Recycled Water Facilities Planning Study - Final

for the

City of Pismo Beach

• April 2015•

WATER SYSTEMS CONSULTING, INC.

Final

Recycled Water Facilities Planning Study

Prepared for the

City of Pismo Beach

CITY OF PISMO BEACH

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LIST OF ACRONYMS AND ABBREVIATIONS

The abbreviations included in this report are spelled out in the text the first time they are used and are subsequently identified by abbreviation only. A summary of the abbreviations used in this report is provided in Table 1.

Note: References are noted throughout the text of this report with the reference number in parentheses, i.e. (2). See Chapter 11 for the corresponding reference information.

Table 1. Table of Abbreviations

Abbreviation	Description
AF	Acre-foot or Acre-feet
AFY	Acre-feet per year
APN	Assessor's Parcel Number
AOP	Advanced Oxidation Process
Basin Plan	Water Quality Control Plan for the Central Coast Basin (2010)
CCF/Year	100 Cubic Feet per Year
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CCWA	Central Coast Water Authority
CEC	Constituent of Emerging Concern
CEQA	California Environmental Quality Act
CHG	Cleath-Harris Geologist, Inc
City	City of Pismo Beach
Coastal Act	California Coastal Act of 1976
County	San Luis Obispo County
Court	Superior Court of California
CPI	Western Region Consumer Price Index
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DDW	Division of Drinking Water – California State Water Resources Control Board
District	San Luis Obispo County Flood Control and Water Conservation District
DWR	California Department of Water Resources
EIR	Environmental Impact Report
FAT	Full Advanced Treatment
Ft	Foot

Abbreviation	Description
FY	Fiscal Year
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
GPM	Gallons per Minute
GRRP	Groundwater Replenishment Reuse Project
HCF	Hundred Cubic Feet
HGL	Hydraulic Grade Line
Hp	Horsepower
In	Inch
IPR	Indirect Potable Reuse
Judgment	Judgment After Trial
LAFCo	Local Agency Formation Commission
lbs/day	Pounds per Day
MCL	Maximum Contaminant Level
MF	Microfiltration
µs/cm	Microsiemens per centimeter
MG	Million gallons
MGD	Million gallons per day
mg/L	Milligrams per Liter
mg/L as $CaCO_3$	Milligrams per Liter as Calcium Carbonate
ml/L/hr	Milliliters per Liter per Hour
MMD	Maximum Month Day
MPN	Most Probable Number
MPN/100 ml	Most Probable Number per 100 milliliters
MSL	Mean Sea Level
NCMA	Northern Cities Management Area
NDMA	N-nitrosodimethylamine
NMMA	Nipomo Mesa Management Area
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
OCSD	Oceano Community Services District
PFD	Process Flow Diagram
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
RO	Reverse Osmosis
RRWSP	San Luis Obispo County Regional Recycled Water Strategic Plan (2014)
RW	Recycled Water
RW Policy	Recycled Water Policy – California State Water Resources Control Board
RWC	Recycled Water Contribution
RWCmax	Recycled Water Maximum Initial Contribution
RWQCB	Regional Water Quality Control Board
SAR	Sodium Adsorption Ratio
SAT	Soil Aquifer Treatment

Abbreviation	Description
SMGB	Santa Maria Groundwater Basin
SMVMA	Santa Maria Valley Management Area
SNMP	Salt and Nutrient Management Plan
SOI	Sphere of Influence
South County	South San Luis Obispo County
SRF	State Revolving Fund
SSLOCSD	South San Luis Obispo County Sanitation District
Sub-basin	Tri-Cities Mesa Sub-basin
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
Title 22	Title 22, Division 4, Chapter 3, Section 60301 et seq., California Code of Regulations
TM	Technical Memorandum
UF	Ultrafiltration
UV	Ultraviolet
UWMP	Urban Water Management Plan
WDR	Water Discharge Requirement
WRR	Water Reclamation Requirement
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

INTRODUCTION

The City of Pismo Beach (City) conducted this Recycled Water Facilities Planning Study (RWFPS) to investigate alternatives for constructing a recycled water (RW) system that will enable the City to produce and beneficially use RW to enhance its water supply portfolio. The City's Wastewater treatment plant currently treats approximately 1.1 million gallons of wastewater per day and discharges the treated effluent to the ocean. Developing a RW system to reuse this water would allow the City and potential partnering agencies to offset existing and future water demands and/or provide a new, drought proof, source of water supply for the region. The RWFPS is funded in part by a grant from the California State Water Resources Control Board (SWRCB) Water Recycling Funding Program.

GOALS AND OBJECTIVES FOR RECYCLED WATER

The City developed goals and objectives for RW through numerous meetings held with potential stakeholders, partner agencies and City staff, considering information presented in prior water supply and RW studies, and based on direction given by the City Council. The resulting goals and objectives are summarized as follows:

1. Offset potable water uses to the extent practicable
2. Further diversify the City's water supply portfolio by developing a local, sustainable and highly reliable water supply
3. Provide a new source of recharge to the Santa Maria Groundwater Basin (SMGB)
4. Relieve increased water demand due to proposed development
5. Develop a viable RW project in a timely manner to facilitate regional use of RW in South County
6. Secure outside funding and/or financing to support the development of the City's RW system

ALTERNATIVES ANALYSIS

A total of four alternatives were identified to be further developed and evaluated in this RWFPS:

- Alternative 1: Providing RW at Disinfected Secondary-23 standards for restricted reuse
- Alternative 2: Providing RW at Disinfected Tertiary standards for unrestricted landscape irrigation
- Alternative 3a: Providing RW that meets the standards for groundwater recharge for injection as a coastal seawater intrusion barrier
- Alternative 3b: Providing RW that meets the standards for groundwater recharge for injection directly into the inland aquifer

A review of the City's recent irrigation meter consumption records identified current customers who could potentially be converted to use RW for irrigation under either Alternative 1 or Alternative 2. This would provide a direct offset to potable water use, but there is not sufficient demand to use the entire available supply for either alternative. As a result, unit cost per acre-foot (AF) of RW use are high for these alternatives.

A preliminary hydrogeologic analysis was conducted to evaluate the feasibility of recharge basins and/or injection wells for groundwater recharge and to identify conceptual design criteria for groundwater recharge facilities. Injection wells were identified as the most feasible method of achieving groundwater recharge for both Alternatives 3a and 3b, although a small portion of water could potentially be recharged at existing storm water ponds overlying the SMGB. Due to limited storage capacity in the portion of the SMGB underlying the Northern Cities area, the ability to continuously inject water depends upon maintaining similar extraction rates at municipal wells. The preliminary hydrogeologic analysis is summarized in Section 5.2. Full advanced treatment (FAT) upgrades are required to produce RW of sufficient quality for groundwater recharge. Implementing groundwater recharge meets the goal of diversifying the City's water supply portfolio by developing a local, sustainable and highly reliable water supply and provides a new source of recharge to the SMGB. It also helps to protect the SMGB from seawater intrusion in the Northern Cities Management Area (NCMA), which improves the reliability of and access to existing groundwater supplies. These benefits are realized by all of the agencies who produce groundwater from the portion of the SMGB underlying the NCMA, and potentially other producers as well.

The alternatives were evaluated and ranked on the basis of the following qualitative, non-economic criteria, which are described further in Section 7.5.1:

- Promotes Beneficial Management of Water Resources
- Promotes Salt & Nutrient Management
- Improves Basin Water Quality
- O&M Complexity
- Expandability
- Ease of Implementation
- Funding Opportunity
- Consistency with Project Goals & Objectives

The total scores resulting from the qualitative analysis are presented in Table ES-1.

Table ES-1. RW Alternatives Qualitative Analysis Summary

Alternative	Total Qualitative Score
Alternative 1 – Secondary-23 Irrigation	39.5
Alternative 2 – Tertiary Irrigation	44
Alternative 3a – FAT for Coastal Injection	70
Alternative 3b – FAT for Inland Injection	70

The alternatives were also compared on the basis of quantitative criteria, including Annualized Unit Cost/AF and Water Recoverable for Beneficial Use. A summary of the results of the quantitative comparison is presented in Table ES-2 on page ES-3.

Table ES-2. RW Alternatives Quantitative Analysis Summary

Alternative	Alternative 1 Secondary-23 Irrigation	Alternative 2 Tertiary Irrigation	Alternative 3a FAT for Coastal Injection	Alternative 3b FAT for Inland Injection
Total Capital Cost	$4,963,000	$20,679,000	$27,045,000	$29,708,000
Annual O&M Cost	$44,000	$236,000	$598,000	$628,000
Total RW Used (AFY)	17	214	930[1]	930[1]
Annualized Cost ($/AF)[2]	$15,900	$5,400	$1,900	$2,100
Estimated % Recoverable	100%	100%	70%	75%
Estimated AFY Recoverable	17	214	651	698
Annualized Cost ($/AF Recoverable)	$15,900	$5,400	$2,700	$2,800

Notes:

1. Based on estimate of actual RW production at buildout
2. The annualized unit cost is calculated by adding the annual payment for borrowed capital costs to the annual O&M cost and dividing by the annual project yield. Annual payment for borrowed capital is based on an interest rate of 5% over a payback period of 30 years.

The alternatives were also compared on the basis of the total qualitative scores and two quantitative criteria: 1) Annualized Unit Cost/AF and 2) Water Recoverable for Beneficial Use. Each alternative received a ranking between 1 and 4, with 1 being the most favorable and 4 being the least favorable. The results of the alternatives ranking are presented in Table ES-3 and the complete alternatives analysis is presented in Chapter 7.

Table ES-3. RW Alternatives Ranking Summary

Alternative	Qualitative/Non Economic Score	Annualized Cost/AF Recoverable	Water Recoverable for Beneficial Use
Alternative 1 – Secondary-23 Irrigation	4	4	4
Alternative 2 – Tertiary Irrigation	3	3	3
Alternative 3a – FAT for Coastal Injection	1	1	2
Alternative 3b – FAT for Inland Injection	1	2	1

RECOMMENDED ALTERNATIVE

The alternatives analysis concluded that groundwater recharge is the most favorable alternative; Alternatives 3a and 3b received similar rankings. Based on the preliminary hydrologic assessment completed as part of this RWFPS, both coastal and inland injection wells warrant further investigation. For the purposes of this RWFPS, Alternative 3b for inland recharge is being carried forward as the recommended alternative because it has the highest volume of water estimated to be recoverable for beneficial use and the cost difference from Alternative 3a is considered insignificant at this preliminary planning stage. However, a combination of coastal and/or inland injection wells should be considered in subsequent analyses to develop the most beneficial groundwater recharge program for the City and NCMA agencies. The recommended project is presented in more detail in Chapter 8.

FUNDING AND FINANCING

It is anticipated that the project will be funded through a combination of grants, low interest loans and cost-sharing contributions from partner agencies. The loans are anticipated to be secured through water rates since the project benefits potable water supply.

The project unit costs presented in Table ES-2 on page ES-3 are based on borrowing 100% of the project cost at 5% interest for a 30 year term, to be consistent with the assumptions used in the 2014 San Luis Obispo County Regional Recycled Water Strategic Plan (RRWSP). However, it is likely that project financing can be secured at a lower interest rate through current financing programs, and obtaining grants would reduce the required principal. Figure ES-1 illustrates the range of annualized unit costs based on varying interest rates. The figure also illustrates the difference in unit cost for the WWTP flow as of 2013 (860 AFY total yield, 645 AFY recoverable) and the buildout WWTP flow (930 AFY total yield, 698 AFY recoverable).

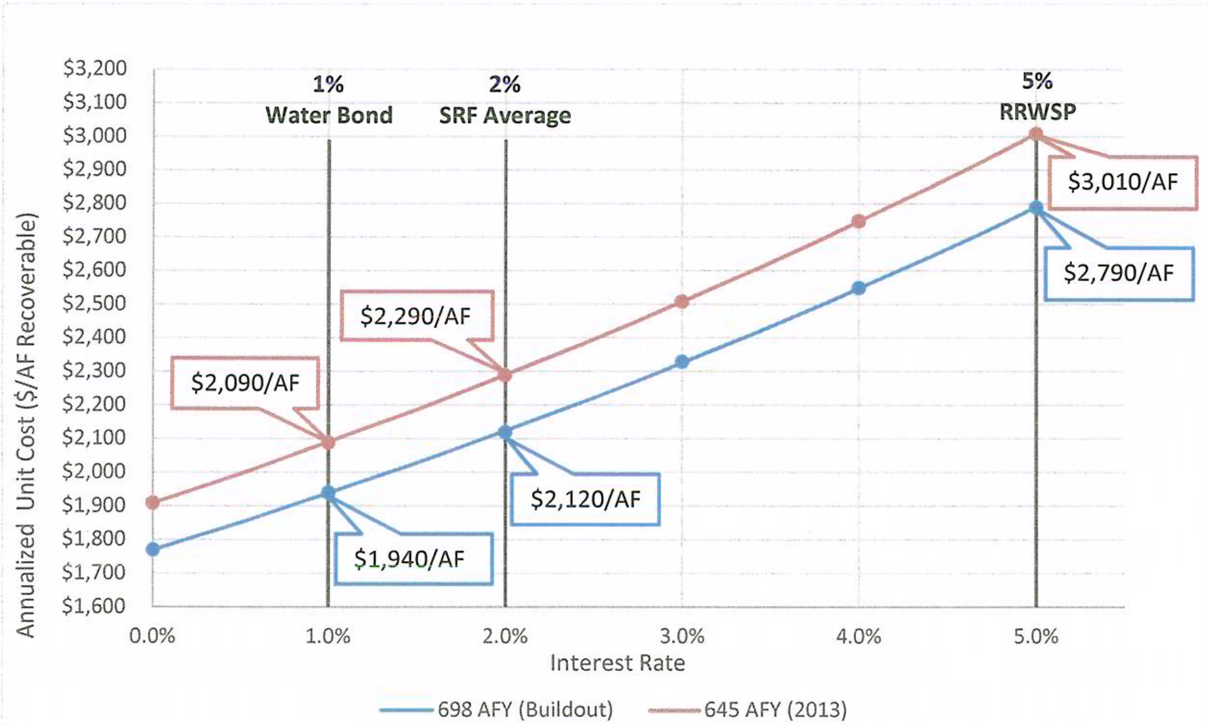


Figure ES-1. Interest Rate and Unit Cost Comparison

1 INTRODUCTION

The City of Pismo Beach (City) contracted with Water Systems Consulting, Inc. (WSC) to provide engineering services to develop a Recycled Water Facilities Planning Study (RWFPS). The purpose of the RWFPS is to investigate alternatives for implementing a recycled water (RW) system to improve the reliability of the City's water supply portfolio. Developing a RW system would allow the City and potential partnering agencies to offset some of the existing and future water demands and provide a new, drought proof, source of water for the region. The RWFPS is funded in part by a grant from the California State Water Resources Control Board (SWRCB) Water Recycling Funding Program.

1.1 BACKGROUND

The City is located in San Luis Obispo County (County) in the central coastal region of California (Figure 1-1 on page 1-2). The City is considered a part of the area known as "Five Cities" in southern San Luis Obispo County (South County), which includes the incorporated cities of Arroyo Grande, Grover Beach and Pismo Beach, as well as the unincorporated communities of Oceano and Halcyon. The Oceano Community Services District (OCSD) provides water and sewer service to the communities of Oceano and Halcyon. Interstate Highway 101 runs from north to south through the City, which serves as the major connecting corridor to San Luis Obispo (approximately 13 miles north), Santa Maria (approximately 20 miles south), and Santa Barbara (approximately 80 miles south). The City is bordered by the Pacific Ocean on the west and Price Canyon on the east. Elevations within the City limits range from zero to approximately 600 feet above mean sea level (MSL). The City's existing water supplies and infrastructure are described in Section 2, and their wastewater systems are described in Section 3.

1.2 GOALS AND OBJECTIVES FOR RECYCLED WATER

The City developed its goals and objectives for RW through numerous meetings held with potential stakeholders and City staff, multiple RW studies, and based on direction given by the City Council. Based on these efforts, the goals and objectives identified to guide the development of a RW program are summarized as follows:

1. Offset some potable water uses
2. Further diversify the City's water supply portfolio by developing a local, sustainable and highly reliable water supply
3. Provide a new source of recharge to the SMGB
4. Relieve increased water demand due to proposed development
5. Develop a viable RW project in a timely manner to facilitate regional use of RW in South County
6. Secure outside funding and/or financing to support the development of the City's RW system

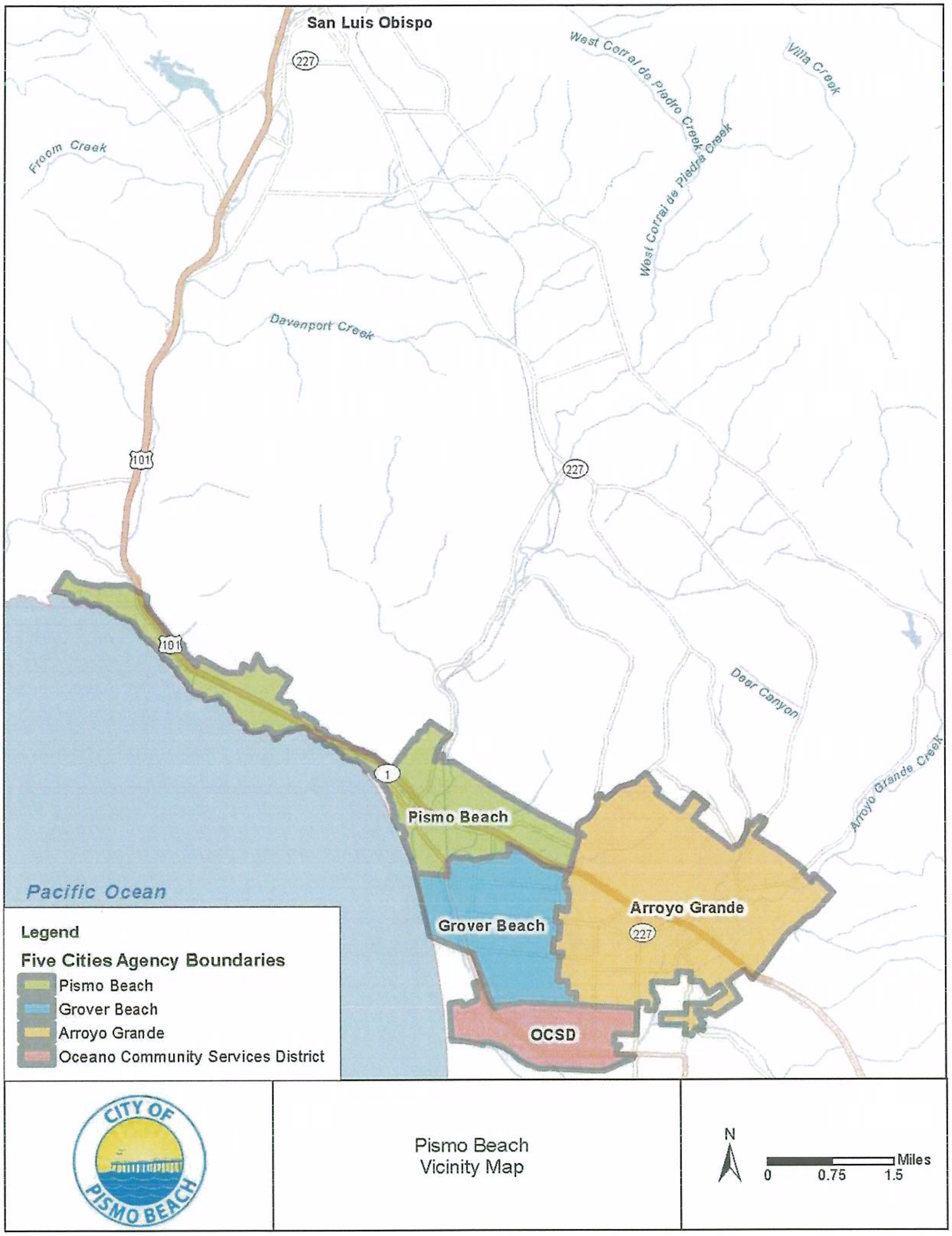


Figure 1-1. City of Pismo Beach Vicinity Map

1.3 SERVICE AREA POPULATION

As of January 1, 2010, the City had a population of 7,676 people in its incorporated areas, representing 2.9 percent of the County population. While the City saw moderate growth of 1.4 percent between 1995 and 2000, the City's population has declined each year since 2000. In fact, the City's average annual growth rate between 1995 and 2010 is a net decline of 0.3 percent annually, and, as of 2010, has nearly returned to its 1990 census population of 7,669 (1). According to the City's 2010 UWMP, the reasons for the City's long-term population decline is likely due to a number of factors, including the high cost of living, an aging population and limited development (2).

The City's General Plan predicts that future population growth in the City will primarily be driven by two contributing factors: re-development within the current City limits; and growth as a result of new developments on currently undeveloped properties within the City's Sphere of Influence (3). The City's General Plan specifies a limit on annual growth of 3 percent. If buildout within the current City limits, estimated at 9,414, were assumed to occur by 2035, the City would experience an average annual growth rate of approximately 0.8 percent (4). Therefore, for planning purposes, this RWFPS will assume an average annual growth within the current City limits of 0.8 percent until buildout is reached, potentially by 2035.

Additionally, the City has the potential to experience population growth as a result primarily of two proposed development projects: Price Canyon and Los Robles Del Mar. Both projects are currently outside the City limits but within the City's Sphere of Influence (SOI). Based on current planning documents available for both development projects, Price Canyon and Los Robles Del Mar have the potential to increase the City's population by up to 2,440 people and would increase water demand and wastewater generation for the City. In November 2014, Pismo Beach voters passed Measure H-14, which applies to the land on which the Price Canyon development is proposed, if it is annexed into the City. Measure H-14 amended the City's General Plan to zone the area as a watershed and resource management area and limited the area to primarily agricultural uses for the next 30 years. A project proposing any other use would be subject to approval by the voters. Additionally, there is outstanding litigation related to the annexation of the Los Robles Del Mar development. It is currently unknown whether either project will receive the necessary Local Agency Formation Commission (LAFCo), City and/or voter approval; therefore, projected growth due to the Price Canyon and Los Robles Del Mar developments is not included in the RWFPS. If and when either project is developed, it is assumed that they will undergo a project-specific water supply and RW analysis at the time of development and will be subject to the City's RW requirements in effect at that time. Table 1-1 describes the City's projected population based on the planning criteria described above. Figure 1-2 on page 1-4 provides a graphical representation of the City's historical and projected population.

Table 1-1. Historical and Projected Future Population

Years	2010	2015	2020	2025	2030	2035
Service Area Population(1)	7,680	8,000	8,330	8,680	9,040	9,410

Notes:
1. Service area population is defined as the population served by the distribution system. Projected population based on estimates of regrowth within the City's current City limits, up to its buildout population of 9,414, assumed to occur by 2035. This equates to an annual average growth rate of 0.8%.

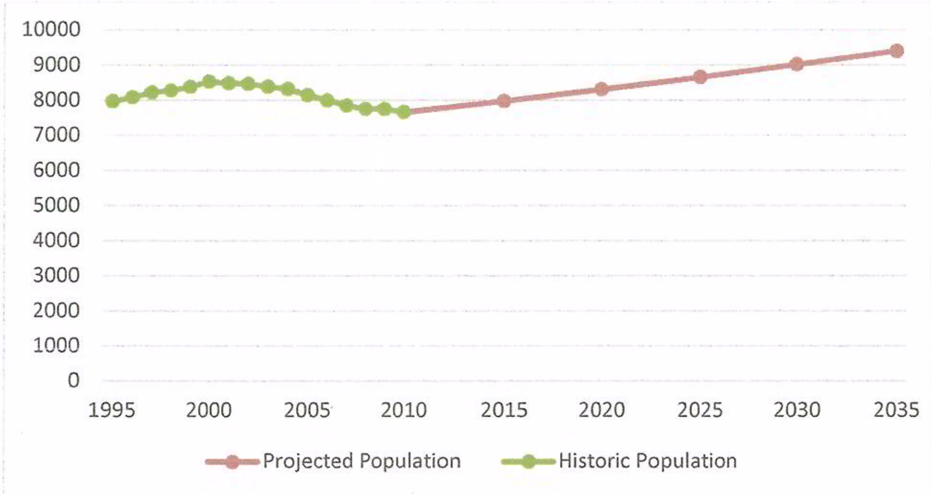


Figure 1-2. Historical and Projected Population

1.4 JURISDICTIONAL BOUNDARIES

1.4.1 City Boundary and Sphere of Influence

A large portion of the City lies within the Coastal Zone as designated by the California Coastal Act of 1976 (Coastal Act). Since the City's western border stretches along the Pacific Ocean shoreline for approximately seven miles, the City is required to have a Local Coastal Plan that is certified by the California Coastal Commission; the City's General Plan serves additionally as its Local Coastal Plan.

The City's General Plan, updated in 1992 and amended several times between 1998 and 2010, identifies boundaries associated with two planning areas: the incorporated area within the City limits and the unincorporated area, which is a combination of the SOI and Extended Planning Area. The City's Extended Planning Area is a term used to describe the area encompassed by the SOI and any land outside its boundaries that may be considered in the City's future planning efforts. The City's SOI (Figure 1-3 on page 1-6) represents the probable ultimate physical boundaries and service area to which the City may extend its services and project its growth. The County LAFCo adopted the City's original SOI in 1983 and amended it in 1987 and 2002. On February 19, 2008, the City Council authorized the initiation of a General Plan Update study for properties within Price Canyon, including lands currently within the adopted SOI and abutting properties within the City's Extended Planning Area (5). The proposed SOI, included in Figure

1-3, is coterminous with the boundaries of the Price Canyon Planning Area. The SOI descriptions provided in this report include the City's current SOI as of the 1992 General Plan update in addition to the proposed SOI expansion detailed in the Price Canyon Specific Plan and Los Robles del Mar Area Annexation Addendum.

The City has historically been a popular tourist destination and tourism continues to be the dominant economic sector in the City. Though the City's permanent population (discussed in Section 1.3) is relatively small, visitors during the summer and on holidays can increase the population from 33 percent up to two hundred or sometimes three hundred percent (6).

1.4.2 Northern Cities Management Area

The Northern Cities, comprised of the OCSD and the Cities of Arroyo Grande, Grover Beach and Pismo Beach, have a long history of cooperative management of their shared water resources, and continue to actively work together to manage groundwater and surface water supplies for a combined service area population of approximately 46,000. The Northern Cities initiated collaborative management of their portion of the SMGB in 1983, with the development of the Agreement Regarding Management of the Arroyo Grande Groundwater Basin (Gentlemen's Agreement). In 1997, the SMGB became subject to litigation and in 2005 the Northern Cities and other Parties entered into the 2005 Stipulation, which formally divided the SMGB into three management areas: the NCMA; the Nipomo Mesa Management Area (NMMA); and the Santa Maria Valley Management Area (SMVMA). The boundaries of each of the management areas are shown in Figure 1-4 on page 1-7. The Superior Court of California (Court) later adopted the Stipulation in its January 25, 2008 Judgment After Trial (Judgment).

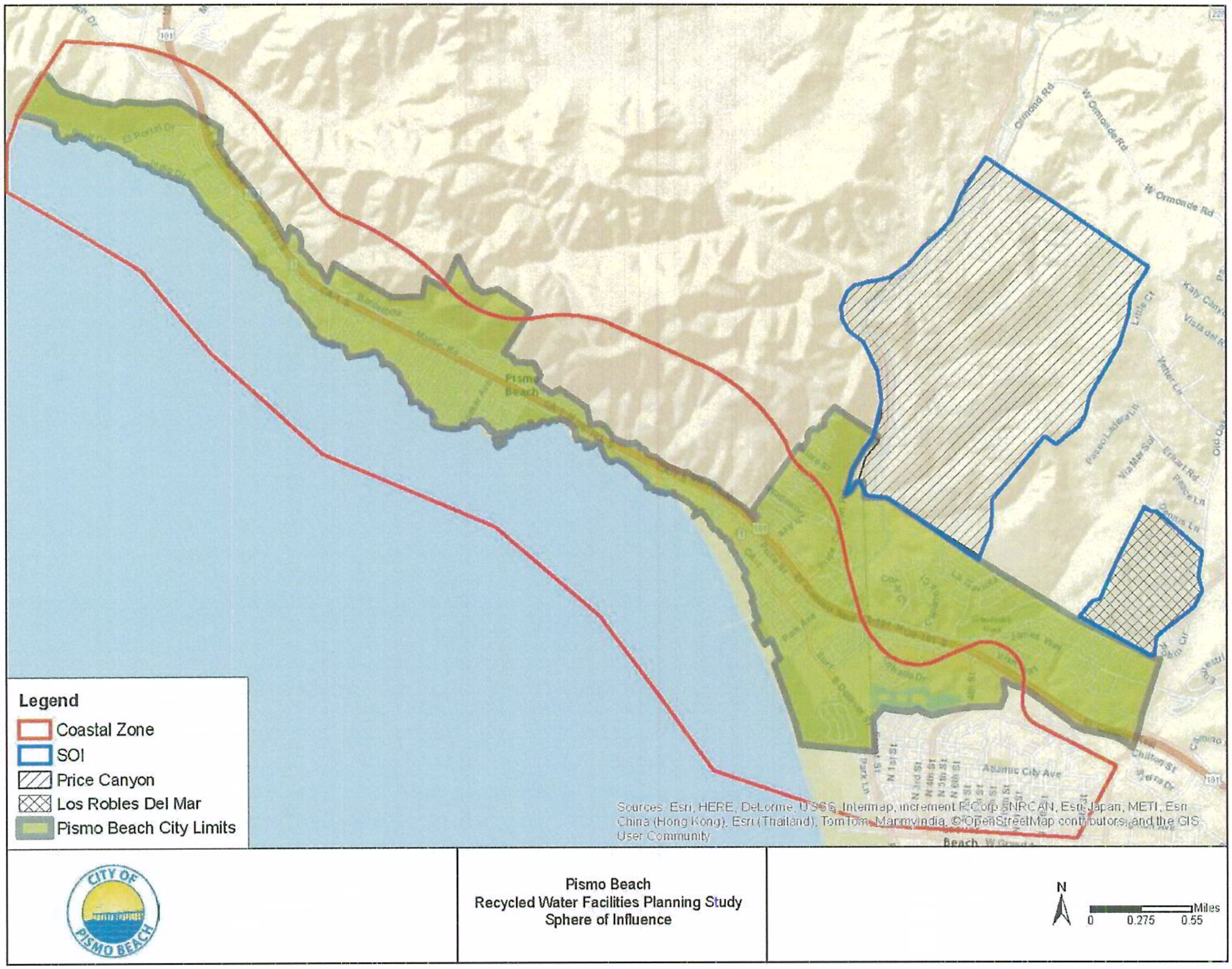


Figure 1-3. Sphere of Influence

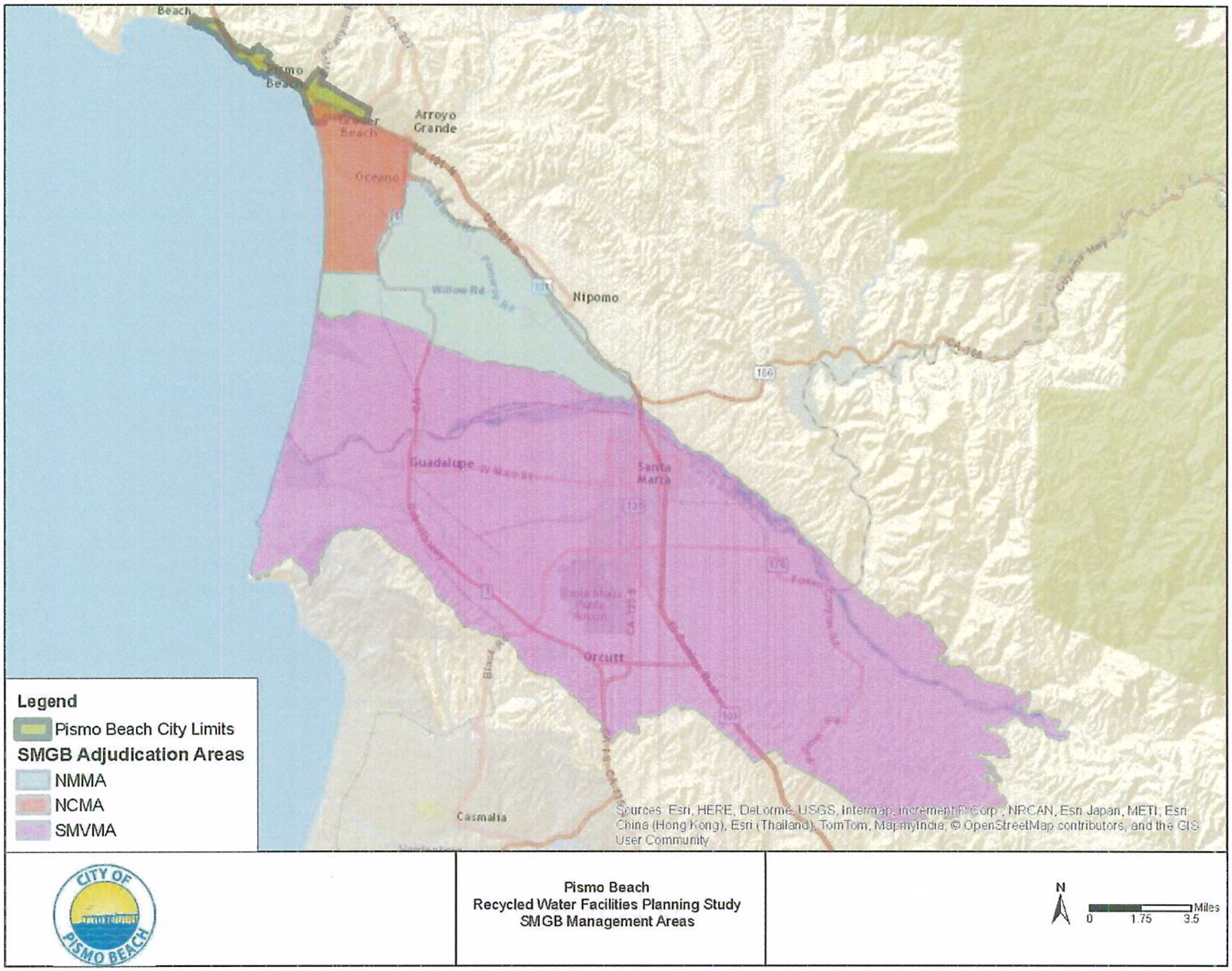


Figure 1-4. SMGB Management Areas

1.5 STUDY AREA

As described in Section 1.2, the City desires to facilitate use of RW in the South County region. The Study Area for this report extends beyond the City's jurisdictional boundaries and includes the entirety of the NCMA, which is shown in Figure 1-4 on page 1-7.

