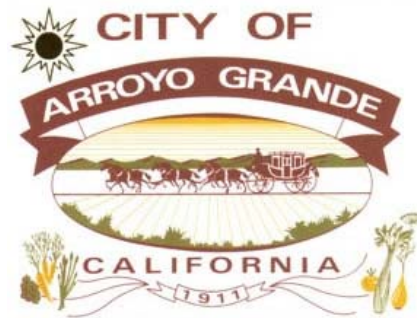


Draft

Recycled Water Facilities Planning Study

Prepared for the

SSLOCSD & The City of Arroyo Grande



Prepared Under the Responsible Charge of:

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12/30/2016



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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 0-1.

Note: References are noted throughout the text of this report with the reference number in parentheses, i.e. (2). See Section 10 on page 10-1 for the corresponding reference information.

Table 0-1. 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
ATP	Advanced Treatment Plant
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 Arroyo Grande
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
DWR	California Department of Water Resources
EIR	Environmental Impact Report
FAT	Full Advanced Treatment
Ft	Foot
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

I&I	Inflow and Infiltration
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
Oceano CSD	Oceano Community Services District
PFD	Process Flow Diagram
PB WWTP	Pismo Beach Wastewater Treatment Plant
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
SLOFC&WCD	San Luis Obispo County Flood Control and Water Conservation District
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
District or 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

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

South San Luis Obispo County Sanitation District (District) and the City of Arroyo Grande (City) contracted with Water Systems Consulting (WSC) to develop a Recycled Water Facilities Planning Study (RW Study). The purpose of the RW Study is to investigate alternatives for constructing a recycled water (RW) system to provide supplemental water for the region. The District's current Wastewater Treatment Plant (WWTP) treats approximately 2.5 million gallons per day (MGD) of wastewater from the Oceano Community Services District (Oceano CSD) and the Cities of Arroyo Grande and Grover Beach. The plant currently discharges the effluent to the ocean through a joint outfall, shared with the City of Pismo Beach Wastewater Treatment Plant (PB WWTP).

This study is envisioned as an integral component of a potential larger regional recycled water project; the Regional Groundwater Sustainability Project (RGSP). The RGSP is a phased project that will utilize advanced treated recycled water to recharge the SMGB and provide supplemental water for the region through indirect potable reuse (IPR). The RGSP stakeholder agencies, which include the District, the Cities of Arroyo Grande, Pismo Beach and Grover Beach and the Oceano CSD, are working collaboratively to implement the project. The current vision for the RGSP is that the first phase of the project (Phase 1) will include construction of an Advanced Treatment Plant and injection of flows from the PB WWTP and that Phase 2 will include expansion of the RGSP to treat and inject flows from the District's WWTP flows. This Study focuses on two options by analyzing both onsite (i.e. at the District's WWTP) and offsite alternatives for the construction of an Advanced Treatment Plant and potential opportunities to utilize the treated effluent to improve the sustainability of the groundwater basin through groundwater recharge or direct delivery to agriculture irrigation customers to offset groundwater pumping.

This Study was funded in part by a Water Recycling Facilities Planning Grant from the California State Water Resources Control Board (SWRCB) Water Recycling Funding Program. The grant provided fifty percent of the funding required for the study, with the remaining fifty percent being split equally by the City and the District.

1.2 GOALS FOR AND OBJECTIVES RECYCLED WATER

The following goals and objectives for this study were identified as a part of this study and were used to evaluate the alternatives.

1. Identify ways the District can contribute to developing a resilient water supply portfolio for southern San Luis Obispo County;
2. Investigate and document potential regulatory, scientific, financing, jurisdictional, and public acceptance constraints to the District developing a recycled water system;
3. Identify opportunities for the District, its member agencies, and regional stakeholders to overcome these constraints and outline a strategy for developing an additional, resilient, drought-proof source of water supply;

4. Provide an opportunity to educate the public and project stakeholders about recycled opportunities in the region; and
5. Coordinate with other local efforts to develop a regional recycled water program.

1.3 WATER SUPPLY

The water supply for the District member agencies currently consists of a combination of groundwater and local and imported surface water. Each of the water purveyors rely upon their own specific combination of these water sources. The specific sources of supply and their baseline (full allotment) amounts are summarized in Table 1-1 in acre-feet (AF). The City of Pismo is not a District member agency but is included due to their role in the RGSP. A more in depth description of the local water supply can be found in Section 3 on page 3-1.

Table 1-1. Local Agency Water Entitlements for 2015

Urban Area	Lopez Lake (AF)	SWP Allocation (AF)	Groundwater Allotment (AF)	Ag Credit (AF)	Other Supplies (AF)	Total (AF)
Arroyo Grande	2,290	0	1,202	121	160	3,773
Grover Beach	800	0	1,198	209	0	2,207
Pismo Beach	892	1,100	700	0	0	2,692
Oceano CSD	303	750	900	0	0	1,953
Total	4,285	1,850	4,000	330	160	10,625

1.4 WASTEWATER CHARACTERIZATION

The District's WWTP receives wastewater from a combination of member agency owned and operated, and District trunk lines. There are smaller municipal lines belonging to the three member agencies that connect into the District's trunk line. The District Trunk Line was constructed as part of the Plant's original design in 1963 and it is comprised of sewer pipe ranging from 15-30 inches in diameter. Due to the naturally sloping topography and the original system design, the District's Trunk Line system is entirely gravity fed. The current treatment train at the District WWTP is shown in Figure 1-1. A description of the treatment processes can be found in Section 4.2 starting on page 4-1.

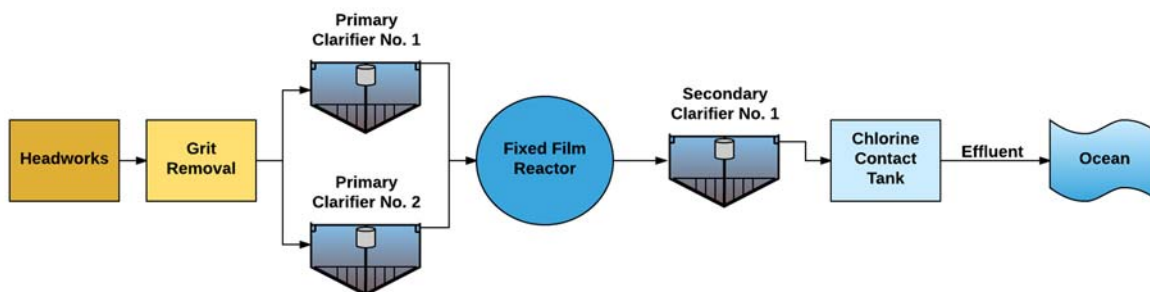


Figure 1-1. Current Treatment Train at the District WWTP

The District is currently working on a project to upgrade their secondary treatment process to provide additional redundancy at the plant. Currently, the WWTP has no redundancy for the secondary treatment process and relies upon a single fixed-film reactor and clarifier. The upgrades are anticipated to include two aeration tanks and an additional secondary clarifier. Construction of the upgrades are scheduled to begin in 2018 and be completed by 2020 pending approval from the California Coastal Commission. The process schematic for the proposed treatment train is shown in Figure 1-2.

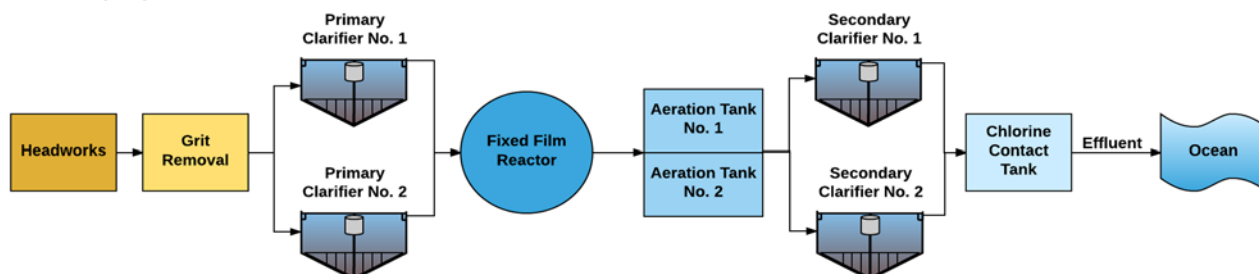


Figure 1-2. Proposed Redundancy Project Treatment Train at the District WWTP

The wastewater characterization performed for this Study includes analysis of flows from both the District and the PB WWTPs. The estimates of Phase 1 flows for the RGSP were based on the historical flows from the PB WWTP and are shown in Table 1-2.

Table 1-2. Phase 1 Flows from PB WWTP

Flow Parameters (MGD)	2010	2011	2012	2013	2014	2015	2010-2015 Average Flows	Peaking Factor (to AA)
Average Annual	1.08	1.09	1.08	1.06	1.04	0.97	1.05	1.00
Average Annual Dry Weather	1.04	1.12	1.12	1.12	1.08	1.03	1.09	1.03
Max Month	1.40	1.28	1.26	1.27	1.22	1.16	1.26	1.20

The Phase 2 flows for RGSP were based on the 2040 projected flows from both the PB and the District's WWTP and are shown in Table 1-3.

Table 1-3. Phase 2 Flows from PB WWTP and the District WWTP

Projected Flow Parameters (MGD)	2015	2020	2025	2030	2035	2040
Anticipated Population	45,648	46,859	47,928	49,442	51,157	52,771
Average Annual	3.56	3.66	3.74	3.86	4.00	4.12
Average Annual Dry Weather	3.59	3.68	3.77	3.89	4.02	4.15
Max Month	4.06	4.16	4.26	4.40	4.55	4.70

The wastewater characterization performed for this study is more thoroughly described in Section 4 starting on page 4-5.

1.5 TREATMENT REQUIREMENTS

The types of reuse considered in this study include groundwater recharge and agricultural irrigation. Both reuse types require different levels of treatment. Figure 1-3 below summarizes the current treatment framework for agricultural irrigation (non-potable reuse) and groundwater reuse (Indirect Potable Reuse). Non-potable reuse only requires tertiary treatment whereas indirect potable reuse requires Full Advanced Treatment (FAT). The treatment requirements for the proposed alternatives are described in more detail in Section 5 starting on page 5-1.

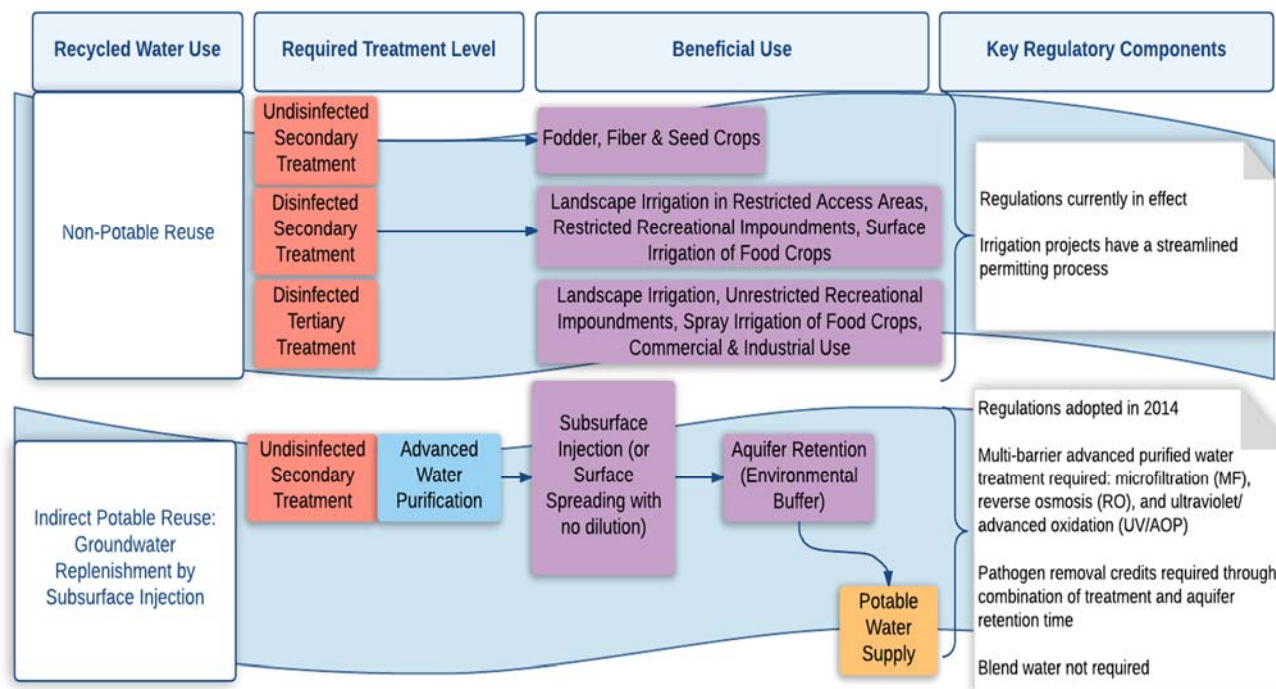


Figure 1-3. Recycled Water Treatment Guide Summary

1.6 ALTERNATIVES ANALYSIS

Based on the results of previous recycled water studies completed for the PB and the District's WWTPs, it was determined that the alternatives analysis for this study should focus on the phased implementation of two options, comparing onsite and offsite Advanced Treatment Plant alternatives. Additional details regarding the alternatives is outlined below and shown in Figure 1-4.

- Alternative A: Development of an onsite Advanced Treatment Plant (ATP) to provide RW for groundwater injection with the possibility of a Hybrid approach that would include agricultural irrigation.
- Alternative B: Development of an offsite Advanced Treatment Plant (ATP) to provide RW for groundwater injection with the possibility of a Hybrid approach that would include agricultural irrigation.

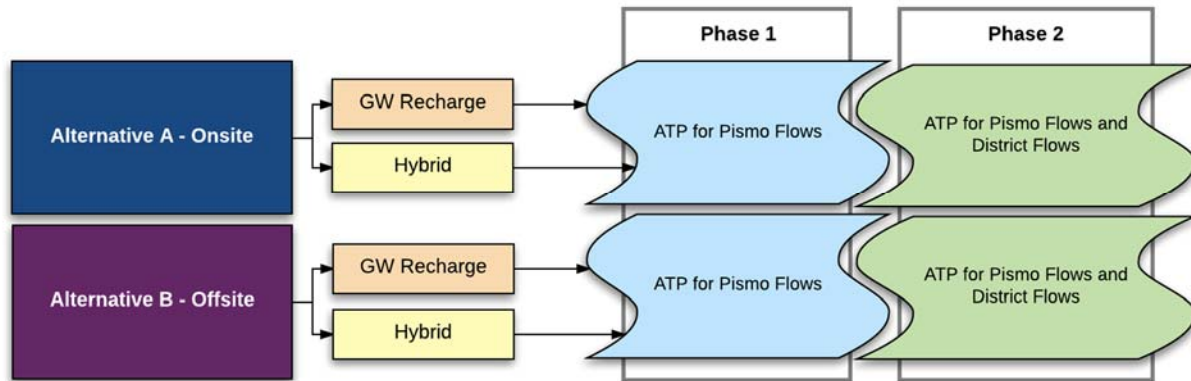


Figure 1-4. Alternatives Summary

A preliminary hydrogeologic analysis done for the RGSP determined that using injection wells were an effective option for recharging the Santa Maria Groundwater Basin (SMGB), which is where the RGSP stakeholders get the majority of their groundwater. These findings helped drive the development of the alternatives for this study. Additionally, due to the close proximity of the District's WWTP to agriculture in the Cienega Valley, this study included an agricultural irrigation component with both alternatives. Because of the potentially limited storage capacity in the portion of the SMGB underlying the District member agencies, the ability to continuously inject water depends upon maintaining similar extraction rates at municipal wells. The hydrogeologic analysis from the RGSP is summarized in Section 6.1.

The alternatives were compared on the basis of capital, O&M and unit costs (i.e. \$/AF) and the results of the quantitative alternatives analysis are included in Table 1-4. Additionally, the alternatives were compared using qualitative criteria, the complete alternatives analysis is presented in Table 1-5. The conveyance infrastructure included in Phase 1, that would be required for Phase 2 was assumed to be sized for Phase 2 future flows and thus contributes the higher capital and unit costs associated with Phase 1. The Annualized Capital estimates were based on a loan term of 30 years and a 5% interest rate. Note that the unit costs (\$/AF) are based on the estimated RW production and yield of each alternative rather than the capacity of the treatment system itself.

