					$ 4,500,000		2%	$ 90,000
							Total O&M Cost	**$ 1,836,000**
Unit Costs								
							Annual Capital Payment	$ 3,042,000
							Annual O&M	$ 1,836,000
							Total Annual Cost	**$ 4,878,000**
							Annual Yield (AFY)	2,390
							Unit Cost ($/AF)	**$2,050**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date
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AREA	**SSLOCSD**					
PROJECT	**S4a - Stream Augmentation; 80% RO - Arroyo Grande Creek**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.4	MGD		2,670	AFY
	Peak Day	2.4	MGD			
	Peak Hour	2.4	MGD		1,656	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment				2.7	mgd		
	RO				2.2	mgd	$2,000,000	$ 4,320,000
Pipeline					Factor			
	12	in	64,000	LF	1.0		$190	$ 12,160,000
Storage								
	@ WWTP				1.19	MG	$1,500,000	$ 1,788,000
Pump Station								
	@ WWTP (System)		1,656	gpm	380	FT	refer to	
			75%	eff	119.1	HP	formula	$ 870,000
							Construction Subtotal	**$ 19,138,000**
					Construction Contingency		30%	$ 5,741,000
							Construction Total	$ 24,879,000
					Implementation Costs		40%	$ 9,952,000
							Total Capital Cost	**$ 34,831,000**
O&M Costs								
Treatment	Tertiary				$ 3	mgd	$150,000	$ 405,000
	RO				$ 2	mgd	$200,000	$ 432,000
Pipeline					$ 12,160,000		1%	$ 122,000
Storage					$ 1,788,000		1%	$ 18,000
Pump Station								
	Maintenance				$ 870,000		5%	$ 44,000
	Power	75%	1656	gpm	380	FT		
				Total:	1,384,206	kW-hr	0.13	$ 180,000
							Total O&M Cost	**$ 1,201,000**
Unit Costs								
							Annual Capital Payment	$ 2,266,000
							Annual O&M	$ 1,201,000
							Total Annual Cost	**$ 3,467,000**
							Annual Yield (AFY)	2,670
							Unit Cost ($/AF)	**$1,300**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S4b - Stream Augmentation - Full AWT - Arroyo Grande Creek**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.1	MGD		2,390	AFY
	Peak Day	2.1	MGD			
	Peak Hour	2.1	MGD		1,482	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Treatment								
	Tertiary Treatment (Not Needed)					mgd	$1,100,000	
	Full AWT (MF/RO/AOP)				2.7	mgd	$6,000,000	$ 16,200,000
Pipeline					Factor			
	16	in	64,000	LF	1.0		$220	$ 14,080,000
Storage								
	@ WWTP				1.07	MG	$1,500,000	$ 1,601,000
Pump Station								
	@ WWTP (System)		1,482	gpm	380	FT	refer to	
			75%	eff	106.7	HP	formula	$ 800,000
							Construction Subtotal	**$ 32,681,000**
					Construction Contingency		30%	$ 9,804,000
							Construction Total	$ 42,485,000
					Implementation Costs		40%	$ 16,994,000
							Total Capital Cost	**$ 59,479,000**
O&M Costs								
Treatment	Tertiary				$ -	mgd	$150,000	$ -
	Full AWT (MF/RO/AOP)				$ 3	mgd	$600,000	$ 1,620,000
Pipeline					$ 14,080,000		1%	$ 141,000
Storage					$ 1,601,000		1%	$ 17,000
Pump Station								
	Maintenance				$ 800,000		5%	$ 40,000
	Power	75%	1482	gpm	380	FT		
				Total:	1,239,046	kW-hr	0.13	$ 162,000
							Total O&M Cost	**$ 1,980,000**
Unit Costs								
							Annual Capital Payment	$ 3,869,000
							Annual O&M	$ 1,980,000
							Total Annual Cost	**$ 5,849,000**
							Annual Yield (AFY)	2,390
							Unit Cost ($/AF)	**$2,450**

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AREA	**SSLOCSD**					
PROJECT	**S4c - Stream Augmentation; 80% RO - Los Berros Creek**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.4	MGD		2,670	AFY
	Peak Day	2.4	MGD			
	Peak Hour	2.4	MGD		1,656	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Treatment									
	Tertiary Treatment				2.7	mgd			
	RO				2.2	mgd	$2,000,000	$	4,320,000
Pipeline					Factor				
	16	in	16,000	LF	1.0		$220	$	3,520,000
Storage									
	@ WWTP				1.19	MG	$1,500,000	$	1,788,000
Pump Station									
	@ WWTP (System)		1,656	gpm	200	FT	refer to		
			75%	eff	62.7	HP	formula	$	870,000
							Construction Subtotal	**$**	**10,498,000**
					Construction Contingency		30%	$	3,149,000
							Construction Total	$	13,647,000
					Implementation Costs		40%	$	5,459,000
							Total Capital Cost	**$**	**19,106,000**
O&M Costs									
Treatment	Tertiary				$ 3	mgd	$150,000	$	405,000
	RO				$ 2	mgd	$200,000	$	432,000
Pipeline					$ 3,520,000		1%	$	36,000
Storage					$ 1,788,000		1%	$	18,000
Pump Station									
	Maintenance				$ 870,000		5%	$	44,000
	Power	75%	1656	gpm	200	FT			
				Total:	728,530	kW-hr	0.13	$	95,000
							Total O&M Cost	**$**	**1,030,000**
Unit Costs									
							Annual Capital Payment	$	1,243,000
							Annual O&M	$	1,030,000
							Total Annual Cost	**$**	**2,273,000**
							Annual Yield (AFY)		2,670
							Unit Cost ($/AF)		**$860**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**					
PROJECT	**S4d - Stream Augmentation - Full AWT - Los Berros Creek**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.1	MGD		2,390	AFY
	Peak Day	2.1	MGD			
	Peak Hour	2.1	MGD		1,482	GPM

Date
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Item	Description	Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs								
Treatment								
	Tertiary Treatment (Not Needed)				mgd	$1,100,000		
	Full AWT (MF/RO/AOP)			2.7	mgd	$6,000,000	$	16,200,000
Pipeline				Factor				
16	in	16,000	LF	1.0		$220	$	3,520,000
Storage								
	@ WWTP			1.07	MG	$1,500,000	$	1,601,000
Pump Station								
	@ WWTP (System)	1,482	gpm	200	FT	refer to		
		75%	eff	56.1	HP	formula	$	800,000
						Construction Subtotal	**$**	**22,121,000**
				Construction Contingency		30%	$	6,636,000
						Construction Total	$	28,757,000
				Implementation Costs		40%	$	11,503,000
						Total Capital Cost	**$**	**40,260,000**
O&M Costs								
Treatment	Tertiary			$ -	mgd	$150,000	$	-
	Full AWT (MF/RO/AOP)			$ 3	mgd	$600,000	$	1,620,000
Pipeline				$ 3,520,000		1%	$	36,000
Storage				$ 1,601,000		1%	$	17,000
Pump Station								
	Maintenance			$ 800,000		5%	$	40,000
	Power	75%	1482	gpm 200	FT			
			Total:	652,130	kW-hr	0.13	$	85,000
						Total O&M Cost	**$**	**1,798,000**
Unit Costs								
						Annual Capital Payment	$	2,619,000
						Annual O&M	$	1,798,000
						Total Annual Cost	**$**	**4,417,000**
						Annual Yield (AFY)		2,390
						Unit Cost ($/AF)		**$1,850**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**					
PROJECT	**S4e - Reservoir Augmentation - Lopez Lake**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	2.1	MGD		2,390	AFY
	Peak Day	2.1	MGD			
	Peak Hour	2.1	MGD		1,482	GPM

Date
09/17/14

Item	Description		Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs									
Treatment	Tertiary Treatment (Not Needed)					mgd	$1,100,000		
	Full AWT (MF/RO/AOP)				2.7	mgd	$6,000,000	$	16,200,000
Pipeline					Factor				
	16	in	78,000	LF	1.0		$220	$	17,160,000
Storage									
	@ WWTP				1.07	MG	$1,500,000	$	1,601,000
Pump Station									
	@ WWTP (System)		1,482	gpm	300	FT	refer to		
			75%	eff	84.2	HP	formula	$	800,000
	@ Terminal Reservoir		1,482	gpm	300	FT	refer to		
	(Booster Station)		75%	eff	84.2	HP	formula	$	800,000
							Construction Subtotal	**$**	**36,561,000**
					Construction Contingency		30%	$	10,968,000
							Construction Total	$	47,529,000
					Implementation Costs		40%	$	19,012,000
							Total Capital Cost	**$**	**66,541,000**
O&M Costs									
Treatment	Tertiary				$ -	mgd	$150,000	$	-
	Full AWT (MF/RO/AOP)				$ 3	mgd	$600,000	$	1,620,000
Pipeline					$ 17,160,000		1%	$	172,000
Storage					$ 1,601,000		1%	$	17,000
Pump Station									
	Maintenance				$ 1,600,000		5%	$	80,000
	Power	75%	1482	gpm	300	FT			
				Total:	978,194	kW-hr	0.13	$	128,000
	Power	75%	1482	gpm	300	FT			
				Total:	978,194	kW-hr	0.13	$	128,000
							Total O&M Cost	**$**	**2,145,000**
Unit Costs									
							Annual Capital Payment	$	4,329,000
							Annual O&M	$	2,145,000
							Total Annual Cost	**$**	**6,474,000**
							Annual Yield (AFY)		2,390
							Unit Cost ($/AF)		**$2,710**