1.6 RELATED INITIATIVES

There are several other regional initiatives related to water supply and RW which are ongoing or have recently been completed. The goals and recommendations presented in this Study are intended to work conjunctively with these related initiatives to improve, increase and/or protect regional water supplies. These related initiatives are summarized in the following subsections.

1.6.1 San Luis Obispo County Regional Recycled Water Strategic Plan

The San Luis Obispo County RRWSP was completed in November 2014. The purpose of the of the RRWSP was to identify and prioritize potentially viable next steps in successfully implementing water reclamation in a safe and cost effective way across the County. The RRWSP focused on four study areas, including Morro Bay, Nipomo Community Services District, Northern Cities and Templeton Community Services District. The RRWSP used technical information developed by each agency and updated information presented in prior reports. High priority projects were identified based on costs and benefits. The RRWSP recommends next steps for each study area and includes policy, regulatory, permitting, legal, and funding/financing considerations.

The RRWSP investigated the use of the City's WWTP effluent for 1) irrigation use within the City and 2) use in a regional RW project in combination with the South San Luis Obispo Community Services District (SSLOCSD) WWTP effluent. The RRWSP identified potential constraints and next steps for further exploration, including:

- Explore alternative treatment other than tertiary
- Compare viable projects with alternative water supplies
- Continue to participate in discussion with regional SSLOCSD projects that could use the City's effluent in a beneficial use and confirm the ability of the City to receive a water supply benefit
- Incorporate the salt and nutrient management planning into water, wastewater and RW planning
- Further investigate the water supply benefits of implementing a small groundwater recharge project
- Determine if the close proximity of potable water wells to the recharge basins is a fatal flaw
- Investigate the NCMA groundwater basin, potentially with a groundwater model, to identify surface recharge locations
- Determine benefits of and need for a seawater intrusion barrier

1.6.2 San Luis Obispo County Integrated Regional Water Management Plan

In 2014, the County of San Luis Obispo, in conjunction with the San Luis Obispo Regional Water Management Group, prepared an update to the San Luis Obispo Integrated Regional Water Management Plan (IRWMP). The IRWMP presents a comprehensive water resources management approach to managing the region's water resources that focuses on strategies to improve the sustainability of current and future needs for San Luis Obispo County. The IRWMP was also developed to help coordinate local, regional and statewide water resource management efforts.

The top three issues identified by the IRWMP stakeholders for San Luis Obispo County include: water supply; groundwater management; and water reclamation from wastewater treatment. To assist in addressing these priority issues a select group of projects, including the Pismo Beach Recycled Water Project, was selected as one of the High Priority Projects, for inclusion in the San Luis Obispo IRWMP and potential future grant funding applications.

1.6.3 Northern Cities Management Area Strategic Plan

In June 2014, the NCMA Technical Group (TG) developed a strategic plan to provide the TG with: 1) a mission statement to guide future initiatives; 2) a framework for communicating water resources goals; and 3) a formalized work plan for the next 10 years. The mission statement for the TG is as follows:

"Preserve and enhance the sustainability of water supplies for the Northern Cities by:

- *Enhancing supply reliability*
- *Protecting water quality*
- *Maintaining cost –effective water supplies*
- *Advancing the legacy of cooperative water resource management"*

Utilizing a screening and objective ranking process, the TG identified the following list of strategies for improving the sustainability of water resources in the NCMA:

- Enhanced Management of NCMA Groundwater
- Improve Inter-agency Coordination
- Develop Supplemental Supply
- Improve Water Management Governance
- Develop Regional UWMP and Water Shortage Contingency Plan
- Enhance Management of Surface Water

Included within each strategy is a series of initiatives that make up the TG's work plan for the next 10 years. The highest priority initiative identified by the TG was the development of a groundwater model to help improve their understanding of the groundwater basin. It is envisioned that the groundwater model will allow the TG to further evaluate groundwater management and supplemental water supply strategies (e.g. groundwater recharge with recycled water) to prevent seawater intrusion and improve the water supply reliability of their groundwater supplies.

1.6.4 South San Luis Obispo Community Services District Recycled Water Facilities Planning Study

The SSLOCSD and the City of Arroyo Grande have partnered to fund the development of a RWFPS for a potential Satellite Water Resource Recovery Facility (SWRRF). A SWRRF would allow for the capture and treatment of wastewater, at a location within the SSLOCSD's collection system outside of the Coastal Zone, to develop a supplemental supply source that could be utilized to offset groundwater pumping or recharge the groundwater basin within the NCMA and/or possibly the NMMA. Additionally, it is envisioned that the SWRRF would assist the SSLOCSD in meeting the redundancy requirements that the Central Coast Regional Water Quality Control Board (CCRWQCB) has placed on its existing wastewater treatment plant. The RWFPS will include evaluating and identifying a preferred SWRRF alternative and developing an implementation plan. It is anticipated that the RWFPS will be partially funded through a SWRCB Water Recycling Facilities Planning Grant.

The SSLOCSD RWFPS will be completed after this RWFPS and will consider the analysis and recommended project presented herein when evaluating alternatives within the NCMA.

2 WATER SUPPLIES AND CHARACTERISTICS

The City's water supply sources include surface water purchased from the Lopez Project and the State Water Project (SWP) as well as groundwater from the SMGB. Table 2-1 presents the current and projected water supplies available to the City. Additional information about the City's water supply sources can be found in the Urban Water Management Plan (UWMP). As shown in Table 2-1 the City's water supply is not expected to increase in the future.

Table 2-1. Water Supplies - Current and Projected (3)

Water Supply Sources		Projected Water Supply (AFY)					
Water purchased from:	Wholesaler	2010	2015	2020	2025	2030	2035
Lopez Reservoir	Yes	892	892	892	892	892	892
State Water Project[1]	Yes	1,240	1,240	1,240	1,240	1,240	1,240
Groundwater from the SMGB[2]	No	700	700	700	700	700	700
	Total	2,832	2,832	2,832	2,832	2,832	2,832

Notes:

1. The City's current entitlement of SWP supply totals 1,240 AFY. Of this, 40 acre-foot (AF) is allocated to Brad Wilde Pismo 98, LLC (Preserve Property) and a 100 AF is allocated to Los Robles Del Mar. Therefore the current supply available to the City is 1,100 AFY.
2. Groundwater supplies include the 700 AFY allocation from the NCMA of the Tri-Cities Mesa Sub-basin.

2.1 SURFACE WATER

The City's possesses water supply contracts with the San Luis Obispo County Flood Control and Water Conservation District (District) for its Lopez Project and SWP surface water supplies.

2.1.1 Lopez Project

The Lopez Project consists of Lopez Lake and Dam, Lopez Terminal Reservoir, Lopez Water Treatment Plant and the Lopez Pipeline with turnouts. Water from Lopez Reservoir is diverted to the Lopez Terminal Reservoir, treated at the Lopez Water Treatment Plant and delivered to Pismo Beach through the Lopez Pipeline, through one of the City's four Lopez Pipeline turnouts.

The reservoir's total capacity is 51,990 AF and has an identified safe yield of 8,730 AFY. Of this safe yield, 4,530 AFY is allocated for diversion to municipal users and 4,200 AFY is allocated for downstream release to Arroyo Grande Creek for agricultural irrigation, groundwater recharge and environmental habitat. Of the 4,530 AFY for municipal diversion, the City is currently allocated 892 AFY of water from the Lopez Project. Surplus Water from the reservoir is periodically available, but not on a consistent basis.

2.1.2 State Water Project

The City is a SWP subcontractor through a subcontract with the District. The District is a primary SWP contractor with DWR and serves as the entity through which the City receives its SWP allocation. The Coastal Branch pipeline, which connects to the California Aqueduct, delivers water from the SWP system to the SWP subcontractors in San Luis Obispo and Santa Barbara Counties. The District possesses a contract with the Central Coast Water Authority (CCWA) for treatment of its SWP supplies at the Polonio Pass Water Treatment Plant. The District takes delivery of the treated SWP water at the Lopez Turnout, located along the Coastal Branch pipeline near the Lopez WTP. Treated SWP water is blended with treated Lopez Project water at the Lopez Water Treatment Plant Clearwell and delivered to the City through the City's four Lopez Pipeline turnouts. The City's current contract entitlement amount of SWP with the District is 1,240 AFY.

In addition, the District operates a drought buffer program whereby agencies subcontractors, participating in the SWP through the District, can purchase additional SWP supply allocation for an annual fee. Drought buffer water is water that has no associated pipeline capacity for delivery. Rather, it is used to increase deliveries during time of drought when available deliveries are reduced. The City current has a contract for 1,240 AFY of drought buffer with the District.

2.2 GROUNDWATER BASIN, MANAGEMENT AND OVERDRAFT

The city limits for the City overly a portion of the NCMA of the SMGB, with the majority of the City's boundary service area being located outside of the SMGB boundary. However, the City's groundwater production wells are located within the SMGB and the basin is an important component of the City's water supply portfolio.

The Department of Water Resources (DWR) identifies the SMGB as basin Number 3-12, as described in DWR Bulletin 118, and defines its boundaries to include Santa Maria Valley, the Nipomo Mesa, Tri-Cities Mesas, Arroyo Grande Plain, and the Arroyo Grande and Pismo Creek Valleys. The entire SMGB is approximately 288 square miles (184,000 acres).

The City currently extracts groundwater from the Arroyo Grande Plain of the Tri-Cities Mesa Sub-basin (Sub-basin), which is the northern most portion of the SMGB. The NCMA includes the Tri-Cities Mesa and Arroyo Grande Plain portions of the SMGB. As discussed in Section 1.4.2, the SMGB is adjudicated. The safe yield of the Sub-basin was estimated at 9,500 AFY.

Natural recharge of the SMGB within the NCMA comes from seepage losses from major streams, percolation of rainfall, and subsurface flow. Percolation of flow in Pismo Creek provides recharge for the northern portion of the SMGB. Percolation of flow in Arroyo Grande Creek, controlled by releases from Lopez Dam, provides recharge for the Tri-Cities Mesa, Arroyo Grande Plain, and Arroyo Grande Valley portions of the SMGB. Incidental recharge results from deep percolation of urban and agricultural return water, and septic tank effluent. Some subsurface flow comes from consolidated rocks surrounding the NCMA.

As described in Section 1.4.2, the Northern Cities are responsible for the management of the groundwater within the NCMA. The Judgment requires that each Management Area develop a monitoring program that must include data collection and monitoring. This information must be presented to the Court in an annual report that summarizes the results of the monitoring program, changes in groundwater supplies and any threats to groundwater supplies.

The 2008 Annual Monitoring Report for the NCMA indicated that drought conditions and subsequent increased groundwater pumping were causing groundwater elevations to drop below MSL, increasing the risk for and potentially causing seawater intrusion into the coastal groundwater aquifers. Monitoring in 2009 detected water quality constituents consistent with seawater intrusion in one of NCMA monitoring wells. These findings sparked an aggressive campaign from the City and its NCMA partners to limit water consumption, reduce groundwater pumping, increase groundwater elevations and prevent seawater intrusion. The City and the NCMA agencies intentionally shifted their production strategy to utilize available surface water supplies to alleviate stress on groundwater supply. As a result of these groundwater conservation activities, the NCMA agencies were able to decrease their total groundwater pumping to 1,544 AFY in 2013, a decrease of 51 percent since 2008.

The 2013 NCMA Annual Report identified that groundwater elevations are highest in the eastern portion of the NCMA and drop to approximately 5 ft above MSL along the coastline. It also identified that there are pumping depressions within the NCMA associated with municipal and agricultural pumping. The area with lowest groundwater elevations occurred in the east-central part of the NCMA in the vicinity of, and south of, lower Arroyo Grande Creek. Though the pumping depression persists in the north-central portion on the NCMA where the municipal wells fields are located, other measured groundwater elevations have recovered to above sea level conditions, decreasing the risk for seawater intrusion. However, seawater intrusion from the coastal zone into fresh groundwater supply remains a primary concern for the City and for the SMGB in general.

2.2.1 Groundwater Pumping Facilities

The City's groundwater is pumped from two wells located outside of its City limits in Grover Beach. Table 2-2 describes the existing well supply capacity of the two groundwater wells currently in use by the City.

Table 2-2. Existing Groundwater Wells (3)

Well Number	Location	Year Installed	Casing Depth (feet)	Production Capacity (GPM)
5	8th Street and Grand Avenue	1973	500	600
23	900 Block of Huber Street	1990	395	950
			Total (GPM)	1,550

2.3 WATER QUALITY

As reported in the 2010 UWMP, all of the City's water supplies consistently meet state and federal primary and secondary drinking water standards. The primary water quality factor affecting supply reliability for the City is the threat of seawater intrusion into its groundwater supplies. Under natural and historical conditions, a net outflow of freshwater from the groundwater basin towards the ocean has kept the seawater/freshwater interface from moving onshore. However, as described previously, during a period of depressed groundwater levels in 2007 through 2009, water quality constituents consistent with seawater intrusion were detected in one of NCMA monitoring wells. Through implementation of additional water conservation efforts, increased surface water importation and improved hydrologic conditions, groundwater levels and water quality in the monitoring wells recovered in 2010.

However, in late 2013 and throughout most of 2014, groundwater levels within the NCMA monitoring wells have dropped to levels similar to those seen in 2008 and 2009. This drop in groundwater levels has occurred in spite of significantly reduced municipal groundwater pumping and increased conservation efforts. Additionally, a deepening pumping depression within the NMMA appears to have reduced or eliminated the groundwater divide between the NCMA and NMMA. With the loss of this divide there has been a reversal of groundwater gradients and the development of a landward gradient in the southern portion of the NCMA. This landward gradient creates conditions favorable for seawater intrusion in the NCMA and NMMA (7). In spite of the NCMA agencies' ongoing efforts to reduce their groundwater pumping to amounts well below the identified safe yield for the NCMA (8), groundwater levels have declined to levels that are similar to those observed in 2009, when seawater intrusion was detected in one of the NCMA TG's coastal monitoring wells. Given the decreased groundwater levels, the NCMA agencies are very concerned that seawater could intrude into the basin and impact the water quality of their groundwater supplies.

2.4 WATER RIGHTS

As stated in Section 2.2, the safe yield of the Sub-basin was estimated at 9,500 AFY. The SMGB is adjudicated and the City is allocated 700 AFY of the identified safe yield of Sub-basin, as dictated by the Judgment, which is discussed in Section 1.4.2.

2.5 WATER USE TRENDS

The City provides potable water service to its residential, commercial, landscape, and institutional customers within its service area. Projected water demands were determined using the interim and target per capita consumption rates as described in the 2010 UWMP, with the application of conservation targets. These per capita consumption rates were applied to the projected population of the City as described in Section 1.3. The projected demands include system losses, which the City estimates to be 10%. Projected water demands are presented in Table 2-3. The historical and projected future water demands are presented in Figure 2-1 on page 2-5.

Table 2-3. Projected Water Demands

Year	Distribution System Population[1]	Projected Water Use[2]	
		MGD	AFY
2015	7,996	1.88	2,108
2020	8,329	1.76	1,970
2025	8,676	1.83	2,053
2030	9,038	1.91	2,138
2035	9,414	1.99	2,227

Notes:
1. Distribution system population projections estimated as described in Section 1.3.
2. Demand projections are based on the City's per capita water use targets for 2015 and 2020.

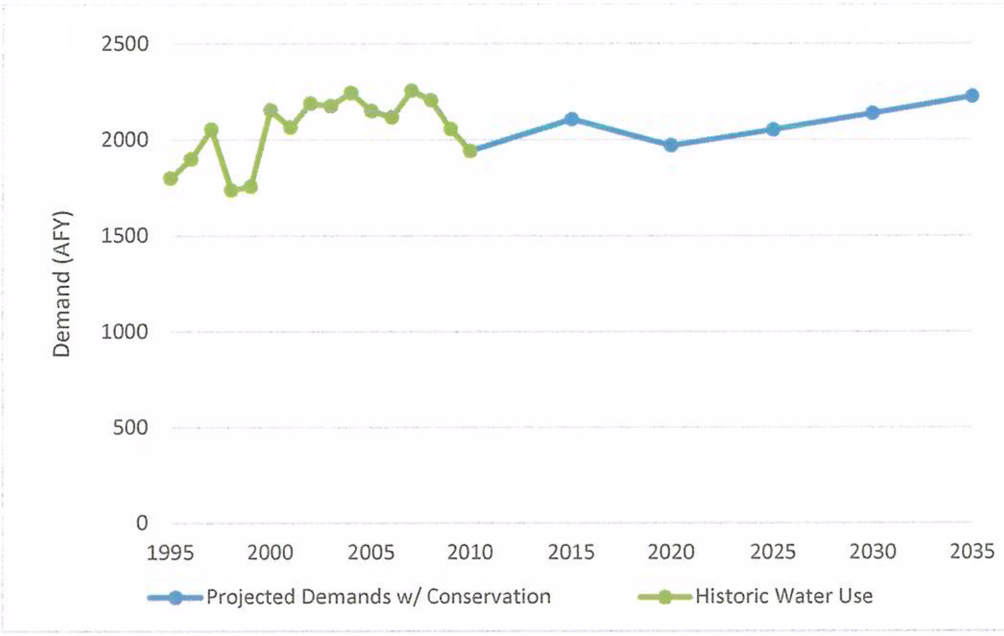


Figure 2-1. Historic and Projected Water Demand

2.6 WATER PRICING

The City's water rates are designed using the commodity-demand methodology. In the commodity-demand method, revenue requirements are assigned as commodity costs (variable costs), demand costs (fixed costs), and customer costs (fixed costs). Water rates are based on rates per HCF to account for variable costs and water service charges to account for fixed costs.

The City is a member of the California Urban Water Conservation Council (CUWCC), and as such has designed its rates to comply with the CUWCC Best Management Practice No. 1.4, to recover 30% of revenues from fixed costs and 70% from variable costs to encourage conservation (7). The City's billing cycle is bi-monthly and the current rate structure is shown in Table 2-4 and Table 2-5 on page 2-6.

Table 2-4. Water Rates (Effective July 2014)

Service Type		Water Rates Per HCF
Single Family Residential	Tier One (0-10 HCF)	$ 2.60
	Tier Two (11-20 HCF)	$ 3.22
	Tier Three (21-35 (HCF)	$ 3.80
	Tier Four (Over 35 HCF)	$ 5.20
Multi Family, Mobile Homes		$ 3.22
Commercial		$ 3.22
Irrigation		$ 3.80
Construction/Hydrant		$ 6.44
Municipal		$ 3.22
Municipal Irrigation		$ 3.80

Table 2-5. Current Water Service Charges (Effective July 2014)

Meter Size	Water Service Charge
5/8"	S 25.43
3/4"	S 25.43
1"	S 50.85
1 1/2"	S 84.67
2"	S 135.53
3"	S 254.27
4"	S 423.87
6"	S 1,017.09

2.7 PLANS FOR NEW FACILITIES OR ADDITIONAL WATER SOURCES

If implemented, any development in Price Canyon and Los Robles Del Mar will require additional water sources to provide long-term sufficient supply for its residents and visitors. As described in Section 1.3, these developments are not considered in this RWFPS and will be addressed on a project-specific basis.

3 WASTEWATER CHARACTERISTICS AND FACILITIES

The City owns and operates a 1.9 million gallon per day (mgd) wastewater treatment plant (WWTP) located adjacent to Pismo Creek. The WWTP discharges secondary treated municipal wastewater to the Pacific Ocean through an outfall diffuser system jointly owned by the City and the South San Luis Obispo County Sanitation District (SSLOCSD) and is located near Oceano, California. The location of the WWTP is shown in Figure 3-1 on page 3-3.

The WWTP receives wastewater from the City owned collection system that consists of gravity sewers, lift stations and force mains. The City's service area and anticipated future service area annexations are discussed in Section 1.4.1.

3.1 EXISTING REGULATORY REQUIREMENTS

The wastewater stream that is treated by the WWTP consists largely of sewage generated from urban land uses. Domestic wastewater is the primary constituent with a small measure of commercial and light industrial waste. There are no significant sources of major industrial waste or processing water treated by the facility. The City's discharges are currently regulated by the National Pollution Discharge Elimination System (NPDES) permit (CA0048151) issued on March 10, 2009. A summary of effluent requirements for conventional pollutants contained within the permit is presented in Table 3-1. Based on the permit, the WWTP can discharge up to 1.9 mgd via the ocean outfall. This flow is combined with up to 5.0 mgd of effluent from the SSLOCSD. The combined flow is discharged to the ocean through an outfall diffuser system, which provides a minimum initial dilution of approximately 165 to 1 (ocean water to effluent). The SSLOCSD discharge is regulated under NPDES Permit No. CA0048003.

Table 3-1. Summary of Current Conventional Pollutant Discharge Limits for the Pismo Beach WWTP (NPDES Permit CA0048151)

Parameter	Units	Average Monthly	Average Weekly	Maximum Daily
BOD5	mg/L	30	45	90
	lbs/day	475	713	1426
TSS	mg/L	30	45	90
	lbs/day	475	713	1426
Settleable Solids	ml/L/hr	1	1.5	3
Turbidity	NTUs	75	100	225
Oil and Grease	mg/L	25	40	75
	lbs/day	396	634	1188
Fecal Coliform Bacteria	MPN/100 ml		200[1]	2000
pH	pH units	6.0 - 9.0 at all times		

Notes:
1. 7-sample median

A copy of the existing NPDES permit, which expired on October 23, 2014, is attached in Appendix A. The City is currently working through the permit renewal process but does not anticipate any significant changes. Therefore, for this RWFPS, it is anticipated that the City's WWTP will produce secondary effluent in accordance with their current NPDES permit until the WWTP is upgraded.

3.2 EXISTING FACILITIES

The City's WWTP was originally constructed in 1955. Process modifications and additions were constructed in 1973 and 1984, and largely redeveloped in 2006, bringing the plant to its current capacity. The WWTP provides secondary wastewater treatment for the community with processes consisting of the following:

- Screening: The plant currently has a single mechanical bar screen at the headworks with 0.625 inch (in) bar spacing to capture large debris, such as rags and sticks. To improve screening capabilities, the City is in the process if replacing the existing screen with a new Duperon Flexrake bar screen with ¼-in bar spacing
- Oxidation Ditches: Flow from the headworks is split between the two oxidation ditches, each with a side water depth of 12 feet (ft) and a volume of 0.89 million gallons (MG). Approximately 12 percent of each tank is anoxic, and 88 percent is aerobic. Aeration is provided by mechanical aerators. The oxidation ditches remove nitrogen/ammonia to meet current permit conditions
- Secondary Clarification: Effluent from the oxidation ditches passes through the mixed liquor splitter box and is distributed between the plant's two 65-foot (ft) diameter secondary clarifiers
- Chlorine Contact Basins: Flow from secondary clarifiers travels through a sodium hypochlorite mixing box to the chlorine contact basin. Adequate detention time is provided to disinfect the treated wastewater to meet discharge permit conditions
- Dechlorination: To neutralize the toxic effects of chlorine, the final effluent is dechlorinated with sodium bisulfite
- Ocean Outfall Discharge: A five-mile pipeline conveys treated effluent to the SSLOCSD treatment plant located just south of Oceano, California, as shown on Figure 3-1 on page 3-3. Final effluent from the WWTP comingles with the final effluent from SSLOCSD and is discharged at a depth of approximately 55 feet through a 4,400 ft outfall diffuser system
- Biosolids Treatment: Waste biosolids from the oxidation ditch are thickened in the dissolved air floatation tanks, stored and dewatered with a belt filter press prior to hauling to the Engel & Gray Composting Facility in Santa Maria for further treatment and land application. The City is currently designing upgrades to the sludge dewatering system, see Section 3.5 for discussion

The WWTP currently treats approximately 1.1 mgd of average annual flow. Figure 3-2 on page 3-4 presents a schematic of the existing treatment plant processes.

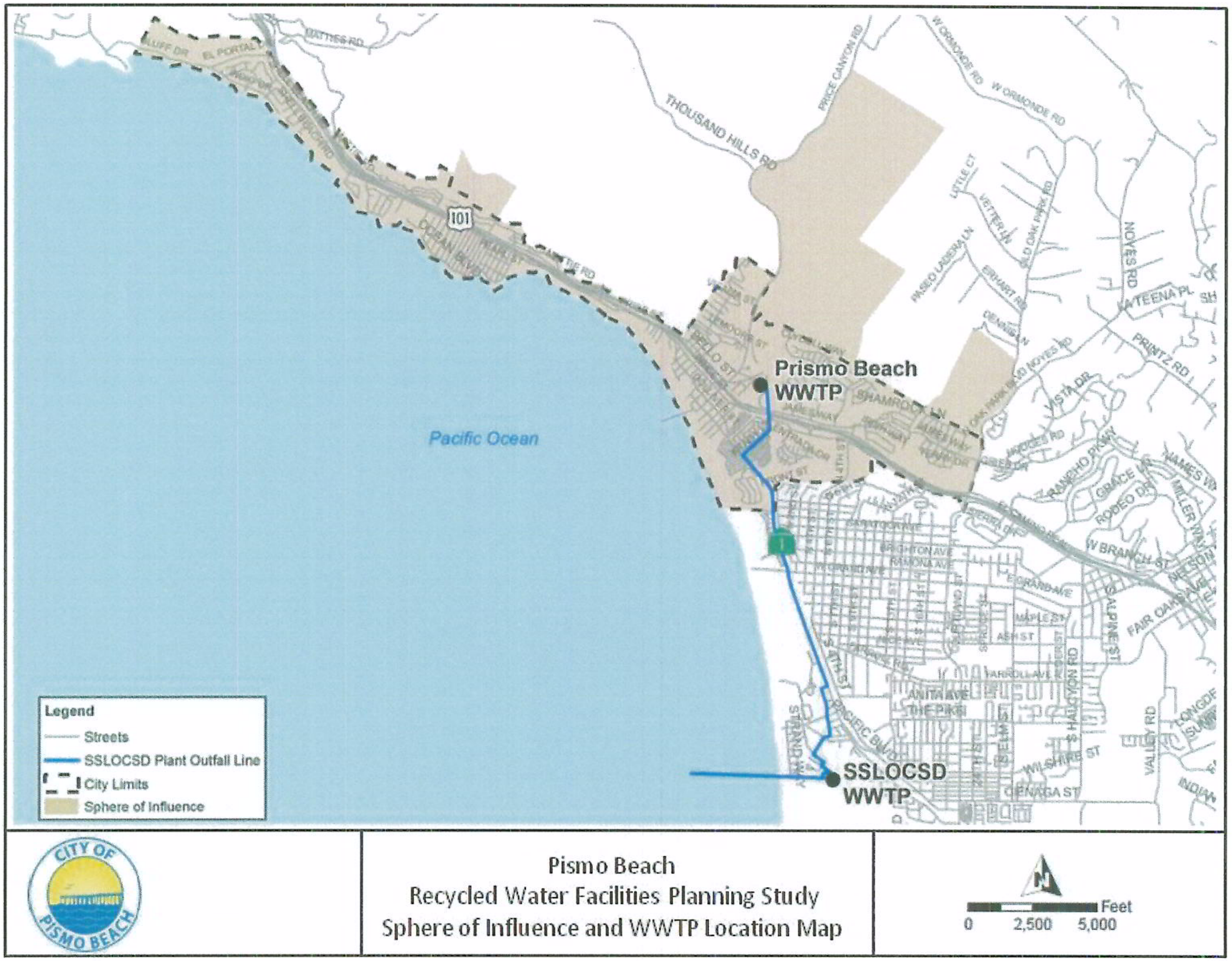


Figure 3-1. Sphere of Influence and WWTP Location Map

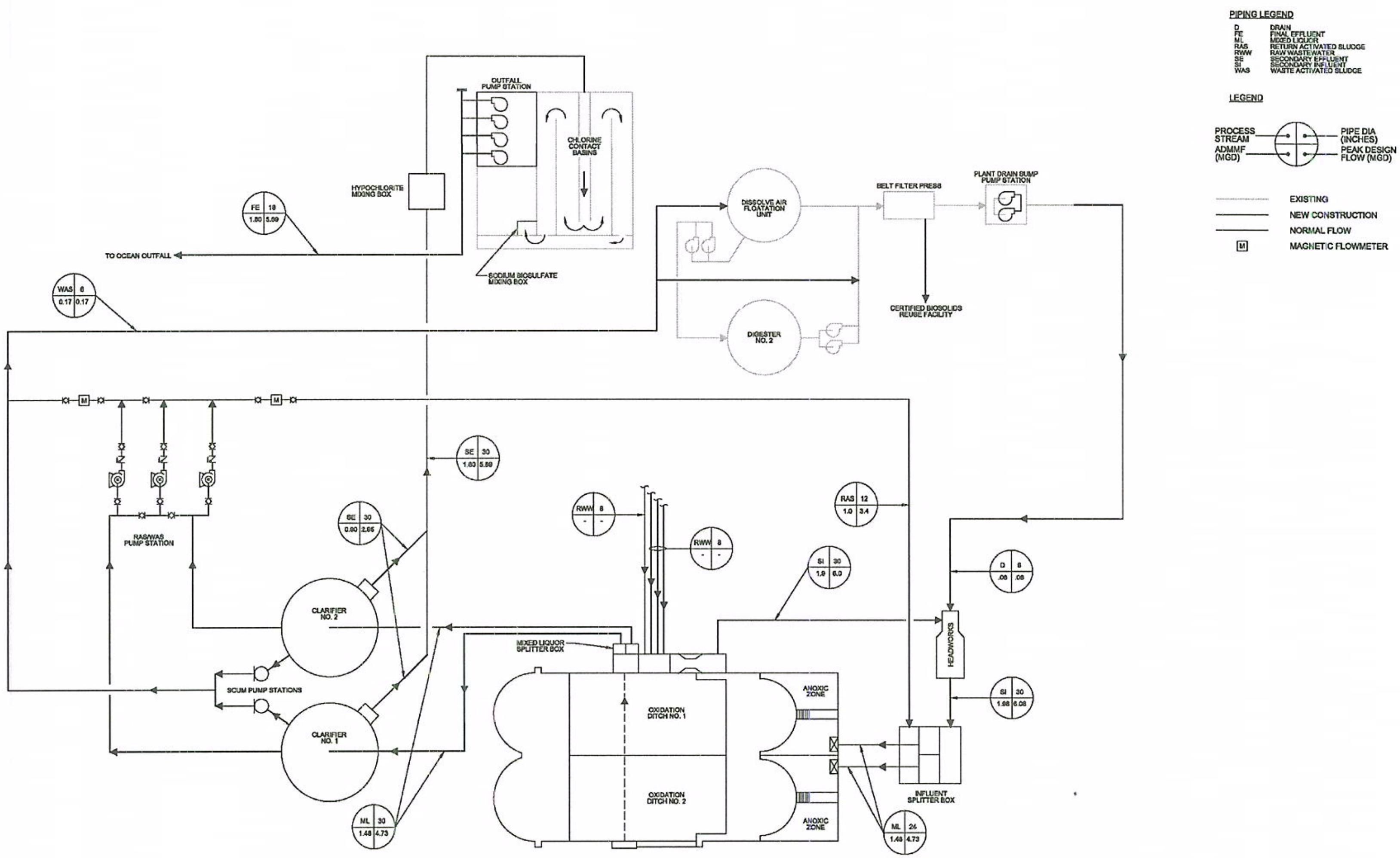


Figure 3-2. Process Flow Schematic

3.3 EXISTING AND PROJECTED WASTEWATER FLOWS

As discussed in Section 1.3, this report assumes an annual population growth within the current City limits of 0.8 percent until buildout is reached, potentially by 2035. The analysis of historical flow forms the basis of developing wastewater flow projections. The assessment of current flow conditions for the WWTP is based on data from January 2009 through December 2013. Table 3-2 presents the historical and current wastewater flow parameters.