Table 1-4. Cost Summary

Phase 1				
	Onsite A - Groundwater Recharge	Onsite A - Hybrid	Offsite B - Groundwater Recharge	Offsite B - Hybrid
Total Capital	\$24,900,000	\$35,300,000	\$29,700,000	\$41,300,000
Annualized Capital	\$1,620,000	\$2,300,000	\$1,930,000	\$2,690,000
Annualized O&M	\$910,000	\$800,000	\$970,000	\$860,000
Total Annualized	\$2,530,000	\$3,100,000	\$2,900,000	\$3,550,000
Yield (Before Injection)	900 AFY	943 AFY	900 AFY	943 AFY
Cost/AF (Before Injection)	\$2,800	\$3,300	\$3,200	\$3,800
Yield (After Injection)	657 AFY	812 AFY	657 AFY	812 AFY
Cost/AF (After Injection)	\$3,900	\$3,800	\$4,400	\$4,400
Phase 2				
	Onsite A - Groundwater Recharge	Onsite A - Hybrid	Offsite B - Groundwater Recharge	Offsite B - Hybrid
Total Capital	\$59,300,000	\$78,000,000	\$66,500,000	\$86,500,000
Annualized Capital	\$3,860,000	\$5,070,000	\$4,330,000	\$5,630,000
Annualized O&M	\$3,380,000	\$2,620,000	\$3,490,000	\$2,930,000
Total Annualized	\$7,240,000	\$7,690,000	\$7,820,000	\$8,560,000
Yield (Before Injection)	3,530 AFY	3,658 AFY	3,530 AFY	3,658 AFY
Cost/AF (Before Injection)	\$2,100	\$2,100	\$2,200	\$2,300
Yield (After Injection)	2,577 AFY	3,031 AFY	2,577 AFY	3,031 AFY
Cost/AF (After Injection)	\$2,800	\$2,500	\$3,000	\$2,800

For the qualitative component of the alternative analysis, each alternative was compared and ranked on the basis of qualitative criteria. Each alternative received a score between 1 and 3, with three being the highest score and 1 being the lowest score.

The recommendations from this analysis were not decided based solely on the lowest cost or the highest qualitative score. Both quantitative and qualitative criteria were considered and the recommendations were developed based on which options provide the best value for the region RGSP Stakeholders. The results of the qualitative and the quantitative analysis is presented in Table 1-5.

Table 1-5. Qualitative and Quantitative Alternative Summary Table

	Assigned Scores					Weighted Scores			
	A		B			A		B	
Qualitative/Non-Economic Criteria	Onsite GWR	Onsite Hybrid	Offsite GWR	Offsite Hybrid	Weight	Onsite GWR	Onsite Hybrid	Offsite GWR	Offsite Hybrid
Community Impact/Construction Complexity	3	2	2	1	3	9	6	6	3
Flood risk	2	2	3	3	1	2	2	3	3
Ease of Operation/Maintenance Requirements	3	2	2	1	1	3	2	2	1
Energy Requirements/Greenhouse Gas Emissions	2	3	1	2	1	2	3	1	2
Operational and beneficial use Flexibility	1	2	2	3	3	3	6	6	9
Governance	3	2	2	1	3	9	6	6	3
Ability to Phase	1	2	2	3	3	3	6	6	9
Permitting Uncertainty/Complexity	1	1	3	3	3	3	3	9	9
Total (Non-Economic/Qualitative)	16	16	17	17		34	34	39	39
Cost/AF (Phase 2, Before Injection)						\$2,100	\$2,100	\$2,200	\$2,300
Cost/AF (Phase 2, After Injection)						\$2,800	\$2,500	\$3,000	\$2,800

1.7 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 project unit costs presented in Table 1-4 on page 1-7 are based on borrowing 100% of the project cost at 5% interest for a 30-year term, to provide a conservative estimate of project costs. 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 1-5 and Figure 1-6 illustrate the range of annualized unit costs based on varying interest rates for the onsite and offsite groundwater recharge alternatives. The figures also illustrate the difference in unit cost for the RGSP for Phase 1 (900 AFY total yield, 657 AFY recoverable) and for Phase 2 (3,530 AFY total yield, 2,577 AFY recoverable).

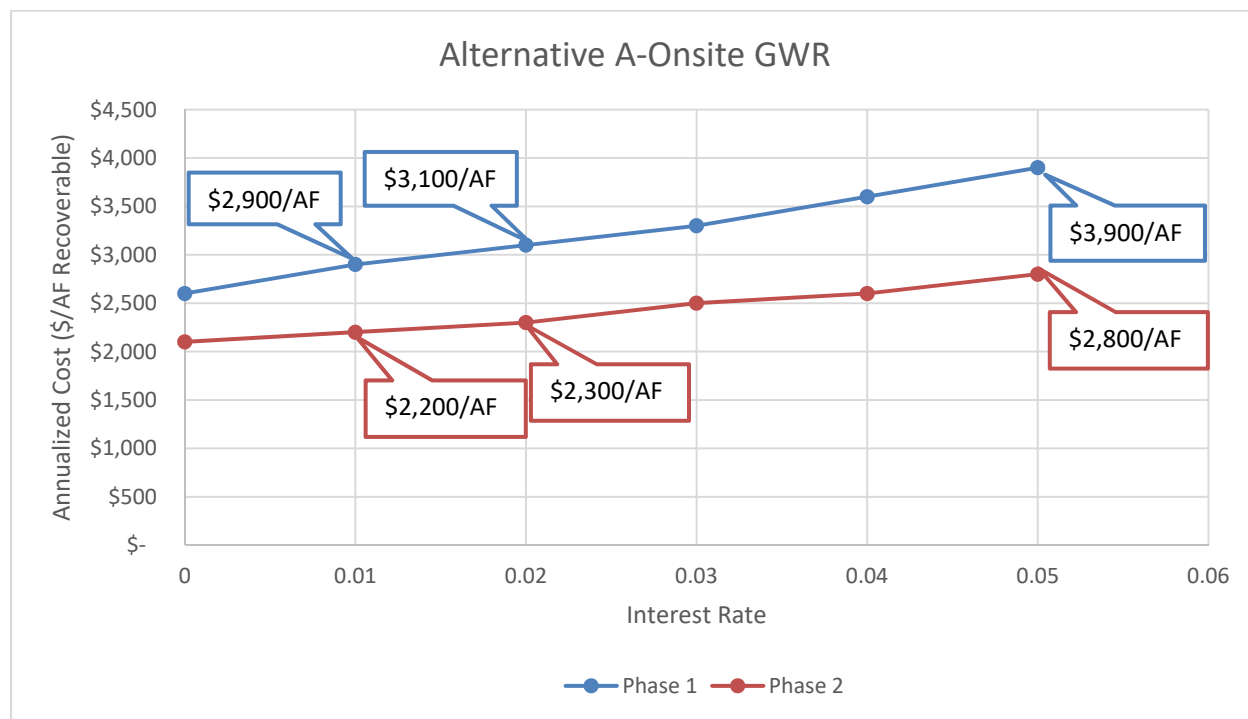


Figure 1-5. Interest Rate and Unit Cost Comparison for Alternative A

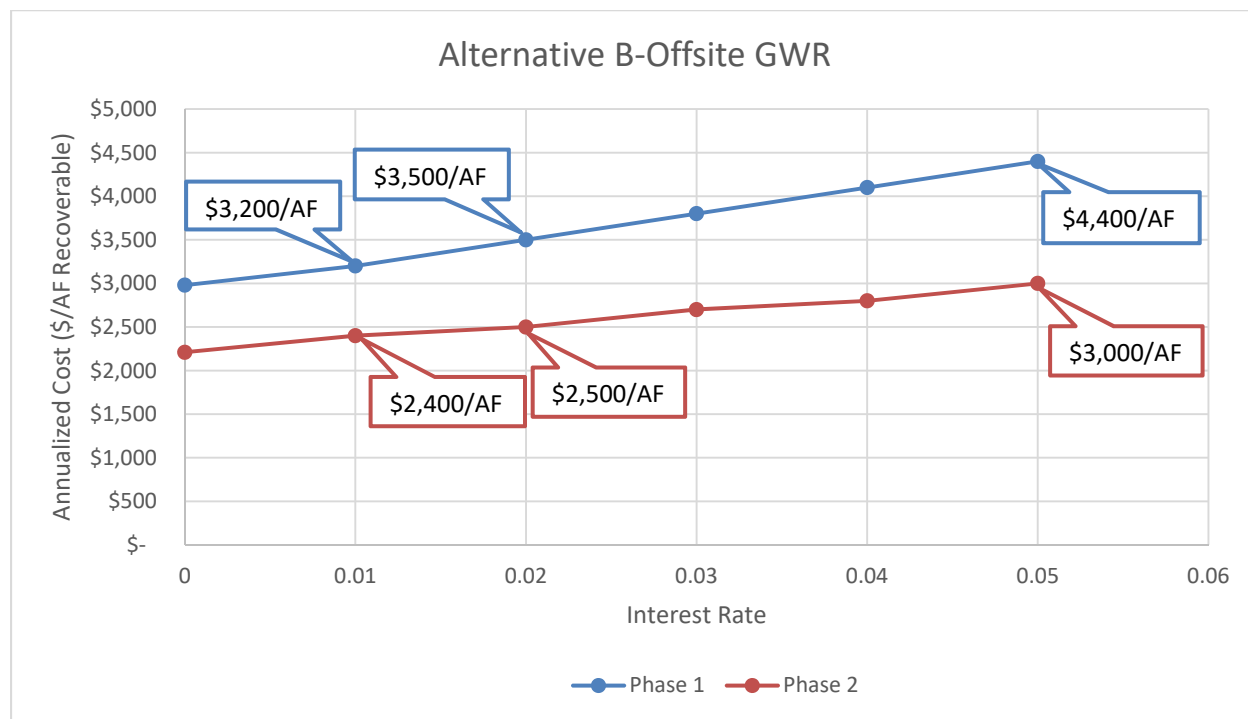


Figure 1-6. Interest Rate and Unit Cost Comparison for Alternative B

1.8 RECOMMENDATIONS

Both the onsite and offsite alternatives meet the goal of diversifying the RGSP Stakeholders water supply portfolio by developing a local, resilient water supply and providing a new source of recharge to the SMGB. Based on the results of the alternatives analysis, it is recommended that the District and the RGSP Stakeholders move forward with an Environmental Impact Report (EIR) that evaluates both the onsite and offsite options.

1.8.1.1 Onsite Alternative Pros and Cons

With the onsite alternatives, less infrastructure is required to convey secondary effluent from the existing WWTPs to the ATP, reducing capital and O&M costs. Additionally, there is no additional cost to purchase property for the ATP for the onsite alternatives.

However, while the onsite alternatives require less conveyance infrastructure and have lower unit costs, there may be regulatory constraints that could limit the District and the RGSP Stakeholders from obtaining the necessary permits to develop FAT upgrades at the existing District WWTP site. Ongoing discussion with the Coastal Commission regarding infrastructure upgrades at the District WWTP site will help inform the District and its RGSP Stakeholders on the viability of the onsite alternatives.

1.8.1.2 Offsite Alternative Pros and Cons

With the offsite alternatives, the District will have fewer regulatory constraints associated with obtaining the permits to develop the ATP facilities. However, the offsite alternatives require more infrastructure to convey secondary effluent from the existing WWTPs to the ATP, increasing capital and O&M costs. Also, there will be the additional cost of purchasing property for the offsite ATP.

1.8.1.3 Groundwater Recharge Only

In comparison to the hybrid alternatives, the groundwater recharge alternatives have a lower capital cost because infrastructure to convey recycled water to the agriculture irrigation customers is not required. One additional advantage of the groundwater recharge alternatives is that all of the water treated through the FAT process will have a better water quality than the Hybrid alternatives, and will provide a greater long term benefit to the basin water quality.

However, the groundwater recharge alternatives have a higher O&M cost due to the need to treat all of the water through the FAT process. Also, it was estimated that 27% 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. Additional hydrogeologic investigation being performed for the RGSP will help to compare the benefits to the groundwater basin from groundwater recharge versus offsetting groundwater pumping through delivery of recycled water to agriculture irrigation customers.

1.8.1.4 Groundwater Recharge and Agriculture Irrigation

In comparison to the groundwater recharge alternatives, even with the increased capital costs the hybrid alternatives have lower unit costs (i.e. \$/AF) due to the increase yield assumed for the agriculture irrigation alternatives and the lower O&M costs associated with tertiary treatment.

The Hybrid alternatives have a higher total annualized cost (i.e. sum of annual capital repayment and O&M costs) due to the additional infrastructure required to deliver the water to agricultural customers. One additional consideration is that while the Hybrid alternatives could present the opportunity for lower unit costs (i.e. \$/AF), developing a framework for ensuring that benefiting agencies and individuals are contributing to the cost of the project is more complicated than in the groundwater recharge only alternatives, therefore it may make the hybrid alternatives more difficult to implement.

1.9 NEXT STEPS

Additional work is being completed as part of the RGSP and will help the participating agencies better understand the advantages and disadvantages of the onsite and offsite locations. Table 1-6 outlines the ongoing and upcoming initiatives, the lead agencies and the timelines that will allow the RGSP Stakeholders to implement the RGSP. Additional information regarding these initiatives is provided in Section 8.

Table 1-6. RGSP Near Term Initiative Timeline

	RGSP Initiative	Intended Outcome	Lead Agency(ies)	Completion Timeline
Near Term	Expanded EIR	Provide the RGSP stakeholders with the necessary environmental documents to ensure CEQA compliance. Provide additional environmental impact information needed to complete the SWRCB State Revolving Fund and other funding applications.	City of Pismo Beach, District	2017
	Letters of Intent (LOI)	Support letters from the RGSP stakeholders stating a desire to work together to develop a phased groundwater recharge and extraction project.	RGSP Stakeholders	Q1 2017
	Phase 1A of Groundwater Model	Construction, calibration and utilization of a hydraulic model to analyze injection and extraction scenarios for flows from the PB WWTP.	City of Pismo Beach	Q4 2016
	Phase 1B of Groundwater Model	Expand the Phase 1A hydrogeologic model support analysis of recharge and extraction scenarios for the PB and District WWTPs.	City of Pismo Beach, District	Q3 2017
	Offsite RGSP Site Identification	Identify of potential locations for the offsite ATP and allow RGSP Stakeholders to develop purchase/option agreements with property owners for preferred site(s).	City of Pismo Beach, District	Q2 2017
	Coastal Commission Communication	Inform the RGSP stakeholders on the potential to obtain Coastal Development Permits for the ATP upgrades at the existing District WWTP.	District	Q1 2017

Table 1-7. RGSP Long Term Initiative Timeline

	RGSP Initiative	Intended Outcome	Lead Agency(ies)	Completion Timeline
Long Term	Governance Discussion	Development of a governance framework for the RGSP	RGSP Stakeholders	2017/2018
	RGSP Site Procurement	Procure locations suitable for an offsite ATP (if selected as preferred location) and associated injection wells.	District, City of Pismo Beach	2018
	Test Injection Well	Design and build a test injection well and associated monitoring wells to help inform the RGSP final design.	City of Pismo Beach, District	2017
	Phase 2 of the Groundwater Model	Update and expand the hydrogeologic model to potentially include the Bulletin 118 fringe areas to provide a tool for developing comprehensive water management strategies and assisting with SGMA compliance.	NCMA Agencies, NMMA Parties, SLO County	2018
	Water Quality Sampling	Sample effluent water from the PB WWTP and develop estimates of anticipated District WWTP effluent quality, after the Redundancy Project, to determine the anticipated water for the Phase 1 and Phase 2 ATP influent.	District, City of Pismo Beach	Ongoing
	SNMP/Antidegradation Analysis	Develop a SNMP/Antidegradation Analysis to demonstrate that injected effluent will not detrimentally impact SMGB beneficial uses	District, City of Pismo Beach	2017
	WDR and/or WRR Permits	Submit a Report of Waste Discharge to the RWQCB and an Engineering Report to CCRWQCB and DDW	District	2018
	Infrastructure Permits	Obtain permits to construct the recommended project	District	2018
	Change Petition	Obtain approval from the SWRCB in accordance with the CWC sections 1210-1212	District	2018

2 INTRODUCTION

The South San Luis Obispo County Sanitation District (District) and the City of Arroyo Grande (City) engaged Water Systems Consulting (WSC) to develop a Recycled Water Facilities Planning Study (RW Study). The purpose of the RW Study is to investigate alternatives for developing advanced treatment facilities and a recycled water system to provide a supplemental water supply for the region. The RW Study is funded in part by a grant from the California State Water Resources Control Board (SWRCB) Water Recycling Funding Program.

The District was formed in 1963 to provide wastewater collection and treatment services to residents in the Cities of Arroyo Grande, Grover Beach, and the Oceano CSD, as well as a small additional service area of unincorporated San Luis Obispo County. The District's wastewater treatment plant (WWTP) provides primary and secondary treatment and currently treats 2.5 million gallons per day (MGD); the WWTP is permitted to treat up to 5.0 MGD. All of the treated effluent from the WWTP is currently discharged to the Pacific Ocean through an outfall pipeline which is shared with the PB WWTP.

This Study was funded in part by a Water Recycling Facilities Planning Grant from the California SWRCB Water Recycling Funding Program. The grant was matched by the City and the District to fully fund the Study.

2.1 STUDY AREA CHARACTERISTICS

The District service area encompasses a geographic area of 8.8 square miles according to LAFCO shapefiles (LAFCO, 2016). Figure 2-1 shows the service area for District.

2.1.1 Service Area Population

The District developed a Long-Range Plan, Wastewater Treatment Plant Improvements Report in 2005 detailing the service area development to the year 2020. This report estimated that by 2020, the District could potentially serve a population of 51,200, and treat flows of approximately 4.2 MGD.

The residents of the City of Arroyo Grande make up approximately 44% of the total District service area population (SSLOCSD, 2008). Arroyo Grande consists of a combination of residential and rural canyon lands.