San Luis Obispo County Regional Recycled Water Strategic Plan

AREA	**SSLOCSD**						**Date**
PROJECT	**S5 - Industrial Reuse (Phillips 66 Refinery) - Tertiary Treatment**						09/17/14
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP					
	Available	Max	2.7	MGD	3,024	AFY	
DEMAND	**Average**	0.98	MGD		1,100	AFY	
	Peak Day	1.28	MGD				
	Peak Hour	1.70	MGD		1,179	GPM	

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Treatment			1.28	mgd	$1,100,000	
	RO				mgd	$2,000,000	$ -
							$ -
Pipeline				Factor			
12	in	38,500	LF	1.0		$190	$ 7,315,000
Storage							
	@ WWTP			1.28	MG	$1,500,000	$ 1,916,000
Pump Station							
	@ WWTP (System)	1,179	gpm	300	FT	refer to	
		75%	eff	67.0	HP	formula	$ 670,000
Customer Conversions - Industrial				1	EA	$100,000	$ 100,000
						Construction Subtotal	**$ 10,001,000**
				Construction Contingency		30%	$ 3,000,000
						Construction Total	$ 13,001,000
				Implementation Costs		30%	$ 3,900,000
						Total Capital Cost	**$ 16,901,000**
O&M Costs							
Treatment							
	RO			0	mgd	$200,000	$ -
Pipeline				$ 7,315,000		1%	$ 74,000
Storage				$ 1,916,000		1%	$ 20,000
Pump Station							
	Maintenance			$ 670,000		5%	$ 34,000
	Power	75%	682 gpm	300	FT		
			Total:	450,215	kW-hr	$0.13	$ 59,000
						Total O&M Cost	**$ 187,000**
Unit Costs							
						Annual Capital Payment	$ 1,099,000
						Annual O&M	$ 187,000
						Total Annual Cost	**$ 1,286,000**
						Annual Yield (AFY)	1,100
						Unit Cost ($/AF)	**$1,170**

San Luis Obispo County Regional Recycled Water Strategic Plan

Date 09/17/14

AREA	**SSLOCSD**					
PROJECT	**S5 - Industrial Reuse (Phillips 66 Refinery) - 100% RO**					
SUPPLY	**Source**	SSLOCSD WWTP & Pismo Beach WWTP				
	Available	Max	2.7	MGD	3,024	AFY
DEMAND	**Average**	0.98	MGD		1,100	AFY
	Peak Day	1.28	MGD			
	Peak Hour	1.70	MGD		1,179	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost		Cost
Capital Costs								
Treatment								
	Tertiary Treatment			1.50	mgd		$	-
	RO			1.50	mgd	$2,000,000	$	3,005,000
							$	1,502,500
Pipeline				Factor				
12	in	38,500	LF	1.0		$190	$	7,315,000
Storage								
	@ WWTP			1.28	MG	$1,500,000	$	1,916,000
Pump Station								
	@ WWTP (System)	1,179	gpm	300	FT	refer to		
		75%	eff	67.0	HP	formula	$	670,000
	Redundant Pumping (50% of Base Pump Station)					50%	$	335,000
Customer Conversions - Industrial				1	EA	$150,000	$	150,000
						Construction Subtotal	**$**	**14,893,500**
				Construction Contingency		30%	$	4,468,000
						Construction Total	$	19,361,500
				Implementation Costs		30%	$	5,808,000
						Total Capital Cost	**$**	**25,169,500**
O&M Costs								
Treatment				1.50	mgd			
	RO			1.50	mgd	$200,000	$	301,000
Pipeline				$ 7,315,000		1%	$	74,000
Storage				$ 1,916,000		1%	$	20,000
Pump Station								
	Maintenance			$ 1,005,000		5%	$	51,000
	Power	75%	682 gpm	300	FT			
			Total:	450,215	kW-hr	$0.13	$	59,000
						Total O&M Cost	**$**	**505,000**
Unit Costs								
						Annual Capital Payment	$	1,637,000
						Annual O&M	$	505,000
						Total Annual Cost	**$**	**2,142,000**
						Annual Yield (AFY)		1,100
						Unit Cost ($/AF)		**$1,950**

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Appendix G: Evaluation of Northern Cities Groundwater Recharge Potential

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Tim Cleath
Cleath-Harris Geologists
March 7, 2014

Groundwater Replenishment Options
Northern Cities Groundwater Management Area

Cleath-Harris Geologists, Inc. has performed a reconnaissance level review of surface recharge and injection well options for the Northern Cities Management Area (NCMA). This review includes a description of the hydrogeology and ground water conditions, travel time considerations for injected water, locations where injection wells could potentially be located, and a discussion of further studies and investigations that would be needed for a constraints analysis.

One potential use of treated effluent from the South San Luis Obispo County Sanitation District (SSLOSCD) plant would be to recharge the produced water into the NCMA aquifers tapped by the public water agencies in order to augment the available water from these underground reservoirs. The amount of produced water to be used for injection and the quality of water is not considered in this discussion. The effort herein is to address parameters involved in recharge of the treated effluent.

Hydrogeology

The aquifers underlying the NCMA that are tapped by the community wells include the Paso Robles Formation gravel zones and the Careaga Formation sand. These aquifers underlie the Pismo Creek, Meadow Creek and Arroyo Grande Creek alluvial deposits and the dune sands that cover the Tri-Cities Mesa. The alluvial aquifers and upper Paso Robles Formation aquifers are heavily utilized by the farmers in the Cienaga Valley. Water quality in these overlying aquifers in the Cienaga Valley and the other alluvial areas can be poor due to nitrate buildup or sea water intrusion (as observed in the coastal area near Pismo Creek). The deeper zones have been less degraded and comprise the domestic water supply sources.

The 2002 California Department of Water Resources (DWR) Southern District Report, "Water Resources of the Arroyo Grande-Nipomo Mesa Area", and the 1970 DWR Bulletin No. 63-3, "Sea-Water Intrusion: Pismo-Guadalupe Area" provide information on the hydrogeology of the NCMA (referred to as the Arroyo Grande/Tri-Cities Mesa area in the 1970 bulletin). This information, as modified by Cleath-Harris Geologists was used to establish the boundaries within which potential recharge could occur benefiting the public water supply wells. The southern boundary would be the faults located south of Arroyo Grande Creek. The north boundary is where an inferred anticline has been defined herein. To the east, low permeability sedimentary beds appear to rise to a boundary roughly at about Halcyon Road.

In general, the ground water bearing aquifers deepen to the south and west, reaching depths of about 700 feet. In the vicinity of the Arroyo Grande wells, the aquifers are about 400-500 feet deep. North of Grand Avenue, there are no significant producing wells. Cleath-Harris Geologists has been involved in other projects south of Hwy 101 that suggest that a west-east trending anticline may be present below the Grover Beach highlands area north of Grand Avenue. As such, it is possible that the lower aquifers maybe found at shallower depths in this area.

Ground Water Occurrence and Movement

The ground water levels within the NCMA have been measured regularly by the public agencies and San Luis Obispo County Public Works Department. Therefore water levels at individual wells are known. Interpretation of the overall ground water level contours based on this data has been performed for the NCMA annual reports. Evidence of sea water intrusion has been observed in the vicinity of Oceano. In the 2002 DWR publication, the Spring 2000 ground water level contour map shows a gentle gradient toward the coastline, from a 30-foot contour line near to Halcyon Road-Valley Road, to levels below 10-foot elevation along the coastline. The 2000 ground water level information indicates that the ground water gradient is about 20 feet of decline in pressure head over 10,000 feet distance (0.002 feet per foot)

Travel Time/Setback

One general guideline with respect to the use of recharged treated effluent is that there be a twelve-month residency time for recharged treated effluent in the aquifer prior to reuse of the water. Assuming that a mound is developed where injection of the treated effluent occurs within the aquifer, the ground water gradient would be much steeper than the regional gradient. Assuming a gradient of 0.10 occurs due to injection, the hydraulic conductivity of the more permeable aquifer zones is 20 feet per day, and porosity of the aquifers is 0.30, the distance ground water will flow over a 12-month period of time would be roughly 2300 feet. Therefore, we assume that there needs to be a 2300-foot setback from a domestic water supply well tapping the same aquifers to the injection well site.

Surface Recharge Areas

Areas where surface recharge to the deeper water supply aquifers of the groundwater basin can occur are not well defined at this time. The deeper aquifers unconformably underlie the older dune sands mapped in the Grover Beach/Arroyo Grande areas on the north and the alluvium along Arroyo Grande Creek. As a result, any surface recharge would be percolated into the dune sands or the alluvium before recharging the deeper water supply aquifers. Further studies and potentially, groundwater flow modeling would need to be performed to establish areas where surface recharge can effectively pass through these shallow formations into the deeper water supply aquifers.