Table 3-2. Wastewater Flows

Flow Parameter (mgd)/ Years	2009	2010	2011	2012	2013	Average	Peaking Factor
Average Annual Flow	1.13	1.08	1.09	1.08	1.06	1.09	1.0
Maximum Month Flow	1.29	1.40	1.28	1.26	1.27	1.30	1.2
Maximum Day Flow	2.68	3.05	2.79	2.81	2.81	2.83	2.6
Peak Hour Wet Weather Flow	7.28	7.29	5.07	4.16	4.51	5.66	5.2

The flow projections presented in Table 3-3 are based on Average flows presented in Table 3-2 and anticipated community growth, as presented in Section 1.3. The future average annual flow was determined by multiplying the projected population by the average observed unit per capita wastewater generation rate, which is 138 gallons per capita per day (gpcd). This is the average gpcd based on plant data collected between 2009 and 2013. The resulting average annual flow projections are summarized in Table 3-3. Other projected flow rates were estimated by applying peaking factors developed through evaluation of existing conditions to the projected average annual flows. This basic flow projection technique was used for maximum month, maximum day, and peak hour wet weather flow.

Table 3-3. Wastewater Flow Projections

Flow Parameter/ Years	2015	2020	2025	2030	2035
Anticipated Population	7,996	8,329	8,676	9,038	9,414
Average Annual Flow (mgd)	1.11	1.15	1.20	1.25	1.30
Maximum Month Flow (mgd)	1.32	1.38	1.43	1.49	1.56
Maximum Day Flow (mgd)	2.87	2.99	3.12	3.25	3.38
Peak Hour Wet Weather Flow (mgd)	5.75	5.99	6.24	6.50	6.77

As discussed in Section 1.3, the Price Canyon and Los Robles Del Mar developments have the potential to increase the City's population by up to 2,440 people, which would increase wastewater generation. Based on the methodology described in this section, these developments would increase the Annual Average Flow by 0.34 mgd. Due to the uncertain timing of these developments, treatment and reuse of these flows are not evaluated in this RWFPS; however, consideration will be given to phasing of treatment plant upgrades to allow for incremental expansion in the future if needed.

3.3.1 Seasonal Variation

The seasonal variation of the average monthly flow is presented in Figure 3-3. Typically for WWTPs, the summertime flow (July through September) is the low flow period due to minimal precipitation and dry ground conditions. However for the City, the flows during these months are higher than the average annual flows due to tourist population influx. Based on the City's General Plan, visitors during the summer and on holidays can increase the population from 33 percent up to three hundred percent.

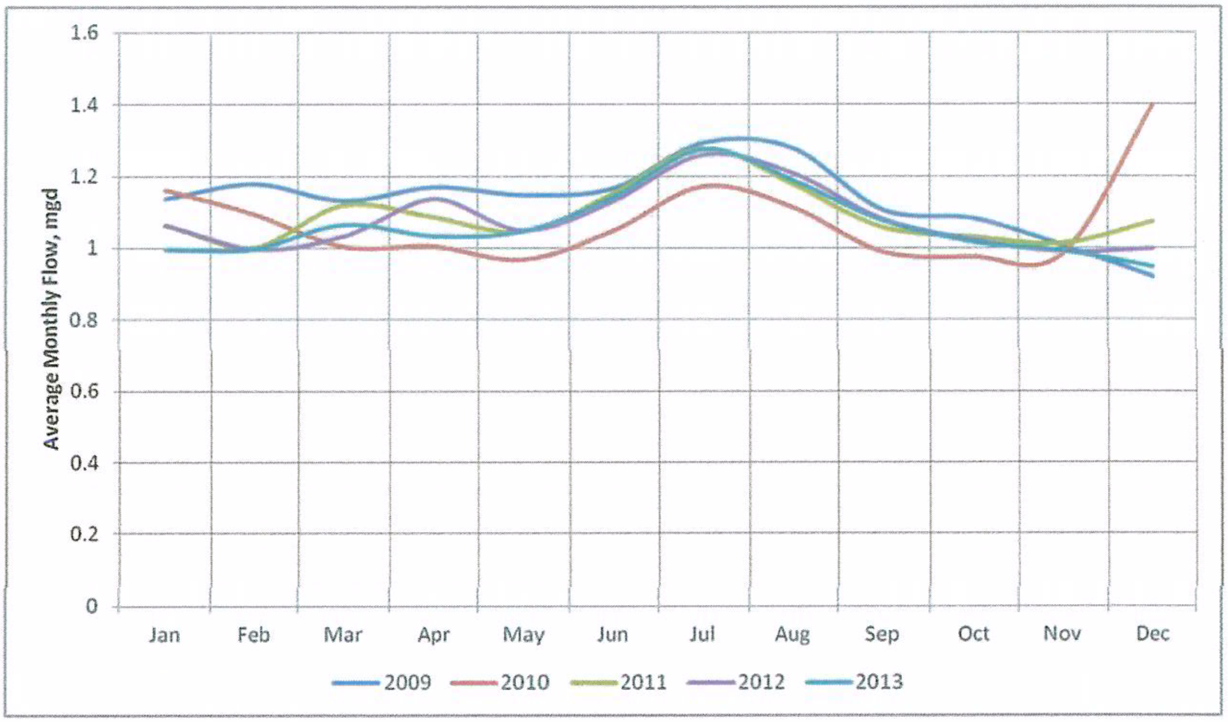


Figure 3-3. Seasonal Variation of Average Monthly Flow

3.4 RECYCLED WATER

Currently, the City does not recycle wastewater and all of the effluent is discharged through the joint ocean outfall. The agreement between the City and SSLOCSD for operation and maintenance of the joint ocean outfall does not require the City to maintain a flow to the outfall; therefore, the City has rights to use all of the current and future treated wastewater for RW projects.

3.5 FUTURE FACILITIES

As discussed in Section 3.2, the City is planning to upgrade the headworks by installing a new Duperon Flexrake bar screen with ¼-in bar spacing to reduce pump clogging and debris accumulation within the WWTP. These upgrades are anticipated to be complete in 2015 and are therefore not included in the costs in this RWFPS.

The City is also currently designing upgrades to the sludge handling system. The project includes replacement of the existing dissolved air floatation tanks with a Rotary Screen Thickener for sludge thickening, replacement of the existing belt filter press with a Screw Press for sludge dewatering, a new building to house the sludge handling equipment, demolition of an abandoned digester, and upgrades to the existing electrical, polymer and piping systems. The project is currently in the final design stage and the City has applied for funding through the State Revolving Fund (SRF) loan program. The project will begin upon funding approval and is anticipated to be complete in 2016.

No other improvements or facilities are anticipated at this time to accommodate growth or maintain regulatory compliance.

4 TREATMENT REQUIREMENTS

4.1 RECYCLED WATER QUALITY REQUIREMENTS

This chapter identifies the RW quality requirements for each potential type of RW use. RW quality requirements are established by state regulations and policies for various types of reuse. This chapter also describes the operational and on-site requirements for RW systems. The types of reuse considered in this feasibility study include:

- Irrigation – Landscape irrigation
- Groundwater Recharge – Inland and/or coastal injection and/or surface spreading

4.2 RECYCLED WATER REGULATIONS

The SWRCB establishes general policies governing the permitting of RW projects consistent with its role of protecting water quality and sustaining water supplies. The SWRCB Division of Drinking Water (DDW) (formerly under the California Department of Public Health) is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water. The SWRCB also exercises general oversight over RW projects, including review of Regional Water Quality Control Board (RWQCB) permitting practices. The RWQCB is charged with protection of surface and groundwater resources and with the issuance of permits that implement DDW recommendations.

This section includes an overview of the regulations and policies that pertain to RW use for irrigation and groundwater recharge, including:

- DDW Regulations - Title 22, Division 4, Chapter 3, Section 60301 et seq., California Code of Regulations (Title 22)
- SWRCB Policies – Recycled Water Policy and Antidegradation Policy
- CCRWQCB – Central Coast Basin Plan

4.2.1 California Code of Regulations – Title 22

Title 22, established and administered by DDW, defines four types of RW uses based on the treatment process used and water quality produced. These four types of RW are described as follows and as summarized in Table 4-1 on page 4-3:

- Undisinfected secondary RW - Oxidized wastewater
- Disinfected secondary-23 RW - RW that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a Most Probable Number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30 day period
- Disinfected secondary-2.2 RW - RW that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which

analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30 day period

- Disinfected tertiary RW - Filtered and subsequently disinfected wastewater that meets the following criteria:
  - (a) The filtered wastewater has been disinfected by either:
    1. A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or
    2. A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration
  - (b) The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters

Title 22 also establishes approved uses of RW for industrial use, as shown in Table 4-2 on page 4-4.

Table 4-1. Summary of Approved Title 22 Uses of RW for Irrigation

Treatment Level	Approved Uses	Total Coliform (median)
Undisinfected Secondary	Fodder, Fiber and Seed Crops	N/A
Disinfected Secondary 23	Pasture for Milking Animals Landscape Irrigation[1] Landscape Impoundment Soil Compaction, Dust Control on Roads and Streets	23/100 ml
Disinfected Secondary 2.2	Surface Irrigation of Food Crops Restricted Recreational Impoundment Surface Irrigation of Orchards, Vineyards	2.2/100 ml
Disinfected Tertiary	Spray Irrigation of Food Crops Landscape Irrigation[2] Unrestricted Recreational Impoundment	2.2/100 ml

Notes:
1. Includes restricted access golf courses, cemeteries, freeway landscapes, and landscapes with similar public access.
2. Includes unrestricted access golf courses, parks, playgrounds, schoolyards, and other landscaped areas with similar access.

Table 4-2. Summary of Approved Title 22 Industrial RW Uses

Industrial Use	Approved Uses
Supply for Cooling and Air Conditioning	Industrial or commercial cooling or air-conditioning involving cooling tower, evaporative condenser, or spraying that creates mist.
	Industrial or commercial cooling or air-conditioning not involving cooling tower, evaporative condenser, or spraying that creates mist
Other Allowed Uses	Flushing toilets and urinals
	Priming drain traps
	Structural fire fighting
	Non-structural fire fighting
	Industrial process water that will not come into contact with workers
	Industrial process water that may contact workers
	Industrial boiler feed water
	Decorative fountains
	Commercial laundries
	Consolidation of backfill material around potable water pipelines
	Dust control on roads and streets
	Mixing concrete
	Flushing sanitary sewers
	Soil compaction
	Artificial snow making for commercial outdoor use
	Cleaning roads, sidewalks, and outdoor work areas
	Commercial car washes, not heating the water, excluding the general public from washing processes

4.2.2 Groundwater Recharge Regulations

In response to current drought conditions in California, Senate Bill 104 was signed into law in March 2014. This bill included a requirement for DDW to adopt emergency regulations for groundwater replenishment using RW by June 30, 2014. The current Groundwater Recharge Regulations were adopted as an emergency regulation and became effective June 18, 2014. These regulations have been incorporated in the California Code of Regulations (CCR), Title 22.

The Groundwater Recharge Regulations define a Groundwater Replenishment Reuse Project (GRRP) as a project using recycled municipal wastewater for the purpose of replenishment of groundwater that is designated a source of water supply in a Water Quality Control Plan, or which has been identified as a

GRRP by the RWQCB. GRRPs can employ surface spreading basins or subsurface injection methods. The Groundwater Recharge Regulations address the following types of recharge:

- Surface spreading without full advanced treatment (FAT)
- Subsurface application (FAT required for the entire flow)
- Surface spreading with FAT

CCR Title 22, Section 60320.201 defines FAT as "the treatment of an oxidized wastewater . . . using a reverse osmosis (RO) and an oxidation treatment process (AOP) . . . ." According to the Groundwater Recharge Regulations, FAT is the required treatment process for groundwater augmentation using direct injection, unless an alternative treatment has been demonstrated to DDW as providing equal or better protection of public health and has received written approval from DDW.

Both surface spreading and subsurface application are considered to be indirect potable reuse (IPR). The specific regulations for these different methods of groundwater recharge are different. However, the regulations generally address the following elements:

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

Several of the key regulatory requirements for groundwater recharge are summarized in Table 4-3 on page 4-6. Additional descriptions of pathogen controls, retention time and the RW contribution follows.

Pathogen controls include specific provisions for log reduction of microorganisms and treatment process requirements. The treatment process used to treat recharge water for a GRRP must provide treatment that achieves at least 12-log enteric virus reduction, 10-log Giardia cyst reduction, and 10-log Cryptosporidium oocyst reduction from raw sewage to usable groundwater. The treatment train shall consist of at least three separate treatment processes. For each pathogen (i.e., virus, Giardia cyst, or Cryptosporidium oocyst), a separate treatment process may be credited with no more than 6-log reduction, with at least three processes each being credited with no less than 1.0-log reduction.

The Groundwater Recharge Regulations require a minimum "response retention time" or minimum groundwater travel time of two months between the point of surface application or injection, and the point of extraction. Groundwater travel time can be estimated by various methods, including intrinsic tracer studies, numerical modeling, or analytical modeling. Depending on the method used, the "response time credit" is discounted by different factors. The more rigorous the estimating approach, the more advantageous the discounting factor.

The Groundwater Recharge Regulations require that the ratio of purified RW to the total injected water, known as the RWC, be determined periodically, and that it is not to exceed a value determined during the DDW's review of the engineering report and the results of public hearings. Only water that is either a DDW-approved drinking water, or meets certain quality criteria (e.g., does not exceed primary or secondary MCLs or notification levels) may be used as diluent water. The Groundwater Recharge Regulations allow the RWC to be 100% if it can be demonstrated that sufficient protections are afforded within the total project design and proposed operational scheme.

Table 4-3. Summary the Groundwater Recharge Regulations

Element	Surface Recharge	Subsurface Recharge
Treatment	Disinfected tertiary	100% RO and AOP treatment for the entire waste stream
Retention time(1)	Minimum 2 months (however additional treatment may be required for < 6 months)	Minimum 2 months
Recycled Water Max Initial Contribution (RWCmax)	Up to 20% disinfected tertiary Up to 100% with RO and AOP	Up to 100% with RO and AOP
Total Nitrogen	Average <10 mg/L	Average <10 mg/L
Total Organic Carbon	Mound < 0.5 mg/L ÷ RWC	< 0.5 mg/L
Dilution water compliance calculation	Based on 120-month running average	Based on 120-month running average

Notes:
1. Must be verified by a tracer study. An 8 month minimum is required for planning level estimates based on numerical modeling

4.2.3 Recycled Water Policy

The SWRCB adopted the Recycled Water Policy (RW Policy) in February 2009, and subsequently amended it in January 2013. The purpose of the policy was to provide the RWQCBs, proponents of RW projects, and the public the appropriate criteria to be used in issuing permits for RW projects. The RW Policy established more uniform requirements throughout the State and streamlined the permitting process for the vast majority of RW projects. Key components of the RW Policy are summarized in Table 4-4 on page 4-7.

Table 4-4. Key Components of the RW Policy

Component	Description
Recycled Water Targets	200,000 AFY by 2020 300,000 AFY by 2030
Permitting Process	RW irrigation projects permitted within 120 days (except for unusual requirements) without groundwater monitoring component.
Salt and Nutrient Management Plans	Required for all groundwater basins. Includes identification of salt and nutrient sources, assimilative capacity evaluation, load estimates, fate and transport analysis and implementation measures. Includes antidegradation analysis for RW projects.
Landscape Irrigation Project Requirements	Requirements related to controlling water runoff, salt, and soil nutrients. Provisions for streamlined permitting for projects that meet specific criteria related to application rates, oversight, and controls.
RWQCB Groundwater Requirements	Allows RWQCB to impose more stringent requirements for groundwater recharge projects to address site specific conditions.
Anti-degradation Analysis	Requirements for anti-degradation analysis for groundwater recharge and landscape irrigation projects based on the amount of assimilative capacity use by the project.
CEC Monitoring	Requirements for Constituent of Emerging Concern (CEC) monitoring for groundwater recharge projects.

One of the key components of the RW Policy is the requirement for a Salt and Nutrient Management Plan (SNMP). The RW Policy states that SNMPs should be developed to facilitate basin-wide management of salts and nutrients from all sources in a manner that optimizes RW use while ensuring protection of groundwater supply and beneficial uses, agricultural beneficial uses, and human health. A discussion of Basin Plan Objectives follows in section 4.2.4.

Currently, an SNMP does not exist for the SMGB; however, the NCMA Strategic Plan identifies development of an SNMP as a key strategic initiative and NCMA agencies are beginning to appropriate funds for preparation of an SNMP. It is anticipated that an SNMP would be developed in conjunction with the permitting process for the City's RW projects, and will be incorporated into the project implementation plan.

The SNMP will consider the Basin Plan water quality objectives, the existing groundwater quality data and determine the assimilative capacity of the basin. The findings of the SNMP are anticipated to aid in establishing the minimum treatment requirements for RW irrigation projects. The SNMP findings would not likely impact groundwater recharge via injection projects because FAT effluent water quality is better than the water quality objectives and may even be identified as a mitigation measure in the SNMP.

4.2.4 General Order for Recycled Water Use

The SWRCB adopted a General Order on June 3, 2014 to streamline permitting for RW. The General Order took effect immediately following adoption. This General Order was developed in response to the Governor's Jan. 17, 2014 proclamation of a Drought State of Emergency.

The General Order establishes standard conditions for the use of RW and is intended to relieve producers, distributors and users of RW from the sometimes lengthy permit approval process and provide them with certainty around the requirements that they will be expected to meet. To obtain coverage under the Order, applicants must submit a Notice of Intent and an application fee to the appropriate RWQCB.

Coverage under this General Order is limited to treated municipal wastewater for non-potable uses. It does not apply to the use of RW for groundwater recharge, or the disposal of treated wastewater by means of percolation ponds. Specifically, the General Order allows the use of tertiary disinfected, secondary disinfected and, in some cases, secondary undisinfected recycled municipal wastewater for Title 22 approved non-potable uses such as agricultural irrigation, landscape irrigation, dust control and cooling tower make-up water. RW use for irrigation is limited to agronomic application rates; therefore, the amount of RW that could potentially reach groundwater will be limited. All uses of RW allowed by the General Order must be consistent with SNMPs.

4.2.5 Basin Plan Objectives

The Water Quality Control Plan for the Central Coast Basin (2011) (Basin Plan) identifies the beneficial uses for surface waters and groundwater and the water quality objectives established to protect those uses. As discussed in Section 2.2, the City is located within the SMGB. This groundwater basin underlies the Santa Maria Valley in the coastal portion of northern Santa Barbara and southern San Luis Obispo Counties. The basin also underlies Nipomo and Tri-Cities Mesas, Arroyo Grande Plain, and the Nipomo, Arroyo Grande and Pismo Creek Valleys (8).

The Basin Plan has general narrative objectives for taste and odor that apply to all groundwater. The plan also imposes criteria for bacteria and DDW primary and secondary maximum contaminant levels (MCLs) that apply to groundwaters designated as municipal drinking water supplies; narrative groundwater objectives to protect agricultural beneficial uses and soil productivity; and sub-basin specific numeric objectives for total dissolved solids (TDS), chloride, sulfate, boron, sodium, and nitrogen. The numeric objectives for the Lower Nipomo Mesa, which is located within the northern section of the basin as shown in Figure 4-1 on page 4-9 are presented in Table 4-5 on page 4-9.

Table 4-5. Groundwater Quality Objectives for the Lower Nipomo Mesa

Parameter	Objective
Total Dissolved Solids	710 mg/L
Chloride	95 mg/L
Sulfate	250 mg/L
Boron	0.15 mg/L
Sodium	90 mg/L
Nitrogen	5.7 mg/L as N [1]

Notes:

1. The basin exceeds useable mineral quality. (Footnote provided in the Basin Plan)

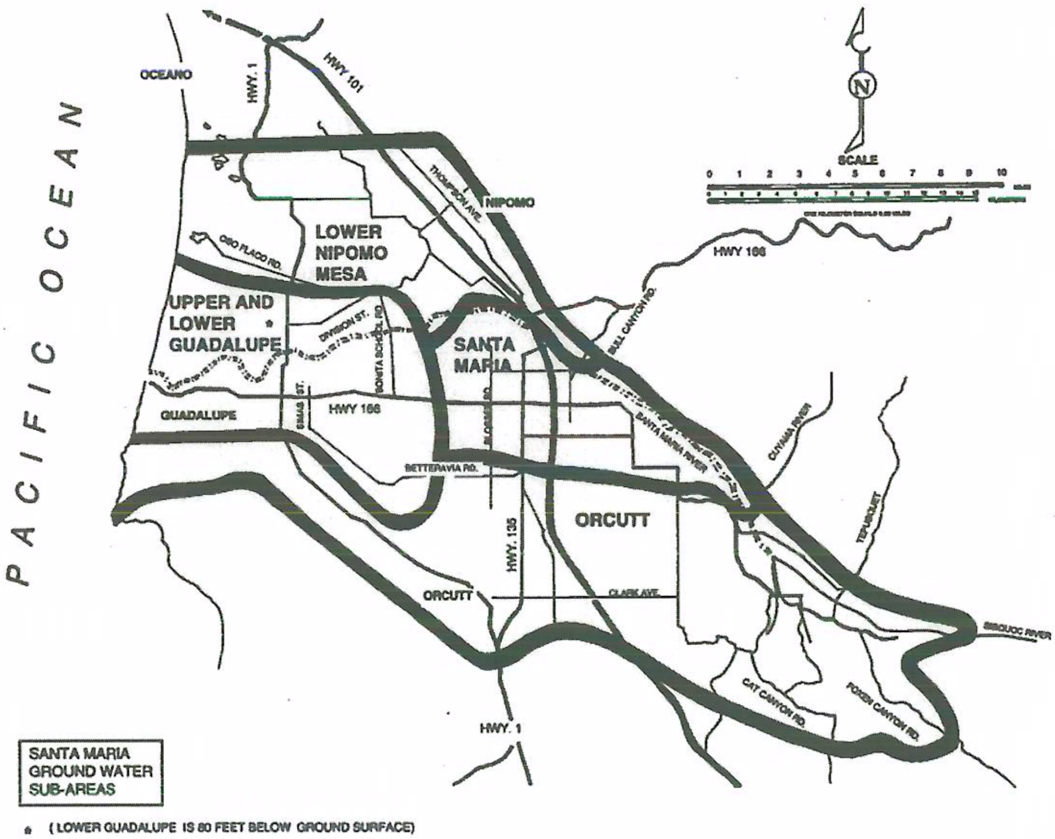


Figure 4-1. Santa Maria Groundwater Subareas (9)

4.2.6 Anti-degradation Policy

The RW Policy addresses implementation of the Anti-degradation Policy, as it relates to RW projects (see Section 4.2.3). In general, the Anti-degradation Policy requires protection of groundwaters and surface waters having quality that is better than that established in effective policies. The policy states that high quality waters shall be maintained unless any change will be consistent with the maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial uses and will not result in water quality less than that prescribed in the policies.

4.3 RECYCLED WATER QUALITY TARGETS

Specific uses of RW as well as the Basin Plan objectives (see Section 4.2.5) can define water quality requirements. Water quality requirements may be established based on the specific use of RW or based on the objectives established in the Basin Plan to be protective of the groundwater.

4.3.1 Water Quality Targets – Basin Plan

The Basin Plan stipulates that discharges to groundwater (including groundwater recharge projects) cannot cause or contribute to an exceedance of the water quality objectives. As discussed in Section 4.2.3, an SNMP would include an evaluation of existing water quality, existing salt and nutrient loads to the basin, and available assimilative capacity for RW projects. For the purposes of this RWFPS, a comparison of existing WWTP effluent and Basin Plan Objectives will be used to determine whether there is potential for a RW project, that contributes a new load to the basin, to lead to an exceedance of groundwater quality objectives. Table 4-6 presents the objectives for the Lower Nipomo Mesa and the Pismo Beach WWTP effluent concentrations. The WWTP effluent is not regularly sampled for these Basin Plan parameters. However, grab samples of the effluent from September 25, 2006, June 9, 2011 and June 10, 2011 were analyzed for these Basin Plan parameters. The average concentrations from these three events are included in Table 4-7 on page 4-12. Note that the current WWTP effluent exceeds the Basin Plan groundwater objectives for TDS, chloride, boron and sodium. Therefore, it is assumed that, at a minimum, an assimilative capacity analysis will need to be performed to support a permit application for any RW project which precedes the SNMP.

Table 4-6. Groundwater Quality Objectives for the Lower Nipomo Mesa

Parameter	Objective	Pismo Beach WWTP Effluent
Total Dissolved Solids (mg/L)	710	1100
Chloride (mg/L)	95	310
Sulfate (mg/L)	250	Not analyzed
Boron (mg/L)	0.15	0.33
Sodium (mg/L)	90	240
Nitrogen (mg/L as N)	5.7	Not analyzed

4.3.2 Water Quality Targets- Landscape Irrigation

Water quality guidelines for general landscape irrigation are based on practical limits for different types of irrigation approaches and the tolerance of various plants for specific constituents found in irrigation water. Table 4-7 includes a comparison of constituent guidelines/criteria and the WWTP effluent quality. The WWTP effluent is not regularly sampled for the parameters that are used to evaluate landscape irrigation use restrictions. Grab samples from September 25, 2006, June 9, 2011 and June 10, 2011 were analyzed for most of the parameters in Table 4-7 on page 4-12. Average concentrations from the three events are included in Table 4-7.

The constituents that can impact use of RW for general landscape irrigation primarily include minerals and nutrients. The WWTP effluent concentrations fall within the ranges highlighted in red in Table 4-7 on page 4-12. In general, comparison of most constituents suggests that there may be slight restrictions in the use of WWTP effluent for general landscape irrigation.

There are operational techniques associated with RW for landscape irrigation that can improve and sustain a specific use. The successful long-term use of irrigation water depends on rainfall, leaching, soil drainage, irrigation water management, salt tolerance of plants, soil management practices, as well as water quality. Since salinity problems may eventually develop from the use of any water, the following guidelines are given, should they be needed, to assist water users to better manage salinity:

- Irrigate more frequently to maintain an adequate soil water moisture
- Select plants that are tolerant of an existing or potential salinity level
- Routinely use extra water to satisfy the leaching requirements and to drive salts below the root zone
- If possible, direct the spray pattern of sprinklers away from foliage. To reduce foliar absorption, try not to water during periods of high temperature and low humidity or during windy periods. Change time of irrigation to early morning, late afternoon, or night
- Maintain good downward water percolation by using deep tillage or artificial drainage to prevent the development of a perched water table
- Salinity may be easier to control under sprinkler and drip irrigation than under surface irrigation. However, sprinkler and drip irrigation may not be adapted to all qualities of water and all conditions of soil, climate, or plants

Table 4-7. Comparison of Pismo WWTP Effluent with Irrigation Water Quality Criteria

Parameter	Units	Degree of Use Restriction[2]			Pismo Beach WWTP Effluent
		None	Slight	Severe	
Salinity					
Electrical Conductance	µS/cm	<700	700-3000	>3000	1800
Total Dissolved Solids (TDS)	mg/L	<450	450-2000	>2000	1100
Permeability					
SAR[3] = 0 - 3 and EC		700	700-200	<200	
= 3 - 6 and EC		≥1200	1200-300	<300	
= 6 - 12 and EC		≥1900	1900-500	<500	SAR = 6.2, EC = 1800
= 12 - 20 and EC		≥2900	2900-1900	<1900	
= 20 - 40 and EC		≥5000	5000-2900	<2900	
Sodium					
Root Absorption	SAR	<3	3-9	>9	6.2
Foliar Absorption	mg/L	<70	>70	-	240
Chloride					
Root Absorption	mg/L	<140	140-355	>365	310
Foliar Absorption	mg/L	<100	>100	-	310
Boron	mg/L	<0.7	0.7-3.0	>3.0	0.33
Total Alkalinity (as $CaCO_3$)	mg/L	<90	90-500	>500	167
pH	–	6.5-8.4 (normal range)			7.35 to 7.56[4]
Ammonia	mg/L as N	(see total N values below)			0.078[4]
Nitrate	mg/L as N	(see total N values below)			16
Total Nitrogen	mg/L	<5	5-30	>30	Not analyzed
Hardness (as $CaCO_3$)[4]	mg/L	<90	90-500	>500	290

Notes:

1. Adapted from University of California Committee of Consultants (1974) and Water Quality for Agriculture (Ayers and Westcot 1985).
2. Definition of the "Degree of Use Restriction" terms:
   None = Reclaimed water can be used similar to the best available irrigation water
   Slight = Some additional management will be required above that with the best available irrigation water in terms of leaching salts from the root zone and/or choice of plants
   Severe = Typically cannot be used due to limitations imposed by the specific parameters
3. SAR = Sodium absorption ratio. Presence of bicarbonate can result in unsightly foliar deposits.
4. From 2013 annual report (pH monthly average range, ammonia single sample)
5. The City's WWTP effluent concentrations fall within the ranges highlighted in red.