The residents of the City of Grover Beach make up approximately 36% of the District population (SSLOCSD, 2008). Most of Grover Beach consists of commercial, suburban, and recreational development.

OCSD is an unincorporated area of San Luis Obispo County. OCSD includes the towns of Oceano and Halcyon and represents approximately 20% of the total District population (SSLOCSD, 2008). The development in OCSD is a mix of residential, open space, and agricultural fields.

Residents in the unincorporated County areas outside of OCSD represent less than 1% of the District's service area population. The population of the unincorporated area within the District was estimated by assuming there are approximately 2.4 occupants in each of the 50 residences and then projecting out to the year 2035 at a growth rate of 2% per year.

The current and projected populations are shown in Table 2-1 and were obtained from San Luis Obispo Council of Governments (SLOCOG) population studies. A graphical representation of the projected growth shown in Table 2-1 is provided in Figure 2-2.

The City of Pismo Beach is not within the District's service area but is included in reference information throughout this study because they work closely with the District member agencies to manage local water supplies and may be a partner on a project resulting from the information contained in this study.

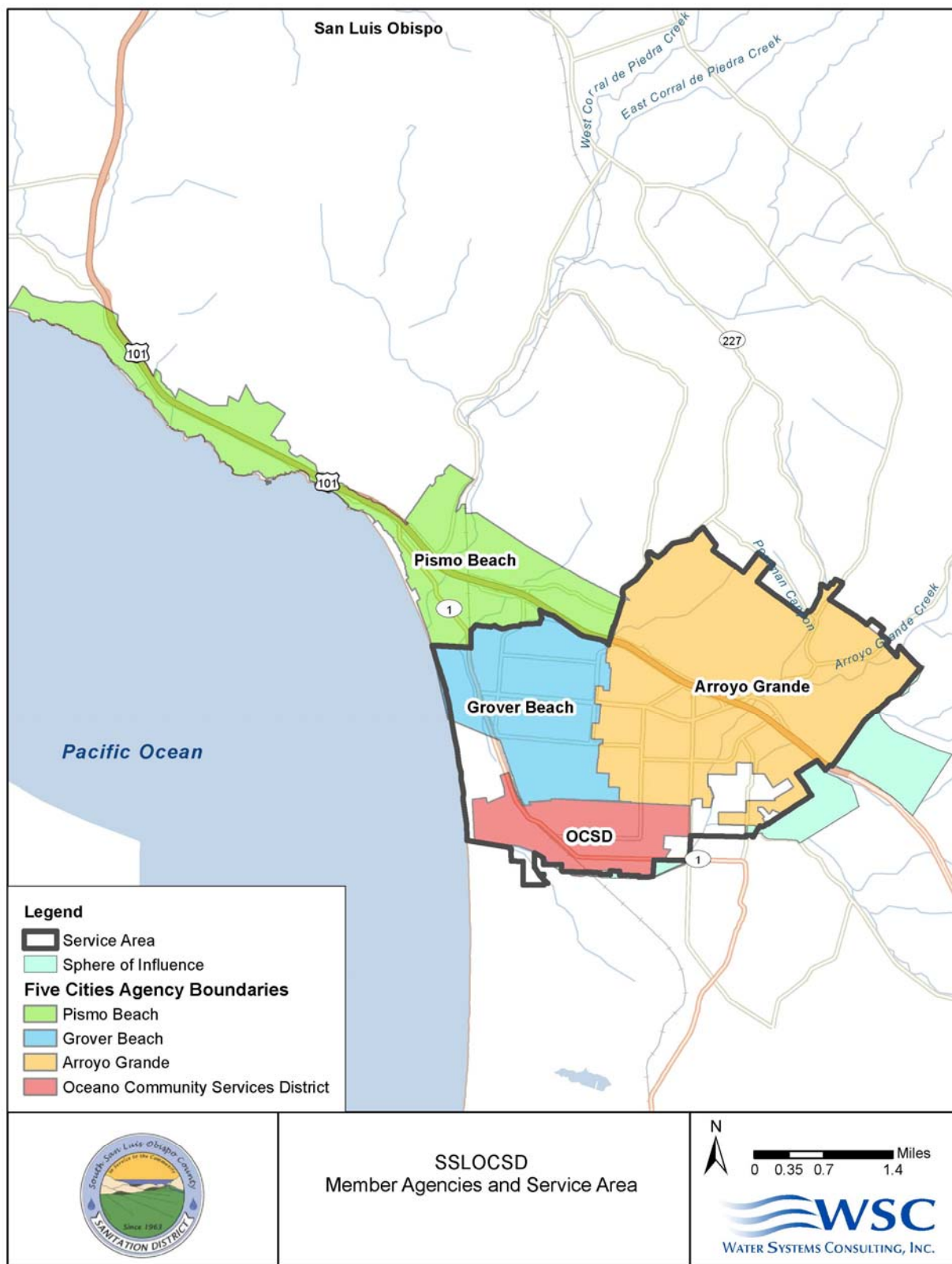


Figure 2-1. District Service Area and RGSP Stakeholder Boundaries

Table 2-1. Current and Projected Service Area Population Estimates

	Census	Projections						
	2010	2014	2015	2020	2025	2030	2035	2040
Pismo Beach	7,642	7,724	7,744	7,912	8,140	8,426	8,714	9,010
Arroyo Grande ¹	17,078	17,345	17,412	18,032	18,489	19,062	19,640	20,234
Oceano CSD	7,108	7,205	7,230	7,351	7,504	7,869	8,426	8,848
Grover Beach	12,967	13,107	13,142	13,432	13,650	13,925	14,201	14,486
Unincorporated ²	97	108	120	132	145	160	176	193
Total	37,250	37,765	37,904	38,947	39,788	41,016	42,443	43,761

¹ Arroyo Grande, Oceano CSD, and Grover Beach population estimates from SLOCOG

² From the District estimate of 50 residences assuming an average of 2.4 (from AECOM SLOCOG study) people per household projected at a growth rate of 2% per year

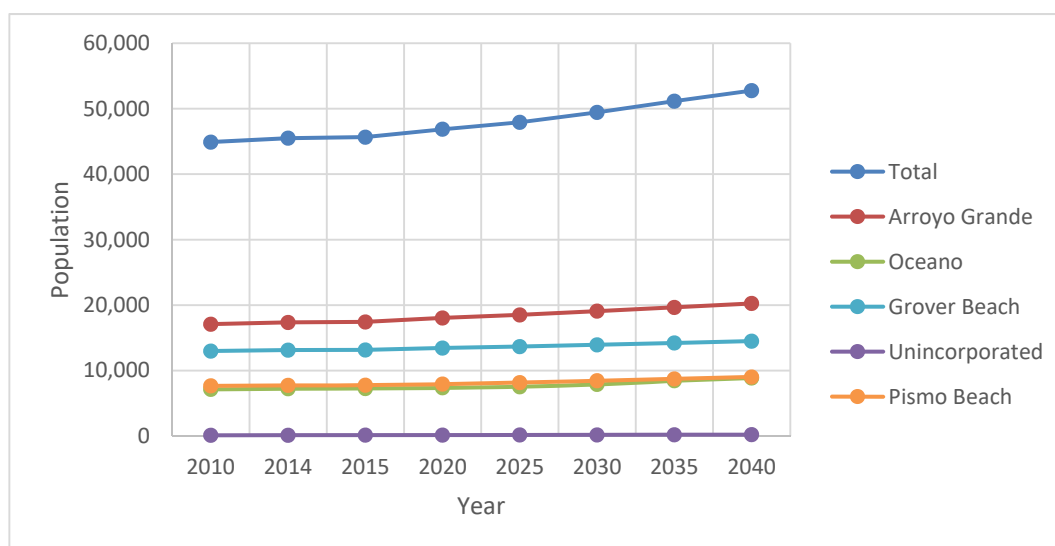


Figure 2-2. Current and Projected Service Area Population Estimates

2.2 RELEVANT JURISDICTIONAL BOUNDARIES

2.2.1 District Boundary

The District does not have any direct retail customers. The District is responsible for the maintenance and upkeep of the WWTP and its trunk lines. When a property falls outside of the jurisdiction of member agencies, San Luis Obispo County has the authority to enforce current building and construction codes and ordinances.

2.2.2 Coastal Zone

Portions of the District's service area, including the WWTP, lie within the Coastal Zone, as designated by the California Coastal Act of 1976 (Coastal Act). Due to this designation, District projects within the Coastal Zone require a Coastal Development Permit. The Coastal Zone boundary is shown in Figure 2-3.

2.2.3 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. 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 a Stipulation, which formally divided the SMGB into three management areas: the Northern Cities Management Area (NCMA); the Nipomo Mesa Management Area (NMMA); and the Santa Maria Valley Management Area (SMVMA). The boundary of NCMA is shown in Figure 2-3. The Superior Court of California (Court) later adopted the Stipulation in its January 25, 2008 Judgment After Trial (Judgment).

2.2.4 Study Area

The Study Area for the RW Study includes the current District service area and the remainder of the Northern Cities Management Area (NCMA). The Study Area is shown in Figure 2-3.

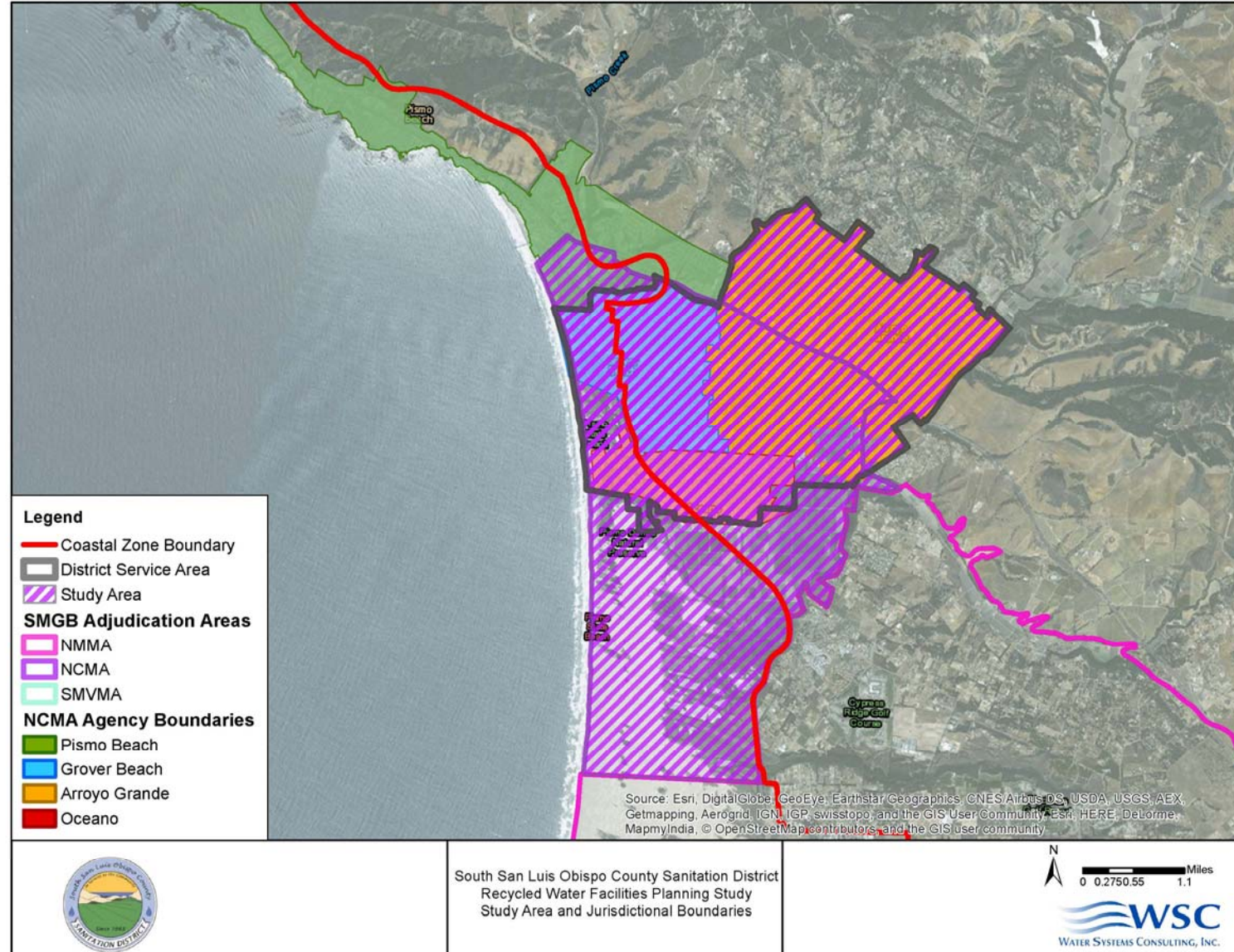


Figure 2-3: Recycled Water Facilities Planning Study Area and Jurisdictional Boundaries

2.3 BACKGROUND

Ongoing drought conditions in San Luis Obispo County and throughout California have stressed available water supplies and forced agencies to identify additional creative solutions for developing more reliable and locally controlled water resource portfolios. For the Oceano CSD and the Cities of Arroyo Grande and Grover Beach, the three municipalities served by the District, a potential approach is to further treat their wastewater so it can be used to replenish or offset pumping in the Santa Maria Groundwater Basin (SMGB). These agencies, along with the City of Pismo Beach and rural and agriculture users, rely upon water from the Northern Cities Management Area (NCMA) of the SMGB as a part of their water supply portfolios. Recent drought conditions have highlighted the vulnerability of the NCMA groundwater sources to seawater intrusion. Developing a recycled water system to better utilize local wastewater resources has long been considered a favorable option for improving water supply reliability and reducing the threat of seawater intrusion in the NCMA. However, the expected cost of a recycled water system, as well as the location of the existing WWTP within the Federal Emergency Management Agency (FEMA)-designated 100-year flood zone, have historically been limiting factors in the District's ability to develop a recycled water system. However, there have been several recent related initiatives that have advanced the state of water resource planning in the region and motivated the District and the other RGSP Stakeholders to initiate this Study to evaluate opportunities to further advance these initiatives toward implementation.

2.4 GOALS AND OBJECTIVES FOR RECYCLED WATER

The District, the City, and WSC (Project Team) developed goals and objectives for the RW Study through meetings that included staff from the District, its member agencies, WSC, and regional stakeholders. As a product of these efforts, the following goals and objectives for the RW Study were developed:

1. Identify ways that the District can contribute to developing a resilient water supply portfolio for southern San Luis Obispo County;
2. Investigate and document potential regulatory, scientific, financing, jurisdictional, and public acceptance constraints to the District developing a recycled water system;
3. Identify opportunities for the District, its member agencies, and regional stakeholders to overcome these constraints and outline a strategy for developing a resilient, drought-proof source of supply;
4. Provide an opportunity to educate the public and project stakeholders about recycled opportunities in the region; and
5. Coordinate with other local efforts to develop a regional recycled water program.

2.5 RELATED INITIATIVES

This section describes several key regional initiatives related to water supply and the District's WWTP, which are either ongoing or have recently been completed. This study is intended to leverage the work done toward these initiatives and build on prior analysis to further advance concepts that will enhance and/or protect regional water supplies. The related initiatives are described below.

2.5.1 South San Luis Obispo County Sanitation District Redundancy Project

The District has been working towards completing WWTP upgrades, including secondary treatment process upgrades and redundancy improvements (Redundancy Project), in an effort to address RWQCB

requirements. The Redundancy Project design consultant was selected in March 2016 and construction is scheduled to begin sometime in 2018. The Redundancy Project is scheduled to be completed and operational by 2020.

The Redundancy Project is currently in the permitting process through the California Coastal Commission (Coastal Commission). Through this permitting process, the Coastal Commission has relayed several potential concerns regarding the Redundancy Project and has requested additional information from the District on the Environmental Sensitive Habitat Area (ESHA) near the project site, potential flooding issues, and potential impacts from sea level rise. Currently it is believed that these issues can be mitigated and should not restrict approval of the Coastal Development Permit for the Redundancy Project.

2.5.2 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 an objective screening and 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 reliability of groundwater supplies.

2.5.3 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 Regional Groundwater Sustainability Project (discussed in Section 2.5.6), was selected as part of the High Priority Projects, for inclusion in the San Luis Obispo IRWMP and potential future grant funding applications.

2.5.4 San Luis Obispo County Regional Recycled Water Strategic Plan

The San Luis Obispo County Regional Recycled Water Strategic Plan (RRWSP) was completed in November 2014. The purpose 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 conceptual 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 District and the PB WWTP effluent for agricultural irrigation, industrial reuse, groundwater recharge, seawater intrusion barrier, and surface water augmentation. The RRWSP identified potential constraints and next steps for further exploration, including:

- Define the treatment upgrades that would be needed at the plant to take advantage of water recycling opportunities;
- Compare viable projects with alternative water supplies;
- Continue to participate in discussion with regional projects that could use the District and the City of Pismo Beach's effluent in a beneficial use and confirm the ability of the participating agencies to receive a water supply benefit;
- Incorporate the salt and nutrient management planning into water, wastewater and recycled water planning;
- 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; and
- Determine benefits of and need for a seawater intrusion barrier.