Injection Well Areas

Using these hydraulic parameters and the geologic framework of the basin, recharge through injection could be done in the following areas (Figure 1):

- -south of Arroyo Grande Creek,
- -along the coastline between Hwy 1 and the dunes,
- -along the northern edge of the basin where the supply aquifers may shallow,
- -along a line south of Farroll Avenue between the production wells.

South of Arroyo Grande Creek, injection wells would recharge an area that is largely utilized by agricultural pumpers, although Oceano CSD wells are located adjacent to the farmed area. The agricultural wells produce from the alluvial and Paso Robles Formation aquifers while the municipal wells produce groundwater from the deeper zones of the lower Paso Robles Formation and Careaga Formations where lower nitrate water is more likely to be found.

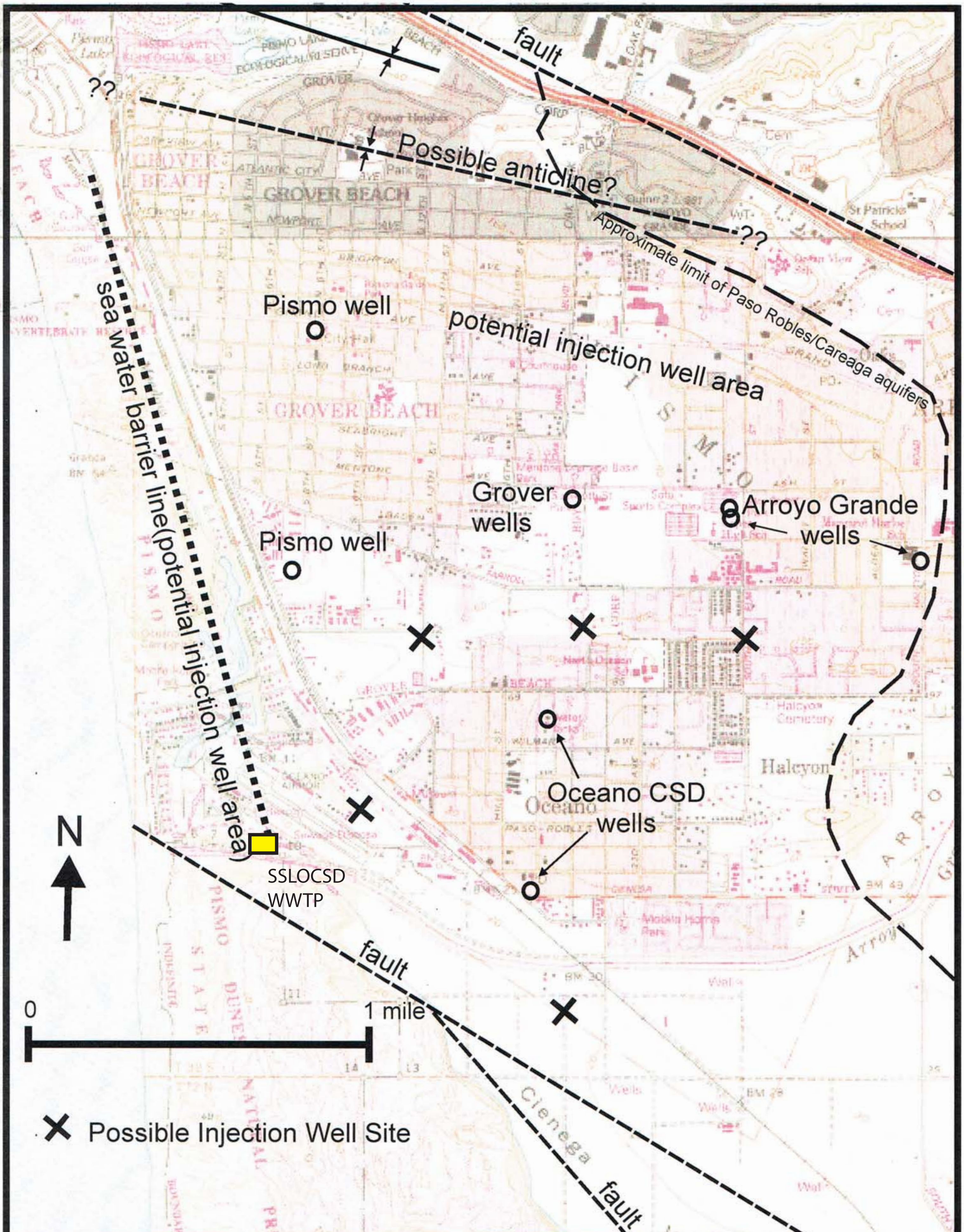
The coastal injection line could perform the function of preventing sea water intrusion as well as recharging the basin. The number of wells placed along this two mile stretch would need to be determined by additional analysis. The wells to the south would be deeper than the wells to the north (roughly 400 feet on the north to 700 feet on the south).

Injection wells along the northern area (essentially north of Grand Avenue) would probably be shallower than elsewhere in the basin but the hydrogeology is not well defined in this area. Further studies would be required for assessing the potential design and siting of wells in this area.

The domestic water wells serving the communities generally are spaced ½ to 1 mile apart. Injection wells, therefore could be interspersed between the production wells. There is an area just south of Farroll Avenue that appears to be sufficient distance to allow for the 12-month residency time.

Investigations and Studies

Injection well design and maintenance need to be more thoroughly investigated and are beyond the level of effort allowed for this reconnaissance level discussion. Site specific hydrogeologic conditions including aquifer characteristics, ground water levels and water quality should be further defined in order to evaluate the feasibility of such facilities and the effectiveness of the recharge. Ground water modeling of possible alternatives would be useful in considering where to site the wells.



Cleath-Harris Geologists, Inc.

Figure 1
Location of Injection well options

Appendix H: Templeton CSD Project Concepts

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Unit Cost Basis

Item	Unit Cost	Unit	Reference	Cost Basis	Notes
CAPITAL COSTS	*(May 2014 dollars)*				
Treatment					
TCSD - High Rate Filtration System (0.67 MGD)	$2,580,000	LS	HMM, 2012	Jan 2012	
SSLOCSD - Tertiary Filtration & Disinfection	$1,100,000	mgd	Wallace, 2009	Dec 2008	for 3.0 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$7,500,000	mgd	Carollo, 2007	Jan 2007	for 0.15 MGD
Pismo Beach - Tertiary Filtration & Disinfection	$1,100,000	mgd	Carollo, 2007	Jan 2007	for 1.6 MGD
NCSD - Tertiary Filtration & Disinfection	$1,600,000	mgd	AECOM, 2009	Nov 2008	for 1.67 MGD
Tertiary Filtration & Disinfection	$1,400,000	mgd			Consolidation of references
Reverse Osmosis	$2,000,000	mgd	Dudek, 2012	Sep 2011	
Full Advanced Water Treatment (AWT) (MF/RO/AOP)	$6,000,000	mgd	RMC, 2012	Jan 2011	
Conveyance					
Pipe Dia (in)					
4	$110	LF			
6	$130	LF			
8	$150	LF			
10	$170	LF			
12	$190	LF			
16	$220	LF			
18	$250	LF			
Pipe Installation Factors					
Trenchless - Directional	2.0				
Trenchless - Jack & Bore	1.5				
Unpaved Areas	0.75				
Pump Station / Booster Station	*Refer to formula*		Sanks, 2008	2012	$=2*10^(0.7583*log(Qp)+3.1951) Qp = Peak Flow
Storage (Aboveground)	$1,500,000	MG			

Feed and Fodder Irrigation System	$3,000	ac		
Recharge Pond Construction	$15,000	ac	Means	
Evaporation Pond Construction w/ Liner	$80,000	ac	Means	Liner @ $1.5/SF
Land Purchase	$200,000	ac	Loopnet	For agricultural land
Injection Wells	$2,000,000	EA	LADWP	
Landscape Irrigation Customer Conversions	$15,000	EA		
O&M COSTS				
Treatment - Tertiary Filtration	$150,000	mgd		
Treatment - RO	$200,000	mgd	Dudek, 2012	Sep 2011
Treatment - Full AWT (MF/RO/AOP)	$600,000	mgd	RMC, 2012	Jan 2011
Pipeline	1%			
Storage	1%			
Pump Stations	5%			
Injection Wells	2%			
Recharge Basins	$5,000	ac		
Pump/Motor Efficiency	75%			
Electricity	$0.13	kw-Hr		
FINANCING COSTS / ASSUMPTIONS				
Interest Rate	5%			
Term (years)	30			
Contigencies / Soft Costs				
Construction Contigency	30%			
Engineering/Admin/CM/etc.	30%			
For Potable Reuse & Stream Augmentation	40%			

California Construction Cost Index (CCCI) www.documents.dgs.ca.gov/resd/pmb/ccci/cccitable.pdf

The California Construction Cost index is developed based upon Building Cost Index (BCI) cost indices for San Francisco and Los Angeles produced by Engineering News Record (ENR).