4.4 OPERATIONAL AND ON-SITE REQUIREMENTS

Permit prohibitions and operational requirements will be directly from Title 22 and will be included in the City's RW permit. In addition, for RW irrigation use, the City will need to establish a "recycled water ordinance" and "rules and regulations for recycled water". Additional operational and site requirements for RW irrigation use may also be included in these documents.

4.4.1 Incidental Runoff

The RW Policy defines incidental runoff as unintended small amounts of runoff from RW use areas, such as unintended, minimal over-spray from sprinklers that escapes the RW use area. Water leaving a RW use area is not considered incidental if it is part of the following:

- Facility Design
- Excessive Application
- Intentional Overflow or Application
- Negligence

Incidental runoff may be regulated by waste discharge requirements, or when necessary, through an NPDES permit. Regardless of the regulatory instrument, the project shall include the following practices:

- Implementation of an operations and management plan that provides for detection of leaks, and correction within 72 hours of learning of the runoff, or prior to the release of 1,000 gallons, whichever occurs first
- Proper design and aim of sprinkler heads
- Refraining from application during precipitation events
- Management of any ponds containing RW such that no discharge occurs unless discharge is a result of a 25-year, 24-hour storm event or greater, and there is notification of the appropriate RWQCB Executive Officer of the discharge

4.4.2 Title 22 Use Area Requirements

Title 22 includes two main requirements that will need to be considered during the design phase. Per Title 22, no irrigation with disinfected tertiary RW shall take place within 50 feet of any domestic water supply well unless the well meets certain criteria including:

- An annular seal
- Well housing to prevent RW spray from contacting the wellhead
- The City approves of the elimination of the buffer zone

Also per Title 22, no impoundment of disinfected tertiary RW shall occur within 100 feet of any domestic water supply well.

4.4.3 Recycled Water Ordinance

The purpose of a RW ordinance is to establish a water recycling policy and criteria for its use within the SOI. In general, a RW ordinance will accomplish the following:

- Establish Administrative Authority
- Establish approved uses of RW
- Define areas of potential eligibility for RW service

- Specify mandatory and voluntary uses of RW, depending on user classifications
- Require installation of transmission and distribution infrastructure
- Provide enforcement and severability clauses

4.4.4 Recycled Water Rules and Regulations

The Rules and Regulations will govern the design, construction, and use of both the distribution system, to be operated by the City, and on-site RW systems to be operated by the users. In general, the Rules and Regulations document will include the following elements:

- Responsibilities for the City and Users
- Requirements for the design, installation, and inspection of the distribution systems and on-site RW systems
- Application procedures and the City approval process
- Operation, Maintenance, and Management responsibilities for Users and the City
- Cross connection control test procedures
- Employee training requirements
- Prohibitions and Enforcement

5 RECYCLED WATER MARKET/OPPORTUNITIES

5.1 MARKET ANALYSIS UPDATE

The City has made steady progress to develop RW as a viable resource to supplement potable supplies. The City's previously completed RW studies include those summarized in Table 5-1, in chronological order, starting with the most recent. This report builds on the market analyses previously completed for Secondary-23 and disinfected tertiary Title 22 RW.

Table 5-1. Pismo Beach Previous RW Reports

Report Title, Year	Author	Stated Purpose	Findings/Recommendations
San Luis Obispo County Regional Recycled Water Strategic Plan, 2014	Cannon	Identify and prioritize potentially viable next steps in successfully implementing RW across the County in a cost-effective manner while protecting public health.	Confirm demand estimates for cost effective projects. Refine potential projects to develop a phased RW program
Recycled Water Distribution System Conceptual Plan – City of Pismo Beach WWTP, 2010	Wallace Group	Investigate the feasibility of a cooperative project with the City of Arroyo Grande to deliver Secondary-23 RW to customers in Pismo Beach and Arroyo Grande	A stand-alone Secondary-23 project is not economically viable, however annualized unit cost of the project can be decreased substantially with tertiary treatment and expanding deliveries to Title 22 customers
Urban Water Management Plan, 2010	Carollo Engineers	Comply with the Urban Water Management Act	The City is committed to the development of RW for irrigation and groundwater recharge/ recovery
Incremental Reclaimed Wastewater Study, 2008 **Spanish Springs Specific Plan**	RRM Various	Provide a conceptual framework to reduce potable demand through the supply of RW. Provide required environmental and civic planning documentation for the proposed development	Phased implementation of tertiary upgrades at the WWTP and construction of a pond storage and reclaimed distribution system to serve existing irrigation demands within the City limits and the proposed development areas in Price Canyon.RW demands, proposed infrastructure, and project impacts/mitigation measures
Water Reuse Study, 2007	Carollo Engineers	Identify potential locations for using reclaimed wastewater and estimate the cost of the infrastructure and operating costs for implementation	Phased implementation of tertiary upgrades at the WWTP and construction of a distribution system to serve existing demand adjacent to the WWTP and the proposed Price Canyon Annexation area.
Spanish Springs Specific Plan	Various	Provide required environmental and civic planning documentation for the proposed development	RW demands, proposed infrastructure, and project impacts/mitigation measures

The market analyses for the previous studies were updated, where possible, with Fiscal Year (FY) 2010-2013 water consumption data to enhance the assessment of potential RW uses and the project alternatives analysis.

5.1.1 Secondary-23 Market Analysis

The *Recycled Water Distribution System Conceptual Plan – City of Pismo Beach WWTP, Wallace Group, 2010* (2010 Wallace Group Report) identified multiple potential Secondary-23 users in the City and in neighboring cities. The 2010 Wallace Group Report's potential Secondary-23 RW use estimates for the City were updated with 2010– 2013 consumption data, where available, as shown in Table 5-2. The City of Arroyo Grande's Secondary-23 potential RW use estimates from the 2010 Wallace Group report are provided in Table 5-3 for reference.

Table 5-2. Pismo Beach Potential Secondary-23 Water Use

Site	Metered Use [CCF/year][1]	Average Annual Demand [AFY]	Average Annual Demand [mgd]	Maximum Month Demand [mgd][2]	Peak Day Demand [mgd][3]
James Way Slopes	993	2.28	0.002	0.005	0.007
Caltrans Median	6,259	14.37	0.013	0.029	0.043
TOTALS	**7,252**	**16.65**	**0.015**	**0.033**	**0.050**

Notes:
1. James Way Slopes could not be updated with available FY 2010-2013 consumption data, so the consumption from the 2010 Wallace Group Report was maintained. Caltrans Median updated with FY 2010-2013 consumption data.
2. Based on Maximum Month Demand peaking factor of 2.25 X Average Annual Demand from the 2010 Wallace Group Report.
3. Based on Peak Day Demand peaking factor of 1.5 X Maximum Month Demand from the 2010 Wallace Group Report.

Table 5-3. Arroyo Grande Potential Secondary-23 Water Use (10)

Site	2007-2009 Metered Use [CCF/year]	Average Annual Demand [AFY]	Average Annual Demand [mgd]	Potential Irrigation Reduction	Reduced Average Annual Demand [AFY]
Arroyo Grande Cemetery[1]	12,952	29.7	0.027	20%	23.8
Caltrans Median[2]	4,985	11.4	0.010	N/A	11.4
TOTALS	**17,937**	**41.2**	**0.037**		**35.2**

Notes:
1. Existing average calculated from 2010-2012 consumption data.
2. Existing average calculated from 2010-2013 consumption data.

5.1.2 Disinfected Tertiary Market Analysis

Because the potential uses for Secondary-23 RW are limited, the City would need to implement disinfected tertiary treatment to serve a larger amount of potential RW uses. All previous studies have analyzed Title 22 potential uses to some extent. The *San Luis Obispo County Regional Recycled Water Strategic Plan- Draft, 2014* (RRWSP) prepared by Cannon, compiled the market analyses completed prior to 2014 and assigned an Identification Number (RRWSP ID No.) and ID Name to each of the 26 previously identified potential users.

The prior market analysis was updated for this RWFPS with FY 2010-2013 bi-monthly water consumption data from irrigation meters throughout the City. All users were assigned a new ID No. and ID Name. The City provided consumption data for approximately 160 irrigation users. Some of these accounts were matched to RRWSP ID No. and ID Names, which are shown in Table 5-4 on page 5-4. A large majority were associated with a service location identified by Assessor's Parcel Number (APN). There were 119 accounts that matched an APN within the City's GIS Parcel database; the remaining 43 accounts did not have sufficient address or APN information to be located at this time. In total, the accounts that were not assigned an APN accounted for less than 10.5 AFY, or 5%, of total average 2010-2013 water consumption and each individually used less than 1.7 AFY. Due to the relatively minor demands associated with these users, further investigation into these accounts is not planned at this time.

Three users were identified that do not have separate irrigation meters but who are known to have significant irrigation water use: Francis Judkins Middle School, Shell Beach Elementary School and the Everett Estate, a private residence. For these accounts, the City provided FY 2010-2013 water consumption data which included the total indoor and outdoor water use. The average consumption readings for the two lowest billing periods, which occurred in February and April of each year, were assumed to represent the base indoor water use. The additional incremental water use throughout the year was assumed to equal the outdoor irrigation water use.

The top 38 potential RW uses over 2 AFY are shown in Table 5-4 on page 5-4, Figure 5-1 on page 5-5 and Figure 5-2 on page 5-6. The users are generally numbered by largest use first, however some users do not follow this rule as their demands were clarified after the initial ID numbers were assigned. The complete list of 123 accounts were considered in the alternatives evaluation and are listed in Appendix B. Only the top 38 are listed in this chapter for brevity.

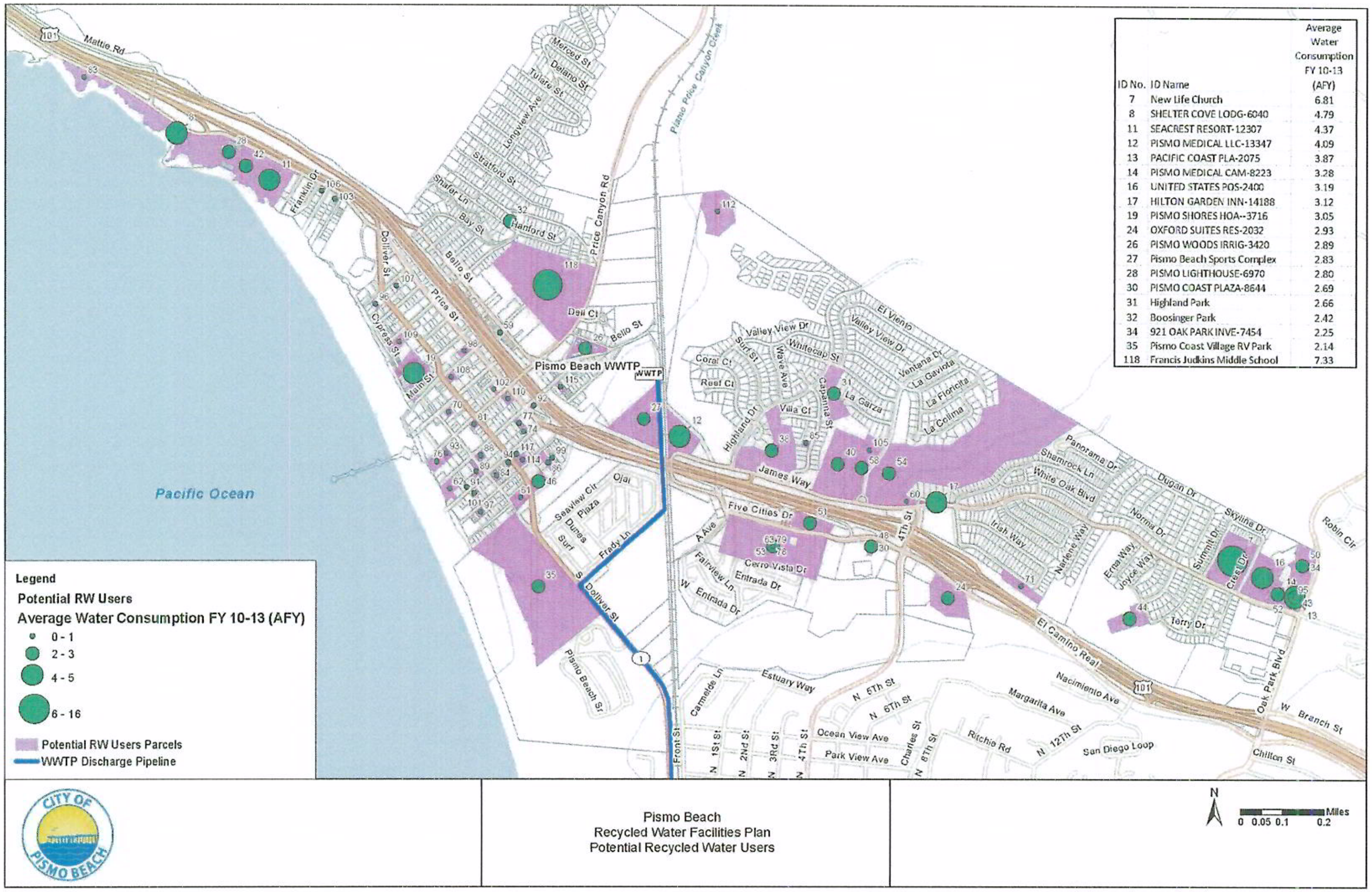
Table 5-4. Disinfected Tertiary RW Use- Top 38 Potential Customers

ID No.	ID Name	Account	Address	APN	Average Irrigation Consumption 2010-2013 (AFY)	RRWSP ID No. & Name
1	Palisades Park	1774	EL DORADO	010-154-033	15.91	14 Palisades Park
2	Cal Trans (Hwy 101) Irrigation	461	928 SHELL BEACH	Caltrans	14.36	3 Cal Trans (Hwy 101) Irrigation
3	Dinosaur Cave Park	8289	200 CLIFF	010-345-013	9.36	5 Dinosaur Cave Park
4	Baycliff Condos HOA	944	510 1/2 FOOTHILL	010-071-068	8.46	1 Baycliff Condos HOA
119	Shell Beach Elementary School	507	2100 Shell Beach Road	010-221-009	8.40	20 Shell Beach School
118	Francis Judkins Middle School	3929	680 Wadsworth	005-041-021	7.32	8 Francis Judkins MS
5	CLIFFS SHELL BEAC-4606	4606	2757 SHELL BEACH	010-041-044	7.03	
7	New Life Church	3150	990 JAMES	005-403-045	6.80	27 New Life Church
8	SHELTER COVE LODG-6040	6040	2651 PRICE	005-261-001	4.78	
9	SPYGLASS RIDGE HO-8999	8999	MATTIE	010-045-041	4.67	
10	RANCHO PACIFICA H-8168	8168	MATTIE	010-072-038	4.40	
11	SEACREST RESORT-12307	12307	2241 PRICE	005-261-005	4.36	
12	PISMO MEDICAL LLC-13347	13347	2 JAMES	005-271-004	4.08	
13	PACIFIC COAST PLA-2075	2075	OAK PARK	005-391-062	3.86	
6	Everett Estate	493	2801 Shell Beach Road	010-152-008	3.82	7 Everett Estate
14	PISMO MEDICAL CAM-8223	8223	941 OAK PARK	005-391-062	3.28	
15	SPYGLASS RIDGE HO-946	946	CALLE CONSUETTA	010-044-052	3.20	
16	UNITED STATES POS-2400	2400	100 CREST	005-391-060	3.18	
17	HILTON GARDEN INN-14188	14188	601 JAMES	14188	3.11	
18	SPYGLASS RIDGE VI-941	941	BARCELONA	010-045-034	3.10	
19	PISMO SHORES HOA--3716	3716	100 PISMO	005-301-054	3.05	
20	PLAYA DEL SOL HOA-4668	4668	PLAYA DEL SOL	010-083-054	3.02	
21	SPYGLASS RIDGE VI-942	942	COSTA DEL SOL	010-084-038	2.99	
22	Seacliff Park	7686	BEACHCOMBER SOUTH	010-144-025	2.97	19 Seacliff Park
23	South Palisades Park/Walk	1941	SHELL BEACH	010-551-048	2.93	21 South Palisades Park/Walk
24	OXFORD SUITES RES-2032	2032	651 FIVE CITIES	005-242-042	2.92	
25	Spyglass Park	1104	2551 SPYGLASS	010-051-001	2.91	22 Spyglass Park
26	PISMO WOODS IRRIG-3420	3420	442-480 BELLO	005-311-040	2.89	
27	Pismo Beach Sports Complex [1]	4445	FRADY-FORD FIELD	005-271-003	2.83	16 Pismo Beach Sports Complex
28	PISMO LIGHTHOUSE-6970	6970	2411 PRICE	005-263-071	2.79	
29	DOLPHIN BAY HOTEL-8379	8379	2727 SHELL BEACH	010-041-028	2.77	
30	PISMO COAST PLAZA-8644	8644	FIVE CITIES	005-242-050	2.69	
31	Highland Park	2396	87 WHITECAP	005-385-055	2.66	9 Highland Park
32	Boosinger Park	4021	821 WADSWORTH	005-018-006	2.42	2 Boosinger Park
33	VILLAS ANTIQUA HO-882	882	2074 COSTA DEL SO	010-045-001	2.30	
34	921 OAK PARK INVE-7454	7454	921 OAK PARK	005-391-064	2.24	
35	Pismo Coast Village RV Park	5977	165 S DOLLIVER	005-241-053	2.13	17 Pismo Coast Village RV Park
36	SEARIDGE OWNERS A-868	868	SEARIDGE	010-141-027	2.05	

[1] Prior to July 2013 the Pismo Beach Sports Complex used private wells, which did not give an accurate estimate for future RW demand. Therefore, values from Fiscal Year 2013/14 were used.

ID No.	ID Name	Average Water Consumption FY 10-13 (AFY)
1	Palisades Park	15.91
2	Cal Trans (Hwy 101) Irrigation	14.37
3	Dinasour Cave Park	9.36
4	Baycliff Condos HOA	8.47
5	CLIFFS SHELL BEAC-4606	7.04
6	Everett Estate	3.82
9	SPYGLASS RIDGE HO-8999	4.67
10	RANCHO PACIFICA H-8168	4.40
15	SPYGLASS RIDGE HO-946	3.20
18	SPYGLASS RIDGE VI-941	3.11
20	PLAYA DEL SOL HOA-4668	3.02
21	SPYGLASS RIDGE VI-942	3.00
22	Seacliff Park	2.98
23	South Palisades Park/Walk	2.93
25	Spyglass Park	2.92
29	DOLPHIN BAY HOTEL-8379	2.77
33	VILLAS ANTIQUA HO-882	2.31
36	SEARIDGE OWNERS A-868	2.05
119	Shell Beach Elementary School	8.40

Figure 5-1. Potential Disinfected Tertiary RW Use - Northern Section Map



ID No.	ID Name	Average Water Consumption FY 10-13 (AFY)
7	New Life Church	6.81
8	SHELTER COVE LODG-6040	4.79
11	SEACREST RESORT-12307	4.37
12	PISMO MEDICAL LLC-13347	4.09
13	PACIFIC COAST PLA-2075	3.87
14	PISMO MEDICAL CAM-8223	3.28
16	UNITED STATES POS-2400	3.19
17	HILTON GARDEN INN-14188	3.12
19	PISMO SHORES HOA--3716	3.05
24	OXFORD SUITES RES-2032	2.93
26	PISMO WOODS IRRIG-3420	2.89
27	Pismo Beach Sports Complex	2.83
28	PISMO LIGHTHOUSE-6970	2.80
30	PISMO COAST PLAZA-8644	2.69
31	Highland Park	2.66
32	Boosinger Park	2.42
34	921 OAK PARK INVE-7454	2.25
35	Pismo Coast Village RV Park	2.14
118	Francis Judkins Middle School	7.33

Figure 5-2. Potential Disinfected Tertiary RW Use -Southern Section Map

5.2 PRELIMINARY HYDROGEOLOGICAL ASSESSMENT OF GROUNDWATER RECHARGE WITH RECYCLED WATER

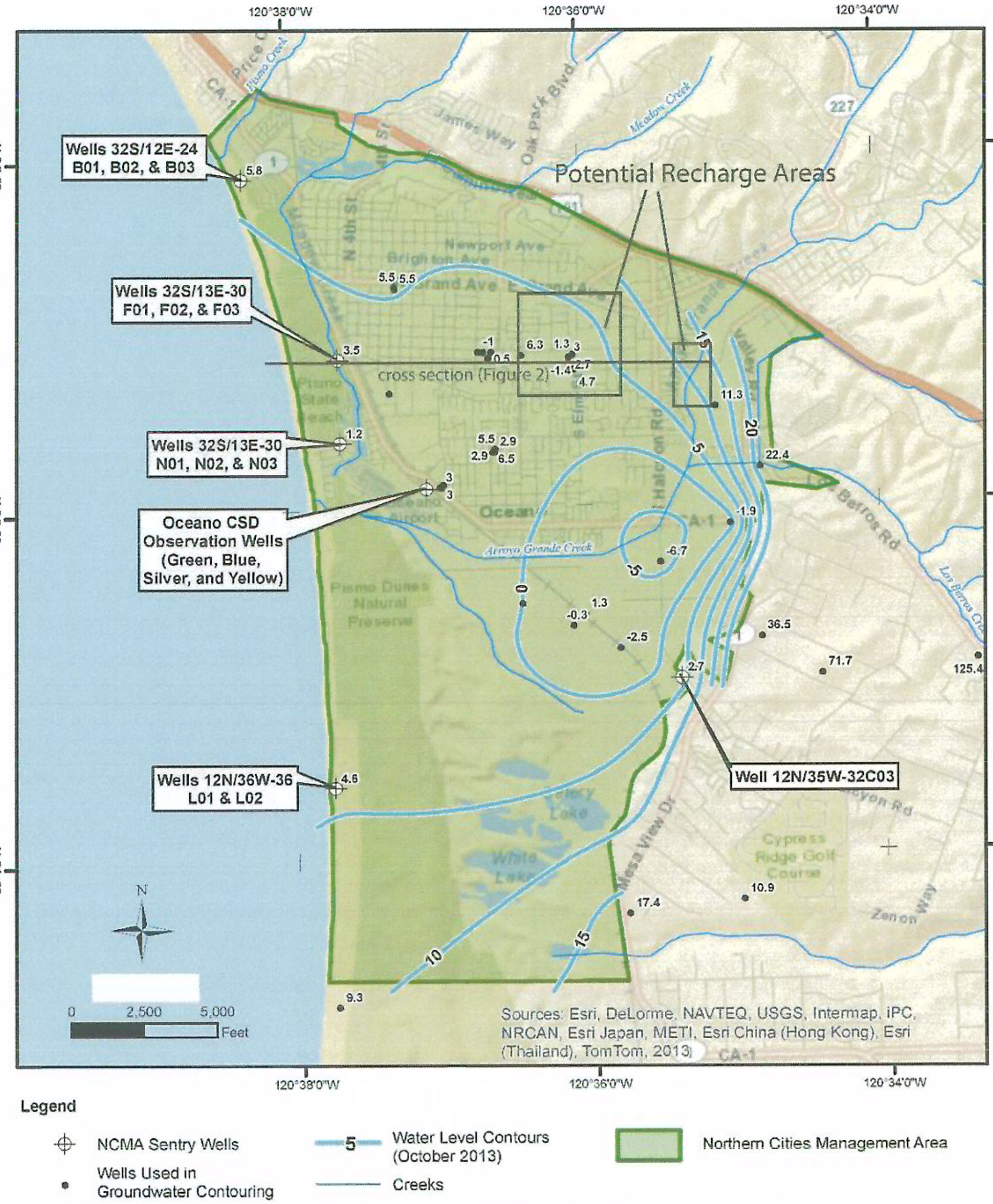
As part of this RWFPS, Cleath-Harris Geologists, Inc. (CHG) prepared a Technical Memorandum (TM) documenting their Preliminary Hydrogeologic Assessment of Groundwater Recharge with Recycled Water (Hydrogeologic Assessment TM). The Hydrogeologic Assessment TM is attached in Appendix C and a summary of the findings is presented below. This preliminary assessment is based on hydrogeologic data contained in published reports, as well as the August 2014 Draft Santa Maria Groundwater Basin Characterization prepared by Fugro under contract with the County. There are no groundwater models published for this area. The Hydrogeologic Assessment TM presents conceptual design criteria based on preliminary and conservative assumptions developed through review of available data. Hydraulic constraints and the impact of regional groundwater extractions should be investigated further on a site specific basis to refine the design criteria.

The Hydrogeologic Assessment TM evaluated the feasibility of recharge basins and/or injection wells for groundwater recharge within the NCMA. The area of focus was bounded by Grand Avenue and Highway 1, where the municipal/public water supply wells are located. In this area, groundwater levels vary seasonally and regionally from 10 ft below sea level to 15 ft above sea level with the lower levels closer to the coast. Pumping depressions occur in close proximities to producing wells. The available groundwater storage in this area is roughly estimated to be 1,000 - 1,500 AF. Due to limited storage capacity in the basin, the ability to continuously inject water depends upon maintaining similar extraction rates at municipal wells.

5.2.1 Surface Spreading

The NCMA area is generally underlain by aquitards that can perch water in the upper dune sands; however, these silt and clay aquitards are not present everywhere and may not totally restrict downward migration of percolated groundwater. Based on a review of geologic cross sections, the Hyrdogeologic Assessment TM identified boundaries within which surface spreading would reach the aquifers used for municipal supply. These areas are shown in Figure 5-3 on page 5-8. Within these areas, the City of Arroyo Grande operates several stormwater infiltration basins. The assessment evaluated whether these existing basins could be used in the dry season to recharge the groundwater basin.

Two basins were identified that have potential for use as RW percolation sites: the Ash Street Basins and the Poplar Street basin. For planning level GRRP siting, the Groundwater Recharge Regulations require a minimum retention time of 8 months if based on numerical modeling estimates. To achieve an 8-month retention time from municipal water supply wells of 8 months, a required setback of 550 feet is estimated. Because the City of Arroyo Grande has several wells very close to the Ash Street Basins, it may be difficult to prove that this retention time can be achieved so the Ash Street basins were not considered further. The Poplar Basin is the only remaining stormwater basin under consideration. It is estimated that 50 – 100 AFY of RW could be recharged this location during the dry season, which is assumed to span eight months.



Sources: Base Map: Fugro Consultants, Northern Cities Management Area 2013 Annual Report Figure 10;
Cross section alignment from DWR Bulletin 63-3

Figure 1
Location Map
Recycled Water Facilities Planning Study
City of Pismo Beach

Cleath-Harris Geologists

Figure 5-3. Potential Groundwater Recharge Areas in the NCMA

5.2.2 Subsurface Injection

The Hydrogeologic Assessment TM also developed conceptual design criteria for both inland and coastal injection wells. It was estimated that a setback of 200 ft is required to achieve a minimum 8 month retention time for injection wells.

For inland injection, each well is assumed to be capable of injecting 200-300 AFY based on the transmissivity of the aquifers. The wells would be designed to inject into the main aquifer zones with total depths ranging from 400-600 ft. The total available injection capacity in the area where the municipal/public water supply wells are located is estimated to at 1,000 to 1,500 AFY. However, the capacity could be higher, considering additional unsaturated aquifers within the pumping depression area. It is estimated that 75% of the water injected could be recovered by municipal wells for beneficial use.

For coastal injection, the wells would be designed to pump into the aquifer zones which have exhibited evidence of seawater intrusion. A steady state groundwater flow model was constructed to conduct preliminary analysis for the seawater intrusion barrier wells. Based on model predictions, it was determined that three (3) injection wells, spaced at 4,000 ft apart would be sufficient to effect a seawater intrusion barrier by injecting a combined 350 AFY. Additional water, up to 1,100 AFY total, could be injected at these well locations provided that the three (3) nearby Pismo Beach and Oceano CSD wells produce a total of 800 AFY to limit groundwater pressure heads. It is estimated that 70% of the water injected could be recovered by municipals wells for beneficial use.

For each injection well, two monitoring wells would be needed to satisfy the Groundwater Recharge Regulations. Monitoring wells would be equipped with water level and water quality monitoring equipment.

Maintenance of the injection wells would involve monitoring of pressures, frequent inspections and cleaning out the well casings and removing microbial build-up once every two years. This bi-annual maintenance could be completed within 2 weeks.

5.3 STAKEHOLDER OUTREACH

Throughout the preparation of this RWFPS, the City encouraged the other NCMA agencies to participate in the discussion and development of RW alternatives.

A kickoff workshop was conducted on April 23, 2014 to define the project goals and objectives and to identify opportunities for joint use alternatives with the other NCMA agencies as well as coordination needs. Representatives from the cities of Arroyo Grande and Grover Beach were invited to the workshop. A representative from the City of Arroyo Grande attended the Kickoff workshop and provided input on the goals and objectives and expressed the City of Arroyo Grande's interest in continuing to explore joint RW use opportunities with the City.

A RW discussion was conducted during an NCMA Technical Group Meeting on May 12, 2014, which was attended by representatives from the Cities of Pismo Beach, Arroyo Grande and Grover Beach as well as Oceano CSD and SSLOCSD. Topics included a discussion of coordination with potential future SSLOCSD

RW projects, an update on the City's Study, a discussion of potential grant funding available and a request for available stormwater basin data.

An alternatives development workshop was held on June 30, 2014 to develop RW project alternatives to be evaluated as part of this RWFPS. Representatives from the cities of Arroyo Grande and Grover Beach were invited to the workshop and a representative from the City of Arroyo Grande participated in the workshop.

A presentation was conducted at the regular City Council meeting on August 19, 2014 to present the project status, potential RW project alternatives and a preliminary quantification of RW landscape irrigation demands within the City. This was a noticed public meeting.

An alternatives selection workshop was held on October 20, 2014 to review the alternatives analysis, evaluate alternatives and select a preferred alternative. Representatives from The cities of Arroyo Grande and Grover Beach were invited to the workshop and a representative from the City of Grover Beach participated in the workshop.

A workshop was held on December 23, 2014 to review and discuss the Draft Study. Representatives from The cities of Arroyo Grande and Grover Beach were invited to the workshop

A second presentation to the City Council will be conducted following City staff's review of the Draft Final Study to present the project status, the recommended alternative, associated costs (capital and O&M), and to seek input from the City Council. This will also be a noticed public meeting.

6 PLANNING AND DESIGN ASSUMPTIONS

This section presents the criteria applied to the project alternatives evaluated in this RWFPS and includes:

- Facilities planning and design criteria
- Planning level cost estimate assumptions

6.1 FACILITIES PLANNING AND DESIGN CRITERIA

RW 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)

The basis for sizing RW facilities is presented in Table 6-1.