2.5.5 The City of Pismo Beach Recycled Water Facility Planning Study

In April 2015, the City of Pismo Beach completed a Recycled Water Facilities Planning Study (PB RW Study). The purpose of the PB RW Study was to expand on the concepts in the RRWSP and further investigate alternatives to beneficially reuse the effluent from the PB WWTP for recycled water reuse and recharge projects to a new drought proof source of water for the region. The other NCMA agencies were

encouraged to participate throughout the development of the PB RW Study and their input helped identify opportunities for near term and long term regional collaboration.

The PB RW Study identified four alternatives for recycled water:

- Alternative 1 – Secondary 23 Irrigation
- Alternative 2 – Disinfected Tertiary Irrigation
- Alternative 3a – Full Advanced Treatment for Coastal Injection
- Alternative 3b – Full Advanced Treatment for Inland Injection

The findings of the PB RW Study determined that groundwater recharge via coastal and/or inland injection was the most favorable alternative. This alternative requires the construction of an ATP to produce advanced purified water for groundwater recharge, either at the PB WWTP site or another offsite location.

2.5.6 The Regional Groundwater Sustainability Project

As per the results of the PB RW Study, the City of Pismo Beach took the lead on the recommended project and kicked off the Regional Groundwater Sustainability Project (RGSP) in February 2016. The RGSP is a Phased project that will recharge the SMGB and provide supplemental water for the region through indirect potable reuse (IPR). Phase 1 is currently in progress; the primary objectives of Phase 1 include:

- Develop and begin implementing an outreach program to build community support for the Project;
- Meet and work with regulators and other stakeholders to understand the potential permitting, legal, and administrative issues;
- Develop 10% design documents to provide project definition and cost estimates and support preparation of environmental compliance documents;
- Begin the development of required documents and studies to apply for project funding; and
- Apply for construction grants and loans through the State Water Resources Control Board (SWRCB) Water Recycling Funding Program (WRFP) and potentially other funding programs.

As part of Phase 1, Pismo Beach, the District, and the other NCMA agencies are continuing to work together to identify opportunities to collaborate on the RGSP, as discussed further in this study.

2.6 STUDY PURPOSE

The District and the City's original proposed concept for evaluation in this RW Study was to investigate the potential for a Satellite Water Resource Recovery Facility (SWRRF) located along one of the trunk mains leading to the WWTP. The SWRRF would be located outside of the flood plain, near potential recharge locations, and could potentially offset some of the upgrade costs associated with the Redundancy Project. However, an initial financial analysis (Investment Analysis) determined that a SWRRF was not an effective option for developing a recycled water system in the region due to the expected costs associated with developing a satellite facility, including new infrastructure for primary, secondary, tertiary and advanced treatment. For reference, the Investment Analysis is included as Appendix A.

Following the Investment Analysis, the District and the City re-evaluated the approach to the RW Study and decided to take the opportunity to more closely align this study with the RGSP, which is in the early Phases of implementation and has not yet selected a site for the ATP. Since the goals of the RGSP and the RW Study are the same, the project teams have been collaborating to develop the best RW solution for the RGSP Stakeholders and have often considered the concept of a combined regional project that utilizes flows from both the PB WWTP and District WWTP. To further advance this concept, the scope of this Study was modified to evaluate a Phased approach where Phase 1 will send the flows from the PB WWTP through a shared ATP, and Phase 2 will be expanded to include flows from the District's WWTP as well. The updated alternatives evaluated in this study include:

- Advanced Treatment Plant upgrades at the existing District WWTP to provide water for groundwater and/or recharge agricultural irrigation; and
- An offsite Advanced Treatment Plant to treat secondary effluent from the PB WWTP and the District WWTP to provide water for groundwater and/or recharge agricultural irrigation

It is envisioned that the findings from this Study will be incorporated into the RGSP and will inform the selection of a shared ATP location that will set the foundation for a cohesive regional recycled water program for the NCMA.

Although potential upgrades at the existing WWTP have been studied in previous reports, subsequent steps to advance a recycled water project have not advanced for a variety of reasons described above. However, through the Redundancy Project, the District is pursuing permits from the Coastal Commission and working to address these previous concerns at the existing site. The results of this effort will help inform the District and the other RGSP Stakeholders about the potential opportunity to construct future infrastructure upgrades at the existing WWTP, including an ATP.

3 WATER SUPPLIES AND CHARACTERISTICS

The water supply for the District member agencies currently consists of a combination of groundwater and local and imported surface water. Each of the water purveyors rely upon their own specific combination of these water sources. The specific sources of supply and their baseline (full allotment) amounts are summarized in Table 3-1 in acre-feet (AF). The City of Pismo is not a District member agency but is included due to their role in the project.

Table 3-1. Local Agency Water Entitlements for 2015

Urban Area	Lopez Lake (AF)	SWP Allocation (AF)	Groundwater Allotment (AF)	Ag Credit (AF)	Other Supplies (AF)	Total (AF)
Arroyo Grande	2,290	0	1,202	121	160	3,773
Grover Beach	800	0	1,198	209	0	2,207
Pismo Beach	892	1,100	700	0	0	2,692
Oceano CSD	303	750	900	0	0	1,953
Total	4,285	1,850	4,000	330	160	10,625

3.1 SURFACE WATER

The District member agencies possess water supply contracts with the San Luis Obispo County Flood Control and Water Conservation District (SLOCFC&WCD) for Lopez Project and State Water Project (SWP) surface water supplies.

3.1.1 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 the District's member agencies and other SLOCFC&WCD Zone 3 agencies through the Lopez Pipeline.

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. Due to successive dry years, Zone 3 created the Low Reservoir Response Plan (LRRP). The LRRP was adopted in December 2014 and enacted in April 2015 when the storage dropped below 20,000 AF. The enactment of Stage 2 of the LRRP resulted in approximately a 10% decrease in municipal diversions and downstream releases as shown in Table 3-2 and Table 3-3. The Zone 3 2015 UWMP projects that the municipal entitlements will remain constant at 4,530 AFY through 2035 under normal conditions and that it will be able to supply all contracted agencies with their requested allocations in full during single dry years and multiple dry years until the fourth dry year (Group, 2015).

Table 3-2. Municipal Diversion Reduction Strategy Under the LRRP

Storage Level (AF)	Municipal Diversion Reduction	Municipal Diversion (AFY) ¹
20,000	0%	4,530
15,000	10%	4,077
10,000	20%	3,624
5,000	35% ²	2,941
4,000	100%	0

¹ The actual amount of water diverted may vary as agencies extend the delivery of their Lopez Entitlement

² The 35% reduction provides sufficient water to supply 55 gallons per capita per day (GPCD) for the estimated population of the Zone 3 agencies (47,696 in 2010 per the 2010 Zone 3 UWMP). 55 GPCD is the target residential indoor water usage standard used in California Department of Water Resource's 2010 UWMP Method 4 Guidelines.

Table 3-3. Downstream Release Reduction Strategy Under the LRRP

Storage Level (AF)	Municipal Diversion Reduction	Municipal Diversion (AFY) ¹
20,000	9.5%	3,800
15,000	9.5%	3,800
10,000	75.6%	1,026
5,000	92.9%	300
4,000	100.0%	0

¹These downstream releases represent the maximum amount of water that can be released. Actual releases may be less if releases can be reduced while still meeting the needs of the agricultural stakeholders and addressing the environmental requirements (Group, 2015).

Of the allocation for municipal diversion, the member agencies are allocated 3,393 AFY and the City of Pismo Beach is allocated 892 under normal conditions. Under the current LRRP, the member agencies are allocated 3,002 AFY and the City of Pismo Beach is allocated 803 AFY (Fugro Consultants, 2016). Surplus Water from the reservoir is periodically available, but not on a consistent basis. The District member agencies all receive water from Lopez Lake. Table 3-4 shows the water allocation for the District member agencies before and after the LRRP 10% reduction (Fugro Consultants, 2016).

Table 3-4. Lopez Lake 2015 Water Allocation under LRRP 10% Diversion Reduction Strategy (AFY)

Contractor	Normal Water Allocation (AFY) ¹	LRRP Reduced Diversion (AFY)
City of Arroyo Grande	2,290	2,061
City of Grover Beach	800	720
City of Pismo Beach	892	803
Oceano CSD	303	273
CSA 12 (not it NCMA)	245	221
Total:	4,530	4,077
Downstream Releases	4,200	3,800
Safe Yield of Lopez Lake	8,730	7,877
¹ Allocations and diversions are from the Northern Cities Management Area 2015 Annual Report		

3.1.2 State Water Project

Oceano CSD and the City of Pismo Beach are SWP subcontractors through subcontracts with the SLOCFC&WCD. The SLOCFC&WCD is a primary SWP contractor with DWR and serves as the entity through which Oceano CSD and Pismo Beach receive their 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 SLOCFC&WCD possesses a contract with the Central Coast Water Authority (CCWA) for treatment of its SWP supplies at the Polonio Pass Water Treatment Plant. The SLOCFC&WCD 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 member agencies through the Lopez Pipeline. Oceano CSD's current contract entitlement amount of SWP with the SLOCFC&WCD is 750 AFY.

In addition, the SLOCFC&WCD operates a drought buffer program whereby agencies subcontractors, participating in the SWP through the SLOCFC&WCD, 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 supplies are reduced. Oceano CSD is in the process of obtaining 750 AFY of drought buffer from the SLOCFC&WCD to help bolster its water supply portfolio and provide additional reliability during drought periods.

SWP water deliveries vary from year to year depending on supply from rainfall, snowpack, runoff, reservoir storage, pumping capacity from the Delta, and legal environmental constraints. The historical SWP Afor San Luis Obispo County are shown in Table 3-5 for the SLOCFC&WCD and the Central Coast Water Authority (CCWA).

Table 3-5. Annual SWP available Allocations for San Luis Obispo County

Year	Annual Allocation (%)	Available SLOCFC&WCD SWP Allocation (AF)
2004	63	15,750
2005	82	20,500
2006	93	23,250
2007	60	15,000
2008	34	8,500
2009	33	8,250
2010	39	9,750
2011	80	20,000
2012	65	16,250
2013	35	8,750
2014	5	1,250
2015	20	5,000
2016	60	15,000

3.2 GROUNDWATER

As shown in Figure 3-1, the service area boundary for the District overlies a portion of the NCMA within the SMGB. Most of the District member agencies' groundwater production wells are located within the NCMA portion of the SMGB and the basin is an important component of the member agencies' water supply portfolio.

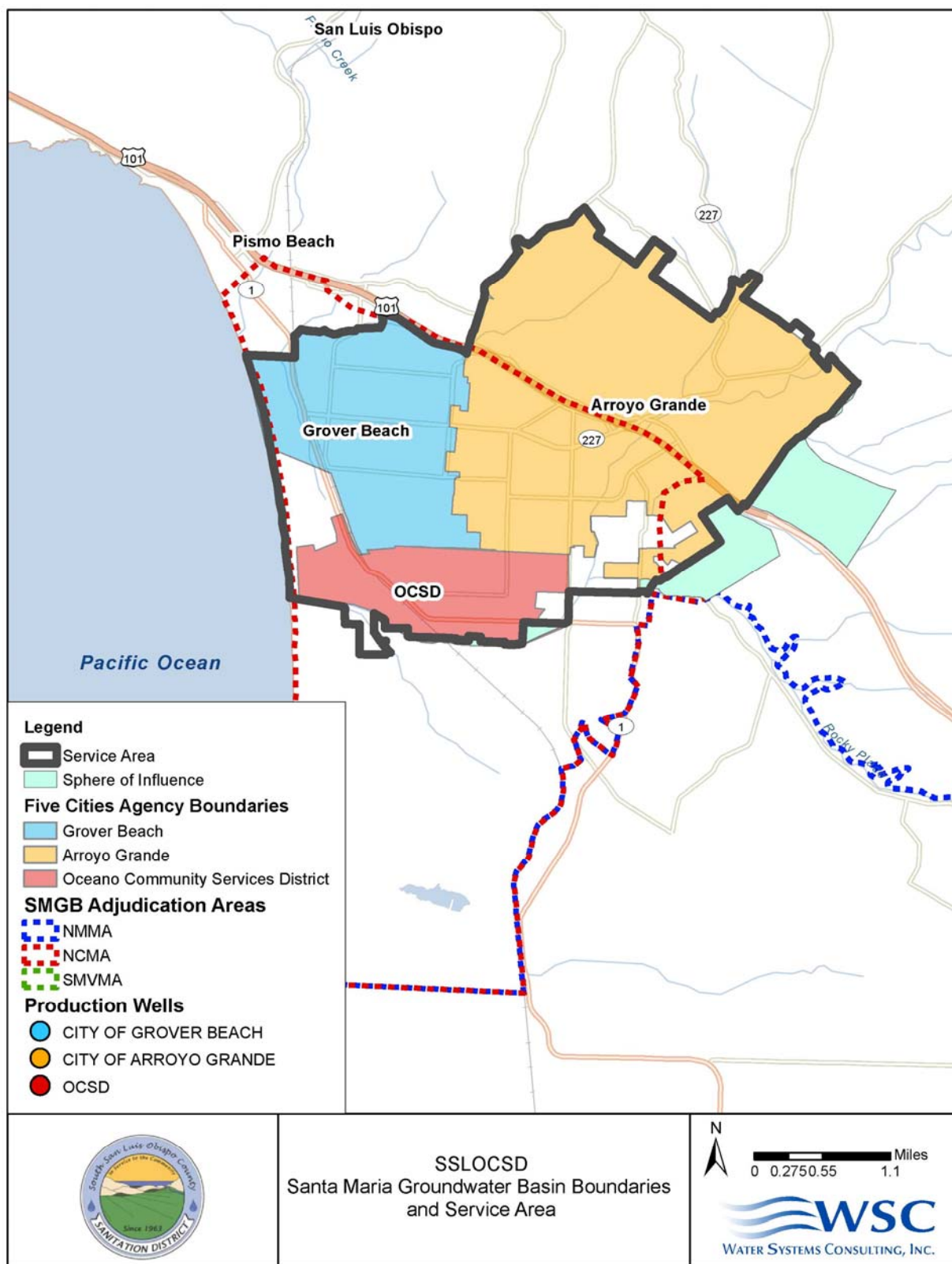


Figure 3-1. Santa Maria Groundwater Basin Boundaries and Service Area

The Department of Water Resources (DWR) identifies the SMGB as Basin Number 3-12, as described in DWR Bulletin No. 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 member agencies currently extract 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 2.2.3, the SMGB is adjudicated. The safe yield of the Sub-basin, as identified in the Management Agreement, is 9,500 AFY.

The City of Arroyo Grande also has two production wells in operation in the Pismo Formation. The Pismo Formation is a deep aquifer at the northeastern section of the City of Arroyo Grande. The formation is not adjudicated and has not been identified as over drafted, nor is it projected to be over drafted by DWR. The City of Arroyo Grande has two wells capable of extracting 80-90 AFY each and a third well in construction that is anticipated to extract 40-45 AFY once completed (Consulting, 2016).

Natural recharge into 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 2.2.3, 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.

3.2.1 Management Strategies

The 2008 Annual Monitoring Report for the NCMA indicated that drought conditions and subsequent increased groundwater pumping were causing groundwater elevations to drop below mean sea level (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 NCMA partners to limit water consumption, increase surface water imports and reduce groundwater pumping in an effort to allow groundwater elevations to recover and prevent further seawater intrusion. As a result of these groundwater conservation activities, the NCMA agencies were able to decrease their total groundwater pumping from 8,771 AFY in 2008 to 5,943 AFY in 2015, a reduction of 70 percent (Fugro Consultants, 2016).

However, ongoing drought conditions have reduced SWP deliveries and triggered Lopez reductions through the LRRP, which have impacted ability of the NCMA agencies to utilize surface water supplies to offset their groundwater pumping. Since 2014, storage levels in Lopez Reservoir have dropped to

historically low levels and, if the drought continues, Lopez Water will likely be unavailable to the NCMA agencies, forcing them to further rely upon groundwater supplies.

3.2.2 Recent Conditions

3.2.2.1 Groundwater Levels

The April 2015 groundwater level contour maps contained in the 2015 NCMA Annual Report identified two areas of pumping depressions. One is in the north-central part of the area near some centralized municipal pumping, and the second is in the eastern part of the NCMA in the region of centralized agricultural pumping. Water levels along the coast ranged from 4.53 to 8.10 feet NAVD88.

Groundwater contours in October 2015 show a similar overall trend as in April 2015, although with a general lowering of water levels across the region. Much of the area from the north-central portion of the NCMA to near the southern boundary of the NCMA appears to have had water levels below sea level at this time, with water level elevations along the coast ranging from -0.4 to 6.97 feet NAVD88. A groundwater elevation map for April 2015 is shown in Figure 3-2 and the map for October 2015 is shown in Figure 3-3.

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 NCMA agencies.