Reference	Month	CCI
RRWSP	**May 2014**	**5957**
Morro Bay (Dudek, 2012)	Sep 2012	5777
Templeton CSD (HMM, 2012)	**Jan 2012**	**5683**
SSLOCSD (Wallace, 2009)	Dec 2008	5322
Nipomo CSD (AECOM, 2009)	Nov 2008	5375
Pismo Beach (Carollo, 2007)	Jan 2007	4869

Templeton CSD

Demands

#	Customer	AFY/AC: 2.5		Annual	Peak Day		Peak Hour		Project #				
#	Customer	SF	AFY	AFY	Factor	GPD	Factor	GPM	1a	1b	1c	1d	1e
1	Templeton HS	270,000	15.5	15	2.0	26,782	3.0	56	1				
2	Templeton MS	85,000	4.9	5	2.0	8,927	3.0	19	1				
3	Templeton Park	120,000	6.9	7	2.0	12,498	3.0	26	1				
4	Evers Sports Park	Meter Data		16	2.0	28,568	3.0	60		1			
5	Vineyard ES	400,000	23.0	20	2.0	35,710	1.0	25			1		
6	Jermin Park	100,000	5.7	5	2.0	8,927	3.0	19				1	
				68									
	Templeton Equestrian	3,397,680	195	160	2.0	285,678	3.0	595					1
				228		**407,091**		**799**	27	16	20	5	160
	Notes:								3	1	1	1	1

Vineyard ES has on-site storage tanks

Evers Sports Park demand based on meter

	Agricultural Irrigation	AFY	Factor	Peak Day (DGP)	Factor	Peak Hr (GPM)
2a	Direct - 12-hr	260	2.0	460,000	2.0	640
2b	Direct - 12-hr - 65% RO	260	2.0	460,000	2.0	640
2c	Direct - 24-hr	260	2.0	460,000	1.0	320
2d	Direct - 24-hr - 65% RO	260	2.0	460,000	1.0	320
	Groundwater Recharge					
3	100% Full AWT	500	1.0	450,000	1.0	310

MF/RO Recovery

MF Recovery	93%
RO Recovery	85%
MF/RO Recovery	79%

Partial RO

RO = 98% reduction in TDS, Cl, Na

	TDS	
	% of Q	mg/L
Goal		**500**
Existing	35%	1400
RO Influent	65%	
RO Product	52%	28
Blended Product	86%	**500**
Brine	14%	1372

Check Other Constituents @ 65% RO

N	Na	Cl
mg/L	mg/L	mg/L
5	**110**	**150**
14	263	397
0.28	5.3	7.9
5.0	**94**	**142**

	Full AWT			65% RO	
	MGD	afy		MGD	afy
Influent	0.53	593		0.53	593
Bypass				0.18	206
RO Influent	0.53	593		0.35	387
RO Product	0.45	504		0.29	329
Blended Product	**0.45**	**504**		**0.48**	**534**
Brine	0.08	89		0.05	58

	Evaporation Ponds				
	Full AWT			65% RO	
Concentrate Disposal Rate		0.24	afd	0.16	afd
Evaporation Rate		0.3	ft/day	0.3	ft/day
Evaporation area		0.97	ac	0.64	ac
		80%		80%	
Total Ponds Area		**1.22**	ac	**0.80**	ac

Summary of TCSD Potential Projects

Project Type	Landscape Irrigation Projects			
Alt #	T1a	T1b	T1c	T1d
Description	Core Project	Extension to Evers Sports Park	Extension to Vineyard Elementary	Extension to Jermin Park
Max Supply	0.53 MGD 594 AFY	0.53 MGD 594 AFY	0.53 MGD 594 AFY	0.53 MGD 594 AFY
Demand				
Average	0.02 MGD **27 AFY**	0.01 MGD **16 AFY**	0.02 MGD **20 AFY**	0.00 MGD **5 AFY**
Peak Day	0.05 MGD	0.03 MGD	0.04 MGD	0.01 MGD
Peak Hour	0.10 MGD 63 GPM	0.09 MGD 60 GPM	0.04 MGD 25 GPM	0.03 MGD 19 GPM
Capital Costs				
RO or AWT	$ -	$ -	$ -	$ -
Pipeline	$ 1,265,000	$ 396,000	$ 924,000	$ 440,000
Storage	$ 73,000	$ 43,000	$ 54,000	$ 14,000
Pump Station	$ 70,000	$ 70,000	$ 40,000	$ 30,000
Customer Conversions	$ 45,000	$ 15,000	$ 15,000	$ 15,000
Construction Subtotal	*$ 1,453,000*	*$ 524,000*	*$ 1,033,000*	*$ 499,000*
Construction Contingency	$ 436,000	$ 157,000	$ 310,000	$ 150,000
Construction Total	*$ 1,889,000*	*$ 681,000*	*$ 1,343,000*	*$ 649,000*
Implementation Costs	$ 567,000	$ 204,000	$ 403,000	$ 195,000
Total Capital Cost	**$ 2,456,000**	**$ 885,000**	**$ 1,746,000**	**$ 844,000**
O&M Costs				
RO or AWT	$ -	$ -	$ -	$ -
Pipeline	$ 13,000	$ 4,000	$ 10,000	$ 5,000
Storage	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Pump Station				
Maintenance	$ 4,000	$ 4,000	$ 2,000	$ 2,000
Power	$ 1,000	$ 1,000	$ 1,000	$ 1,000
Injection Wells				
Total O&M Cost	**$ 19,000**	**$ 10,000**	**$ 14,000**	**$ 9,000**
Annual Cost Method				
Annual Capital Payment	$ 160,000	$ 58,000	$ 114,000	$ 55,000
Annual O&M	$ 19,000	$ 10,000	$ 14,000	$ 9,000
Total Annual Cost	$ 179,000	$ 68,000	$ 128,000	$ 64,000
Annual Yield (AFY)	27	16	20	5
Unit Cost ($/AF)	**$6,630**	**$4,250**	**$6,400**	**$12,800**

	Project Concepts with Tertiary Treatment Costs Included			
Tertiary Trmt Capital Cost	$ 314,000	$ 186,000	$ 232,000	$ 58,000
Capital Cost (from above)	$ 2,456,000	$ 885,000	$ 1,746,000	$ 844,000
Total Capital Cost	**$ 2,770,000**	**$ 1,071,000**	**$ 1,978,000**	**$ 902,000**
Tertiary Trmt O&M Cost	$ 7,200	$ 4,300	$ 5,400	$ 1,300
O&M Cost (from above)	$ 19,000	$ 10,000	$ 14,000	$ 9,000
Total O&M Cost	**$ 26,200**	**$ 14,300**	**$ 19,400**	**$ 10,300**

Annual Cost Method				
Annual Capital Payment	$ 180,000	$ 70,000	$ 129,000	$ 59,000
Annual O&M	$ 26,200	$ 14,300	$ 19,400	$ 10,300
Total Annual Cost	$ 206,200	$ 84,300	$ 148,400	$ 69,300
Annual Yield (AFY)	27	16	20	5
Unit Cost ($/AF)	**$7,640**	**$5,270**	**$7,420**	**$13,860**

Summary of TCSD Potential Projects

Project Type		**Agricultural Irrigation Projects**		
Alt #	**T1e**	**T2a**	**T2b**	**T2c**
Description	**Templeton Equestrian**	**Direct Reuse (12-hr Delivery)**	**Alt 2a with 65% RO**	**Direct Reuse (24-hr Delivery)**
Max Supply	0.53 MGD 594 AFY	0.53 MGD 594 AFY	0.53 MGD 594 AFY	0.53 MGD 594 AFY
Demand				
Average	0.14 MGD **160 AFY**	0.23 MGD **260 AFY**	0.23 MGD **260 AFY**	0.23 MGD **260 AFY**
Peak Day	0.29 MGD	0.46 MGD	0.46 MGD	0.46 MGD
Peak Hour	0.86 MGD 595 GPM	0.92 MGD 640 GPM	0.92 MGD 640 GPM	0.46 MGD 320 GPM
Capital Costs				
RO or AWT	$ -	$ -	$ 969,000	$ -
Pipeline	$ 1,690,000	$ 1,300,000	$ 1,300,000	$ 1,300,000
Storage	$ 429,000	$ 697,000	$ 795,000	$ 697,000
Pump Station	$ 400,000	$ 420,000	$ 420,000	$ 250,000
Customer Conversions	$ 15,000			
Construction Subtotal	*$ 2,534,000*	*$ 2,417,000*	*$ 3,484,000*	*$ 2,247,000*
Construction Contingency	$ 760,000	$ 725,000	$ 1,045,000	$ 674,000
Construction Total	*$ 3,294,000*	*$ 3,142,000*	*$ 4,529,000*	*$ 2,921,000*
Implementation Costs	$ 988,000	$ 943,000	$ 1,359,000	$ 876,000
Total Capital Cost	**$ 4,282,000**	**$ 4,085,000**	**$ 5,888,000**	**$ 3,797,000**
O&M Costs				
RO or AWT	$ -	$ -	$ 68,900	$ -
Pipeline	$ 17,000	$ 13,000	$ 13,000	$ 13,000
Storage	$ 5,000	$ 7,000	$ 8,000	$ 7,000
Pump Station				
Maintenance	$ 20,000	$ 21,000	$ 21,000	$ 13,000
Power	$ 6,000	$ 5,000	$ 5,000	$ 5,000
Injection Wells				
Total O&M Cost	**$ 48,000**	**$ 46,000**	**$ 120,900**	**$ 38,000**
Annual Cost Method				
Annual Capital Payment	$ 279,000	$ 266,000	$ 384,000	$ 248,000
Annual O&M	$ 48,000	$ 46,000	$ 120,900	$ 38,000
Total Annual Cost	$ 327,000	$ 312,000	$ 504,900	$ 286,000
Annual Yield (AFY)	160	260	260	260
Unit Cost ($/AF)	**$2,050**	**$1,200**	**$1,950**	**$1,100**