Table 6-1. RW Facility Planning and Design Criteria

Facilities	Design Criteria
Distribution System Facilities	
Pipelines	Sized to maintain a headloss gradient of less than 10 ft of headloss per 1000 ft of pipeline during peak hour.
Booster Pump Stations	Capacity based on peak hour demand (assumes no gravity system storage) Station efficiency is assumed to be 75% All pumps will have Variable Frequency Drives (VFDs) Irrigation system booster stations will be equipped with a hydropneumatic tank to control pressure variations
System Storage	Capacity based on maximum day demand
Injection Well Site Size	50' x 50' permanent site; additional construction easements based on site specific requirements
Customer Facilities	
Customer Facilities	Requirements will be site specific based on existing system configuration and use area characteristics. Assume average costs for dedicated services and combined systems. See Section 6.1.1 for more information.

6.1.1 Customer Conversion Costs

For this RWFPS, on-site customer facility costs to convert existing potable water irrigation services to RW irrigation services are estimated based on the anticipated level of complexity of the conversion and are classified into two types: (1) dedicated services and (2) combined systems. Conversion for customers who already have a dedicated irrigation service which is separate from their potable service is anticipated to be less complex due to the existence of separate piping systems. This type of conversion would require tie-over of the existing meter to the RW system and minor on-site retrofits such as painting RW appurtenances purple, installing signage, retrofitting or removing hose bibs and adjusting sprinklers to minimize overspray and runoff. The cost of a dedicated service conversion is estimated at $10,000. A combined system which currently serves the domestic and irrigation systems through one service connection and shared on-site piping is anticipated to be more complex. This category applies to customers such as parks and schools which often have restrooms and drinking fountains that are served from a shared piping system. The conversion of a combined system would require research of the existing piping system to identify cross connections, installation of a new RW meter and service line from the RW system to the point of RW use on-site, elimination of cross connections with the potable system, and the minor retrofits described for the dedicated service conversion. The cost of a combined service conversion is estimated at $50,000. A cross-connection inspection and on-site supervisor training would be provided for all customer types.

Actual customer conversion costs will vary depending on the complexity of the existing domestic and irrigation systems on each site. Each site will require an individual investigation to determine the retrofits required to separate the RW system from the potable system and cost estimates should be refined accordingly as the project develops.

6.1.2 Irrigation Demand Peaking Factors

Seasonal and hourly irrigation demand peaking factors used in the 2010 Wallace Group Report, the 2007 Carollo Water Reuse Study and the RRWSP were developed based on rainfall and evapotranspiration rates and assumed that all irrigation use would be spread equally over an 8-hour period overnight. WSC also reviewed the peaking factors developed for the *Draft Recycled Water Master Plan Update – City of San Luis Obispo, Wallace Group, 2014* (2014 Wallace Group Draft Report). The City of San Luis Obispo (SLO) developed a RW distribution system in 2006 and has been serving irrigation customers similar to those identified in Pismo Beach, including schools, parks, freeway landscape, commercial landscape and a sports complex. As part of the 2014 Wallace Group Draft Report, the peaking factors developed for the City of SLO's RW demands were compared to actual hourly demands in 2013 recorded by the City of SLO's SCADA system. Based on this comparison, the peaking factors were determined to be reasonable. Due to the similar nature of RW use and the availability of actual hourly demand data for comparison, the peaking factors used in the 2014 Wallace Group Draft Report are applied in this RWFPS. The peaking factors used in this RWFPS are presented in Table 6-2.

Table 6-2. Irrigation Demand Peaking Factors

Peaking Factors		
Maximum Month	2.5	Times Average Annual Demand
Maximum Day	1.2	Times Maximum Month
Peak Hour	3.5	Times Maximum Day

6.2 PLANNING LEVEL COST ESTIMATES

Planning level cost estimates were developed for each of the alternatives presented in this chapter. Assumptions used as the basis of these cost estimates are discussed in this section.

6.2.1 Cost Opinion Basis

The cost opinions included in this RWFPS are prepared in conformance with industry practice and, as planning level cost opinions, will be ranked as a Class 4 Conceptual Opinion of Probable Construction Cost as developed by the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The AACE classification system is intended to classify the expected accuracy of planning level cost opinions, and is not a reflection on the effort or accuracy of the actual cost opinions prepared for the RWFPS. According to AACE, a Class 4 Estimate is to intended to provide a planning level conceptual effort with an accuracy that will range from -30% to +50% and includes an appropriate contingency for planning and feasibility studies. The conceptual nature of the design concepts and associated costs presented in this RWFPS are based upon limited design information available at this stage of the projects.

These cost estimates have been developed using a combination of data from RS Means CostWorks®, recent bids, experience with similar projects, current and foreseeable regulatory requirements and an understanding of the anticipated project components. As the projects progress, the design and associated costs could vary significantly from the project components identified in this RWFPS.

For projects where applicable cost data is available in RS Means CostWorks® (e.g. pipeline installation), cost data released in Quarter 2 of 2014, adjusted for San Luis Obispo, California, is used. Material prices were adjusted in some cases to provide estimates that align closer with actual local bid results.

For projects where RS Means CostWorks® data is not available, cost opinions are generally derived from bid prices from similar projects, vendor quotes, material prices, and labor estimates, with adjustments for inflation, size, complexity and location.

Cost opinions are in 2014 dollars (ENR 20 City Average Construction Cost Index of: 9,800 for June 2014). When budgeting for future years, appropriate escalation factors should be applied.

Cost opinions are planning-level and may not fully account for site-specific conditions that will affect the actual costs, such as soils conditions and utility conflicts.

6.2.2 Markups and Contingencies

For the development of the planning level cost estimates, several markups and contingencies are applied to the estimated construction costs to obtain the total estimated project costs. The markups are intended to account for costs of engineering, design, administration, and legal efforts associated with implementing the project (collectively, Implementation Markup). For the RWFPS, two different Implementation Markups are used depending on the type of project. Irrigation projects have a 30% markup, while GRRPs have a 40% markup. This difference is to account for the greater number of studies required and the extended implementation schedule of a GRRP.

Unaccounted-for Items and Contingency account for additional construction costs that could not be anticipated at the time of this analysis. A summary of the markups and contingencies applied in this RWFPS are presented in Table 6-3 on page 6-4.

Table 6-3. Capital Cost Estimating Assumptions

	Estimated Construction Cost
+	20% of Construction Subtotal for Contingency
+	20% of Construction Subtotal for Unaccounted-for items
=	**Subtotal 1**
+	30% of Subtotal 1 for Irrigation (or 40% of Subtotal 1 for GRRP) for Implementation Cost
=	**Total Capital Cost**

6.2.3 Excluded Costs

- Overall Program Management. If the magnitude of the capital program exceeds the capacity of City staff to manage all of the work, then the services of a program management team may be required
- Public Information Program. Depending on the relative public acceptability of a major RW facility or a group of facilities, there may be a need for a public information program, which could take many different forms. It is recommended that the City engage in a proactive public outreach program in coordination with other existing or planned outreach programs

6.2.4 Capital Cost Estimate Comparison for Alternatives

Unit costs of the various alternatives are 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 this RWFPS. 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:

- 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 2004 to June 2014). The average annual escalation rate for California CCI is 3.6%, while the average annual inflation rate for CPI is 2.3%.
- Project Financing: Interest Rate & Payback Period: 5% over 30 years. This assumption was used to coincide with the RRWSP. It should be noted that multiple lower-interest funding programs are available, including the SRF loans, which the City is currently pursuing for other projects. Refer to Chapter 10 for further discussion of SRF and other financing 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, this RWFPS assumes that all facilities have a useful life matching the financing payback period of 30 years.

7 PROJECT ALTERNATIVES ANALYSIS

7.1 ALTERNATIVES EVALUATED

Based on discussions at the alternatives development workshop, a total of four alternatives were identified to be further developed and evaluated in this RWFPS. These alternatives include:

- Alternative 1: Providing RW at Disinfected Secondary-23 standards for restricted reuse
- Alternative 2: Providing RW at Disinfected Tertiary standards for unrestricted landscape irrigation
- Alternative 3a: Providing RW that meets the standards for groundwater recharge for injection as a coastal intrusion barrier
- Alternative 3b: Providing RW that meets the standards for groundwater recharge for injection directly into the inland aquifer

7.1.1 Alternative 1 – Secondary 23

Secondary-23 RW may only be used to irrigate restricted access areas such as cemeteries, freeway landscaping or restricted access golf courses.

7.1.1.1 Potential Water Use

Within Pismo Beach, there are four potential customer connections: three Caltrans meters for freeway landscape irrigation and James Way Slopes for restricted landscape irrigation. The three Caltrans connections will demand a total 14.4 AFY and James Way Slope would use 2.3 AFY, as shown in Table 5-2 on page 5-2. The total demands for alternative will be 16.6 AFY, which accounts for approximately 1% of the current effluent. The remaining 99% of the WWTP effluent will continue to be discharged to the existing ocean outfall.

The Secondary-23 RW effluent could also be used for soil compaction and for dust control; however, the potential demand associated with these types of uses is variable and difficult to quantify. These uses are not evaluated as part of this alternative.

7.1.1.2 Storage, Pumping & Distribution System

This alternative will require a 40,000 gallon reservoir and a 1 hp booster pump located at the WWTP. The City will also need to install approximately 21,900 LF of 6-inch pipeline from the WWTP to the four customer connections. Figure 7-1 on page 7-4 illustrates the conceptual layout for Alternative 1.

7.1.1.3 Treatment Upgrades

Although water quality of the City's existing WWTP effluent is not consistent with disinfected secondary-23 RW standards, the City recently conducted a disinfection test to determine if the existing plant is capable of meeting these standards. The results of this initial test resulted in inconsistent effluent MPN values which were often higher than the Secondary-23 limits and the chlorine residual was unexpectedly high. However, it is believed that a plant upset that occurred prior to testing may have contributed to the inconsistent plant performance. Toward the end of the test, the MPN was trending down toward the required levels to meet Secondary-23 standards, indicating Secondary-23 effluent may be achievable with minor modifications. The City may conduct additional testing including water quality sampling to investigate the source of the chlorine demand, more frequent maintenance of the chlorine contact chamber to mitigate sludge buildup and a tracer test to investigate whether mixing and contact time in the chlorine contact chamber is sufficient.

This alternative is based on the existing plant being able to meet Secondary-23 standards and does not include costs for treatment upgrades. If the existing plant is found to be unable to meet Secondary-23 standards, or upgrades are needed to improve reliability of performance, treatment upgrade costs for this alternative should be revisited.

7.1.1.4 Unit Cost

The unit cost for Alternative 1 consist of the capital and O&M costs of the 40,000 gallon reservoir, booster pump, 21,900 LF 6-inch pipeline and the 4 dedicated meter conversions. As discussed in Section 7.1.1.3, this alternative assumes upgrades to the WWTP are not required; therefore, no additional WWTP treatment capital and O&M costs are included. Table 7-1 provides the estimated unit cost. The unit cost per AF is $15,900. Detailed calculations are included in Appendix D.

Table 7-1. Unit Cost of Alternative 1

Segment	Annual Average (AFY)	Total Capital Cost	Cumulative O&M Cost	Unit Cost $/AF
1	16.6	$ 4,963,000	$ 44,000	$ 15,900

7.1.1.5 Advantages and Disadvantages

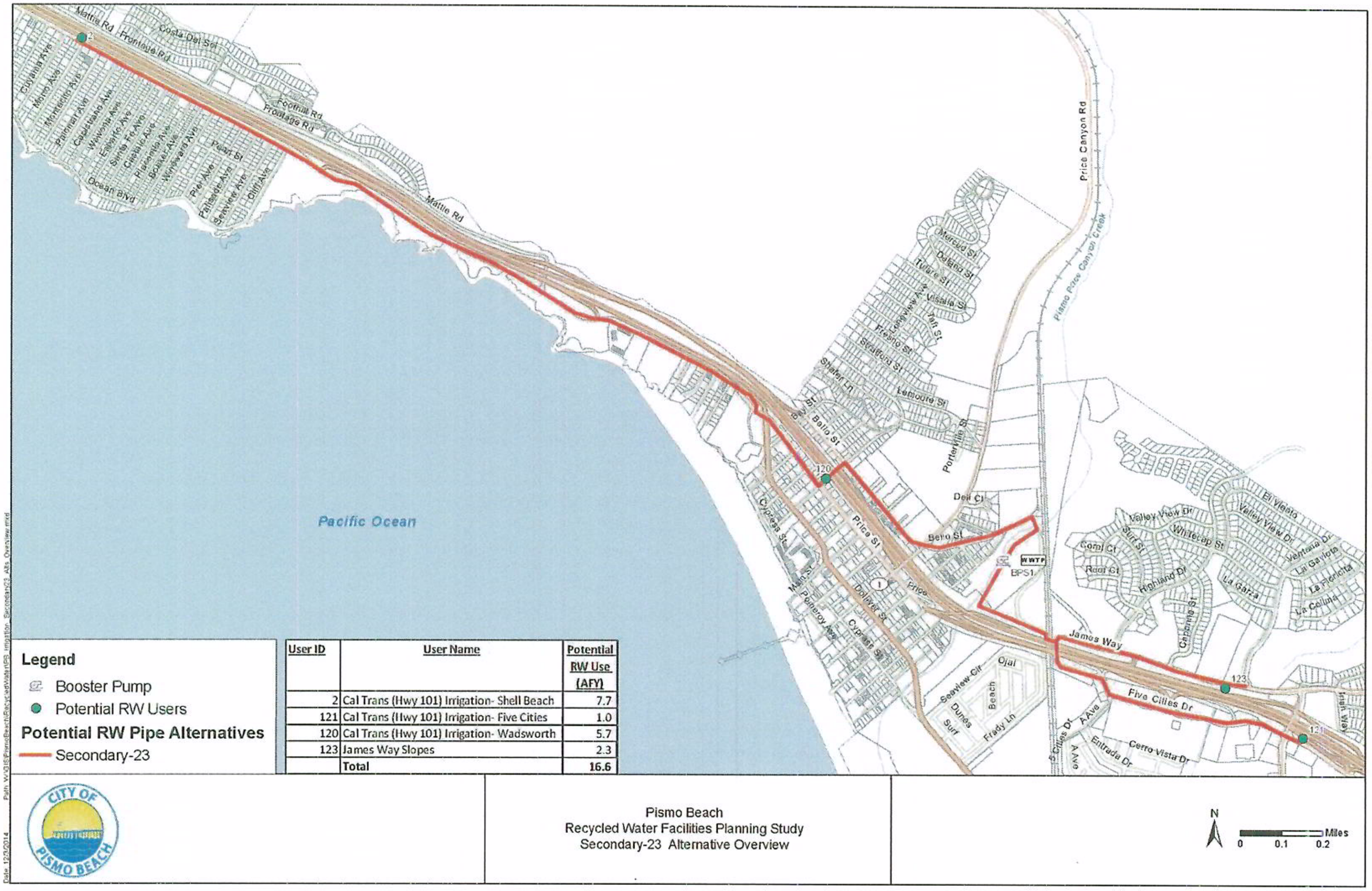
As discussed in Section 7.1.1.3, Alternative 1 may not require treatment upgrades to the existing WWTP process. As a result, this alternative could be implemented in a relatively short time period.

Alternative 1 meets the City's goal to develop a local, sustainable and highly reliable water supply and provides a direct offset to some potable water use. However, with reuse of only 1% of the WWTP effluent, the volume of water put to beneficial use is very small. The remaining 99% of the effluent would continue to be discharged to the ocean outfall.

The approved uses for Secondary-23 water limit the available reuse options and only four customers were identified within the City. Alternative 1 could be expanded to include the potential City of Arroyo Grande Secondary-23 customers listed in Table 5-3 on page 5-2; however, a significant length of pipeline would have to be added. The unit cost would remain high while the percent of reuse percent would remain low, so this was not evaluated as part of Alternative 1.

The primary disadvantage is the exceptionally high unit cost. Since the four customer connections are spread throughout the City, there is a large pipeline cost which greatly increases the unit cost per AF beyond reasonable values. Additionally, Alternative 1 does not benefit the other NCMA agencies.

Caltrans previously expressed an interest in installing RW piping within the City to convert their existing freeway landscape irrigation services to RW; however, the City was recently informed by Caltrans that funding for this for conversion is not currently available. If Caltrans funding becomes available to fund a portion of the infrastructure under this alternative, the effective unit cost of this alternative could potentially be reduced.



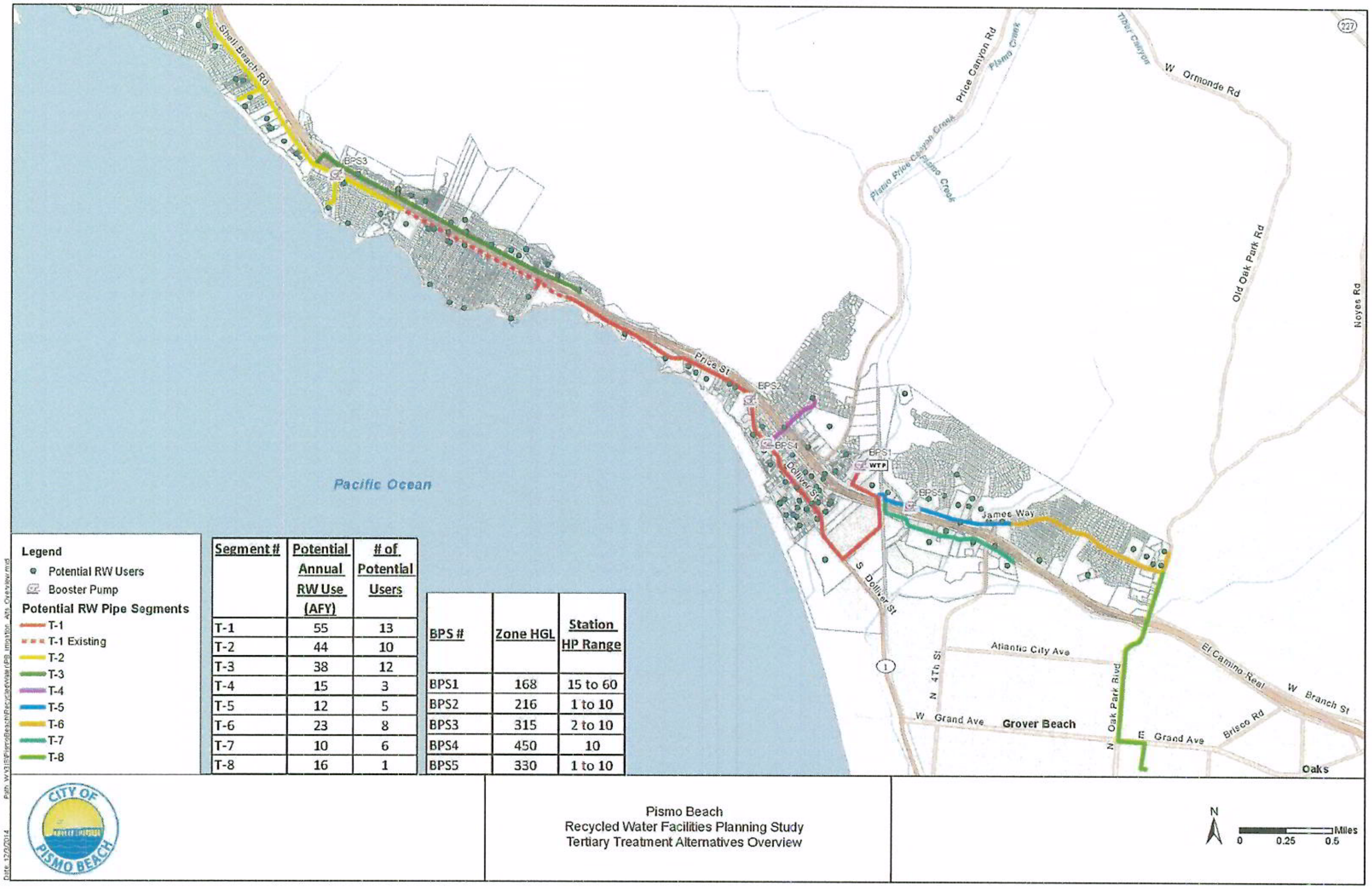
User ID	User Name	Potential RW Use (AFY)
2	Cal Trans (Hwy 101) Irrigation- Shell Beach	7.7
121	Cal Trans (Hwy 101) Irrigation- Five Cities	1.0
120	Cal Trans (Hwy 101) Irrigation- Wadsworth	5.7
123	James Way Slopes	2.3
	Total	**16.6**

Figure 7-1. Alternative 1 – Secondary-23 Overview

7.1.2 Alternative 2 – Disinfected Tertiary

Alternative 2 consists of upgrading the current WWTP to include tertiary treatment for unrestricted irrigation for existing customers within the City. Additionally, the Groundwater Recharge Regulations allow for disinfected tertiary RW to be reused for surface spreading with an initial RWC of 20% and blend water of 80%. This alternative will utilize disinfected tertiary RW for irrigation of parks, school yards, Caltrans freeway landscape and commercial/residential landscape as well as surface spreading at an existing storm water infiltration pond.

Alternative 2 includes eight pipeline segments (T-1 through T-8). Segments T-1 through T-7 will serve groups of irrigation customers within the City. Segment T-8 delivers water to the Poplar Storm Water Basin in the City of Arroyo Grande for surface spreading. The segments are organized incrementally and will be constructed in sequence as additional customer connections are desired. A conceptual layout of Alternative 2 is shown in Figure 7-2 on page 7-6.



Segment #	Potential Annual RW Use (AFY)	# of Potential Users
T-1	55	13
T-2	44	10
T-3	38	12
T-4	15	3
T-5	12	5
T-6	23	8
T-7	10	6
T-8	16	1

BPS #	Zone HGL	Station HP Range
BPS1	168	15 to 60
BPS2	216	1 to 10
BPS3	315	2 to 10
BPS4	450	10
BPS5	330	1 to 10

Figure 7-2. Alternative 2 – Disinfected Tertiary Overview

7.1.2.1 Potential Water Use

As previously stated, Segments T-1 through T-7 serve groups of irrigation customers within the City. To identify these potential customer groups, irrigation customers were screened to include only those with an annual irrigation water use greater than 1 AFY. City owned facilities with annual use less than 1 AFY were also included. Conceptual pipeline segment alignments were selected that would serve the largest customers as well as smaller customers adjacent to the pipeline. In general, segment breaks were placed where a booster station would be required to serve additional customers or where significant piping would be required to reach the next customer.

Segment T-8 conveys RW to the Poplar Street storm water basin in the City of Arroyo Grande for surface spreading, as discussed in 5.2.1. Because Alternative 2 uses Disinfected Tertiary RW, the Groundwater Recharge Regulations set a maximum initial RWC of 20%, as described in Table 4-3. The remaining 80% blend water must be of sufficient quality to meet primary drinking water MCLs. Water quality data for the storm water entering the Poplar Street basin is not available to assess suitability as blend water; however, storm water volume captured in the Poplar basin in estimated for the purposes of determining potentially available blend water volumes. The *2007 Water Balance Study for the Northern Cities Area* (2007 Water Balance) (11) estimates inflows into the basin, including storm water inflows for each of the City of Arroyo Grande storm water basins. Based on the data presented in the 2007 Water Balance, the estimated annual storm water infiltration into the Poplar Street basin is approximately 65 AFY. Based on this blend water volume, up to 16 AFY of RW could be discharged to the Poplar Street basin to meet the maximum initial RWC of 20%. As allowed by the Groundwater Recharge regulations, the RWC could be increased over time if Total Organic Carbon (TOC) concentrations can be maintained below 0.5 mg/l. As noted, the water quality of the blend water may need to be assessed to verify whether the storm water qualifies as blend water. If storm water is found to be of insufficient quality, potable water from the City of Arroyo Grande's adjacent distribution system could be considered as an alternate blend water source.

A summary of the potential RW use for each segment in Alternative 2 is presented in Table 7-2 on page 7-8. As shown, the potential total RW use for this alternative is 214 AFY if all segments are constructed, which provides service to 57 irrigation customers and one surface spreading pond. Figure 7-4 on page 7-11 and Figure 7-5 on page 7-12 shows the locations of potential customers and their annual irrigation water usage.

Based on the FY 2010-2013 average bi-monthly water consumption data provided by the City, the monthly irrigation demands for each segment were identified. The irrigation demand fluctuates seasonally as shown in Figure 7-3 on page 7-8.

To maximize the volume of reuse, the treatment upgrades will be based on daily demands in the maximum month, which occurs in July. The maximum month day (MMD) demands for each segment individually and cumulatively are presented in Table 7-3 on page 7-9.

Table 7-2. Alternative 2 – RW Use and Customers by Segment

Segment	RW Use (AFY)	Number of Customers
T-1	55.1	13
T-2	43.8	10
T-3	37.7	12
T-4	15.4	3
T-5	11.8	5
T-6	23.4	8
T-7	10.4	6
T-8	16.0	1
Alternative 2 Total	**214**	**58**

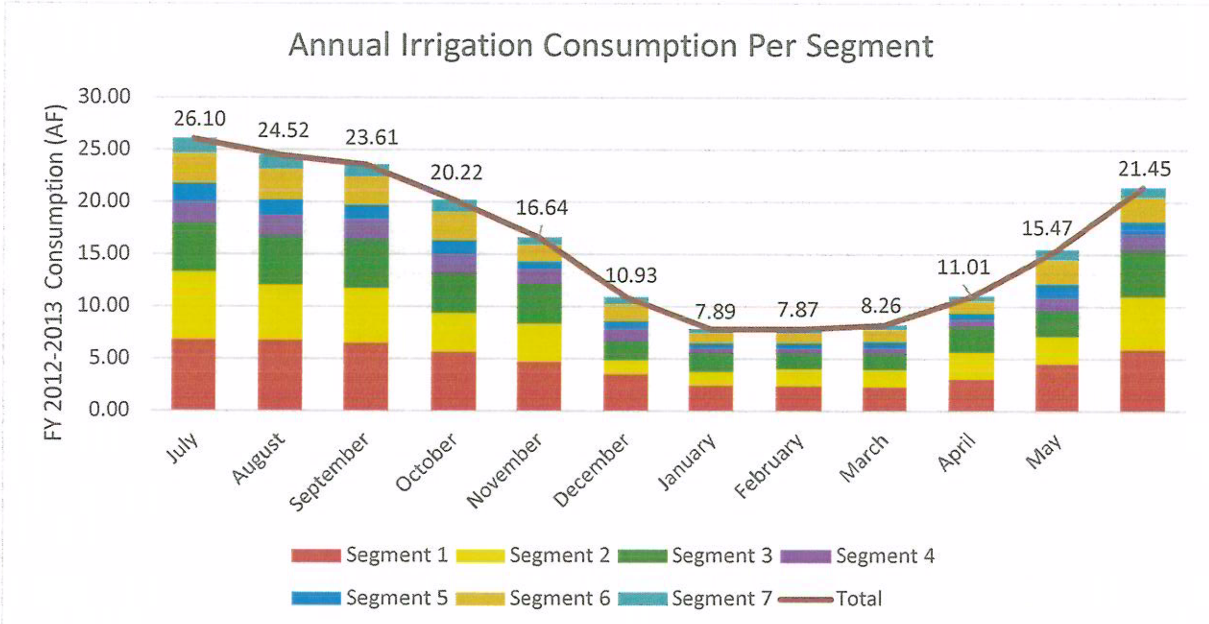


Figure 7-3. Estimated Seasonal Irrigation Consumption Per Segment

Table 7-3. Estimated MMD Demands

Segment	MMD Demand (gpd), July	Cumulative MMD Demand (gpd)
T-1	74,000	74,000
T- 2	73,000	147,000
T-3	49,000	196,000
T-4	21,000	217,000
T-5	19,000	236,000
T-6	31,000	267,000
T-7	15,000	282,000
T-8	14,000	296,000

As summarized in the previous section, the RW produced in this alternative will be used to irrigate school yards, parks and other landscaped areas. To manage potential salinity problems that may eventually develop from the use of RW, the guidelines presented in Section 4.4 can/should be followed by the tertiary irrigation customers.

7.1.2.2 Storage, Pumping & Distribution System

Alternative 2 consists of a 0.6 MG reservoir located at or near the WWTP site along with five booster pumps throughout the system, as shown in Table 7-5 on page 7-10. These booster stations are required to provide reasonable service pressure ranges to customers throughout the City and separate the RW distribution system into five pressure zones. These zones are similar to the existing potable water system zones; however the HGL's for the RW zones will be 10 ft lower than the corresponding potable water zone. This will reduce the risk of backflow of RW into the potable water system in the event of a cross connection. The range of hp for each booster pump presented in Table 7-5 on page 7-10 depends on the number of segments constructed. As more segments are added, the hp requirements increase since each booster needs to be sized to convey the total flow to its respective zone as well as all downstream zones.

Alternatively, the system could be served via elevated storage located northwest of the WWTP at the end of Highland Drive near the City's existing Pacific Estates reservoir. This configuration would only require one booster station at the WWTP. However it would require extra piping and power to pump the entire volume of water to a higher elevation along with several pressure reducing stations. This is anticipated to be a higher cost alternative and is not evaluated further.

This alternative will also include a total of 11.25 miles of distribution pipeline of different sizes. The facilities are summarized in Table 7-4 on page 7-10. A portion of the T-1 segment pipeline is shown as existing in Figure 7-4 on page 7-11. This segment has not yet been installed but is proposed by the City as part of another project. The funding for this pipeline segment is included in another project so it is considered existing for the purposes of this section.