3.2.2.2 Water Quality

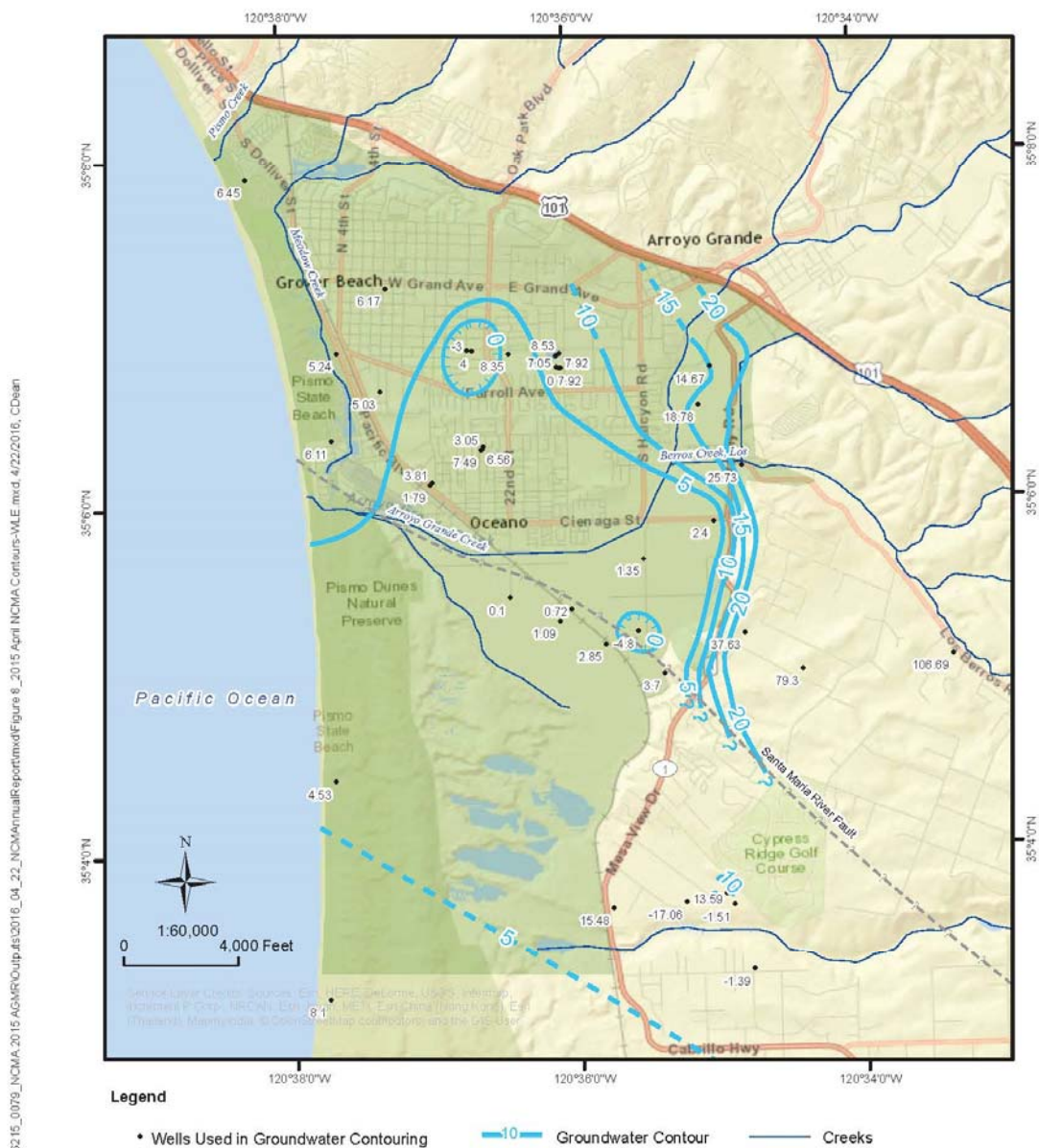
The primary water quality factor affecting supply reliability for the member agencies is the threat of seawater intrusion into its groundwater supplies. Under natural and historical conditions, a net outflow of freshwater from the groundwater basin towards the ocean has kept the seawater/freshwater interface 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 2015, groundwater levels within the NCMA monitoring wells have dropped to levels similar to those seen in 2008 and 2009. This drop in groundwater levels occurred in spite of significantly reduced municipal groundwater pumping and increased conservation efforts. 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.

3.2.3 Groundwater Rights

As stated in Section 3.2, the safe yield of the Sub-basin, as identified in the Management Agreement, is 9,500 AFY. The SMGB is adjudicated and the District's member agencies are allocated a total of 3,630 AFY and the City of Pismo Beach is allocated 700 AFY of the identified safe yield of the Sub-basin (discussed in Section 2.2.3).

Northern Cities Management Area
Project No. 04.62150079



WATER LEVEL ELEVATION, APRIL 2015
Northern Cities Management Area
San Luis Obispo County, California

FIGURE 8

Figure 3-2. Water Level Elevation Map for April 2015 from the 2015 NCMA Annual Report



FIGURE 9

Figure 3-3. Water Level Elevation Map for October 2015 from the 2015 NCMA Annual Report

3.3 WATER USE TRENDS

Urban water demands are presented in Table 3-6 and Figure 3-4 for the District's member agencies and the City of Pismo Beach from 2005 through 2015. These demand values represent all water used within the three member agencies in the District's service area, including the portions of Arroyo Grande that extend outside the NCMA (see Figure 2-1), as well as system losses. Urban demand declined steadily from a high in 2007 until 2011, increased slightly each year for the three dry years from 2011 through 2013 reaching 5,791 AF, but then declined dramatically in 2014 to 4,906 AF. The dramatic decline in urban demand in 2014 continued into 2015, with total demands dropping to 4,207 AF. Overall, there has been a downward trend in the water use even though the population has actually grown since 2010. This downward trend in water demand is linked to local conservation efforts.

Table 3-6. Urban Water Demand (Groundwater and Surface Water, AF)

Year	Arroyo Grande	Grover Beach	Pismo Beach	Oceano CSD	Total Urban Demand
2005	3,460	2,082	2,142	931	6,473
2006	3,425	2,025	2,121	882	6,332
2007	3,690	2,087	2,261	944	6,721
2008	3,579	2,051	2,208	933	6,563
2009	3,315	1,941	2,039	885	6,141
2010	2,956	1,787	1,944	855	5,598
2011	2,922	1,787	1,912	852	5,561
2012	3,022	1,757	2,029	838	5,617
2013	3,111	1,792	2,148	888	5,791
2014	2,752	1,347	1,949	807	4,906
2015	2,239	1,265	1,736	703	4,207

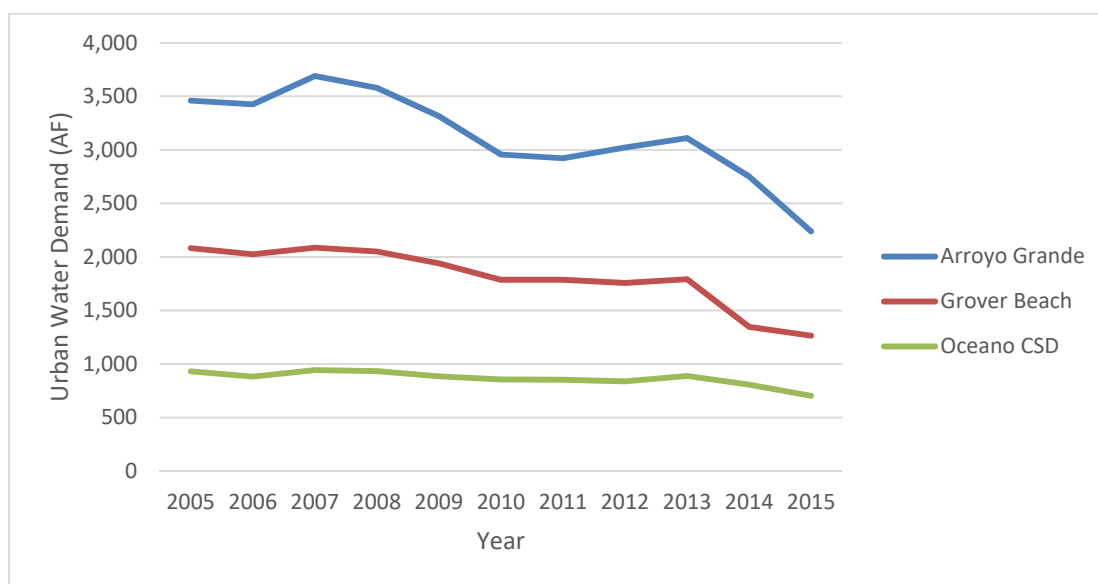


Figure 3-4. Urban Water Demand

3.4 WATER RATES

The District member agencies' water rates are designed using the commodity-demand method. In the commodity-demand method, revenue requirements are assigned as commodity costs (variable costs like chemicals, power, amount of water use, etc.), demand costs (costs like treatment, storage, and distribution facilities), and customer costs (costs like meter maintenance and reading, billing, collection, and accounting), and fire protection costs. Water rates are based on rates per HCF to account for variable costs and water service charges to account for fixed costs.

3.5 PLANS FOR NEW FACILITIES OR ADDITIONAL WATER SOURCES

3.5.1 Lopez Reservoir Spillway Raising

In 2008/2009, the contract agencies of the Lopez Project conducted a study and evaluation to consider raising the spillway elevation of Lopez Reservoir, as a means of increasing safe yield in the reservoir and thus increasing water supply entitlements to the contract agencies. By raising the spillway a few feet, the overall capacity of the reservoir increases significantly. The increased capacity will correlate to a greater entitlement of the water supply that can be distributed to the District member agencies and the surrounding contract agencies. Further evaluation of this project is currently on hold, while the SLOFC&WCD are developing a Habit Conservation Plan (HCP) for the Arroyo Grande Creek, which feeds Lopez Reservoir.

3.5.2 Supplemental State Project Water via the Coastal Branch and Lopez Pipelines

The SLOFC&WCD completed a hydraulic study to determine if additional capacity exists in the Central Coast Water Authority (CCWA) State Water Pipeline for supplemental water deliveries to CCWA subscribers, including Contract Agencies (served via the Lopez Pipeline). The hydraulic study modeled the

entire CCWA pipeline delivery system, plus the Lopez pipeline. The results of this study identified significant excess capacity in portions of the pipeline and the results are being used as a starting point for the SLOCFC&WCD and CCWA to enter into discussions to consider utilization of the SLOCFC&WCD's excess SWP entitlement. Expanding delivery options for the SLOCFC&WCD's excess entitlement could provide an opportunity for the member agencies to obtain a supplemental supply source.

3.5.3 Additional Storm Water Reclamation

A detention basin currently exists at the Wal-Mart Site near the intersection of West Branch Street and Camino Mercado in the City of Arroyo Grande; according to staff, this basin holds water year-round due to storm water inflow. The year-round storage volume is currently unknown; however the approximate volume of the basin is 6.4 acre-feet (City of Arroyo Grande, April 2010). The *Recycled Water Distribution System Conceptual Plan Technical Memorandum* recommends conducting a feasibility study for the storm water reclamation project. If the storm water is deemed a viable source of water, it would potentially offset potable water demand by approximately 43 AFY (Steve Tanaka, PE & Valerie Huff, PE, June 2010).

The City recently received a grant to prepare a Storm Water Resource Plan for the Arroyo Grande and Pismo Creek Watersheds. This plan will be starting 2017 and will likely identify additional areas and projects to capture stormwater.

4 WASTEWATER CHARACTERISTICS AND FACILITIES

The District owns and operates a 5.0 MGD WWTP located next to the airport in Oceano, California. The WWTP discharges secondary treated municipal wastewater to the Pacific Ocean through an outfall diffuser system jointly owned by the City of Pismo Beach and the District.

4.1 EXISTING REGULATORY REQUIREMENTS

The District's WWTP is currently operating under a National Pollution Discharge Elimination System (NPDES) permit (CA0048003) issued on October 23, 2009. A copy of the existing NPDES permit is attached in Appendix B. Table 4-1 summarizes the effluent requirements for conventional pollutants contained within the permit. Based on their NPDES permit, the District can discharge up to 5.0 MGD via the ocean outfall. This flow is combined with up to 1.9 MGD of effluent from the PB WWTP. The combined flow is discharged to the ocean through an outfall diffuser system at an approximate ratio of 165 to 1 (ocean water to effluent) (2008). The PB WWTP effluent is regulated under NPDES permit CA0048151 included in Appendix C.

Table 4-1: Summary of Existing NPDES Discharge Limits For Selected Pollutants

Parameter	Units	Effluent Limitations		
		Average Monthly	Average Weekly	Maximum Daily
BOD ₅	mg/L	40	60	90
	lbs/day	1668	2502	3753
TSS	mg/L	40	60	90
	lbs/day	1668	2502	3753
Settleable Solids	MmL/L/hr	1	1.5	3
Turbidity	NTUs	75	100	225
Oil & Grease	mg/L	25	40	75
	lbs/day	1042	1668	3127
Fecal Coliform Bacteria	MPN/100 mL		200 ^[1]	2,000
pH	pH units	6.0-9.0 at all times		
¹ 7-sample median				

The District is currently under administrative extension of its permit. It does not anticipate any significant changes to the effluent limitations. However, the District is currently designing and permitting secondary treatment upgrades (i.e. Redundancy Project) for its WWTP. Therefore, for this study, it was assumed that the future secondary effluent from the District WWTP's will have a water quality equivalent to that of an activated sludge WWTP (verses the current trickling filter).

4.2 EXISTING FACILITIES

The District was formed on September 3, 1963 and the construction of nine miles of trunk line, the original WWTP, and an ocean outfall were completed by 1966. The plant has had various upgrades and process

modifications over the years, as outlined in Figure 4-1. The most recent upgrade was the addition of the Grit Removal System in 2016.

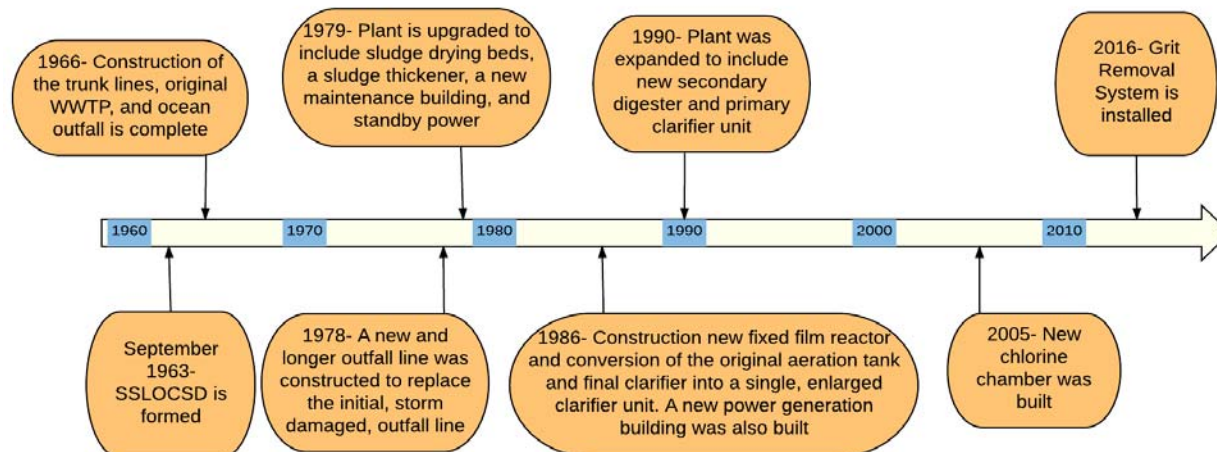


Figure 4-1. Construction History at the District WWTP

The WWTP receives wastewater from a combination of member agency owned and operated and District trunk lines. There are smaller municipal lines belonging to the three member agencies that connect into the District's trunk line. The District Trunk Line was constructed as part of the Plant's original design in 1963 and it is comprised of sewer pipe ranging from 15-30 inches in diameter. Due to the naturally sloping topography and the original system design, the District's trunk line system is entirely gravity fed. The current treatment train at the District WWTP is described below and shown in Figure 3-2.

- **Headworks:** This is where the influent enters the wastewater treatment process. Sticks, rags, large food particles, sand, gravel, toys, etc. are removed during this stage. An upgrade to the headworks, with the inclusion of mechanical bar screens, will be completed in spring 2017.
- **Grit Removal:** This removes sand, gravel, cinder, food waste, and anything that could cause unnecessary abrasion and wear of downstream mechanical equipment. The headworks and grit removal make up preliminary treatment at the District WWTP.
- **Primary Clarification:** This is the second step of the treatment process. The clarifiers hold wastewater for several hours allowing the heavier solids to settle to the bottom as sludge and the lighter solids float to the top as scum.
- **Fixed Film Reactor:** The fixed film reactor is filled with substrates such as rocks, sand, or plastic. The substrates grow microorganisms that react with the organic matter and nutrients in the wastewater as the wastewater flows through the reactor.
- **Secondary Clarification:** Wastewater flows through a secondary clarifier to remove additional suspended solids.

- Chlorine Contact Tank: This is the final stage of treatment and focuses on disinfection. Flow from secondary clarifiers travels to the chlorine contact basin. Adequate detention time is provided to allow chlorine to disinfect the treated wastewater to meet discharge permit conditions.