	Project Concepts with Tertiary Treatment Costs Included			
Tertiary Trmt Capital Cost	$ 1,859,000	$ 3,021,000	$ 3,021,000	$ 3,021,000
Capital Cost (from above)	$ 4,282,000	$ 4,085,000	$ 5,888,000	$ 3,797,000
Total Capital Cost	**$ 6,141,000**	**$ 7,106,000**	**$ 8,909,000**	**$ 6,818,000**
Tertiary Trmt O&M Cost	$ 42,900	$ 69,600	$ 69,600	$ 69,600
O&M Cost (from above)	$ 48,000	$ 46,000	$ 120,900	$ 38,000
Total O&M Cost	**$ 90,900**	**$ 115,600**	**$ 190,500**	**$ 107,600**

Annual Cost Method				
Annual Capital Payment	$ 399,000	$ 462,000	$ 580,000	$ 444,000
Annual O&M	$ 90,900	$ 115,600	$ 190,500	$ 107,600
Total Annual Cost	$ 489,900	$ 577,600	$ 770,500	$ 551,600
Annual Yield (AFY)	160	260	260	260
Unit Cost ($/AF)	**$3,060**	**$2,220**	**$2,960**	**$2,120**

Summary of TCSD Potential Projects

Project Type	Groundwater Recharge Projects		
Alt #	T3a	T3b	T3c
Description	Recharge Basins 65% RO	Recharge Basins Full AWT	Well Injection Full AWT
Max Supply	0.53 MGD 594 AFY	0.53 MGD 594 AFY	0.53 MGD 594 AFY
Demand			
Average	0.47 MGD **530 AFY**	0.45 MGD **500 AFY**	0.45 MGD **500 AFY**
Peak Day	0.47 MGD	0.45 MGD	0.45 MGD
Peak Hour	0.47 MGD 308 GPM	0.45 MGD 291 GPM	0.45 MGD 291 GPM
Capital Costs			
RO or AWT	$ 769,000	$ 3,260,000	$ 3,260,000
Pipeline	$ 3,145,000	$ 2,275,000	$ 2,873,000
Storage	$ 795,000	$ 670,000	$ 670,000
Pump Station	$ 560,000	$ 230,000	$ 230,000
Customer Conversions			
Construction Subtotal	*$ 5,996,000*	*$ 6,778,000*	*$ 9,033,000*
Construction Contingency	$ 1,799,000	$ 2,033,000	$ 2,710,000
Construction Total	*$ 7,795,000*	*$ 8,811,000*	*$ 11,743,000*
Implementation Costs	$ 3,118,000	$ 3,524,000	$ 4,697,000
Total Capital Cost	**$ 10,913,000**	**$ 12,335,000**	**$ 16,440,000**
O&M Costs			
RO or AWT	$ 207,000	$ 318,000	$ 318,000
Pipeline	$ 32,000	$ 23,000	$ 29,000
Storage	$ 8,000	$ 7,000	$ 7,000
Pump Station			
Maintenance	$ 28,000	$ 12,000	$ 12,000
Power	$ 29,000	$ 14,000	$ 9,000
Injection Wells			
Total O&M Cost	**$ 328,000**	**$ 388,000**	**$ 420,000**
Annual Cost Method			
Annual Capital Payment	$ 710,000	$ 803,000	$ 1,070,000
Annual O&M	$ 328,000	$ 388,000	$ 420,000
Total Annual Cost	$ 1,038,000	$ 1,191,000	$ 1,490,000
Annual Yield (AFY)	530	500	500
Unit Cost ($/AF)	**$1,960**	**$2,390**	**$2,980**

	Project Concepts with Tertiary Treatment Costs Included		
Tertiary Trmt Capital Cost	$ 3,079,000		
Capital Cost (from above)	$ 10,913,000	$ 12,335,000	$ 16,440,000
Total Capital Cost	**$ 13,992,000**	**$ 12,335,000**	**$ 16,440,000**
Tertiary Trmt O&M Cost	$ 71,000		
O&M Cost (from above)	$ 328,000	$ 388,000	$ 420,000
Total O&M Cost	**$ 399,000**	**$ 388,000**	**$ 420,000**

Annual Cost Method			
Annual Capital Payment	$ 910,000	$ 802,000	$ 1,069,000
Annual O&M	$ 399,000	$ 388,000	$ 420,000
Total Annual Cost	$ 1,309,000	$ 1,190,000	$ 1,489,000
Annual Yield (AFY)	530	500	500
Unit Cost ($/AF)	**$2,470**	**$2,380**	**$2,980**

AREA	**Templeton CSD**						
PROJECT	**Meadowbrook WWTP**						
SUPPLY	**Source**	Meadowbrook WWTP					
	Available	Existing	0.15	MGD	168	AFY	
		w/ Diversion	0.37	MGD	414	AFY	
		Future	0.40	MGD	448	AFY	
		Buildout	0.67	MGD	750	AFY	
		***Max**	**0.53**	**MGD**	**594**	**AFY**	
		*Max = Buildout - Existing					

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	High Rate Filters (0.67 mgd)			1	LS	$2,580,000	$ 2,580,000
						Construction Subtotal	**$ 2,580,000**
				Construction Contingency		30%	$ 774,000
						Construction Total	$ 3,354,000
				Implementation Costs		30%	$ 1,006,000
						Total Capital Cost	**$ 4,360,000**
O&M Costs							
Treatment							
	Tertiary			0.67	mgd	$150,000	$ 100,500
						Total O&M Cost	**$ 100,500**
Unit Cost							
						Annual Capital Payment	**$ 284,000**
						Annual O&M	$ 100,500
						Total Annual Cost	**$ 384,500**
						Annual Yield (AFY)	750
						Unit Cost ($/AF)	**$513**

AREA	**Templeton CSD**				
PROJECT	**T1a - Core Project**				
SUPPLY	**Source**	Meadowbrook WWTP			
	Available	*Max 0.53	MGD	594	AFY
DEMAND	**Average**	0.02	MGD	27	AFY
	Peak Day	0.05	MGD		
	Peak Hour	0.10	MGD	63	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	11,500	LF	1.0		$110	$ 1,265,000
Storage								
	@ WWTP				0.05	MG	$1,500,000	$ 73,000
Pump Station								
	@ WWTP (System)		63	gpm	100	FT	refer to	
			75%	eff	1.2	HP	formula	$ 70,000
Customer Conversions					3	EA	$15,000	$ 45,000
							Construction Subtotal	**$ 1,453,000**
					Construction Contingency		30%	$ 436,000
							Construction Total	$ 1,889,000
					Implementation Costs		30%	$ 567,000
							Total Capital Cost	**$ 2,456,000**
O&M Costs								
Pipeline					$ 1,265,000		1%	$ 13,000
Storage					$ 73,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 70,000		5%	$ 4,000
	Power	75%	17	gpm	100	FT		
				Total:	3,684	kW-hr	0.13	$ 1,000
							Total O&M Cost	**$ 19,000**
Unit Cost								
							Annual Capital Payment	**$ 160,000**
							Annual O&M	$ 19,000
							Total Annual Cost	**$ 179,000**
							Annual Yield (AFY)	27
							Unit Cost ($/AF)	**$6,630**

AREA	**Templeton CSD**				
PROJECT	**T1b - Expansion to Evers Sports Park**				
SUPPLY	**Source**	Meadowbrook WWTP			
	Available	*Max 0.53	MGD	594	AFY
DEMAND	**Average**	0.01	MGD	16	AFY
	Peak Day	0.03	MGD		
	Peak Hour	0.09	MGD	60	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	3,600	LF	1.0		$110	$ 396,000
Storage								
	@ WWTP				0.03	MG	$1,500,000	$ 43,000
Pump Station								
	@ WWTP (System)		60	gpm	200	FT	refer to	
			75%	eff	2.3	HP	formula	$ 70,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 524,000**
					Construction Contingency		30%	$ 157,000
							Construction Total	$ 681,000
					Implementation Costs		30%	$ 204,000
							Total Capital Cost	**$ 885,000**
O&M Costs								
Storage					$ 43,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 70,000		5%	$ 4,000
	Power	75%	10	gpm	200	FT		
				Total:	4,366	kW-hr	0.13	$ 1,000
							Total O&M Cost	**$ 10,000**
Unit Cost								
							Annual Capital Payment	**$ 58,000**
							Annual O&M	$ 10,000
							Total Annual Cost	**$ 68,000**
							Annual Yield (AFY)	16
							Unit Cost ($/AF)	**$4,250**