Table 7-4. Alternative 2 Facilities Summary

Segment	Annual Average Demand (AFY)[1]	Cumulative Demand (AFY)	Treatment Capacity (MGD)	Storage (MG)[2]	Cumulative Storage (MG)	Pipelines (miles)	Pipe Size (in)[3]	Number of Booster Pumps Needed[5]
T-1	55	55	0.30	0.15	0.15	2.76	12	2
T-2	44	99	0.30	0.12	0.26	2.57	8	1
T-3	38	137	0.30	0.10	0.37	1.65	6	-
T-4	15	152	0.30	0.04	0.41	0.36	4	1
T-5	12	164	0.30	0.03	0.44	0.75	6	1
T-6	23	187	0.30	0.06	0.50	1.01	6	-
T-7	10	198	0.30	0.03	0.53	0.89	4	-
T-8	16	214	0.30	0.04	0.57	1.27	6	-

Notes:

1. Average Annual Demands are based on 2010-2013 irrigation demands (AFY) and are summed for all customers served by each segment.
2. Storage volume is based on the maximum day demand of each alternative per .
3. Pipeline size/ headloss calculations are provided in Appendix D.
4. 5 total pumps are required if all segments are constructed. Segments are arranged incrementally so the total number of pumps for each segment is equal to the sum of pumps for that segment plus all prior segments

Table 7-5. Alternative 2 Booster Pump Horsepower

Pump ID	Potable Water Zone	Potable Water HGL (ft)	Hydraulic HGL (ft)	Horsepower (hp)[1]
BPS 1	Main	176	166	15 to 60
BPS 2	Shell Beach 1	226	216	1 to 10
BPS 3	Shell Beach 2	325	315	2 to 10
BPS 4	Pismo Oaks	340	330	10
	Pacific Estates	390	330	
BPS 5	Heights 1	460	450	1 to 10

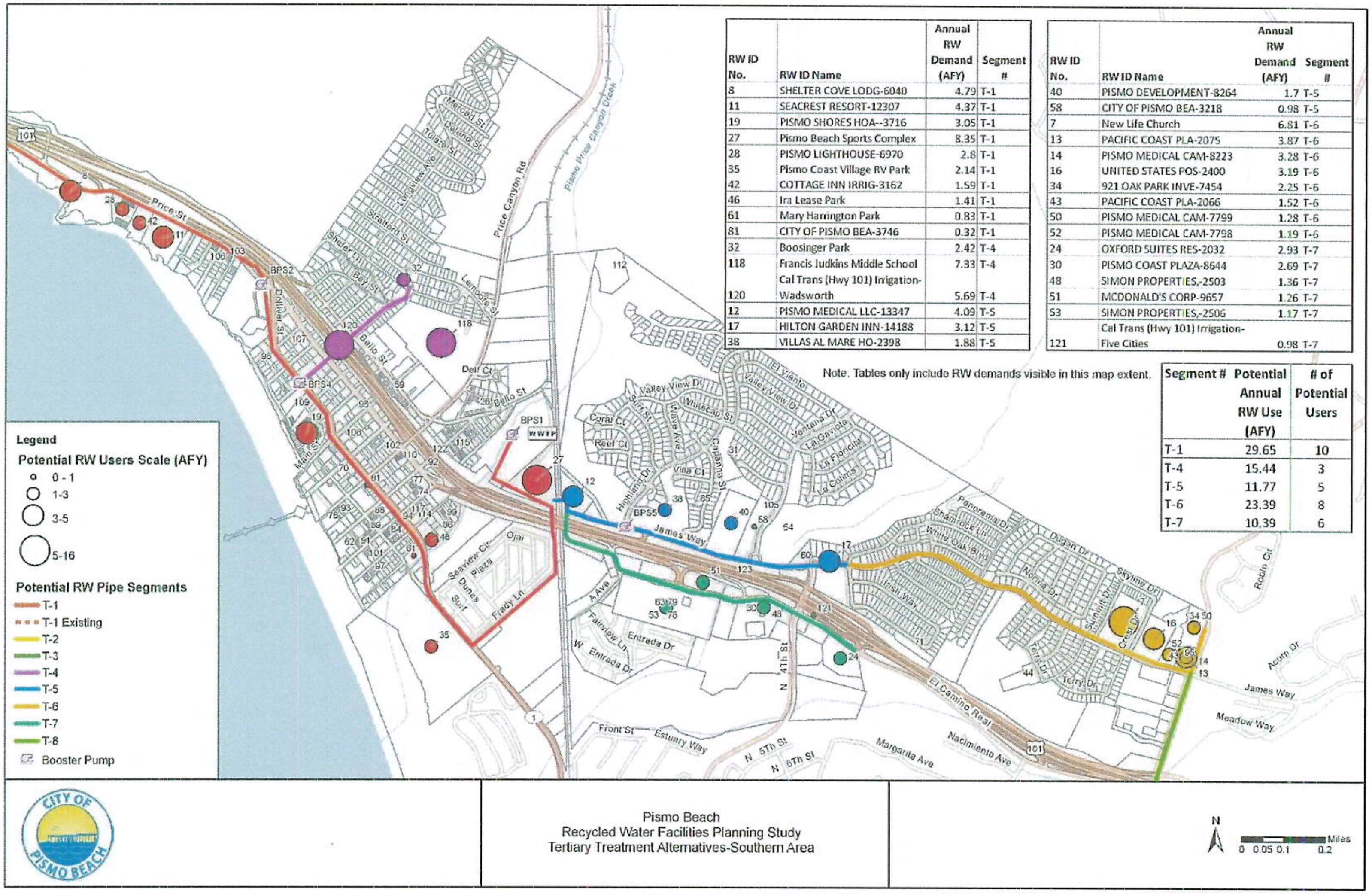
Notes:

1. Horsepower calculations are provided in Appendix D. Horsepower calculations are provided in Appendix D.

RW ID No.	RW ID Name	Annual RW Demand (AFY)	Segment #
2	Cal Trans (Hwy 101) Irrigation- Shell Beach	7.7	T-1
3	Dinasour Cave Park	9.4	T-1
119	Shell Beach Elementary School	8.4	T-1
1	Palisades Park	15.9	T-2
5	CLIFFS SHELL BEAC-4606	7.0	T-2
6	Everett Estate	3.8	T-2
22	Seacliff Park	4.0	T-2
23	South Palisades Park/Walk	2.9	T-2
25	Spyglass Park	2.9	T-2
29	DOLPHIN BAY HOTEL-8379	2.8	T-2
36	SEARIDGE OWNERS A-868	2.1	T-2
49	CITY OF PISMO BEA-6145	1.3	T-2
55	GREEN DOLPHIN HOA-886	1.1	T-2
4	Baycliff Condos HOA	8.5	T-3
9	SPYGLASS RIDGE HO-8999	4.7	T-3
10	RANCHO PACIFICA H-8168	4.4	T-3
15	SPYGLASS RIDGE HO-946	3.2	T-3
18	SPYGLASS RIDGE VI-941	3.1	T-3
20	PLAYA DEL SOL HOA-4668	3.0	T-3
21	SPYGLASS RIDGE VI-942	3.0	T-3
33	VILLAS ANTIQUA HO-882	2.3	T-3
41	SPYGLASS RIDGE VI-952	1.6	T-3
45	RANCHO PACIFICA H-8164	1.5	T-3
47	PRATT CONSTRUCTIO-11686	1.4	T-3
56	EMERALD POINTE LL-1099	1.0	T-3

Segment #	Potential Annual RW Use (AFY)	# of Potential Users
T-1	25.43	3
T-2	43.87311	10
T-3	37.66	12

Figure 7-4. Northern Area - Potential RW Customers



RW ID No.	RW ID Name	Annual RW Demand (AFY)	Segment #
8	SHELTER COVE LODG-6040	4.79	T-1
11	SEACREST RESORT-12307	4.37	T-1
19	PISMO SHORES HOA--3716	3.05	T-1
27	Pismo Beach Sports Complex	8.35	T-1
28	PISMO LIGHTHOUSE-6970	2.8	T-1
35	Pismo Coast Village RV Park	2.14	T-1
42	COTTAGE INN IRRIG-3162	1.59	T-1
46	Ira Lease Park	1.41	T-1
61	Mary Harrington Park	0.83	T-1
81	CITY OF PISMO BEA-3746	0.32	T-1
32	Boosinger Park	2.42	T-4
118	Francis Judkins Middle School	7.33	T-4
120	Cal Trans (Hwy 101) Irrigation-Wadsworth	5.69	T-4
12	PISMO MEDICAL LLC-13347	4.09	T-5
17	HILTON GARDEN INN-14188	3.12	T-5
38	VILLAS AL MARE HO-2398	1.88	T-5

RW ID No.	RW ID Name	Annual RW Demand (AFY)	Segment #
40	PISMO DEVELOPMENT-8264	1.7	T-5
58	CITY OF PISMO BEA-3218	0.98	T-5
7	New Life Church	6.81	T-6
13	PACIFIC COAST PLA-2075	3.87	T-6
14	PISMO MEDICAL CAM-8223	3.28	T-6
16	UNITED STATES POS-2400	3.19	T-6
34	921 OAK PARK INVE-7454	2.25	T-6
43	PACIFIC COAST PLA-2066	1.52	T-6
50	PISMO MEDICAL CAM-7799	1.28	T-6
52	PISMO MEDICAL CAM-7798	1.19	T-6
24	OXFORD SUITES RES-2032	2.93	T-7
30	PISMO COAST PLAZA-8644	2.69	T-7
48	SIMON PROPERTIES,-2503	1.36	T-7
51	MCDONALD'S CORP-9657	1.26	T-7
53	SIMON PROPERTIES,-2506	1.17	T-7
121	Cal Trans (Hwy 101) Irrigation-Five Cities	0.98	T-7

Note. Tables only include RW demands visible in this map extent.

Segment #	Potential Annual RW Use (AFY)	# of Potential Users
T-1	29.65	10
T-4	15.44	3
T-5	11.77	5
T-6	23.39	8
T-7	10.39	6

Figure 7-5. Southern Area - Potential RW Customers

7.1.2.3 Treatment Upgrades

For Alternative 2, the RW will be treated to disinfected tertiary standards. This includes:

1. A filtration process that produces tertiary effluent with less than 2 nephelometric turbidity unit (NTU) within a 24-hour period, 5 NTU more than 5 percent of the time within a 24-hour period, and 10 NTU at any time, and
2. A disinfection process that produces a total coliform bacteria measured in the disinfected tertiary effluent to not exceed a most MPN of 2.2 per 100 mL for a 7-day average, 23 per 100 mL in more than one sample in any 30-day period, and 240 per 100 mL in any sample.

A process flow diagram (PFD) of this alternative is presented in Figure 7-6 on page 7-15. The new processes required for producing Title 22 water are:

1. Tertiary Influent Pump Station
2. Tertiary Filtration
3. Disinfection

7.1.2.3.1 Tertiary Influent Pump Station

Based on the existing hydraulic profile, the treatment system does not have adequate head availability to accommodate two new processes. Therefore, a new tertiary pump station will be required prior to filtration. The pump station will have an initial flow capacity of 75,000 gpd, expandable to an ultimate capacity of 300,000 gpd if all 8 segments are served with RW.

7.1.2.3.2 Tertiary Filtration

Tertiary filters are designed to remove TSS from secondary effluent. There are several filter media options available including fine sand, dual-media (anthracite/sand), upflow sand filter (e.g., DynaSand®), and cloth filters. For this evaluation, cloth filters were selected because of low cost, low energy, and ease of operation, especially at lower flows anticipated at the City's WWTP.

Cloth filter units are completely submerged and the liquid passes through the cloth media in an outside-in mode (by gravity) and entrained solids collect on the cloth filter surface. These solids will lead to head loss across the cloth filter, resulting in rising water levels within the cloth filter tank. At a predetermined tank water level or time, the backwash cycle is initiated and the solids are removed by a stationary backwash suction head.

DDW has established a maximum loading rate of 6.0 gpm/ft^2 for cloth filter operation. However, typical loading rates would be around 3.25 gpm/ft^2. At loading rates up to 4 gpm/ft^2, a standard single disk would be sufficient to meet the RW demands for segments T-1 through T-8.

7.1.2.3.3 Disinfection

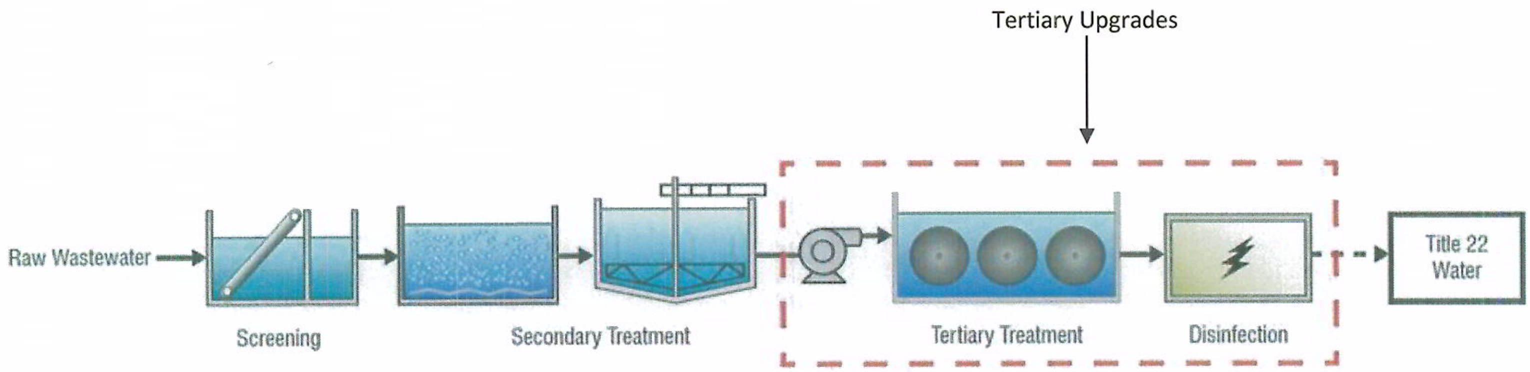
In order to meet Title 22 standards for RW for irrigation use, the RW must be considered "disinfected tertiary RW." A chlorine or ultraviolet (UV) disinfection process following filtration is sufficient to meet Title 22 irrigation water standards. For this RWFPS, inline UV was selected since the capital cost and O&M costs at anticipated treated flows were comparable to chlorine. Additionally, the City need not handle chemicals for UV disinfection.

7.1.2.3.4 Treatment Unit Cost

Preliminary capital and O&M costs were developed for the disinfected tertiary alternative. The estimated costs are presented in Table 7-6.

Table 7-6. Treatment Upgrade Cost for Disinfected Tertiary

Standard Cloth Filters and UV					
Segment	Capacity (gpd)	Cumulative Capacity (gpd)	Total Project Cost ($)	O&M Cost ($/Year)	Unit Cost ($/AF)[1]
T-1 through T-8	300,000	300,000	$1,234,000	$30,000	$250



Pismo Beach
Recycled Water Facilities Planning Study
Simplified Process Flow Diagram for Title 22

Figure 7-6. Simplified Process Flow Diagram to meet Disinfected Tertiary Requirements

7.1.2.4 Total Unit Cost

The unit cost for Alternative 2 is broken down by Segment T-1 through T-8, provided Table 7-7. The unit cost is comprised of capital and O&M cost for a reservoir, booster pump, pipeline, treatment upgrades and customer conversions. Details of Alternative 2 unit cost is provided in Appendix D.

Table 7-7. Unit Cost for Alternative 2

Segment	Annual Average (AFY)	Total Capital Cost	Cumulative O&M Cost	Cumulative Unit Cost $/AF
T-1	55	$ 7,736,000	$ 105,000	$ 8,100
T-2	44	$ 4,372,000	$ 144,000	$ 6,900
T-3	38	$ 2,174,000	$ 162,000	$ 5,800
T-4	15	$ 1,170,000	$ 183,000	$ 5,700
T-5	12	$ 1,486,000	$ 204,000	$ 5,800
T-6	23	$ 1,345,000	$ 215,000	$ 5,500
T-7	10	$ 964,000	$ 221,000	$ 5,400
T-8	16	$ 1,432,000	$ 236,000	$ 5,400
Total	**214**	**$20,679,000**	**$ 236,000**	**$ 5,400**

7.1.2.5 Advantages and Disadvantages

Alternative 2 meets the City's goal to develop a local, sustainable and highly reliable water supply and provides a direct offset to some potable water use in the amount of 198 AFY, if segments T-1 through T-7 are constructed. This alternative also provides a small amount of recharge of the SMGB of approximately 16 AFY via discharge into the Poplar Storm Water Basin if Segment T-8 is constructed.

The tertiary treatment upgrades require a relatively low capital investment and O&M costs and requirements are low for the recommended treatment system. Additionally, the treatment system requires a small site footprint.

This alternative uses approximately 214 AFY, 17% of the current effluent. The remaining 83% of the effluent would not be treated to disinfected tertiary standards and would continue to be discharged to the ocean outfall. For the relatively small percentage of effluent that could be used, Alternative 2 requires a substantial investment of distribution infrastructure to serve irrigation customers located throughout the City.

Alternative 2 could be expanded to include the potential City of Arroyo Grande Disinfected Tertiary RW customers identified in the RRWSP; however, a significant length of pipeline would have to be added to reach these customers. Service to RW customers outside the City was not evaluated as part of this alternative.

Alternative 2 primarily benefits the City.

7.1.3 Alternative 3 – Full Advanced Treatment for Groundwater Recharge

Upgrade to FAT is required for Alternative 3. FAT employs treatment technology to produce a high quality effluent that meets the requirements for groundwater recharge. Regulations for using RW for groundwater recharge are significantly different from those for irrigation use. Since groundwater basins are used for potable purposes, the regulations are designed to protect the beneficial uses of each aquifer. These include control of pathogenic organisms, control of nitrogen compounds, and control of emerging contaminants.

Alternative 3a consists of injecting FAT RW into the SMGB along the coast to help limit seawater intrusion. Alternative 3b consists of injecting FAT RW into the inland portion of the SMGB to recharge the basin. This alternative will benefit the entire basin and the cities that pull water from it. These cities include Pismo Beach, Grover Beach, Arroyo Grande and the Oceano CSD.

The FAT treatment upgrades required for Alternative 3 are described in the following section, followed by descriptions of the reuse evaluated for Alternatives 3a and 3b.

7.1.3.1 Treatment Upgrades

For Alternative 3, the secondary effluent from the existing WWTP would be fed to the advanced treatment process train consisting of microfiltration/ultrafiltration (MF/UF), RO, and UV/ AOP. The combination of MF, RO and AOP is considered the conventional indirect potable reuse treatment train. This treatment train meets the criteria in the DDW Regulations Related to Recycled Water (Title 22, Article 5.2).

The treatment design capacity selected for this RWFPS is 1.3 MGD, which coincides with the current maximum month flow shown in Table 3-2 on page 3-5 and the 2035 average annual flow shown in Table 3-3 on page 3-5.

A PFD of this alternative is presented in Figure 7-7 on page 7-20. The advanced treatment process units identified for the WWTP are:

1. MF
2. RO
3. UV/AOP
4. Inject Water Pumping Station

7.1.3.1.1 Microfiltration

MF membranes are an efficient technology for particle removal and pathogen control either in a pressurized or submerged configuration. For the former, water is pumped through the membranes in modules or cartridges. In the latter form, membranes are submerged in tanks and water is pulled through the membranes by vacuum. Overall, membrane filtration provides a near absolute barrier to suspended solids and microorganisms.

For this analysis, pressurized MF membranes were used as they generally provide greater efficiency and lower operating costs at this flow range. As water is pushed through the membranes using feed pumps, the suspended solids and microorganisms are retained on the outside of the membrane. MF finished water turbidities will be consistently below 0.1 NTU, independent of feed water quality. Due to high-quality effluent produced, MF has been shown to be the preferred pretreatment for RO systems treating wastewater.

7.1.3.1.2 Reverse Osmosis

High-pressure membrane processes, such as RO, are typically used for the removal of dissolved constituents including both inorganic and organic compounds. RO is a process in which the mass-transfer of ions through membranes is diffusion controlled. The feed water is pressurized, forcing water through the membranes, thereby concentrating the dissolved solids that cannot pass through the membrane. Consequently, these processes can remove salts, hardness, synthetic organic compounds, disinfection by-product precursors, etc. However, dissolved gases such as hydrogen sulfide (H2S) and carbon dioxide, and neutral low molecular weight molecules, pass through RO membranes. The rejection by the RO membranes (removal efficiency) is not the same for all dissolved constituents, and is influenced by molecular weight, charge, and other factors.

RO is considered a high-pressure process because it operates from 75 to 1,200 psig, depending upon the TDS concentration of the feed water. Typical operating pressure in a wastewater application is in the range of 150 to 250 psi. Recoveries for RO plants operating on domestic wastewater are around 85 percent depending on the type and concentrations of sparingly soluble salts (calcium sulfate, calcium carbonate, calcium phosphate, silica, etc.) in the feed water. Silica can permanently scale RO membranes when its concentration in the process exceeds about 100 to 120 mg/L. In wastewater applications, calcium phosphate can often be the salt controlling overall recovery.

One of the issues with the RO process is discharge of the concentrate stream. The TDS removed from the feed water is concentrated in the brine stream and needs to be disposed. It is assumed that this concentrate stream can be discharged to the City's existing ocean outfall.

7.1.3.1.3 Ultraviolet Advanced Oxidation Process

In general, advanced oxidation processes are processes that rely on chemical reactions with hydroxyl or other radicals to remove organic compounds in water. For a UV-based advanced oxidation process, a chemical oxidant is added to the process, and with exposure to the UV light, hydroxyl or other radicals are formed. The hydroxyl or other radicals are high-energy, highly reactive molecules that attack chemical bonds of organic molecules and oxidize them. UV/AOP is effective at oxidizing certain CECs such as certain endocrine disrupting compounds, PPCPs, and other microconstituents such as 1,4-dioxane and N-nitrosodimethylamine (NDMA) that can be found in wastewater effluents. In addition, with a UV/AOP process, the UV dose required for radical formation is greater than required for disinfection. Thus, a UV/AOP process provides both a disinfection barrier as well as a microconstituent barrier.

There are several chemical oxidants that can be used in combination with UV to achieve advanced oxidation. Hydrogen peroxide (H2O2) is a common oxidant used for advanced oxidation. Other chemical oxidants that can be combined with UV include ozone and hypochlorite. Each of these chemical oxidants have advantages and disadvantages. The chemical oxidant for the UV/AOP process will be determined in preliminary design.

7.1.3.1.4 RW Production

The design treatment capacity is based on 1.3 MGD as discussed previously. However, due to hourly variations in flow and the absence of flow equalization storage at the WWTP, the actual product water will be less than 1.3 mgd. The City provided hourly WWTP influent flows for the first day of each month for the past 2 years; effluent flow is not currently measured at the WWTP and hourly flow data beyond 2 years is not available.

Actual RW production was estimated by averaging the hourly flows for each hour within a given month, using the monthly data from the past 2 years. Based on the average hourly flow, hourly peaking factors for each hour in each month were determined. These were then applied to the 2013 average monthly flows and reduced by the estimated recovery rates through the MF and RO processes. In this scenario, each day of the month was assumed to have the same flow. Flows for each hour were capped at 1.3 mgd for hours where the flow was greater and the hourly flow results on a monthly basis were summed. The result is an estimated average annual production of approximately 0.77 mgd (860 AFY) based on 2013 monthly flows and approximately 0.83 mgd (930 AFY) based on projected 2035 flows.

It should be noted that there is dampening of the diurnal flows within the WWTP which is not captured in this estimate due to the use of influent flow data. Additionally, the MF and RO recovery rates applied are estimated and actual recovery rates will be a function of source water quality. It is recommended that these RW production estimates be refined during the preliminary and final design phases based on more detailed hourly flow data and actual MF and RO recovery rates. The addition of equalization storage to further dampen diurnal flows and increase RW production could be considered during the preliminary design phase; however storage costs are high and space on the WWTP site is limited.

For this RWFPS, the RW production is assumed to be capped at the buildout flows estimated in Table 3-3 on page 3-5, which corresponds to a RW production of 930 AFY. However, if future flows increase, RW production would increase, up to the full FAT capacity of 1.3 mgd less losses through the MF and RO processes, which is estimated to be approximately 1,100 AFY.

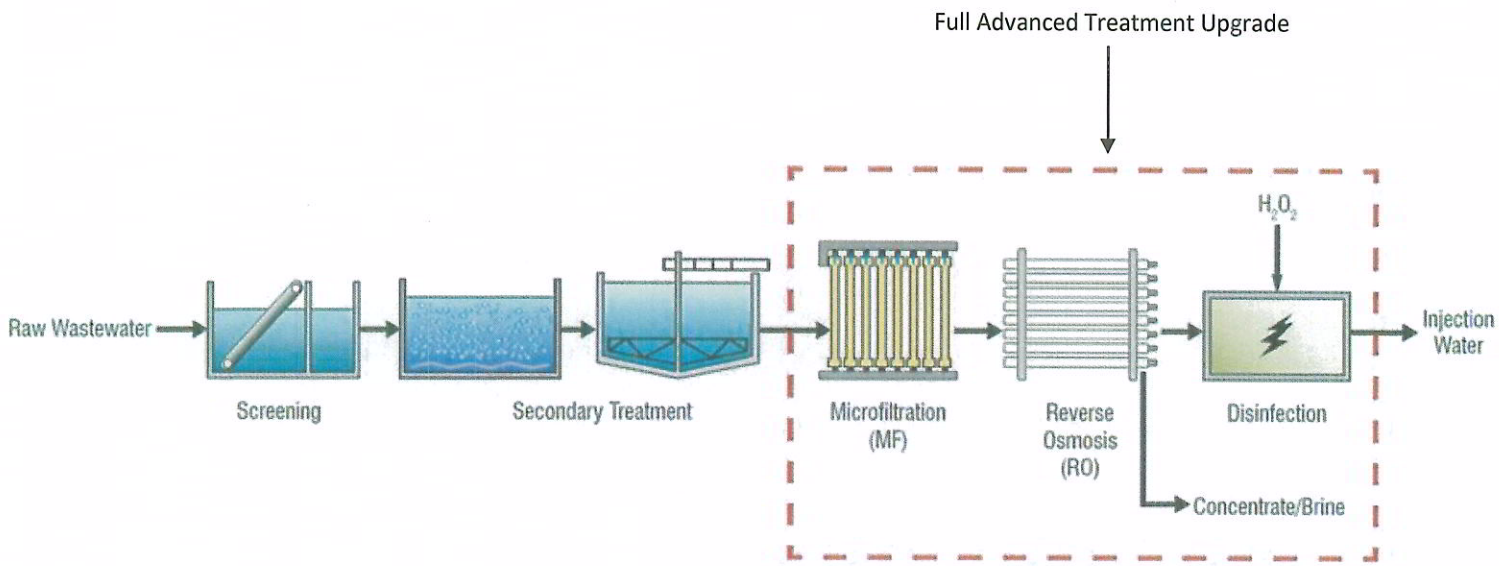
7.1.3.1.5 Treatment Unit Cost

The total estimated treatment capital and O&M cost for the full advanced treatment is presented in Table 7-8. Note that this is based on the estimated RW production of 930 AFY rather than the capacity of the treatment system itself.

Table 7-8. Full Advanced Treatment Unit Cost

Total Project Cost ($)	Annualized Project Cost ($)	O&M ($/year)	Unit Cost ($/AF)[1]
$15,134,000	$670,200	$502,000	$1,300

Notes:
1. Based on 930 AFY



Pismo Beach
Recycled Water Facilities Planning Study
Simplified Process Flow Diagram for Full Advanced Treatment

Figure 7-7. Simplified Process Flow Diagram for Full Advanced Treatment

7.1.3.2 Alternative 3a –Coastal Injection Wells for Seawater Intrusion Barrier
Alternative 3a consists of using the FAT RW at injection wells placed along the coast to provide a barrier against seawater intrusion. Additional water injected in these wells will recharge coastal portion of the groundwater basin.

7.1.3.2.1 Potential Water Use
This alternative will provide a seawater intrusion barrier and groundwater recharge to this portion of the SMGB and will benefit all of the NCMA agencies. As discussed in Section 5.2.2, it is estimated that each injection well could accommodate 200-300 AFY. As part of the Hydrologic Assessment TM, preliminary modeling was conducted to help refine design criteria for the seawater intrusion wells. Based on the model predictions, it is anticipated that the entire 930 AFY effluent could be injected at these 3 wells, provided that the nearby City and Oceano CSD wells are operated enough to maintain reasonable pressure heads. The actual injection capacity of a given well will vary based on hydraulic constraints and regional groundwater extractions impacting the particular well location and should be investigated further as part of subsequent analysis. This results in injection of approximately 310 AFY at each well. It is estimated that 70% of the water injected could be recovered at these municipal wells.

7.1.3.2.2 Injection Wells
This alternative includes three (3) injection wells located along the coast; representative well locations are shown in Figure 7-8 on page 7-23. The locations shown are based on the setback distance to existing wells, a general consideration of drill site area requirements, and the well spacing. As determined by the analytical modeling in the Hydrogeologic Assessment TM, the three injection wells should be spaced 4,000 feet apart and at least 200 feet from water supply wells.

Depths of the wells will depend on the depths of the localized aquifers, ranging from 400 to 600 feet depth. The injected zones and seals will be determined based on the specific site conditions.

In addition to the injection wells, monitoring wells will need to measure the groundwater level and quality. Monitoring wells will be designed as pairs, one shallow and one deep, or nested dual aquifer completions with separate casing in the injected aquifers and within the overlaying aquifer. Conceptually, the monitoring well should be placed between the coastal injection wells and production wells. The Groundwater Recharge Regulations require 2 monitoring wells for each injection well. There are several existing coastal monitoring wells in the vicinity which may meet the requirements. For the purposes of this RWFPS, 2 new monitoring wells per injection well are assumed; however, discussions should be held with the CCRWQCB during the permitting process to determine whether the existing monitoring wells are in suitable locations to be used for this purpose.

The estimated cost of each injection well is $500,000 per well and the estimated cost of each monitoring well is $90,000 per well. Based on 2 monitoring wells, the total cost per injection well is estimated at $680,000. Maintenance of the well should occur every two years which includes cleaning out the well casings and removing microbial build-up. O&M cost per well is estimated to be $10,000 per year.

7.1.3.2.3 Storage, Pumping & Distribution System

As shown in Figure 7-8 on page 7-23, Alternative 3 includes a reservoir located at or near the WWTP site, a 5 hp booster pump and a total of 4.04 miles of pipeline. Similar to Alternative 2, Alternative 3a pipeline is broken into additive segments (FC-1 through FC-3). The sizes and lengths for each pipeline segment are summarized in Table 7-9 below.

Table 7-9. Alternative 3a Pipe Segments Sizes and Lengths

Segment	Pipe Size (In)	Pipe Length (miles)
FC-1	8	1.68
FC-2	8	0.91
FC-3	6	1.45

Notes:

1. Pipeline size/ headloss calculations are provided in Appendix D.

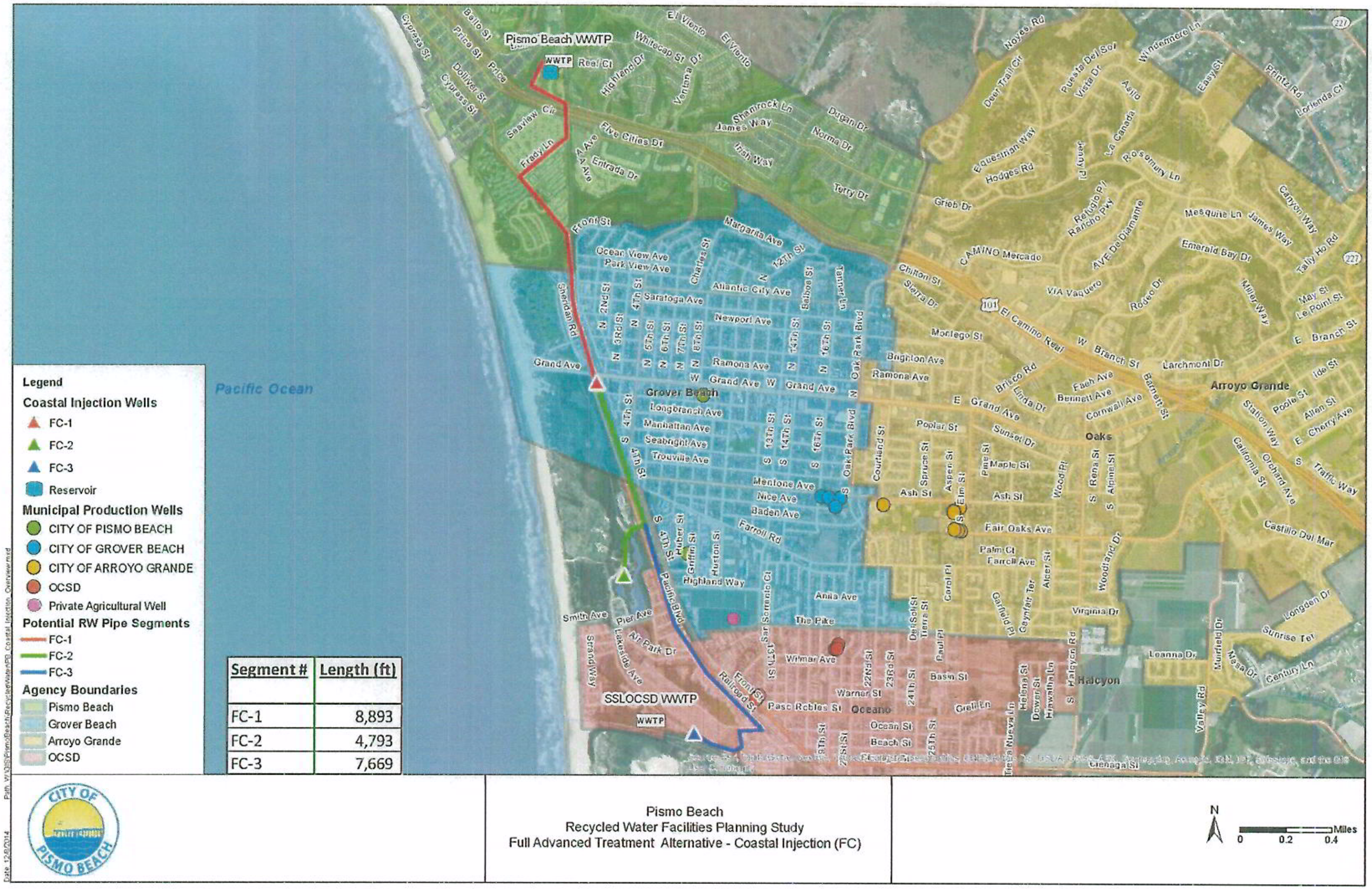


Figure 7-8. Alternative 3a Overview

7.1.3.2.4 Total Unit Cost

Unit costs associated with Alternative 3a includes the WWTP upgrade to FAT, a 0.83 MG reservoir, a 5 hp booster pump, 4.04 miles of pipeline and 3 injection wells. Capital and O&M cost were calculated for all components. These cost are summarized in Table 7-10 and detailed unit cost calculations are provided in Appendix D.