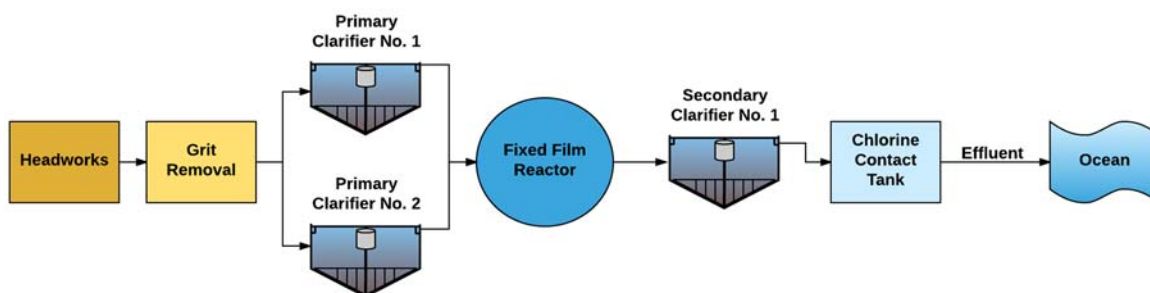


Figure 4-2. Current Treatment Train at the District WWTP

4.3 FUTURE FACILITIES

The District is currently working on a project to upgrade their secondary treatment process to provide additional redundancy at the plant. Currently, the WWTP has no redundancy for the secondary treatment process, which relies upon a single fixed-film reactor and clarifier. The upgrades are anticipated to include two aeration tanks and an additional secondary clarifier. The District has submitted a Coastal Development Permit application to the Coastal Commission, which is currently under review. Pending approval of the permit application, construction is scheduled to begin in 2018 and be completed by 2020. The process schematic for the proposed treatment train is shown in Figure 4-3 and the proposed site layout is shown in Figure 4-4.

The current effluent water quality is discussed in Section 4.5. It is anticipated future effluent to be used for RW will be of higher quality due to the redundancy project.

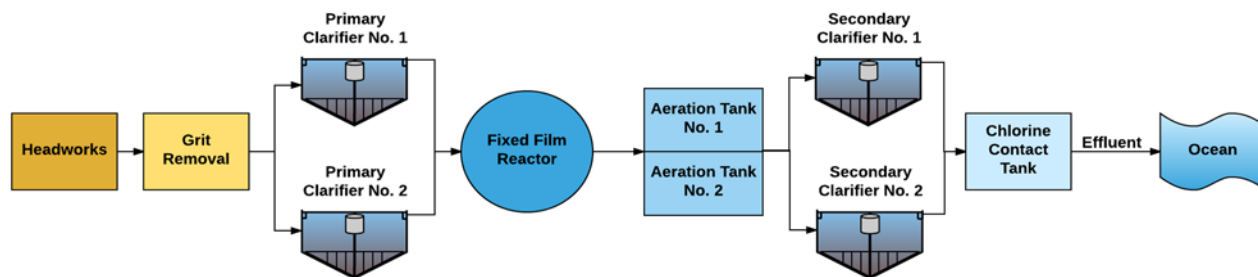


Figure 4-3. Proposed Redundancy Project Treatment Train at the District WWTP



4.4 EXISTING AND PROJECTED WASTEWATER FLOWS

Historical flow patterns and population growth form the basis of developing wastewater flow projections. The current flow assessments are based on flow conditions for the WWTPs from January 2010 to December 2015. The District provided data on daily WWTP influent flows for the past 5 years and circle charts for the peak days of each month. The daily influent flows are the average of the hourly flows at the WWTP. Effluent flow is also measured at the WWTP but the analysis was done using influent flows since the plant has minimal Inflow and Infiltration (I&I) and little equalization so the influent flows are equal to the effluent flows. The Average Dry Weather Flow is the flow during the dry season which included the flows from May through October. Table 4-2 shows the historical flow parameters and peaking factors for the District WWTP. It should be noted that District staff suspect influent readings from May 2015 through May 2016 were recorded to be 100,000 to 200,000 gallons lower than the actual flow due to a mis-calibrated flow meter. However, the numbers were not changed for this study due to the uncertainty of the flow readings, and the minimal anticipated impact on the analysis.

Table 4-2. Historical Flow Parameters at the District's WWTP

Flow Parameters (MGD)	2010	2011	2012	2013	2014	2015	2010-2015 Average Flows	Peaking Factor (to AA)
Average Annual	2.62	2.57	2.51	2.48	2.35	2.18	2.45	1.00
Average Annual Dry Weather	2.63	2.56	2.51	2.50	2.33	2.13	2.44	1.00
Max Month	2.96	2.95	3.01	2.59	2.47	2.40	2.73	1.11
Max Week	4.02	3.14	4.36	2.68	2.60	2.49	3.22	1.31
Max Day	4.85	3.31	7.10	3.16	3.24	2.60	4.04	1.65

Advanced treatment of flows from the PB WWTP is envisioned as Phase 1 of the RGSP, therefore, characterization of the PB WWTP flows is included in this section. The following section describes the flow parameters from the PB WWTP that will be used in this study. The current flow assessments are based on monthly flow conditions for the PB WWTP from January 2010 to December 2015 from their annual reports. Table 4-3 shows the historical flow parameters and peaking factors for the PB WWTP.

Table 4-3. Historical Flow Parameters at the PB WWTP

Flow Parameters (MGD)	2010	2011	2012	2013	2014	2015	2010-2015 Average Flows	Peaking Factor (to AA)
Average Annual	1.08	1.09	1.08	1.06	1.04	0.97	1.05	1.00
Average Annual Dry Weather	1.04	1.12	1.12	1.12	1.08	1.03	1.09	1.03
Max Month	1.40	1.28	1.26	1.27	1.22	1.16	1.26	1.20

The following section describes the flows from the PB WWTP and the District that will be used in any Phase 2 design. Table 4-4 shows the historical combined flow parameters and peaking.

Table 4-4. Historical Flow Parameters at the City of Pismo Beach & the District's WWTP

Flow Parameters (MGD)	2010	2011	2012	2013	2014	2015	2010-2015 Average Flows	Peaking Factor (to AA)
Average Annual	3.70	3.67	3.59	3.54	3.39	3.15	3.51	1.00
Average Annual Dry Weather	3.67	3.68	3.63	3.62	3.41	3.16	3.53	1.01
Max Month	4.36	4.23	4.27	3.87	3.69	3.55	4.36	1.24

The historical flows and the anticipated community growth were used to project the buildout flows. The flow projections presented in Table 4-5 are based on average flows presented in Table 4-2 and anticipated community growth, as presented in Section 2.1.1. The future average annual flow was determined by multiplying the projected population by the average observed unit per capita wastewater generation rate, which is approximately 66 gallons per capita per day (gpcd). This is the average gpcd based on flow data collected between 2010 and 2015 divided by the 2010 population censuses. This basic flow projection technique was used to develop average annual, average annual dry weather, maximum month, maximum week, and maximum day flow projections.

Table 4-5. Projected Wastewater Flows at the District's WWTP

Projected Flow Parameters (MGD)	2015	2020	2025	2030	2035	2040	Buildout
Anticipated Population	37,904	38,947	39,788	41,016	42,443	43,761	45,441
Average Annual	2.50	2.56	2.62	2.70	2.79	2.88	2.99
Average Annual Dry Weather	2.49	2.55	2.61	2.69	2.78	2.87	2.98
Max Month	2.78	2.85	2.92	3.01	3.11	3.21	3.33
Max Week	3.27	3.36	3.44	3.54	3.66	3.78	3.92
Max Day	4.11	4.23	4.32	4.45	4.61	4.75	4.93

The projected wastewater flows account for average population growth based on the existing development predictions within the service area, and does not account for significant new development not accounted for in the population predictions.

The flow projections presented in Table 4-6 for the PB WWTP are based on average flows presented in Table 4-3 and anticipated community growth, as presented in Section 2.1.1. The future average annual

flow is approximately 138 gallons per capita per day (gpcd). The higher PB WWTP gpcd number is most likely due to tourism.

Table 4-6. Projected Wastewater Flows at the PB WWTP

Projected Flow Parameters (MGD)	2015	2020	2025	2030	2035	2040	Buildout
Anticipated Population	7,744	7,912	8,140	8,426	8,714	9,010	13,000
Average Annual	1.07	1.09	1.12	1.16	1.20	1.24	1.79
Average Annual Dry Weather	1.10	1.13	1.16	1.20	1.24	1.28	1.85
Max Month	1.28	1.31	1.35	1.39	1.44	1.49	2.15

The flow projections presented in Table 4-7 are based on projected flows presented in Table 4-2 and Table 4-3.

Table 4-7. Projected Combined Wastewater Flows

Projected Flow Parameters (MGD)	2015	2020	2025	2030	2035	2040	Buildout
Anticipated Population	45,648	46,859	47,928	49,442	51,157	52,771	58,441
Average Annual	3.56	3.66	3.74	3.86	4.00	4.12	4.78
Average Annual Dry Weather	3.59	3.68	3.77	3.89	4.02	4.15	4.83
Max Month	4.06	4.16	4.26	4.40	4.55	4.70	5.48

Influent flows at most WWTPs are affected by inflow and infiltration (I&I) during wet weather. Inflow is stormwater that enters the sanitary sewer system at direct connections, often inappropriate or illegal connections, and infiltration is groundwater that enters the sanitary sewer through defective pipe joints or broken pipes. Figure 4-5 shows the daily plant influent flow overlaid with the daily precipitation values. Although I&I appears to have some effect on the District's flow, it is not the primary cause of peak flow events observed at the District's WWTP.

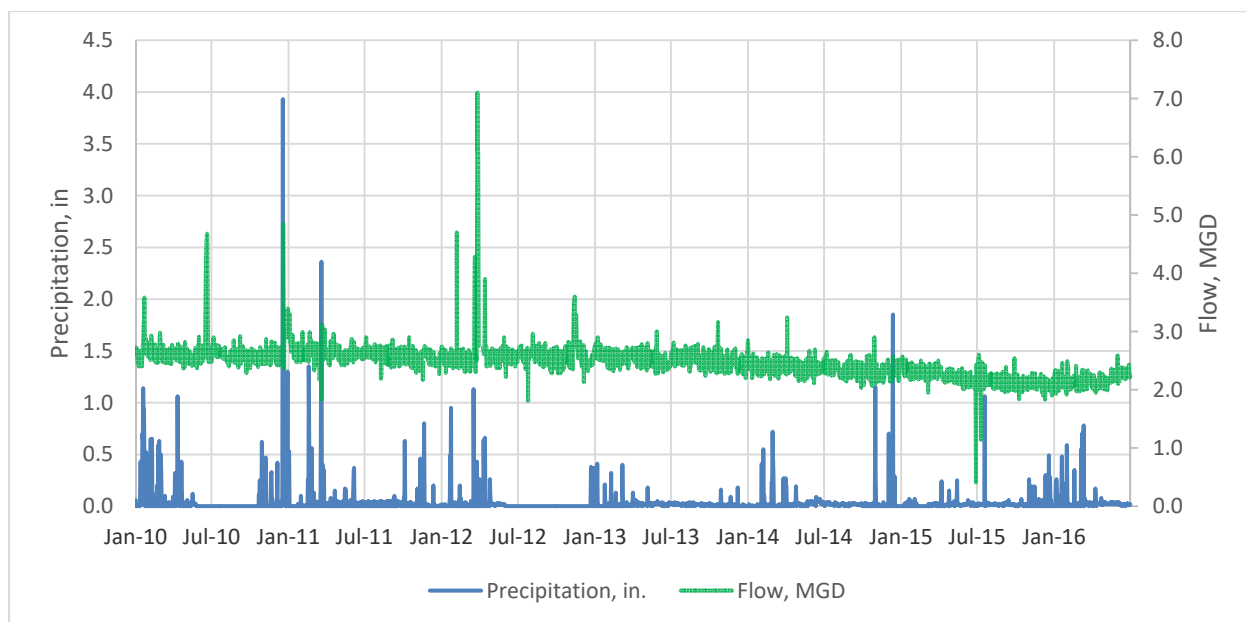


Figure 4-5. Average Daily Flows and Precipitation at the District's WWTP

Figure 4-6 shows the daily plant influent flow for the PB WWTP overlaid with the daily precipitation values. I&I appears to have some effect on the PB WWTP's flow rate.

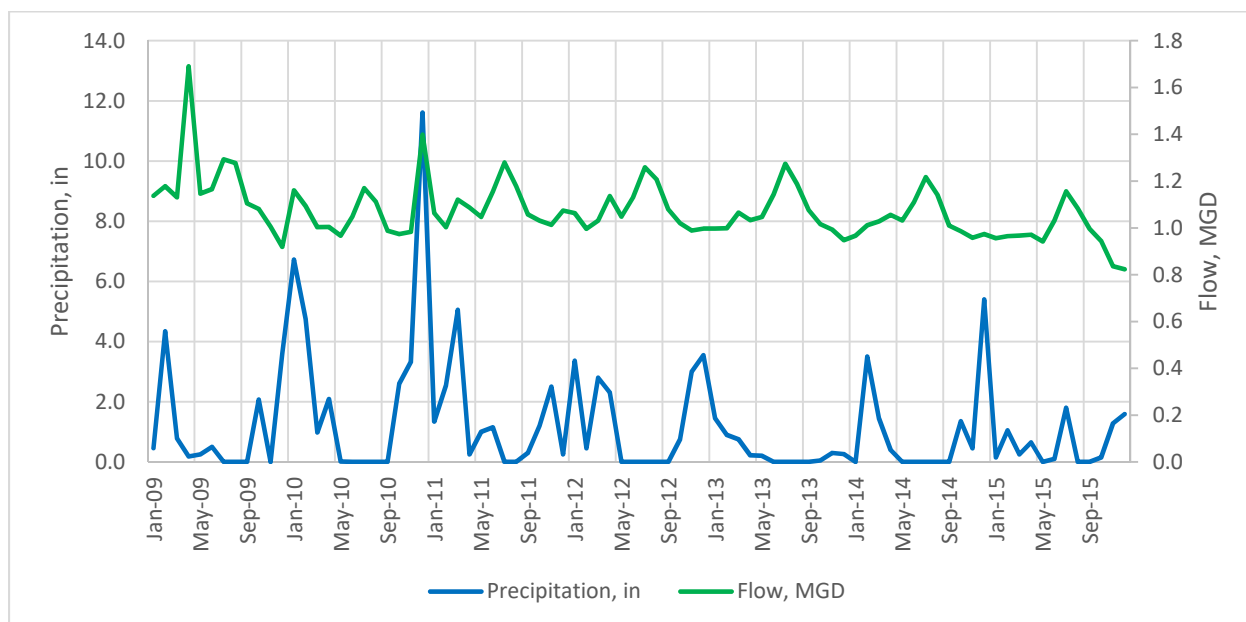


Figure 4-6. Average Daily Flows and Precipitation at the PB WWTP

4.4.1 Seasonal Variation

The seasonal variation of the average monthly flow for the District WWTP is presented in Figure 4-7. Typically for WWTPs, the summertime flow (July through September) is the low flow period because I&I

is minimal due to low precipitation and dry ground conditions. For the District, summertime flows are slightly lower, but overall the seasonal change in flow is minimal.

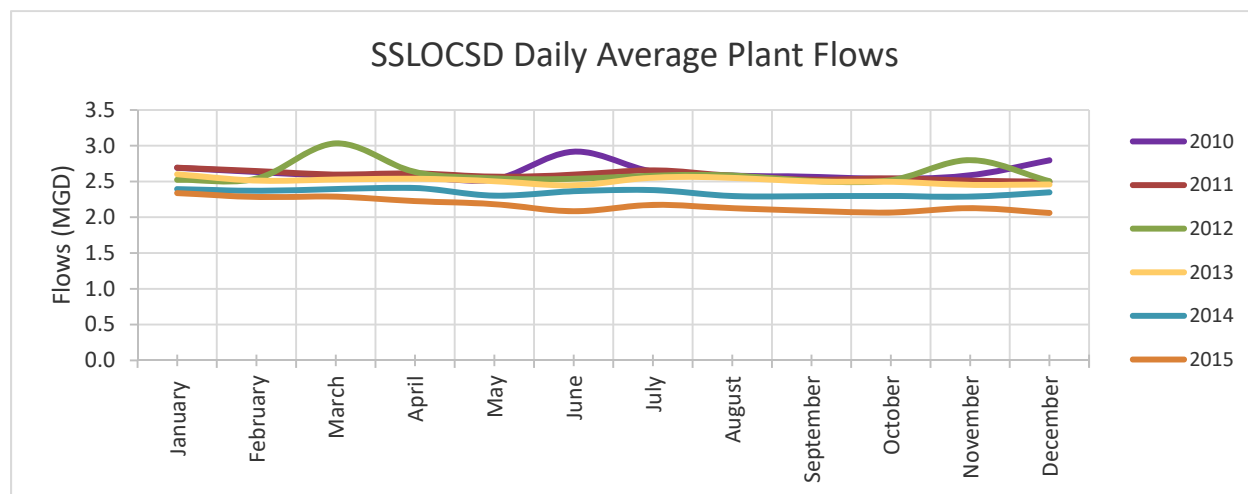


Figure 4-7. Seasonal Variation of Average Influent Plant Flows at the District's WWTP

The seasonal variation of the average monthly flow for the PB WWTP is presented in Figure 4-8. For the PB WWTP, summertime flows are higher and indicate a consistent seasonal increase in flow rate, likely associated with increased tourism.