AREA	**Templeton CSD**				
PROJECT	**T1c - Expansion to Vineyard Elementary**				
SUPPLY	**Source**	Meadowbrook WWTP			
	Available	*Max	0.53 MGD	594	AFY
DEMAND	**Average**	0.02	MGD	20	AFY
	Peak Day	0.04	MGD		
	Peak Hour	0.04	MGD	25	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	8,400	LF	1.0		$110	$ 924,000
Storage								
	@ WWTP				0.04	MG	$1,500,000	$ 54,000
Pump Station								
	@ WWTP (System)		25	gpm	200	FT	refer to	
			75%	eff	0.9	HP	formula	$ 40,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 1,033,000**
				Construction Contingency			30%	$ 310,000
							Construction Total	$ 1,343,000
				Implementation Costs			30%	$ 403,000
							Total Capital Cost	**$ 1,746,000**
O&M Costs								
Storage					$ 54,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 40,000		5%	$ 2,000
	Power	75%	12	gpm	200	FT		
				Total:	5,457	kW-hr	0.13	$ 1,000
							Total O&M Cost	**$ 14,000**
Unit Cost								
							Annual Capital Payment	**$ 114,000**
							Annual O&M	$ 14,000
							Total Annual Cost	**$ 128,000**
							Annual Yield (AFY)	20
							Unit Cost ($/AF)	**$6,400**

AREA	**Templeton CSD**					
PROJECT	**T1d - Expansion to Jermin Park**					
SUPPLY	**Source**	Meadowbrook WWTP				
	Available	*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.00	MGD		5	AFY
	Peak Day	0.01	MGD			
	Peak Hour	0.03	MGD		19	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in	4,000	LF	1.0		$110	$ 440,000
Storage								
	@ WWTP				0.01	MG	$1,500,000	$ 14,000
Pump Station								
	@ WWTP (System)		19	gpm	265	FT	refer to	
			75%	eff	0.9	HP	formula	$ 30,000
Customer Conversions					1	EA	$15,000	$ 15,000
							Construction Subtotal	**$ 499,000**
				Construction Contingency			30%	$ 150,000
							Construction Total	$ 649,000
				Implementation Costs			30%	$ 195,000
							Total Capital Cost	**$ 844,000**
O&M Costs								
Storage					$ 14,000		1%	$ 1,000
Pump Station								
	Maintenance				$ 30,000		5%	$ 2,000
	Power	75%	3	gpm	265	FT		
				Total:	1,808	kW-hr	0.13	$ 1,000
							Total O&M Cost	**$ 9,000**
Unit Cost								
							Annual Capital Payment	**$ 55,000**
							Annual O&M	$ 9,000
							Total Annual Cost	**$ 64,000**
							Annual Yield (AFY)	5
							Unit Cost ($/AF)	**$12,800**

AREA	**Templeton CSD**				
PROJECT	**T1e - Templeton Equestrian**				
SUPPLY	**Source**	Meadowbrook WWTP			
	Available	*Max 0.53	MGD	594	AFY
DEMAND	**Average**	0.14	MGD	160	AFY
	Peak Day	0.29	MGD		
	Peak Hour	0.86	MGD	595	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Pipeline				Factor			
4	in		LF	1.0		$110	$ -
6	in	13,000	LF	1.0		$130	$ 1,690,000
Storage							
@ WWTP				0.29	MG	$1,500,000	$ 429,000
Pump Station							
@ WWTP (System)		595	gpm	200	FT	refer to	
		75%	eff	22.5	HP	formula	$ 400,000
Customer Conversions				1	EA	$15,000	$ 15,000
						Construction Subtotal	**$ 2,534,000**
				Construction Contingency		30%	$ 760,000
						Construction Total	$ 3,294,000
				Implementation Costs		30%	$ 988,000
						Total Capital Cost	**$ 4,282,000**
O&M Costs							
Storage				$ 429,000		1%	$ 5,000
Pump Station							
Maintenance				$ 400,000		5%	$ 20,000
Power	75%	99	gpm	200	FT		
			Total:	43,657	kW-hr	0.13	$ 6,000
						Total O&M Cost	**$ 48,000**
Unit Cost							
						Annual Capital Payment	**$ 279,000**
						Annual O&M	$ 48,000
						Total Annual Cost	**$ 327,000**
						Annual Yield (AFY)	160
						Unit Cost ($/AF)	**$2,050**

AREA	**Templeton CSD**					
PROJECT	**T2a - Direct Agriculture Reuse (12-Hr Delivery)**					
SUPPLY	**Source**	Meadowbrook WWTP				
	Available	*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.23	MGD		260	AFY
	Peak Day	0.46	MGD			
	Peak Hour	0.92	MGD		640	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in		LF	1.0		$110	$ -
	6	in	10,000	LF	1.0		$130	$ 1,300,000
Storage								
	@ WWTP				0.46	MG	$1,500,000	$ 697,000
Pump Station								
	@ WWTP (System)		640	gpm	100	FT	refer to	
			75%	eff	12.1	HP	formula	$ 420,000
							Construction Subtotal	**$ 2,417,000**
				Construction Contingency			30%	$ 725,000
							Construction Total	$ 3,142,000
				Implementation Costs			30%	$ 943,000
							Total Capital Cost	**$ 4,085,000**
O&M Costs								
Treatment	Tertiary					MG	$150,000	$ -
	RO					MG	$200,000	$ -
Pipeline					$ 1,300,000		1%	$ 13,000
Storage					$ 697,000		1%	$ 7,000
Pump Station								
	Maintenance				$ 420,000		5%	$ 21,000
	Power	75%	161	gpm	100	FT		
				Total:	35,471	kW-hr	0.13	$ 5,000
							Total O&M Cost	**$ 46,000**
Unit Cost								
							Annual Capital Payment	**$ 266,000**
							Annual O&M	$ 46,000
							Total Annual Cost	**$ 312,000**
							Annual Yield (AFY)	260
							Unit Cost ($/AF)	**$1,200**

AREA	**Templeton CSD**					
PROJECT	**T2b - Alt T2a with 65% RO**					
SUPPLY	**Source**	Meadowbrook WWTP				
	Available	*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.23	MGD		260	AFY
	Peak Day	0.46	MGD			
	Peak Hour	0.92	MGD		640	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Treatment			0.53	mgd	$ -	$ -
	65% RO			0.34	mgd	$ 2,000,000	$ 689,000
Evaporation Ponds							
	Pond Construction w/ Liner			1.0	ac	$80,000	$ 80,000
	Land Purchase			1.0	ac	$200,000	$ 200,000
Pipeline				Factor			
	6 in	10,000	LF	1.0		$130	$ 1,300,000
Storage							
	@ WWTP			0.53	MG	$1,500,000	$ 795,000
Pump Station							
	@ WWTP (System)	640	gpm	100	FT	refer to	
		75%	eff	12.1	HP	formula	$ 420,000
						Construction Subtotal	**$ 3,484,000**
				Construction Contingency		30%	$ 1,045,000
						Construction Total	$ 4,529,000
				Implementation Costs		30%	$ 1,359,000
						Total Capital Cost	**$ 5,888,000**
O&M Costs							
Treatment	Tertiary						
	RO			0.34	MG	$200,000	$ 68,900
Pipeline				$ 1,300,000		1%	$ 13,000
Storage				$ 795,000		1%	$ 8,000
Pump Station							
	Maintenance			$ 420,000		5%	$ 21,000
	Power 75%	161	gpm	100	FT		
			Total:	35,471	kW-hr	0.13	$ 5,000
Evaporation Ponds				1.0	ac	$5,000	$ 5,000
						Total O&M Cost	**$ 120,900**
Unit Cost							
						Annual Capital Payment	$ 384,000
						Annual O&M	$ 120,900
						Total Annual Cost	**$ 504,900**
						Annual Yield (AFY)	260
						Unit Cost ($/AF)	**$1,950**

AREA	**Templeton CSD**					
PROJECT	**T2c - Direct Agriculture Reuse (24-Hr Delivery)**					
SUPPLY	**Source**	Meadowbrook WWTP				
	Available	*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.23	MGD		260	AFY
	Peak Day	0.46	MGD			
	Peak Hour	0.46	MGD		320	GPM