Table 7-10. Unit Cost for Alterative 3a

Segment	Annual Average (AFY)	Total Capital Cost	Cumulative O&M Cost	Cumulative Unit Cost $/AF
FC-1	310	$ 21,611,000	$ 555,000	$ 4,900
FC-2	310	$ 2,484,000	$ 575,000	$ 2,600
FC-3	310	$ 2,950,000	$ 598,000	$ 1,900
Total	**930**	**$27,045,000**	**$ 598,000**	**$ 1,900**

7.1.3.2.5 Advantages and Disadvantages

Alternative 3a meets the goal of diversifying the City's water supply portfolio by developing a local, sustainable and highly reliable water supply and provides a new source of recharge to the SMGB. It also protects the SMGB against seawater intrusion, which improves the reliability of and access to existing groundwater supplies. These benefits are realized by all of the NCMA agencies who produce groundwater from the SMGB.

Additionally, FAT effluent water quality is better than the basin water quality objectives and may be identified as a mitigation measure in the SNMP to manage basin water quality.

By providing FAT, this alternatives provides the City more flexibility for reuse because the water can be used for groundwater recharge and for all other approved RW uses.

It is estimated that approximately 30% of the water injected will not be recoverable due to flow to the north, south and west. This increases the unit cost on the basis of water put to beneficial use, but does not account for the additional basin capacity that is made available by alleviating the threat of seawater intrusion.

The WWTP upgrade to FAT has a high initial capital cost and will increase the cost and complexity of the WWTP O&M. However, the unit cost of Alternative 3a is among the lowest of all the alternatives evaluated.

7.1.3.3 Alternative 3b – Full Advanced Treatment for Inland Recharge

Alternative 3b focuses on recharging the SMGB through inland injection wells. Similar to alternative 3a, this alternative will benefit not only the City but also the other NCMA agencies that rely on this basin for supply.

7.1.3.3.1 Potential Water Use

As discussed in Section 5.2.2, the total available injection capacity is estimated to be 1,000 to 1,500 AFY, therefore this alternative is based on injecting the entire WWTP RW production volume of 930 AFY. Based on an assumed injection well capacity of 200-300 AFY, four (4) R injection wells would be needed to inject the full volume of available RW. This results in injection of approximately 230 AFY at each well. The actual injection capacity of a given well will vary based on hydraulic constraints and regional groundwater extractions impacting the particular well location.

7.1.3.3.2 Recharge Basins & Injection Wells

Alternative 3b will require four (4) wells located in the northern area of the NCMA. Conceptual well locations are shown in Figure 7-9 on page 7-27. Six (6) total conceptual well locations were identified in the Hydrologic Assessment TM. For the purposes of Alternative 3b, the four (4) closest wells, FI-1, FI-2, FI-3 and FI-4, are included in the cost. The two (2) remaining wells, FI-5 and FI-6, are considered alternate injection well locations in the event additional injection capacity or alternate sites are needed; these are not included in the cost of Alternative 3b. Injection well FI-4 is anticipated to be located on the Poplar Street stormwater basin site. Co-locating these facilities provides the flexibility to percolate RW into the pond during dry periods rather than use the injection well, which may extend the maintenance intervals for the injection well.

The inland injection wells will need to have a minimum setback of 200 feet from existing water supply wells. Depths of the wells will depend on the depths of the localized aquifers, ranging from 400 to 600 feet depth. The injected zones and seals will be determined based on the specific site conditions.

In addition to the injection wells, monitoring wells will need to measure the groundwater level and quality. Monitoring wells will be designed as pairs, one shallow and one deep, or nested dual aquifer completions with separate casing in the injected aquifers and within the overlaying aquifer(s). Conceptually, the monitoring well should be placed between the coastal injection wells and production wells. The Groundwater Recharge Regulations require 2 monitoring wells for each injection well.

The estimated cost of each injection well is $500,000 per well and the estimated cost of each monitoring well is $90,000 per well. Based on 2 monitoring wells, the total cost per injection well is estimated at $680,000. Maintenance of the well should occur every two years which includes cleaning out the well casings and removing microbial build-up. O&M cost per well is estimated to be $10,000 per year.

7.1.3.3.3 Storage, Pumping & Distribution System

Alternative 3b will consist of a 0.83 MG reservoir and a 20 hp booster pump located at the WWTP. This alternative will also include 4.5 miles of pipeline which consist of five segments (FI-0 through FI-4) connecting the WWTP to four injection wells. As discussed previously, two wells and their associated piping (Segments FI-5 and FI-6) are shown as alternates in the event additional injection capacity or alternate sites are needed; these are not included in the cost of Alternative 3b. Sizes and lengths of the pipeline segments are summarized in Table 7-11 on page 7-26.

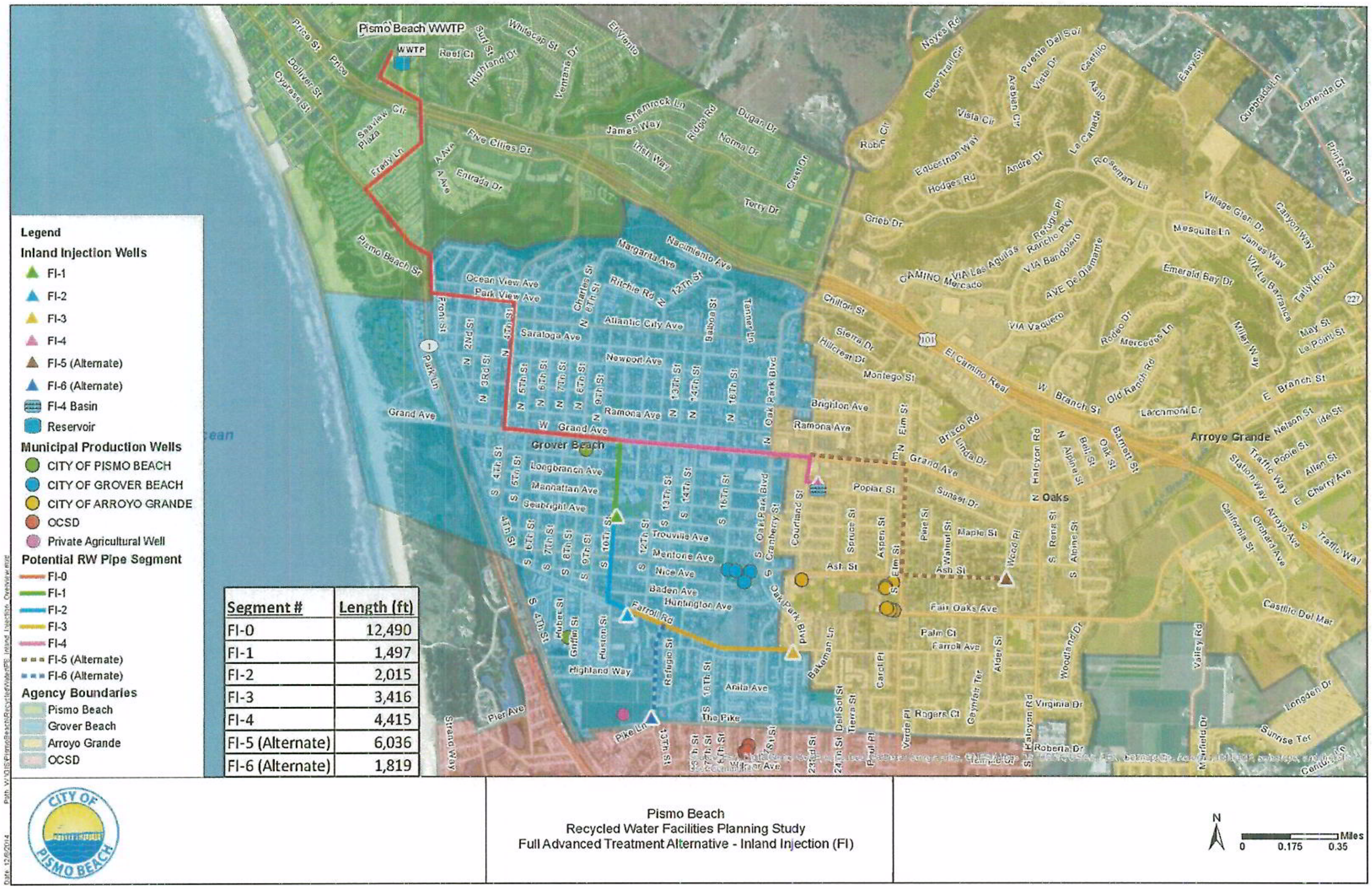
The conceptual layout for Alternative 3b overview is shown in Figure 7-9 on page 7-27.

Table 7-11. Alternative 3b Pipe Segments Sizes and Lengths

Segment	Pipe Size (in)	Pipe Length (miles)
FI-0	12	2.37
FI-1	8	0.28
FI-2	6	0.41
FI-3	6	0.69
FI-4	6	0.84
FI-5 Alternate	6	1.14
FI-6 Alternate	6	0.64

Notes:

1. Pipeline size/ headloss calculations are provided in Appendix D.



Segment #	Length (ft)
FI-0	12,490
FI-1	1,497
FI-2	2,015
FI-3	3,416
FI-4	4,415
FI-5 (Alternate)	6,036
FI-6 (Alternate)	1,819

Figure 7-9. Alternative 3b Overview

7.1.3.3.4 Total Unit Cost

As shown in Table 7-12, the Alternative 3b total unit cost is $2,100. This includes the capital and O&M cost for a 0.83 MG reservoir, WWTP upgrades to FAT, a 20 hp booster pump, 4.5 miles of pipeline, and four (4) injection wells. Detailed unit calculations of the unit cost is provided in Appendix D.

Table 7-12. Unit Cost for Alternative 3b

Segment	Annual Average (AFY)	Total Capital Cost	Cumulative O&M Cost	Cumulative Unit Cost $/AF
FI-0	0	$ 21,883,000	$ 554,000	-
FI-1	232	$ 1,709,000	$ 572,000	$ 7,000
FI-2	232	$ 1,776,000	$ 591,000	$ 3,700
FI-3	232	$ 2,066,000	$ 609,000	$ 2,600
FI-4	232	$ 2,274,00	$ 628,000	$ 2,100
Total	**930**	**$ 21,708,000**	**$ 628,000**	**$ 2,100**

7.1.3.3.5 Advantages and Disadvantages

Alternative 3b meets the goal of diversifying the City's water supply portfolio by developing a local, sustainable and highly reliable water supply and provides a new source of recharge to the SMGB. It also indirectly protects the SMGB against seawater intrusion by alleviating water level drawdown in the vicinity of the municipal supply wells. This improves the reliability of and access to existing groundwater supplies. These benefits are realized by all of the NCMA agencies who produce groundwater from the SMGB.

Additionally, FAT effluent water quality is better than the basin water quality objectives and may be identified as a mitigation measure in the SNMP to manage basin water quality.

By providing FAT, this alternatives provides the City more flexibility for reuse because the water can be used for groundwater recharge and for all other approved RW uses.

It is estimated that approximately 25% of the water injected will not be recoverable at the existing municipal water supply wells; this increases the unit cost on the basis of water put to beneficial use.

The WWTP upgrade to FAT has a high initial capital cost and will increase the cost and complexity of the WWTP O&M. However, the unit cost of Alternative 3b is among the lowest of all the alternatives evaluated.

7.2 NON-RECYCLED WATER ALTERNATIVE

WSC reviewed and compiled previously completed studies that identify non-recycled water supply. These studies include the 2012 Lopez Lake Spillway Raise Project study, the 2008 South San Luis Obispo County Desalination Funding Study and the 2007 Nipomo Community Services District SWP Supply Analysis. The unit cost of water supplies presented in each study are summarized in Table 7-13 on page 7-29. All unit costs were escalated to June 2014 dollars using the ENR Construction Cost Index.

Table 7-13. Non-recycled Water Supply Unit Cost

Supply	Source	Unit Cost ($/AF)
Surface Water	Lopez Lake Spillway Raise Project (Stetson 2012) (12)	$1,300
Ocean Water	South San Luis Obispo County Desalination Funding Study (Wallace 2008) (13)	$2,900
Potable Water	Nipomo Community Services District SWP Supply Analysis (Boyle 2007) (14)	$2,000 to $2,500

Note: Unit cost from each reference are escalated to June 2014 based on ENR Construction Cost Index. Financing assumptions applied by each study are not reconciled.

7.3 WATER CONSERVATION/REDUCTION ANALYSIS

The City is required to reduce water use by 20% by the year 2020 to comply with Senate Bill x 7-7 (SB7). The unit used to measure compliance with water conservation reduction targets is water use in gallons per capita per day (gpcd). The 2010 UWMP describes the SB7 analysis in more detail. As described in the 2010 UWMP, the City's 10 year baseline is 236 gpcd, the interim target (2015) is 214 gpcd, and the target (2020) is 192 gpcd. Table 7-14 shows that the 2010-2013 average of 231 gpcd reflects a reduction from the baseline of 236 gpcd; but gpcd is expected to be further reduced to 214 gpcd by 2015 and 192 gpcd by 2020.

Table 7-14. Existing and Projected gpcd

	2010	2011	2012	2013	2010-2013 Average	2015 Target	2020 Target
Gross Water Use (AFY) [1]	1,944	1,912	2,029	2,148	2,008	2,036	2,002
Gross Water Use (GPD) [1]	1,735,491	1,706,924	1,811,374	1,917,611	1,792,850	1,817,624	1,787,270
Population[2]	7,676	7,697	7,789	7,861		8,484	9,305
gpcd	226	222	233	244	231	214	192

[1] All gross water use data comes from the 2010 UWMP **(2)** or the 2013 NCMA Annual Report **(15)**.
[2] Population estimates based on United States Census Bureau data.

In order to meet conservation targets, the City has pursued multiple new water use efficiency measures and actions in addition to its existing programs. Some of the measures and actions implemented include implementing mandatory water use restrictions, a revised water and wastewater rate structure, and multiple water conservation incentive programs. The new conservation incentive programs analyzed and pursued include: Cash for Grass Rebates; Washing Machine Rebates, Smart Irrigation Controller Program, Irrigation Retrofit Program; and Commercial Flushless Urinal Rebate Program. Since mandatory water use restrictions went into place in February 2014, the City's water consumption has declined.

Outdoor water use conservation measures would reduce the irrigation demands that could be served with RW under Alternatives 1 and 2. This would result in a lower potable water offset and a higher cost per AF of RW put to beneficial use.

Indoor water use conservation measures would reduce wastewater generation and would result in a lower RW production rate and a higher cost per AF of RW put to beneficial use.

7.4 NO PROJECT ALTERNATIVE

A "No Project" alternative would include no treatment upgrades to the City's WWTP and no RW distribution infrastructure. All of the WWTP effluent would continue to be discharged to the ocean. This alternative would not require additional funding.

Relative to Alternatives 1 and 2, effects of the "No Project" alternative include continuing to use potable water for landscape irrigation. The City's irrigation customers would not gain a second, more reliable, supply for irrigation.

Relative to Alternatives 3a and 3b, the effects of the "No-Project" alternative include limiting the water supplies of the NCMA agencies to their current groundwater and surface water supply sources. The risk of seawater intrusion into the groundwater basin would remain.

The No Project Alternative does not meet the City's goals because it does not offset potable water uses, diversify the City's water supply portfolio by developing a local, sustainable and highly reliable water supply and does not provide a new source of recharge to the SMGB.

7.5 ALTERNATIVES ANALYSIS

7.5.1 Qualitative Evaluation Criteria

Each alternative was screened using the following qualitative screening criteria:

- Promotes Beneficial Management of Water Resources
- Promotes Salt & Nutrient Management
- Improves Basin Water Quality
- O&M Complexity
- Expandability
- Ease of Implementation
- Funding Opportunity
- Consistency with Project Goals & Objectives

Each criteria has a corresponding scoring approach. The scoring approaches and definition of each criteria are provided in Appendix E. The scoring approach was then weighted based on the importance of the criteria to the project's goals and objectives. For each alternative, the weighted score for the screening criteria was added to form the qualitative total. Finally, each alternative was ranked based on the qualitative score total.

7.5.2 Quantitative Analysis Summary

Each alternative was compared based on Annualized Cost per AF Recoverable and water available for beneficial use. Table 7-15 summarizes the results from the quantitative comparison.

Table 7-15. RW Alternatives Quantitative Analysis Summary

Alternative	Alternative 1 Secondary-23 Irrigation	Alternative 2 Tertiary Irrigation	Alternative 3a FAT for Coastal Injection	Alternative 3b FAT for Inland Injection
Total Capital Cost	$4,963,000	$20,679,000	$27,045,000	$29,708,000
Annual O&M Cost	$44,000	$236,000	$598,000	$628,000
Total RW Used (AFY)	17	214	930[1]	930[1]
Annualized Cost ($/AF)[2]	$15,900	$5,400	$1,900	$2,100
Estimated % Recoverable	100%	100%	70%	75%
Estimated AFY Recoverable	17	214	651	698
Annualized Cost ($/AF Recoverable)	$15,900	$5,400	$2,700	$2,800

Notes:

1. Based on estimate of actual RW production at buildout
2. The annualized unit cost is calculated by adding the annual payment for borrowed capital costs to the annual O&M cost and dividing by the annual project yield. Annual payment for borrowed capital is based on an interest rate of 5% over a payback period of 30 years.

7.5.3 Alternative Ranking Criteria and Scoring Results

For the alternative analysis, each alternative was compared and ranked on the basis of qualitative criteria, annualized cost per AF recoverable and water available for beneficial use. Each alternative received a ranking between 1 and 4. The ranking system is as follows:

Table 7-16. Alternative Ranking Criteria

Criteria	Ranking of 1	Ranking of 4
Qualitative	Highest weighted score	Lowest weighted score
Annualized Cost per AF Recoverable	Lowest Annualized Cost per AF Recoverable	Highest Annualized Cost per AF Recoverable
Water Available for Beneficial Use	Largest RW amount used	Smallest RW amount used

As shown in Figure 7-10 on page 7-33, Alternatives 3a and 3b ranked the highest. Alternative 1 ranked the lowest for every criteria.

7.5.4 Preferred Alternative

The alternatives analysis concluded that groundwater recharge is the most favorable alternative; Alternatives 3a and 3b received similar rankings. Based on the preliminary hydrologic assessment completed as part of this RWFPS, both coastal and inland injection wells warrant further investigation. For the purposes of this RWFPS, Alternative 3b for inland recharge is being carried forward as the recommended alternative because it has the highest volume of water estimated to be recoverable for beneficial use and the cost difference from Alternative 3a is considered insignificant at this preliminary planning stage. However, a combination of coastal and/or inland injection wells should be considered in subsequent analyses to develop the most beneficial groundwater recharge program for the City and NCMA agencies. The recommended project will be discussed in Chapter 8.

Pismo Beach Recycled Water Facilities Planning Study
Alternatives Evaluation

Qualitative/Non-Economic Criteria	Assigned Scores				Weight	Weighted Scores			
	Alternative 1 - Scondary 23 Irrigation	Alternative 2 - Disinfected Tertiary Irrigation	Alternative 3a - FAT for Costal Injection	Alternative 3b - FAT for Inland Injection		Alternative 1 - Secondary 23 Irrigation	Alternative 2 - Disinfected Tertiary Irrigation	Alternative 3a - FAT for Costal Injection	Alternative 3b - FAT for Inland Injection
Promotes Beneficial Management of Water Resources	1	2	3	3	5	5	10	15	15
Contributes to Salt & Nutrient Management Program	1	1	3	3	3	3	3	9	9
Improves Water Quality	1	1	3	3	3	3	3	9	9
O&M Complexity	3	2	1	1	1	3	2	1	1
Expandability	1.5	1.5	3	3	1	1.5	1.5	3	3
Ease of Implementation	3	1.5	1	1	3	9	4.5	3	3
Funding Opportunity	1.5	2	3	3	5	7.5	10	15	15
Consistency with Project Goals & Objectives	1.5	2	3	3	5	7.5	10	15	15
Total (Non-Economic/Qualitative)	13.5	13	20	20		39.5	44	70	70

Quantitative Criteria	Alternative 1 - Secondary 23 Irrigation	Alternative 2 - Disinfected Tertiary Irrigation	Alternative 3a - FAT for Costal Injection	Alternative 3b - FAT for Inland Injection
Annualized Cost/AF ($)	$15,900	$5,400	$1,900	$2,100
Total RW Used (AFY)	17	214	930	930
Estimated % Recoverable	100%	100%	70%	75%
Annualized Cost $/AF Recoverable	$ 15,900	$ 5,400	$ 2,700	$ 2,800

Ranking				
Qualitative/Non-Economic	4	3	1	1
Annualized Cost/AF	4	3	1	2
Water Recoverable for Beneficial Use	4	3	2	1

Figure 7-10. Alternatives Evaluation Results

8 RECOMMENDED FACILITIES PROJECT PLAN

8.1 RECOMMENDED ALTERNATIVE

As discussed in Chapter 7, Alternative 3b for inland recharge is being carried forward as the recommended alternative because it has the highest volume of water estimated to be recoverable for beneficial use and the cost difference from Alternative 3a is considered insignificant at this preliminary planning stage. This chapter describes representative facilities required to implement a GRRP using inland recharge wells. However, a combination of coastal and/or inland injection wells should be considered in subsequent analyses to develop the most beneficial groundwater recharge program for the City and NCMA agencies.

8.1.1 Potential Water Use

As discussed in Section 7.1.3.3.1, it is anticipated that the entire WWTP RW production volume of 930 AFY can be injected in four (4) inland injection wells. It is anticipated that 75% of the injected water could be recovered by municipal production wells as sustainable water supply.

Alternative 3b employs treatment technology to produce a high quality effluent that meets the most stringent requirements for groundwater recharge. Therefore, dilution water is not anticipated to be required at recharge basins. The proposed FAT process will provide the City with flexibility through the planning period since this water can be used for any approved RW use, including landscape irrigation, if desired.

8.1.2 Treatment Upgrades

A site layout for the recommended alternative is presented in Figure 8-1 on page 8-2. The area shown will accommodate an MF, RO, and UV/AOP with a footprint of approximately 5,000 square feet. The preliminary design parameters of the full advanced treatment are presented below:

1. Micro Filtration
   The preliminary design for the MF process was based on the use of pressure-driven microfiltration membranes. The system can also be constructed with vacuum-driven or submerged membrane systems. The system was designed with an MF recovery rate of 90%, and assuming each MF module would be online 80% of the time, on average, with one redundant unit.
2. Reverse Osmosis
   The preliminary design is based on a standard two-stage RO process with sulfuric acid pretreatment and post treatment that included degasification and lime stabilization post RO. An RO recovery of 85% was assumed.
3. Ultraviolet/Advanced Oxidation Process
   A UV/AOP system was assumed for this process to provide 1.2 log reduction of NDMA and 0.5 log reduction of 1,4-dioxane. The UV dose, chemical oxidant, and chemical oxidant dose required to meet this target will be determined in preliminary design.

Figure 8-1. Conceptual Site Layout for Recommended Alternative

The total estimated capital cost for the WWTP upgrades is approximately $15.1 million. This cost estimate is based upon preliminary engineering and is validated by comparisons with other recently completed design/constructed projects. The advanced treatment alternatives are more expensive, but provide more flexibility for groundwater recharge.

The existing outfall line would continue to be used to for the waste stream from the FAT system as well as for secondary effluent from diurnal flows in excess of the FAT treatment system capacity. Modifications to the effluent pump station and/or piping may be required to accommodate this operation. The abandoned chlorine contact basins could potentially be used to provide some equalization storage. This should be addressed during preliminary design.

8.1.3 Recharge Basins and Injection Wells

The recommended project will require four (4) wells located in the northern area of the NCMA. Conceptual well locations are shown in Figure 8-3 on page 8-6. Six (6) total conceptual well locations were identified in the Hydrologic Assessment TM. The four (4) closest wells, FI-1, FI-2, FI-3 and FI-4, are recommended for this project. The two (2) remaining wells, FI-5 and FI-6, are considered alternate injection well locations in the event additional injection capacity or alternate sites are needed.

The injection wells will require a minimum setback of 200 feet from existing water supply wells. Depths of the wells will depend on the depths of the localized aquifers, ranging from 400 to 600 feet depth. The injected zones and seals will be determined based on the specific site conditions.

In addition to the injection wells, monitoring wells will need to measure the groundwater level and quality. Monitoring well will be designed as pairs, one shallow and one deep, or nested dual aquifer completions with separate casing in the injected aquifers and within the overlaying aquifer. Conceptually, the monitoring well should be placed between the coastal injection wells and production wells. The Groundwater Recharge Regulations require 2 monitoring wells for each injection well.

8.1.4 Storage

A 0.83 MG reservoir will be required to provide equalization of the FAT effluent so that water can be delivered to the injection wells at constant flow rates. Four conceptual locations for the reservoir have been identified at the WWTP site and are depicted on Figure 8-1 on page 8-2. Further investigation of the reservoir siting is required to determine whether these conceptual locations are suitable and whether buried utilities or shallow groundwater are anticipated.

8.1.5 Pump Station

The RW pump station would be located adjacent to the reservoir at the WWTP site. The pump station would be sized to pump the entire effluent at a constant rate of approximately 600 gpm. Based on providing a minimum pressure head at the injection wells of approximately 10 psi, the booster pump is anticipated to be 20 hp.

8.1.6 Piping Distribution System

Construction of approximately 4.5 miles of pipeline, which consists of five segments (FI-0 through FI-4), is required to connect the WWTP to the four injection wells, as shown in Figure 8-3 on page 8-6. As discussed previously, two wells and their associated piping (Segments FI-5 and FI-6) are shown as alternates in the event additional injection capacity or alternate sites are needed; these are not included in the cost of the recommended project. Sizes and lengths of the pipeline segments are summarized in Table 8-1 on page 8-4.

Table 8-1. Recommended Project Pipeline Summary

Segment	Pipe Size (in)	Pipe Length (miles)
FI-0	12	2.37
FI-1	8	0.28
FI-2	6	0.41
FI-3	6	0.69
FI-4	6	0.84
FI-5 Alternate	6	1.14
FI-6 Alternate	6	0.64

8.1.7 Easements & Land Acquisition

The reservoir and booster station are assumed to be located on City property and additional land acquisition for these facilities is not anticipated. The pipelines are assumed to be located within existing easements or public rights-of-way so easement acquisition is not anticipated.

Easement and/or land acquisition may be required for the four injection well sites. Each well site is anticipated to require approximately 2,500 SF, or 0.06 acres for the permanent site. Additional temporary construction easements may be required to accommodate well drilling operations and will be based on site specific space constraints.

8.1.8 Cost Estimate

The cost estimate for the recommended alternative is presented in Table 8-2.

Table 8-2. Cost Estimate for Recommended Alternative

Segment	Annual Average (AFY)[1]	Total Capital Cost	Cumulative O&M Cost	Cumulative Unit Cost $/AF[2]	Estimated AFY Recoverable[1]	Cumulative Unit Cost $/AF Recoverable
FI-0	0	$ 21,883,000	$ 554,000	-	0	-
FI-1	232	$ 1,709,000	$ 572,000	$ 7,000	174	$ 9,300
FI-2	232	$ 1,776,000	$ 591,000	$ 3,700	174	$ 4,900
FI-3	232	$ 2,066,000	$ 609,000	$ 2,600	174	$ 3,500
FI-4	232	$ 2,274,000	$ 628,000	$ 2,100	174	$ 2,800
Total	**930**	**$ 29,708,000**	**$ 628,000**	**$ 2,100**	**698**	**$ 2,800**

Notes:
1. Based on estimate of actual RW production at buildout
2. The annualized unit cost is calculated by adding the annual payment for borrowed capital costs to the annual O&M cost and dividing by the annual project yield. Annual payment for borrowed capital is based on an interest rate of 5% over a payback period of 30 years.

The project unit costs presented in Table 8-2 on page 8-4 are based on borrowing 100% of the project cost at 5% interest for a 30 year term, to be consistent with the assumptions used in the 2014 San Luis Obispo County Regional Recycled Water Strategic Plan (RRWSP). However, it is likely that project financing can be secured at a lower interest rate through current financing programs and obtaining grants would further reduce the net interest rate. Figure 8-2 illustrates the range in annualized unit cost based on varying interest rates. The figure also illustrates the difference in unit cost for the WWTP flow as of 2013 (860 AFY total yield, 645 AFY recoverable) and the buildout WWTP flow (930 AFY total yield, 698 AFY recoverable).