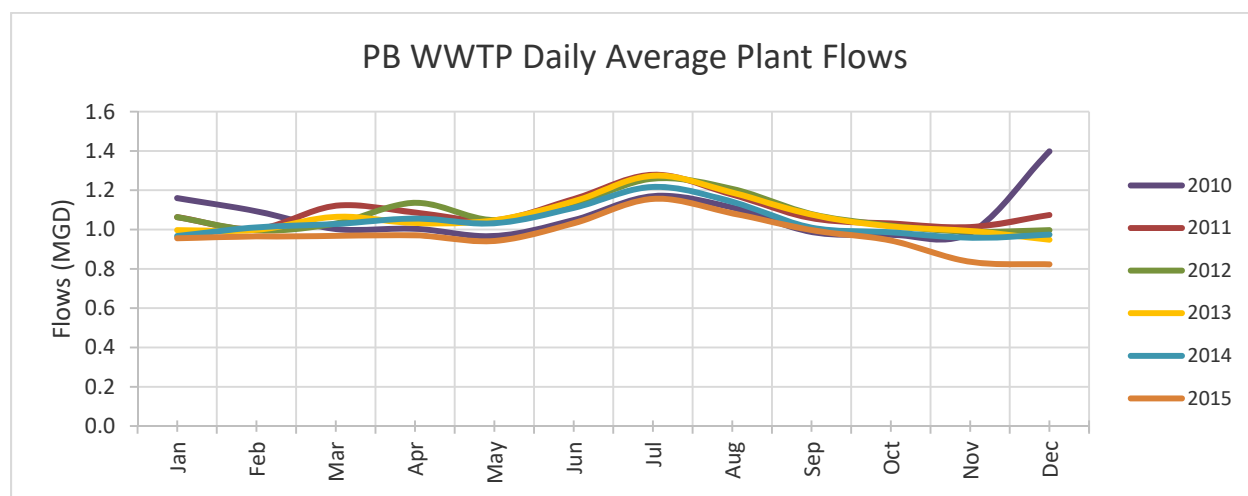


Figure 4-8. Seasonal Variation of Average Influent Plant Flows at the PB WWTP

The seasonal variation of the average monthly flow from 2010 to 2015 is presented in Figure 4-9. The combined flows from the PB WWTP and the District's WWTPs peak in the summer months and is lowest in the fall. However, the overall change in the seasonal flow is minimal.

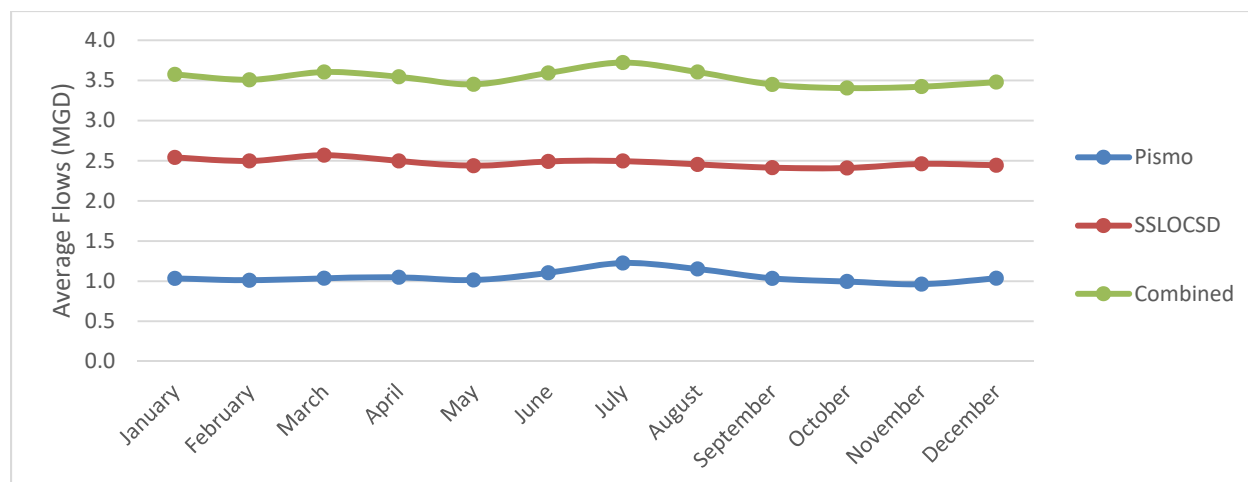


Figure 4-9. Seasonal Variation of Average Influent Flows from 2010 to 2015 at the PB WWTP and the District WWTP

4.5 EXISTING EFFLUENT WATER QUALITY

The wastewater loadings for the District are described in the following section. Figure 4-10 shows the historic BOD and TSS loads at the WWTP along with the influent flows. As mentioned earlier, the influent flow readings from May 2015 through May 2016 were recorded to be 100,000 to 200,000 gallons lower than the actual flow. There is a downward trend in the influent flows even when the water meter mis-calibration is taken into account. This trend can likely be attributed to water conservation and reduced infiltration due to the ongoing drought conditions. The BOD and TSS peak loadings tend to occur after peak flow periods, as shown in Figure 4-10. The NPDES permit limits for BOD and TSS are also shown on the figure. Figure 4-11 and Figure 4-12 show the maximum daily effluent limit (MDEL), average weekly effluent limit (AWEL), and average monthly effluent limit (AMEL) for maximum and average monthly BOD loadings and TSS loadings in 2015.

The District has had several instances where they were unable to meet their effluent load limits in the past, however, it is expected that the Redundancy Project will help them to meet their NPDES limits more consistently in the future.

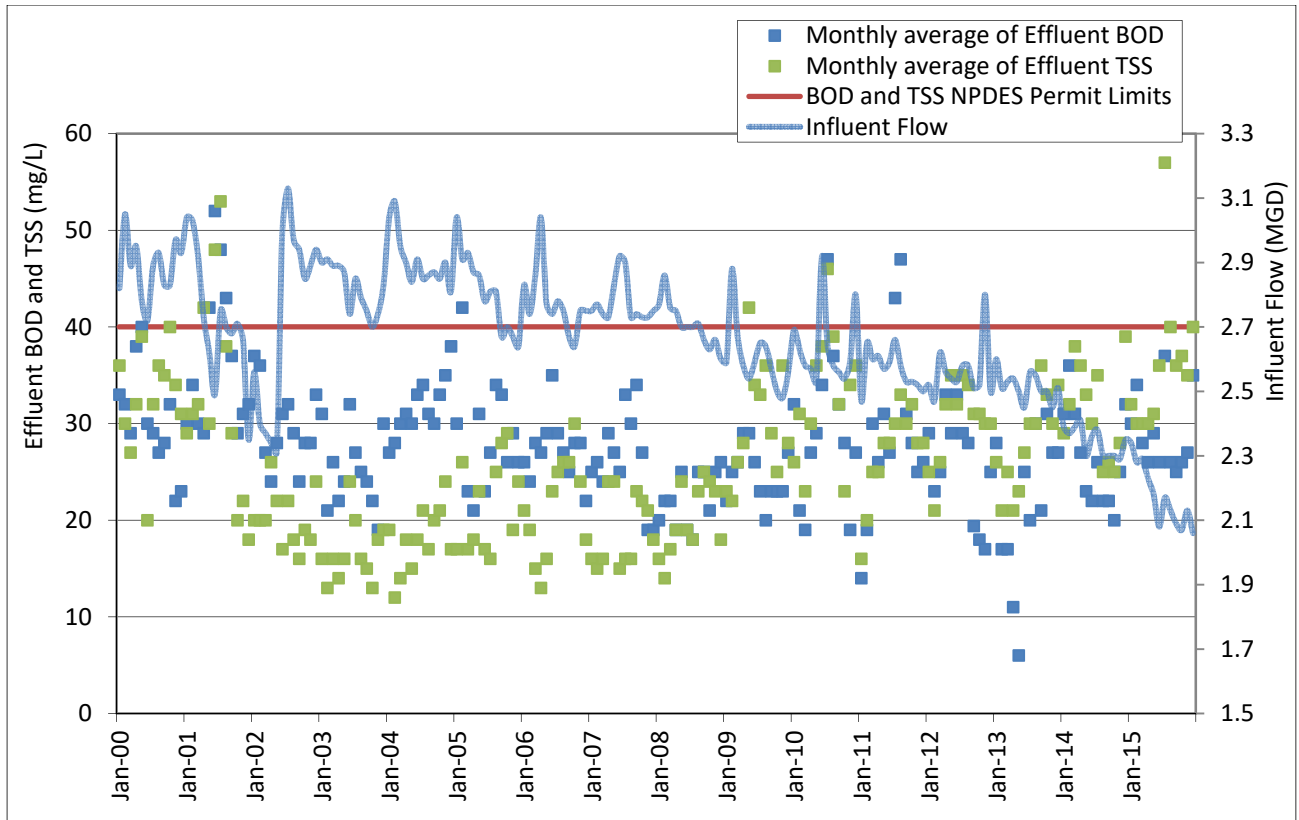


Figure 4-10. Historical Influent Flows and TSS/BOD Effluent Loadings

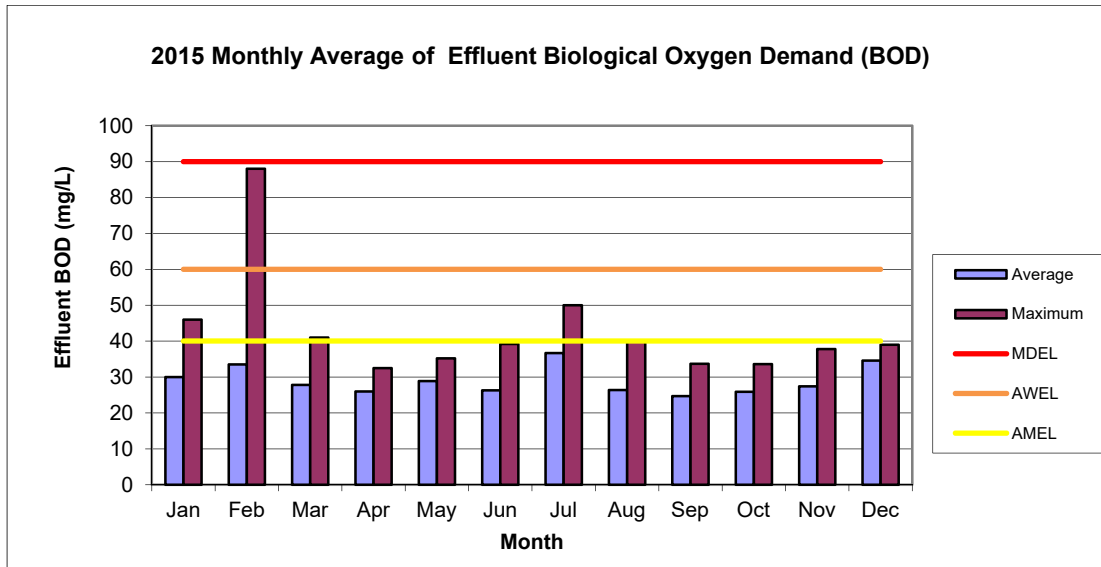


Figure 4-11. Effluent Biological Oxygen Demand

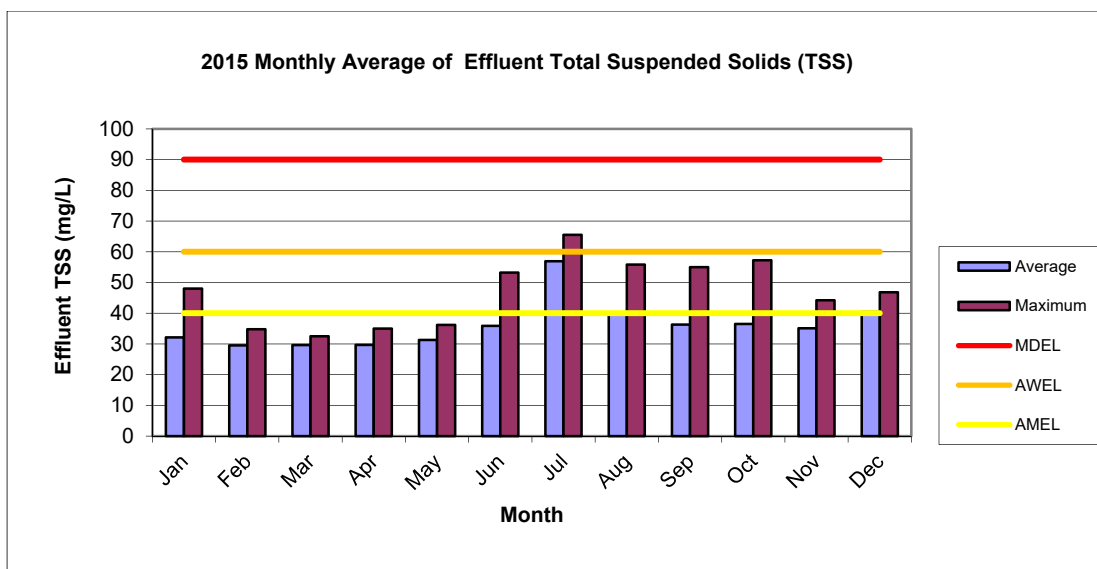


Figure 4-12. Effluent Total Suspended Solids

4.6 EXISTING BENEFICIAL USE/DISPOSAL

Currently, the District does not produce recycled water for offsite use and all of the treated effluent is discharged through the joint ocean outfall. A long standing agreement between the District and the City of Pismo Beach for operation and maintenance of the joint ocean outfall does not include a requirement for the District to maintain a minimum flow to the outfall. However, the San Luis Obispo County Regional Recycled Water Strategic Plan identifies that there is a minimum discharge requirement of 1 MGD to avoid siltation of the outfall. The minimum outfall requirement will not be an issue for Phase 1 since the District will still be discharging through the outfall. Brine production in Phase 2 will likely produce a sufficient volume of brine and other residuals to meet the outfall minimum flow requirement, this study focuses on using all of the flows from the PB WWTP and the District WWTP for the RW analysis.

5 TREATMENT REQUIREMENTS

This section identifies the key RW quality requirements for each potential type of RW use described in this RW Study. RW quality requirements are established by state regulations and policies for various types of reuse. This section also describes the main regulatory requirements for RW systems. The types of reuse considered in this feasibility study include:

- Irrigation – Agricultural irrigation
- Groundwater Recharge – Inland and/or coastal injection

5.1 REGULATORY CONSIDERATIONS

There are several regulatory requirements and policies currently governing the development of recycled water projects. 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 of RW projects. The RWQCB is charged with protection of surface and groundwater resources and with the issuance of permits that implement DDW recommendations. The Central Coast Regional Water Quality Control Board (CCRQCB) is the local RWQCB. The following are existing regulations and policies that pertain to recycled water use:

- 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, including the Salt and Nutrient Management Plan (SNMP)
- CCRQCB – Central Coast Basin Plan

Figure 5-1 provides an overview of the required treatment levels, beneficial uses and regulatory statues for all the recycled water use type. Appendix F provides additional information on the current recycled water regulations.

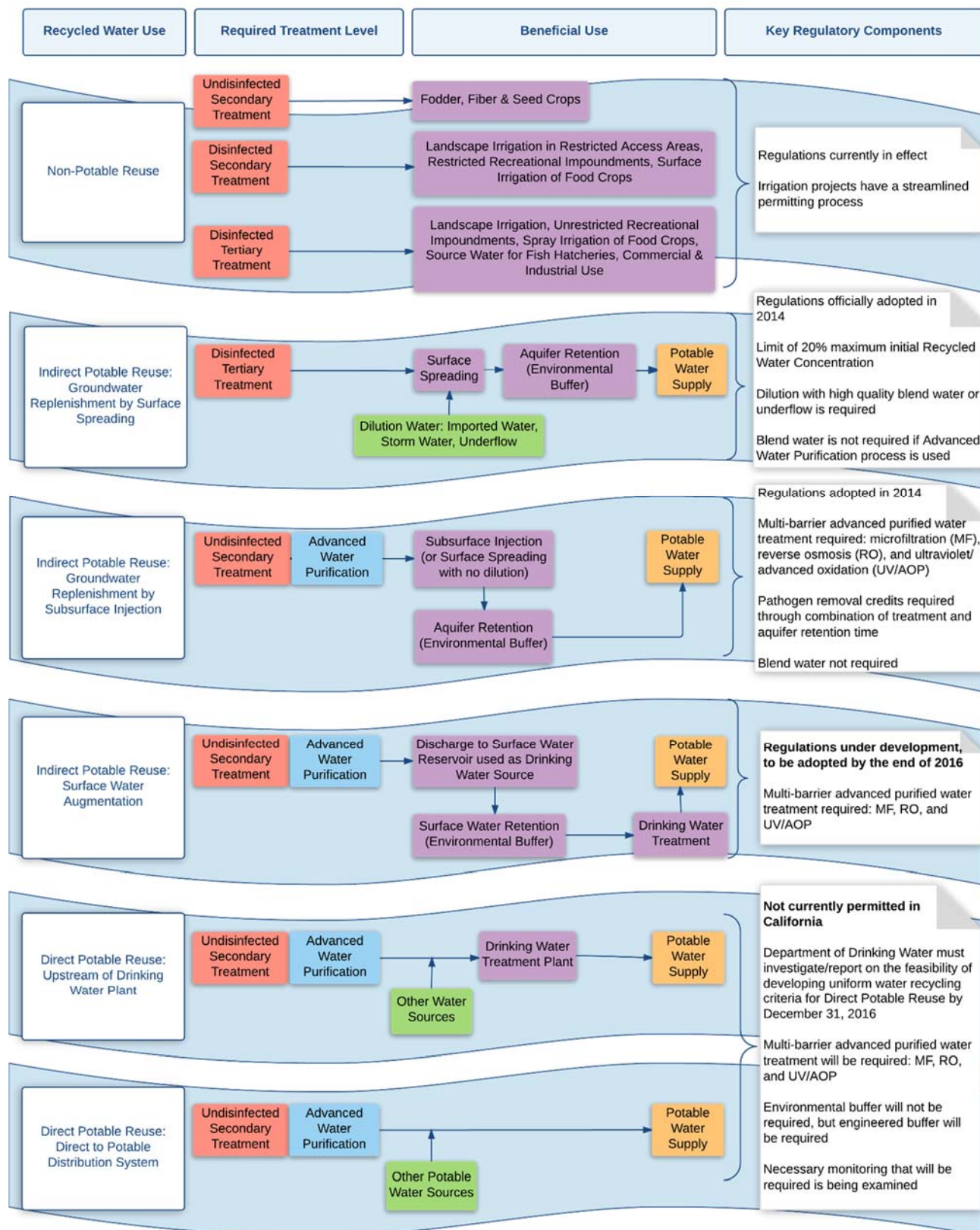


Figure 5-1. Recycled Water Use Type Overview

5.1.1 Groundwater Recharge Regulations

The current Groundwater Recharge Regulations were adopted as an emergency regulation effective June of 2014, and incorporated in the California Code of Regulation (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. There are several treatment and permitting requirements surrounding GRRPs included in the Groundwater Recharge Regulations and the SWRCB's Recycled Water Policy (RW Policy) including:

- Full Advanced Treatment (FAT)
- Salt and Nutrient Management Plans (SNMP)
- Anti-degradation Analysis

FAT is defined 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. The FAT process as it applies to the District is explained in detail in Section 5.2. Because FAT produces such a high water quality, the effluent typically complies with drinking water standards. Even so, strict regulations surrounding groundwater recharge must be met to protect the basin and public health.