Item	Description		Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs								
Pipeline					Factor			
	4	in		LF	1.0		$110	$ -
	6	in	10,000	LF	1.0		$130	$ 1,300,000
Storage								
	@ WWTP				0.46	MG	$1,500,000	$ 697,000
Pump Station								
	@ WWTP (System)		320	gpm	100	FT	refer to	
			75%	eff	6.1	HP	formula	$ 250,000
							Construction Subtotal	**$ 2,247,000**
				Construction Contingency			30%	$ 674,000
							Construction Total	$ 2,921,000
				Implementation Costs			30%	$ 876,000
							Total Capital Cost	**$ 3,797,000**
O&M Costs								
Treatment	Tertiary					MG	$150,000	$ -
	RO					MG	$200,000	$ -
Pipeline					$ 1,300,000		1%	$ 13,000
Storage					$ 697,000		1%	$ 7,000
Pump Station								
	Maintenance				$ 250,000		5%	$ 13,000
	Power	75%	161	gpm	100	FT		
				Total:	35,471	kW-hr	0.13	$ 5,000
							Total O&M Cost	**$ 38,000**
Unit Cost								
							Annual Capital Payment	**$ 248,000**
							Annual O&M	$ 38,000
							Total Annual Cost	**$ 286,000**
							Annual Yield (AFY)	260
							Unit Cost ($/AF)	**$1,100**

AREA	**Templeton CSD**				
PROJECT	**T3a - GWR with Recharge Basins (65% RO)**				
SUPPLY	**Source**	Meadowbrook WWTP			
		*Max	0.53 MGD	594	AFY
DEMAND	**Average**	0.47	MGD	530	AFY
	Peak Day	0.47	MGD		
	Peak Hour	0.47	MGD	308	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment	Tertiary Treatment			0.53	mgd	$ -	$ -
	65% RO			0.34	mgd	$ 2,000,000	$ 689,000
Evaporation Ponds							
	Pond Construction w/ Liner			1.0	ac	$80,000	$ 80,000
	Land Purchase			0.0	ac	$200,000	$ -
Pipeline (for Recycled Water and Blend Water)				Factor			
12	in	17,500	LF	1.0		$150	$ 2,625,000
Pipeline (for Blend Water)							
12	in	4,000	LF	1.0		$130	$ 520,000
Storage							
	@ WWTP			0.53	MG	$1,500,000	$ 795,000
Pump Station (for Recycled Water and Blend Water)							
	@ WWTP (System)	924	gpm	150	FT	refer to	
		75%	eff	26.3	HP	formula	$ 560,000
Recharge Basins (for Recycled Water and Blend Water)							
	Recharge Area Needs	2.9	AFD	2.9	ac	@ 1' /day	
	Land Purchase (1.25 x Recharge Area)			3.6	ac	$200,000	$ 727,000
	Construction			3.6	ac	$15,000	$ 55,000
						Construction Subtotal	**$ 5,996,000**
				Construction Contingency		30%	$ 1,799,000
						Construction Total	$ 7,795,000
				Implementation Costs		40%	$ 3,118,000
						Total Capital Cost	**$ 10,913,000**
O&M Costs							
Treatment	RO			0.34	MG	$600,000	$ 207,000
Pipeline				$ 3,145,000		1%	$ 32,000
Storage				$ 795,000		1%	$ 8,000
Pump Station	Maintenance			$ 560,000		5%	$ 28,000
	Power 75%	657	gpm	150	FT		
			Total:	216,922	kW-hr	$ 0.13	$ 29,000
Evaporation Ponds & Recharge Basins				4.6	ac	$5,000	$ 24,000
						Total O&M Cost	**$ 328,000**

Unit Cost

Annual Capital Payment	$	710,000
Annual O&M	$	328,000
Blend Water Purchase Cost (530 afy * $xxx/af)	$	-
Total Annual Cost	**$**	**1,038,000**
Annual Yield (AFY)		530
Unit Cost ($/AF)		**$1,960**

Note: The cost of blend water purchase is excluded from Total Annual Cost pending further investigation into cost allocation. Similarly, the project yield excludes blend water recharge yield.

AREA	**Templeton CSD**					
PROJECT	**T3b - GWR with Recharge Basins (Full AWT)**					
SUPPLY	**Source**	Meadowbrook WWTP				
		*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.45	MGD		500	AFY
	Peak Day	0.45	MGD			
	Peak Hour	0.45	MGD		291	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment	Tertiary Treatment (Not Needed)				mgd	$ 2,580,000	
	Full AWT MF/RO/AOP			0.53	mgd	$ 6,000,000	$ 3,180,000
Evaporation Ponds							
	Pond Construction w/ Liner			1.0	ac	$80,000	$ 80,000
	Land Purchase			0.0	ac	$200,000	$ -
Pipeline				Factor			
6	in	17,500	LF	1.0		$130	$ 2,275,000
Storage							
	@ WWTP			0.45	MG	$1,500,000	$ 670,000
Pump Station							
	@ WWTP (System)	291	gpm	150	FT	refer to	
		75%	eff	8.3	HP	formula	$ 230,000
Recharge Basins							
	Recharge Area Needs	1.4	AFD	1.4	ac	@ 1' /day	
	Land Purchase (1.25 x Recharge Area)			1.7	ac	$200,000	$ 343,000
	Construction			1.7	ac	$15,000	$ 26,000
						Construction Subtotal	**$ 6,778,000**
				Construction Contingency		30%	$ 2,033,000
						Construction Total	$ 8,811,000
				Implementation Costs		40%	$ 3,524,000
						Total Capital Cost	**$ 12,335,000**
O&M Costs							
Treatment	MF/RO/AOP			1	MG	$600,000	$ 318,000
Pipeline				$ 2,275,000		1%	$ 23,000
Storage				$ 670,000		1%	$ 7,000
Pump Station	Maintenance			$ 230,000		5%	$ 12,000
	Power	75%	310 gpm	150	FT		
			Total:	102,322	kW-hr	$ 0.13	$ 14,000
Evaporation Ponds & Recharge Basins				2.7	ac	$5,000	$ 14,000
						Total O&M Cost	**$ 388,000**
Unit Cost							
						Annual Capital Payment	$ 803,000
						Annual O&M	$ 388,000
						Total Annual Cost	**$ 1,191,000**
						Annual Yield (AFY)	500
						Unit Cost ($/AF)	**$2,390**

AREA	**Templeton CSD**				
PROJECT	**T3c - GWR via Well Injection**				
SUPPLY	**Source**	Meadowbrook WWTP			
		*Max	0.53	MGD	594	AFY
DEMAND	**Average**	0.45	MGD	500	AFY
	Peak Day	0.45	MGD		
	Peak Hour	0.45	MGD	291	GPM

Item	Description	Quantity	Units	Quantity	Units	Unit Cost	Cost
Capital Costs							
Treatment							
	Tertiary Treatment (Not Needed)				mgd	$ 2,580,000	
	Full AWT MF/RO/AOP			0.53	mgd	$ 6,000,000	$ 3,180,000
Evaporation Ponds							
	Pond Construction w/ Liner			1.0	ac	$80,000	$ 80,000
	Land Purchase			0.0	ac	$200,000	$ -
Pipeline				Factor			
	6 in	22,100	LF	1.0		$130	$ 2,873,000
Storage							
	@ WWTP			0.45	MG	$1,500,000	$ 670,000
Pump Station							
	@ WWTP (System)	291	gpm	100	FT	refer to	
		75%	eff	5.5	HP	formula	$ 230,000
Injection Wells							
				1.0	EA	$2,000,000	$ 2,000,000
						Construction Subtotal	**$ 9,033,000**
			Construction Contingency			30%	$ 2,710,000
						Construction Total	$ 11,743,000
			Implementation Costs			40%	$ 4,697,000
						Total Capital Cost	**$ 16,440,000**
O&M Costs							
Treatment	MF/RO/AOP			1	MG	$600,000	$ 318,000
Pipeline				$ 2,873,000		1%	$ 29,000
Storage				$ 670,000		1%	$ 7,000
Pump Station	Maintenance			$ 230,000		5%	$ 12,000
	Power 75%	310	gpm	100	FT		
			Total:	68,214	kW-hr	$ 0.13	$ 9,000
Injection Wells				$ 2,000,000		2%	$ 40,000
Evaporation Ponds				1.0	ac	$5,000	$ 5,000
						Total O&M Cost	**$ 420,000**
Unit Cost							
						Annual Capital Payment	$ 1,070,000
						Annual O&M	$ 420,000
						Total Annual Cost	**$ 1,490,000**
						Annual Yield (AFY)	500
						Unit Cost ($/AF)	**$2,980**

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Appendix I: Evaluation of Templeton Area Groundwater Recharge Potential

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Tim Cleath
Cleath-Harris Geologists
March 7, 2014

GROUNDWATER REPLENISHMENT WITH RECYCLED WATER
TEMPLETON COMMUNITY SERVICES DISTRICT

Groundwater replenishment of the Atascadero Sub-basin of the Paso Robles Groundwater Basin for Templeton Community Services District could be considered for recharging the aquifers that are the producing zones for 10 deep wells operated by the District. These wells produced 56 percent of the District's water from 2002-2011. Fugro Consultants, Inc. has performed two studies that discuss the status of the Templeton Subunit groundwater conditions (updated August 2013) and the District's wells (updated August 2013). A brief summary of the findings of these reports is herein presented followed by a discussion of potential recycled water replenishment of groundwater in, and in the proximity of, the District service area.