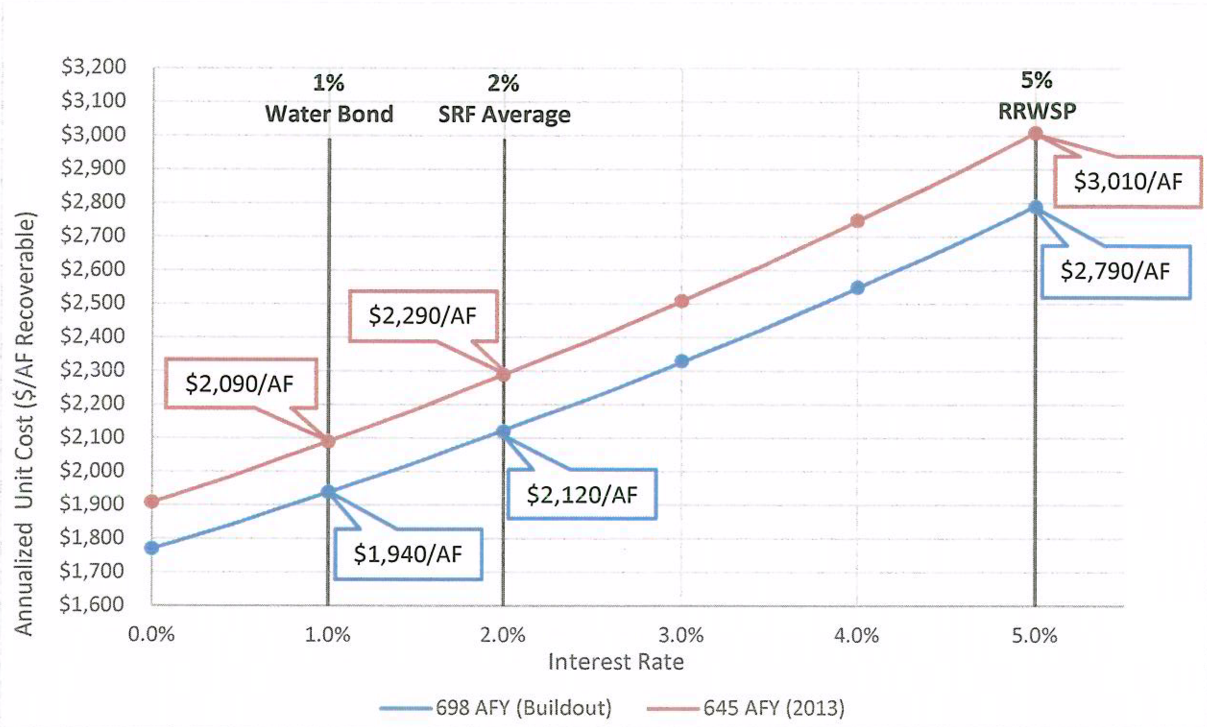
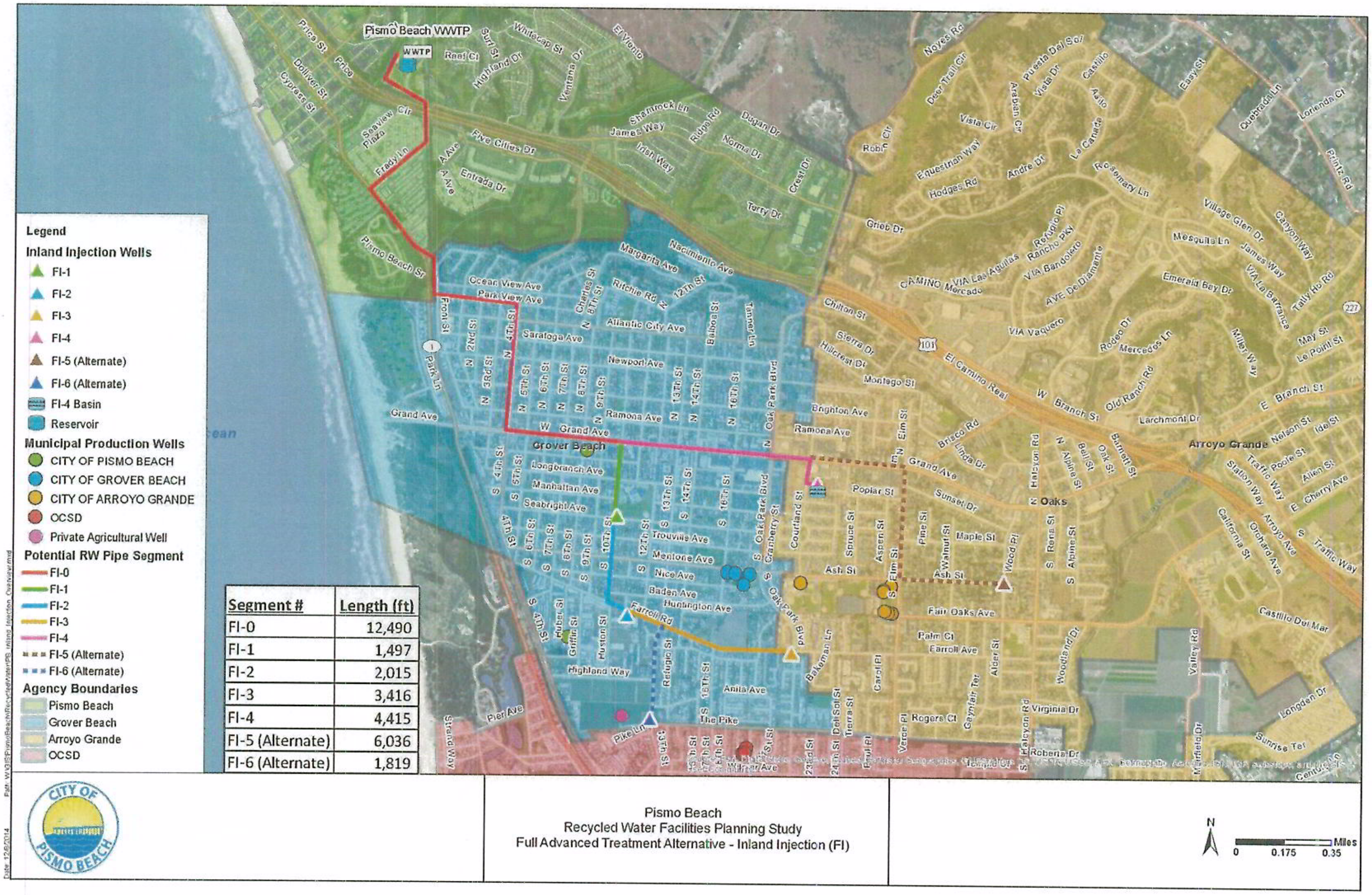


Figure 8-2. Interest Rate and Unit Cost Comparison



Segment #	Length (ft)
FI-0	12,490
FI-1	1,497
FI-2	2,015
FI-3	3,416
FI-4	4,415
FI-5 (Alternate)	6,036
FI-6 (Alternate)	1,819

Figure 8-3. Recommended Alternative Overview

9 IMPLEMENTATION PLAN

The City will need to address the following project components in implementing the RW project.

9.1 PRELIMINARY AND FINAL DESIGN

As part of the preliminary and final design of the WWTP treatment upgrades, injection wells and distribution system, the following specific tasks are recommended.

9.1.1 Groundwater Modeling

For this RWFPS, CHG constructed a conceptual groundwater mounding model of the groundwater basin area along the coastline from Pismo Creek to Arroyo Grande Creek in order to develop planning level design recommendations for the injection well field presented in this RWFPS. The quantity of recharged water at each injection well, number of wells are required, percent of water recoverable, groundwater extraction impacts on the mounding and the pressure heads that can be developed from injection presented in this RWFPS are preliminary. These are critical values that require further refinement for detailed design of an injection well field. Development of a groundwater model, including calibration and sensitivity analysis, should be undertaken to support the preliminary design as well as development of an SNMP. Seawater intrusion modeling for dual density flow will also be an important part of a more detailed flow simulations.

9.1.2 Test Injection Well

The installation and testing of a "test" injection well and nearby monitoring wells would be an important step in further defining the injection capacities and the groundwater level response to the injected water. The site for the test injection well could be chosen based on the follow up modeling as discussed above. The test injection well could be full size and designed for long term use for incorporation into the final project.

9.1.3 Water Quality Sampling for RO Process Design

For RO process design, there are several water quality parameters that are used to refine the estimates of RO recovery, permeate water quality and brine water quality. Many of these parameters are not currently measured per the requirements of the City's NPDES discharge permit and therefore additional monitoring is recommended.

The effluent concentrations for many constituents important for RO design are influenced by the concentrations in the City's drinking water supplies and the addition of constituents between the drinking water distribution system and the secondary effluent. It is recommended that additional sampling is conducted on the drinking water supplies and wastewater on a quarterly basis. Table 9-1 on page 9-2 includes a list of parameters and recommended detection limits.

Table 9-1. Water Quality Parameters for RO Process Design

Parameter	Unit	Recommended Detection Limit
Field Tests		
Temperature [a]	°C	-
pH [a]	S.U.	2 to 12
Turbidity [a]	NTU	0.01
Silt Density Index [a]	S.U.	1
Hydrogen Sulfide [a]	mg/L	0.5
Laboratory Work		
Alkalinity	mg/L as $CaCO_3$	1.0
TDS	mg/L	10
Calcium	mg/L	1.0
Magnesium	mg/L	1.0
Sodium	mg/L	1.0
Potassium	mg/L	1.0
Ammonia	mg/L	0.050
Barium	mg/L	0.002
Strontium	mg/L	0.010
Sulfate	mg/L	10
Chloride	mg/L	5
Fluoride	mg/L	0.050
Phosphate	mg/L	1.0
Silica	mg/L	1.0
Boron	mg/L	0.050
Iron[b]	mg/L	0.1
Manganese	mg/L	0.002
Aluminum	mg/L	0.025

Notes:
a. For secondary effluent samples only
b. If the water is anaerobic, speciation between ferrous/ferric iron is required

9.2 PERMITTING REQUIREMENTS

9.2.1 Tentative Water Recycling Requirements of the CCRWQCB

In order to implement a RW project, the City will need to initiate a permit reopener and renewal process with the CCRWQCB to obtain coverage for the proposed FAT upgrades, waste effluent discharge and injection wells under a Water Discharge Requirement (WDR) and/or Water Reclamation Requirement (WRR) permit. The City will need to submit a Report of Waste Discharge to the CCRWQCB and an Engineering Report to CCRWQCB and DDW. The Engineering Report will need to include:

- Description of the proposed FAT upgrades to the WWTP
- A hydrogeological assessment of the proposed GRRP's setting, including:
  - a general description of geologic and hydrogeological setting of the groundwater basin(s) potentially directly impacted by the GRRP;

  - a detailed description of the stratigraphy beneath the GRRP, including the composition, extent, and physical properties of the affected aquifers; and
  - based on at least four rounds of consecutive quarterly monitoring to capture seasonal impacts:
    - the existing hydrogeology and the hydrogeology anticipated as a result of the operation of the GRRP
    - maps showing quarterly groundwater elevation contours, along with vector flow directions and calculated hydraulic gradients.
- A map of the GRRP site showing (1) the location and boundaries of the GRRP; (2) a boundary representing a zone of controlled drinking water well construction based on required retention times, (3) a secondary boundary representing a zone of potential controlled drinking water well construction, depicting the zone within which a well would extend the boundary in paragraph (2) to include existing or potential future drinking water wells, thereby requiring further study and potential mitigating activities prior to drinking water well construction; and (4) the location of all monitoring wells and drinking water wells within two years travel time of the GRRP based on groundwater flow directions and velocities expected under GRRP operating conditions
- Justification of the required Response Retention Time and a protocol to be used to establish the required retention times
- A protocol describing the actions to be taken following construction of the upgrades to demonstrate that all treatment processes have been installed and can be operated to achieve their intended function
- Demonstration that the project sponsor possesses adequate managerial and technical capability to assure compliance with the regulations
- An emergency response plan for an alternative source of potable water supply or treatment at a drinking water well if the GRRP causes the well to no longer be safe for drinking purposes
- A contingency plan which will assure that no untreated or inadequately-treated wastewater will be delivered to the use area

Water recycling requirements for the GRRP will be in accordance with the Groundwater Recharge Regulations and are anticipated to include the requirements presented in Table 9-2 on page 9-4, which have been incorporated in the recommended project plan. Figure 9-1 on page 9-4 illustrates the anticipated CCRWQCB permitting process required.

Table 9-2. Tentative Water Recycling Requirements

Element	Subsurface Recharge
Treatment	100% RO and AOP treatment for the entire waste stream
Retention time	Minimum 2 months
Recycled Water Max Initial Contribution (RWCmax)	Up to 100% with RO and AOP
Total Nitrogen	Average <10 mg/L
Total Organic Carbon	< 0.5 mg/L
Monitoring Wells	2 monitoring wells down gradient of the GRRP

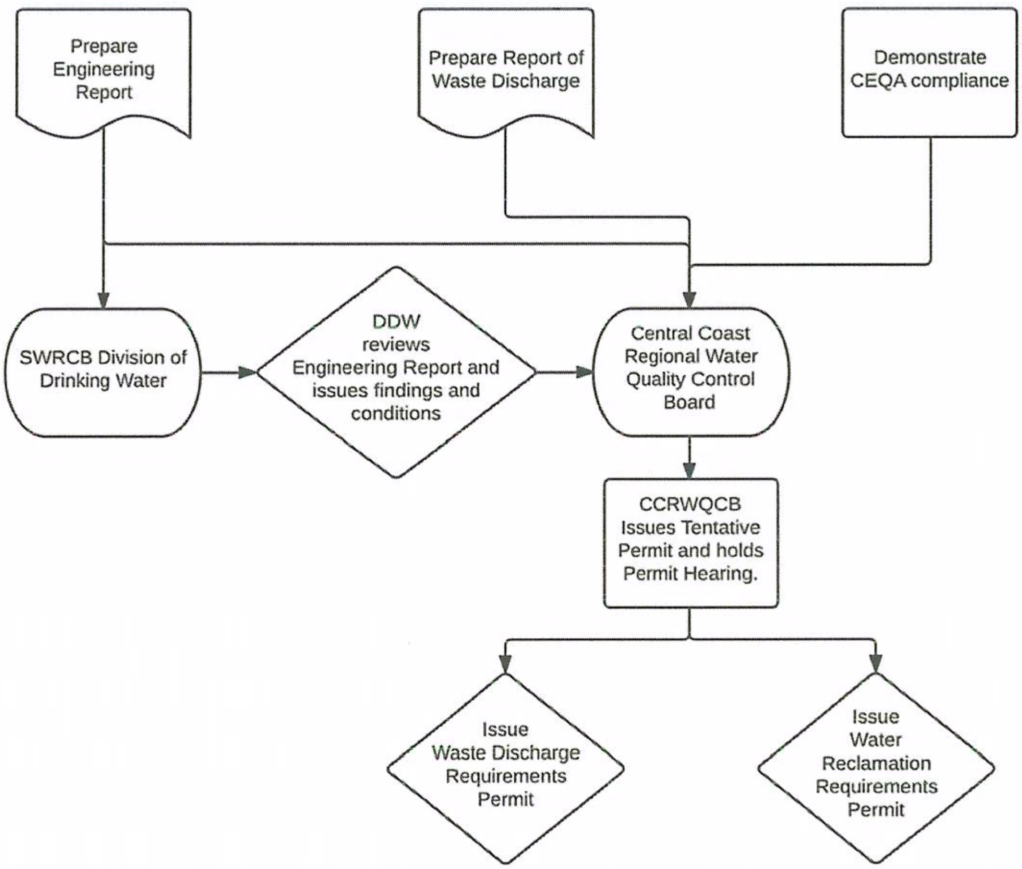


Figure 9-1. CCRWQCB Permitting Process

Prior to the operation of the GRRP, the City will also be required to develop and implement the following:

- An industrial pretreatment and pollutant source control program and maintain a source control program. As a component of the source control program, an outreach program to industrial, commercial, and residential communities discharging to the WWTP will be needed for the purpose of managing and minimizing the discharge of chemicals and contaminants at the source.
- An Operation Optimization Plan which identifies and describes the operations, maintenance, analytical methods and monitoring necessary for the GRRP to meet the requirements of the Groundwater Recharge Regulations.

9.2.2 Infrastructure Permits

It is anticipated that the City will need to obtain multiple permits to construct the recommend project including, but not limited to, the following:

- Caltrans encroachment permits for pipelines within Caltrans Right-of-Way
- Arroyo Grande and Grover Beach encroachment permits for improvements within their respective Rights-of-Way
- Coastal Development Permit for any improvements located within the Coastal Zone and appeals jurisdiction of the California Coastal Commission
- Grading permits for treatment upgrades and injection well sites
- NPDES General Construction Permit
- Building permits
- Streambed Alteration Agreement through California Department of Fish and Game (CDFG) for any stream crossings
- Authority to Construct (ATC) and Permit to Operate (PTO) the WWTP upgrades from the Air Quality Management District

9.2.3 Salt and Nutrient Management Plan

It is anticipated that an SNMP would be developed by the NCMA in conjunction with the permitting process for the project. The SNMP will consider the Basin Plan water quality objectives, the existing groundwater quality data and determine the assimilative capacity of the basin. The SNMP findings would not likely impact permit requirements for the GRRP project because FAT effluent water quality is better than the water quality objectives and may even be identified as a mitigation measure. The SNMP will need to include an implementation plan and monitoring program to meet the salt and nutrient objectives. The monitoring plan should be coordinated with the current basin monitoring efforts as well as the additional monitoring required for the GRRP to optimize monitoring facilities and operations.

9.2.4 Change Petition

Prior to making any change to the point of diversion, place of use, or purpose of use of treated waste water, the City must obtain approval from the SWRCB in accordance with California Water Code (CWC) sections 1210-1212 addressing water rights. This process is initiated by filing a Change Petition with the SWRCB.

9.3 ENVIRONMENTAL DOCUMENTATION REQUIREMENTS (CEQA)

In accordance with the California Environmental Quality Act (CEQA), it is anticipated the City will prepare an Initial Study (IS) followed by an Environmental Impact Report (EIR) for the recommended project. In anticipation of applying for federal funding sources, the City may also prepare an Environmental Assessment (EA) and an Environmental Impact Statement (EIS) to comply with the National Environmental Policy Act (NEPA).

9.4 BENEFICIARIES

The beneficiaries of this project include potable water customers of the City and the other NCMA agencies who rely on the SMGB for a portion of their water supply. The potable water users benefit from a new source of supply which is local, sustainable and highly reliable. In addition, the NCMA agencies water customers benefit from the reduced risk of seawater intrusion, which improves access to and reliability of the existing groundwater supplies.

Wastewater disposal for the City's wastewater customers is currently being achieved effectively through treatment and discharge to the ocean; therefore, the wastewater customers are not considered a beneficiary of this project. However, 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, it is feasible that increasing treatment levels in the future may be required for proper wastewater disposal. In this situation, the wastewater customers would also receive benefits from the treatment upgrades proposed by the recommended project.

9.5 COORDINATION AND GOVERNANCE

It is recommended that City continue discussions with the other interested agencies regarding cost sharing of the fixed and variable project costs and the technical and legal basis for return flow accounting and allocation within the NCMA.

It is anticipated that the City will take the lead on the project in partnership with other participating agencies. With this model, the City would construct and operate the facilities and would negotiate reimbursement agreements with partnering agencies for cost sharing based on the agreed-upon shares of project benefit.

It is anticipated that the allocation of water supply benefits associated with the project would need to be reviewed by the Court.

9.6 PUBLIC OUTREACH

Depending on the relative public acceptability of a GRRP, there may be a need for a public information program, which could take many different forms. It is recommended that the City engage in a proactive public outreach program in coordination with other existing or planned outreach programs.

9.7 IMPLEMENTATION SCHEDULE

A preliminary implementation schedule is presented in Figure 9-2 on page 9-7. Note that this schedule is based on traditional design-bid-build project delivery. AL tentative project delivery strategies, such as design-build, could be considered to accelerate the project schedule.

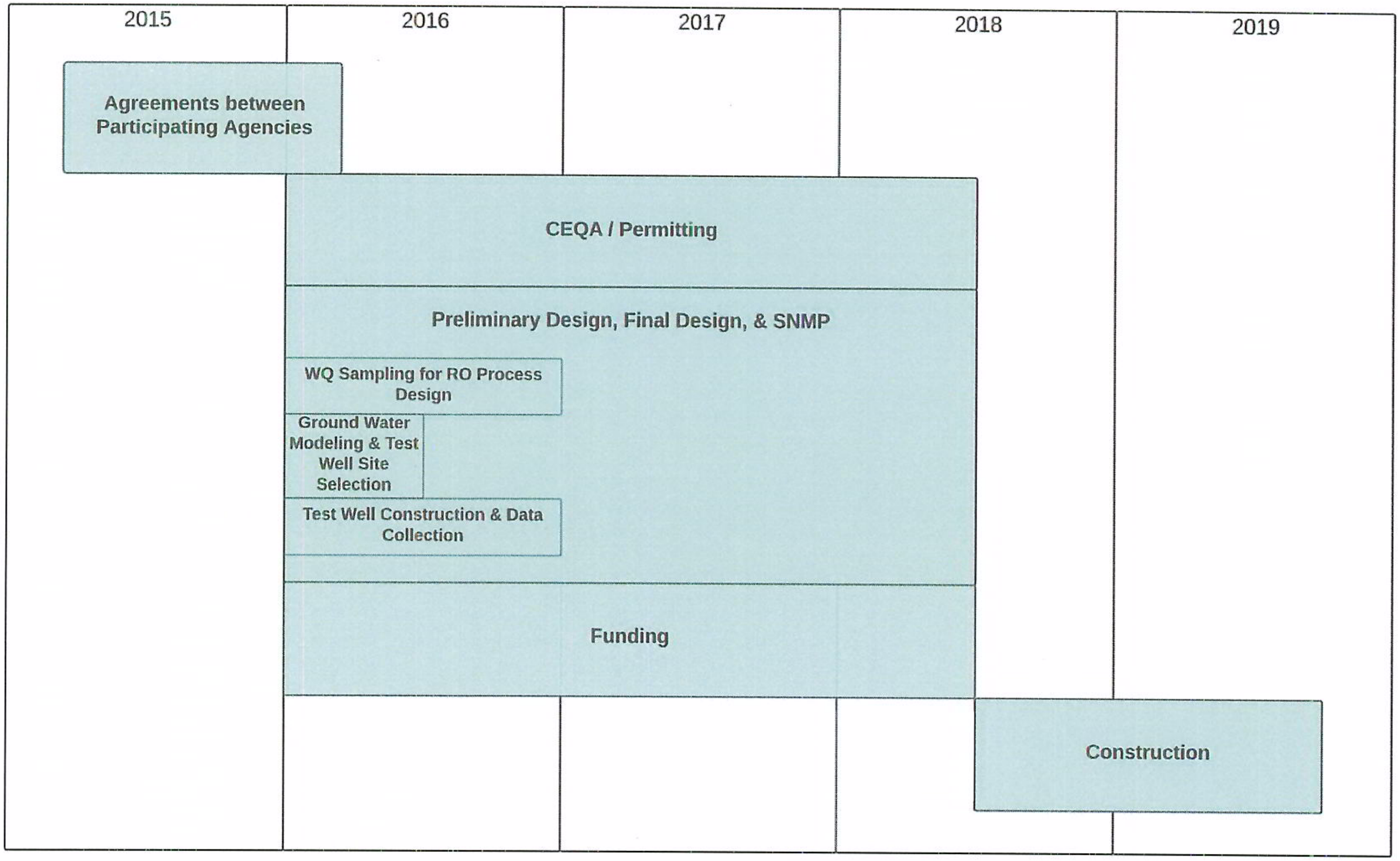


Figure 9-2. Preliminary Implementation Schedule

10 CONSTRUCTION FINANCING PLAN

Planning a RW program and building RW infrastructure requires significant upfront capital. Additionally, adequate funding for annual operation and maintenance (O&M) is necessary to ensure successful operation. Developing and implementing a RW program will require the project partners to develop a sound financial plan.

It is anticipated that the project will be funded through a combination of grants, low interest loans and cost-sharing contributions from partner agencies. The loans are anticipated to be secured through water rates since the project benefits potable water supply.

As discussed in Section 9.4, current regulations do not require upgrades to the City's WWTP so wastewater customers are not currently identified as a significant project beneficiary. Therefore sewer rates are not included in the preliminary financial strategy. If this changes in the future due to regulatory revisions and/or infrastructure constraints, this funding mechanism could be pursued.

10.1 FUNDING OPPORTUNITIES

Pursuing project funding will require an upfront investment by the City, and grant funding is anticipated to be highly competitive. The recommended recycled water project is anticipated to be attractive for grant funding agencies because it meets several objectives commonly prioritized by funding programs, including:

- Relies upon and strengthens local and regional partnerships
- Develops a new, local, sustainable water supply that benefits regional communities, including Oceano, which is a Disadvantaged Community
- Improves groundwater basin quality and provides protection from seawater intrusion
- Reduces ocean discharge of treated wastewater effluent

The following sections present potential grant and loan funding opportunities that may be available for the project, including the recently approved 2014 California Water Bond.

10.1.1 Grant Funding Opportunities

State and Federal grant funding for RW projects can be available through numerous programs. The advantage to grant funding is that it does not have to be repaid and effectively reduces the cost of the RW project borne by the local ratepayers. Table 10-2 on page 10-3 presents several potential grant funding sources.

10.1.2 Debt Funding Opportunities

An alternative funding to internal and grant funding is debt funding. The advantage to debt funding is the availability of a large sum with payback that extends over many years. The two types of debt funding are low interest loans from public programs or private bonds. Table 10-3 on page 10-5 summarizes current loan programs available for RW projects.

10.1.3 2014 Water Bond

The 2014 California Water Bond, formally known as the Water Quality, Supply, and Infrastructure Improvement Act of 2014, was passed by voters in November 2014. This bond will fund $7.7 billion dollars of statewide water projects in the forms of grants and loans. The bond is broken into several different funding categories, which are summarized in Table 10-1.

Table 10-1. 2014 Water Bond Funding Summary

Project Category	Funding Allocation
Regional Water Reliability	$ 810 million
Water Storage Capacity	$ 2.7 billion (projects must be in Bay-Delta watershed area)
Water Recycling	$ 725 million
Groundwater Sustainability	$ 900 million
Safe Drinking Water	$ 520 million
Watersheds and Flood Management	$ 1.89 billion

Since the bond was only recently passed, the timing of applications and funding availability, as well as the specific eligibility criteria are still under development. However, it is anticipated that recommended project may be eligible under the Regional Water Reliability, Water Recycling, Groundwater Sustainability and Safe Drinking Water categories. Worth $810 million, the Regional Water Reliability program is open to projects that will assist with water conservation, storm water capture and other programs that increase local and regional water supplies. The Water Recycling program, worth $725 million, is available to water recycling and salt-removal projects. Funds can be used for projects such as new RW pipelines, testing new treatment technologies and constructing desalination plants. Groundwater protection and cleanup programs are eligible for the Groundwater Sustainability funding, worth $900 million. Since this the recommended project will assist in protecting the SMGB from seawater intrusion and will introduce high quality water into the basin, it is anticipated to qualify for the Groundwater Stainability category. For these reasons, it may also qualify for the safe Drinking Water Category, which is allocated $520 million.

In addition to specific programs discussed above, the bond provides $810 million for regional water reliability projects included in specific plans developed by local communities. The Central Coast region has been allocated $43 million for regional water reliability projects, and developing a RW resource from the City's WWTP was included in the County's RRWSP and IRWMP.

Table 10-2. Potential Grant Funding Sources

Funding Source	Description	Implementation Consideration	Pros and Cons	Administration
Water Recycling Funding Program (WRFP): Water Recycling Construction Program (WRCP)	Grants and loans for the design and construction of water recycling facilities to promote the beneficial use of treated municipal wastewater in order to augment fresh water supplie; Primarily funded through Proposition 50 and SRF loan program	• Public agencies are eligible • Grants are limited to 25% of eligible construction costs of proposed project, up to $5 million • Funding agreement may include a grant and/or loan • Eligible costs may include allowances for design, legal tasks, construction management, engineering during construction	Pros: • Provides grants for 25% of eligible project costs, up to $5 million Cons: • Grants are subject to appropriations and are very limited • Timing is critical	State funds administered by the SWRCB
IRWM Implementation Grants	Grants for the implementation of projects that have been identified within an adopted IRWM Plan as a project or program needed to implement the Plan; Funded through Proposition 84	• Must have engaged in IRWM Planning process • Designed for projects that are ready for or nearly ready for implementation • Maximum grant amount varies for each solicitation, based on total amount available for each funding area • 25% of the total project costs must be paid for with non-State funds • Reimbursable costs include engineering, design, land and easement, and project implementation	Pros: • IRWM Planning Regions compete within funding area for grant funds • Allows City to pursue funding as a group with their IRWM Planning Region Cons: • Projects/programs that are not identified in an adopted IRWM are ineligible	State funds allocated by DWR

Funding Source	Description	Implementation Consideration	Pros and Cons	Administration
WaterSMART: Title XVI Water Reclamation and Reuse Program Construction Grant Funding	Grants for planning, design, and construction of authorized Title XVI projects; Title XVI projects are water reuse projects specifically authorized for funding by Congress under the Reclamation Wastewater and Groundwater Study and Facilities Act (Title XVI of Public Law 102-575)	• Project must be specifically authorized under Title XVI and must meet all Title XVI pre-construction requirements • City must work with Congressional representative to get project authorized as Title XVI • Project needs to have an approved feasibility study that meets Title XVI requirements; Study does not have to be performed through WaterSMART Title XVI Feasibility Studies Funding Program • Maximum grant amount is $4 million • Federal cost share is limited to 25% of total costs • Solicitations are typically released annually	Pros: • Funding program is focused on RW • Grant amount could be up to $4 million Cons: • City needs to prepare a feasibility study that meets Title XVI requirements • City needs to receive Congressional authorization designating project as Title XVI • Must comply with all Title XVI requirements • Compete with 17 Western States and Hawaii for grant funding	Federal funds administered by USBR
2014 California Water Bond Grant Funding	See Section 10.1.3			

Table 10-3. Potential Debt Funding Sources

Funding Source	Description	Implementation Considerations	Pros and Cons	Administration
Clean Water State Revolving Fund (CWSRF)	Low-interest loans for the planning, design and construction of publicly owned facilities, including water reclamation facilities	• Public agencies are eligible • Interest rate is set at ½ of most recent General Obligation (GO) bond rate • Financing term is 20 years (30 years for disadvantaged communities) • No limit to financing available to each project • Maximum financing amount is $50 million per agency per year • Repayment begins 1 year after construction	Pros: • Low-interest loans • Allows costs to be spread out over 20 years • Applications are continuously accepted Cons: • Principal, plus interest, must be repaid	State funds administered by the SWRCB
Drinking Water State Revolving Fund (DWSRF)	Low-interest loans for the planning, design and construction of publicly owned facilities.	• Public agencies are eligible • Interest rates range from 1.5 to 3 percent • $20 million per project	Pros: • Low-interest rates • Allows cost to be spread out over 20 years • Applications are continuously accepted Cons: • Principal, plus interest, must be repaid	State funds administered by the SWRCB

Funding Source	Description	Implementation Considerations	Pros and Cons	Administration
Infrastructure State Revolving Fund (ISRF)	Low-interest loans for planning, design, and construction of a variety of infrastructure projects, including water treatment and distribution and sewage collection and treatment	• Public agencies are eligible • Loan amounts range from $250,000 to $10,000,000 per applicant per year • Maximum of $20 million per jurisdiction per year • Financing term is up to 30 years • Fixed interest rate set at approx. 67% of Thompson's Municipal Market Data for an "A" rated tax exempt security • Eligible costs include land acquisition	Pros: • Low-interest loans • Allows costs to be spread out over up to 30 years • Pre-applications are continuously accepted Cons: • Principal, plus interest, must be repaid	State funds administered by California Infrastructure and Development Bank (I-Bank)
United States Department of Agriculture (USDA) Rural Development: Water & Waste Disposal Loan & Grant Program	Low-interest loans for construction and improvement of infrastructure projects including drinking water treatment and distribution and sewage collection and treatment	• Public agencies are eligible • Agencies must serve rural areas and towns with fewer than 10,000 people • Financing terms is up to 40 years • Average loan amount ranges from $3-5 million • Fixed interest rate based on need of the project and the median household income of the area to be served • Eligible costs include land acquisition	Pros: • Fixed interest rate • Allows cost to be spread out over up to 40 years • Applications are continuously accepted Cons: • Principal, plus interest must be repaid	Federal funds administered by USDA

Funding Source	Description	Implementation Considerations	Pros and Cons	Administration
Seawater Intrusion Control Loan Program	Low-interest loans for design and construction of facilities necessary to protect groundwater quality threatened by seawater intrusion	• Public agencies are eligible • Interest rate is set at ½ of most recent General Obligation (GO) bond rate • Financing term is up to 20 years • Maximum loan amount per project is $2.5 million	Pros: • Low-interest rate • Allows cost to be spread out over up to 20 years. Cons: • Principal, plus interest must be repaid • Project is funded on a first come-first served basis	State funds administered by the SWRCB
2014 California Water Bond Loan Funding	See Section 10.1.3			