The Templeton Subunit refers to the portion of the Atascadero Sub-basin in the general area of Templeton and is an appropriate area for the purposes of this study because it is where the District wells that could benefit from groundwater replenishment are located. Figure 1 of the Fugro "Updated Templeton Subunit Study" shows the location of the District's wells within the Templeton Subunit. Figures 2-20 of that report are groundwater level contour maps for various years between 1989 and 2011. These maps show that the main area where the groundwater level has declined is in the area where the Graff, Fortini, and Platz Deep wells are located. This area is south/southeast of Highway 46, west of the Salinas River and north of Marquita Avenue. The Updated Templeton Subunit Study also concluded that the water quality in this area is generally deteriorating.

Recycled water for groundwater replenishment in the Templeton Subunit could be of benefit, considering that pumpage in this area has resulted in a decrease in groundwater in storage that has created available unsaturated zones that could store replenished waters. The Fugro "Updated Templeton Subunit Study" Appendix B has change of storage maps that show from one year to the next how groundwater change in storage has varied.

Groundwater recharge options that could be considered include injection of the recycled water in the depressed water level area or groundwater recharge where the Paso Robles Formation gravel zones crop out along the western side of the subunit. The gravel beds crop out in this area are shown on a map and geologic cross section (Figures 2 and 3 from that report) prepared by The Morro Group in a 1986 report, Hydrogeology of the J.W. Kleinhammer Property. These figures are attached for reference.

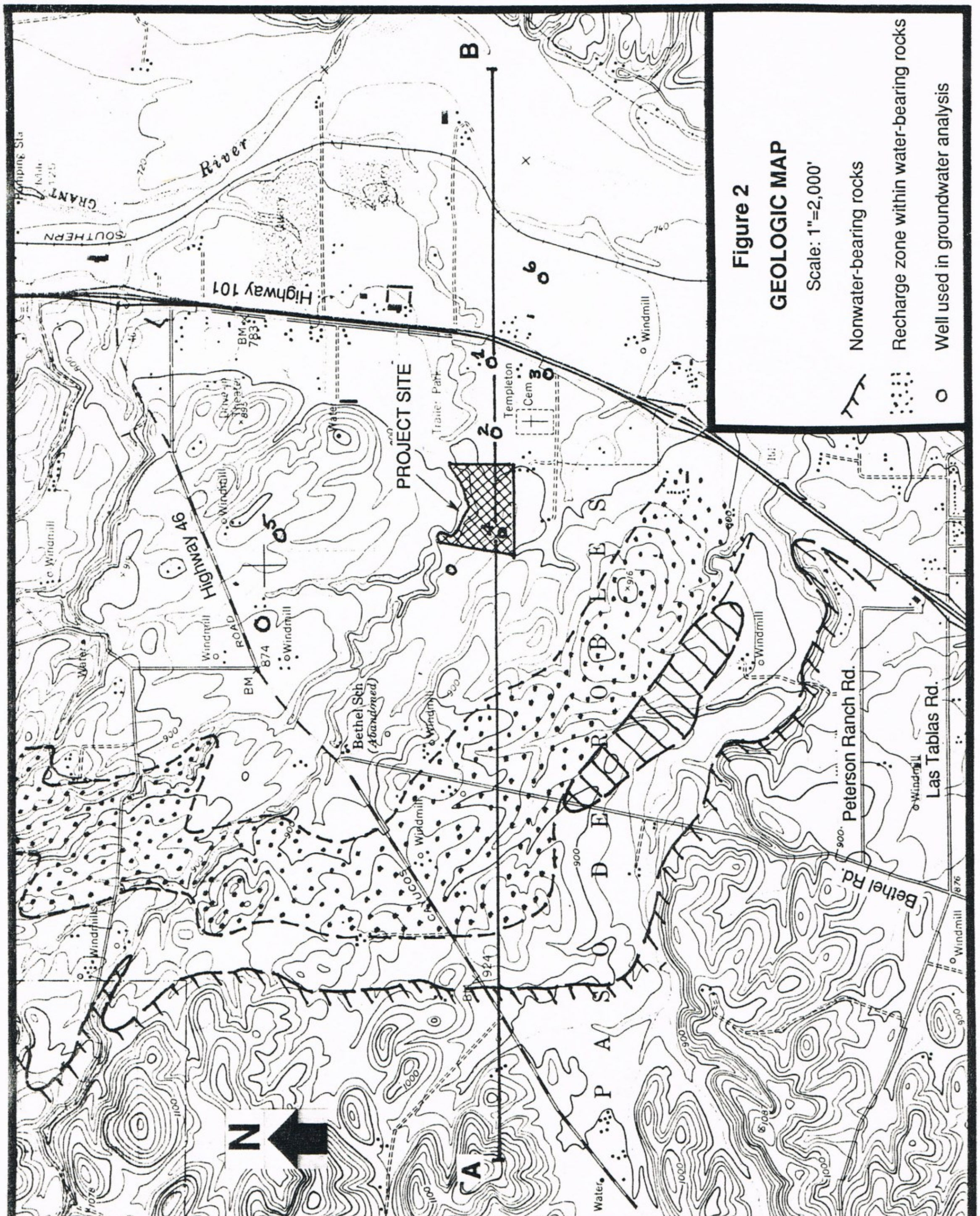
Figure 2
GEOLOGIC MAP
Scale: 1"=2,000'
Nonwater-bearing rocks
Recharge zone within water-bearing rocks
Well used in groundwater analysis
PROJECT SITE
Highway 101
Highway 46
Templeton
Cem
Trailer Park
Bethel Sch (Abandoned)
Peterson Ranch Rd.
Las Tablas Rd.
Bethel Rd.
SOUTHERN
River
GRANT
Windmill
Water
A
B
N
P A S O D E R O B L E S

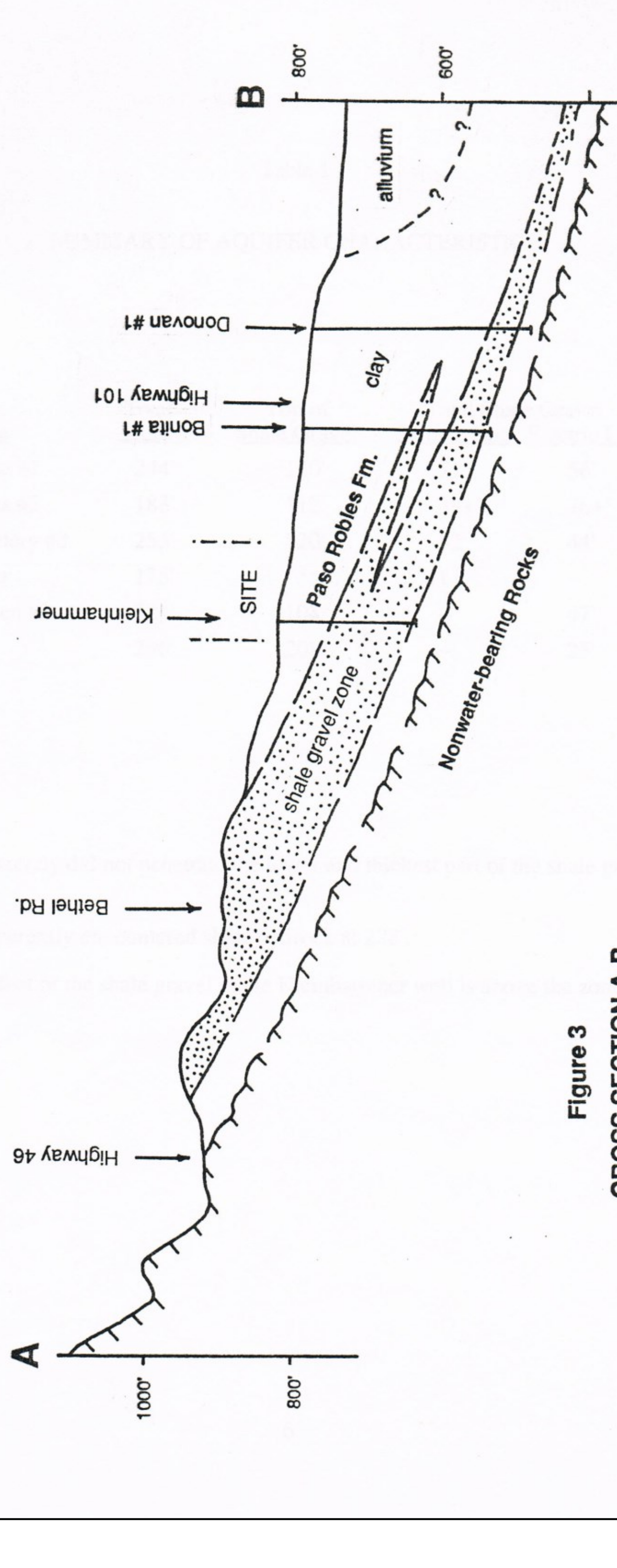

Figure 3
CROSS SECTION A-B
Horizontal Scale: 1"=2,000'
Vertical Scale: 1"=200'
Vertical Exaggeration =10

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