One such regulation includes blending RW with potable water before subsurface injection if the quality is not high enough. 100% injection with no dilution may be permitted as long as the total organic carbon (TOC) is maintained at or below 0.5 mg/L. This is readily achieved with RO membranes and FAT. A GRRP must also demonstrate 12-log removal of viruses, 10-log removal of *Giardia*, and 10-log removal of cryptosporidium from raw sewage to useable groundwater. When FAT processes are coupled (MF/UF, RO, AOP, ect) and a 2-month minimum groundwater retention time is ensured, these log removal credit can be demonstrated to protect public health.

One key component of the SWRCB's RW Policy is the requirement of a SNMP. The SNMP are intended to facilitate basin-wide or watershed-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. 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 a SNMP would be developed in conjunction with the permitting process for the RGSP, and incorporated into the project implementation plan.

A SNMP would consider Basin Plan water quality objectives, existing groundwater quality data and the assimilative capacity of the basin. The findings of the SNMP would aid in establishing the minimum treatment requirements for RW irrigation projects. A GRRP can typically move forward without the need for a SNMP because it applies potable water standards, and with the addition of FAT, salts, CECs, and the

nutrient content of the recharge water will be extremely low, thus protecting the groundwater basin. A GRRP may even be identified as a mitigation measure in a SNMP developed for RW irrigation projects.

The RW Policy also addresses the implementation of an Anti-Degradation Policy (Policy) as it relates to RW projects. In general, the SWRCB's 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. The SWRCB's RW Policy requires an antidegradation study be conducted and submitted to the RWQCB prior to the implementation of a GRRP demonstrating the input of RW will not negatively impact the groundwater basin. Similar to the reason a GRRP may move forward without a SMNP, it may also move forward without an Anti-Degradation study. Because a GRRP requires FAT, the resulting treated recharge water will have extremely low salts, nutrients, and other contaminants. A post-treatment program will be required to add essential minerals to stabilize the RW before injection, and the groundwater quality may likely improve due to the high quality of the injected water.

5.1.2 Agricultural Irrigation Regulations

If an irrigation project is implemented, permit prohibitions and operational requirements will come directly from Title 22, and will be included in the District's RW permit. In addition, for RW irrigation use, the District 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. For further details on specific regulations involving agricultural irrigation see Appendix F.

5.1.3 Water Quality Objectives

The Water Quality Control Plan for the Central Coast Basin (2016 Basin Plan) identifies the beneficial uses for surface waters and groundwater and the water quality objectives established to protect those uses. The District service area is located within the very northern boundary of the Santa Maria Valley Groundwater Basin (SMGB) in the Lower Nipomo Mesa Subarea as shown in Figure 5-2. 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 (California Department of Water Resources, Southern District, 2002).

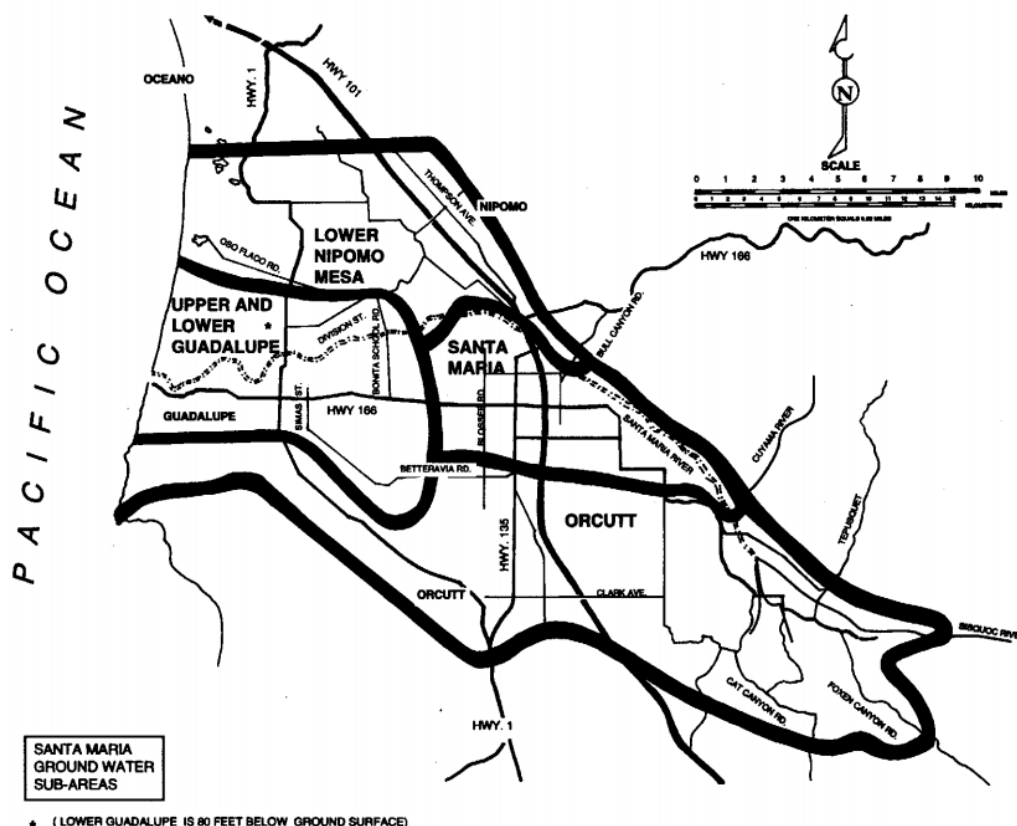


Figure 5-2. Santa Maria Groundwater Subareas (Regional Water Quality Control Board, Central Coast Region, June 2011)

For a GRRP, Basin Plan objectives can define the water quality requirements of the proposed project. The Basin Plan stipulates that discharges to groundwater (including groundwater recharge projects) cannot cause or contribute an exceedance of the water quality objectives. As discussed in Section 5.1.1, the high quality RW from a GRRP may actually improve the groundwater quality. Table 5-1 presents the groundwater quality objectives for the Lower Nipomo Mesa area of the SMGB. Based on review of FAT process performance at other plants, it is anticipated that the RW in a GRRP will be of greater quality than the basin quality objectives.

Table 5-1. 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)	

Water quality guidelines for general agricultural 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. There are also some general maximum concentration requirements for agricultural irrigation listed in the Basin Plan, as presented in Table 5-2. Since FAT will likely be the treatment process for the RW, all these agricultural water quality objectives will be met.

Table 5-2. Agricultural Water Quality Objectives from the Central Coast Basin Plan (Regional Water Quality Control Board Central Coast Region, 2016)

Parameter	Maximum Concentration ¹
Aluminum (mg/L)	5.0
Arsenic (mg/L)	0.1
Beryllium (mg/L)	0.1
Boron (mg/L)	0.75
Cadmium (mg/L)	0.01
Chromium (mg/L)	0.10
Cobalt (mg/L)	0.05
Copper (mg/L)	0.2
Fluoride (mg/L)	1.0
Iron (mg/L)	5.0
Lead (mg/L)	5.0
Lithium (mg/L)	2.5 ²
Manganese (mg/L)	0.2
Molybdenum (mg/L)	0.01
Nickel (mg/L)	0.2
Selenium (mg/L)	0.02
Vanadium (mg/L)	0.1
Zinc (mg/L)	2.0
¹ Values based primarily on "Water Quality Criteria 1972" National Academy of Sciences-National Academy of Engineers, Environmental Study Board, ad hoc Committee on Water Quality Criteria furnished as recommended guidelines by University of California Agriculture Extension Service, January 7, 1974; maximum values are to be considered as 90 percentile values not to be exceeded. Values provided will normally not adversely affect plants or soils; no data available for mercury, silver, tin, titanium, and tungsten. ² Recommended maximum concentration for irrigation citrus is 0.075 mg/l.	

5.2 ADVANCED TREATMENT PLANT PROCESSES

Upgrading to Full Advanced Treatment (FAT) is required for both alternatives in this study. FAT refers to a treatment process that produces 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 public health as well as other beneficial uses of each aquifer. These include control of pathogenic organisms, control of nitrogen compounds, and control of emerging contaminants.

The FAT upgrades anticipated for both alternatives in the Study are described in the following section.

5.2.1.1 Treatment Upgrades

For Alternatives A and B, the secondary effluent from the existing WWTP would be fed to the advanced treatment process train consisting of microfiltration/ultrafiltration (MF/UF), reverse osmosis (RO), and ultraviolet advanced oxidation process (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). A Process Flow Diagram (PFD) for the groundwater recharge alternative is presented in Figure 5-3.

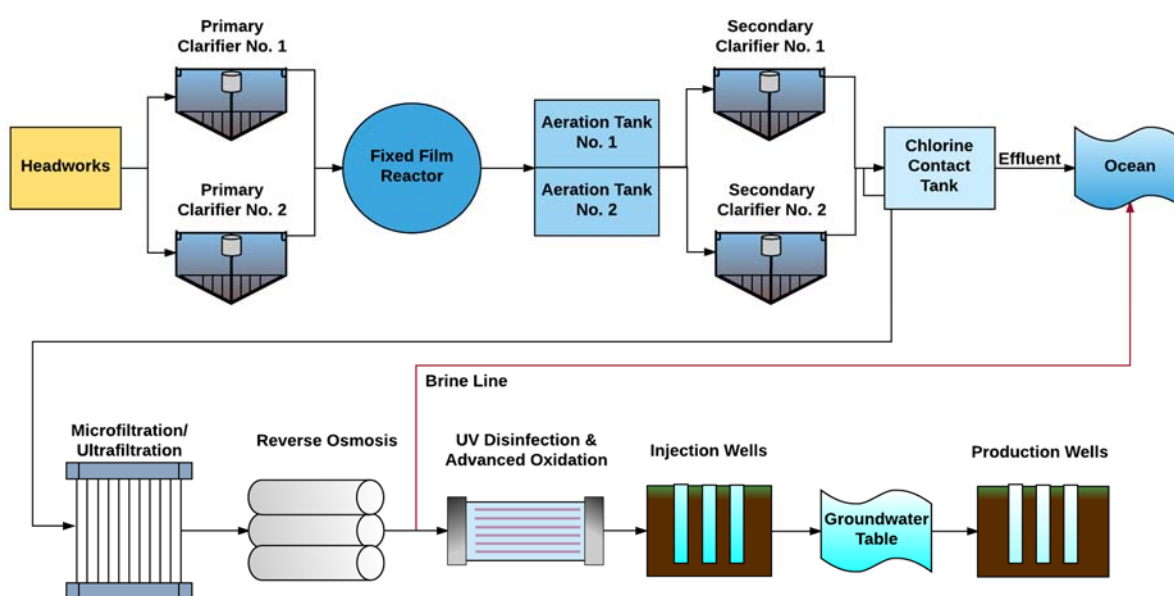


Figure 5-3. Groundwater Recharge Process Flow Diagram

5.2.1.1.1 Microfiltration/Ultrafiltration (MF/UF)

Advanced treatment starts with MF/UF, a pretreatment process, where water is pumped through tubes filled with tiny membranes. Each membrane is made up of hollow fibers, perforated with holes 1/300th the width of a human hair. As the water moves through the tubes, solids and bacteria are caught in the fibers.

MF/UF 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. 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.

5.2.1.1.2 Reverse Osmosis (RO)

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 treatment process is the discharge of the concentrate brine stream. The salts removed from the feed water are concentrated in the brine stream and thus need to be properly disposed. It is assumed that this concentrate brine stream can be discharged through the District's existing ocean outfall and NPDES Permit.

5.2.1.1.3 Ultraviolet Advanced Oxidation Process (UV/AOP)

When hydrogen peroxide (H₂O₂) is exposed to UV light, it reacts to form hydroxyl radicals that are high-energy, highly reactive molecules that attack chemical bonds of organic molecules and oxidize them. Combining UV with H₂O₂ is called an AOP. Other AOP approaches that result in hydroxyl radical formation include the use of ozone with UV, and ozone with H₂O₂. It has been found that hydroxyl radicals are able to oxidize 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 the UV/AOP process (UV plus H₂O₂) the UV dose required to break down the H₂O₂ is significantly greater than that required for typical disinfection (50 to 100 mJ/cm² for disinfection compared with 400 to 500 mJ/cm² for radical formation). Thus, a UV/AOP process provides both a disinfection barrier as well as a microconstituent barrier.

6 RECYCLED WATER MARKET/OPPORTUNITIES

The San Luis Obispo County Regional Recycled Water Strategic Plan (RRWSP) was completed in November 2014 and outlined and prioritized potential next steps for implementing RW in the county. Based on the findings from this report and the PB RW Study, this study focuses on the use of recycled water for groundwater recharge and/or agriculture irrigation. Given the limited land availability in the area around the existing municipal production wells and along the coastline, the groundwater recharge alternatives focused on injection and did not include evaluation of surface spreading. This study evaluated the potential to expand the groundwater injection scenarios identified in the PB RW Study to include flows from the PB WWTP and the District WWTP, and look at opportunities to develop Hybrid reuse alternatives that included groundwater recharge and agriculture irrigation. Additional detail regarding the opportunities for groundwater recharge and agriculture irrigation evaluated in this report are contained in the following sections.

6.1 GROUNDWATER RECHARGE WITH RECYCLED WATER

As part of the PB RW Study, 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 analysis and findings from the Hydrogeologic Assessment TM were used as the basis for the groundwater recharge scenarios evaluated in this Study.

The Hydrogeologic Assessment TM is attached in Appendix D, 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 December 2015 Santa Maria Groundwater Basin Characterization prepared by Fugro under contract with the County. There are no groundwater models published for this area although there is a groundwater model that is currently being developed. 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. This area was used as the focus for the District's groundwater evaluation alternatives as this area would likely provide the greatest benefit to those participating in the RGSP.

6.1.1 Subsurface Injection

The PB RW Study Hydrogeologic Assessment TM developed conceptual design criteria for both inland and coastal injection wells. The PB RW Study Hydrogeologic Assessment TM analyzed a 2-8 month retention time since that is the retention time allows by current Groundwater Recharge Regulations. It was estimated that a setback of 200 ft is required to achieve a minimum 8-month retention time for injection wells. The same design assumptions were used for this report.

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 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 70% of the water injected could be recovered by municipal wells for beneficial use.

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

6.2 AGRICULTURE IRRIGATION

Potential agricultural demand was estimated for the properties to the south and east of the District. The demand was calculated using the 2015 Evapotranspiration (ET) factors from the California Department of Water Resources Consumptive Use Program (CUP) and the property acreage and crop types from NCMA GIS crop layers. The CUP used monthly climate data from the Nipomo California Irrigation Management Information System (CIMIS) station and crop coefficients to calculate ET values for irrigated crops (Fugro Consultants, 2016). The ET factors used in this analysis are shown in Table 6-1.

Table 6-1. Evapotranspiration Factors

Crop Type	2015 Potential ET factor (AF per acre)
Rotational Crops	2
Strawberry	1.2
Nursery Plants	1.7
Potatoes	0.8

The ET factors were multiplied by the acreage of each property and then summed to determine the irrigation demands for the irrigation area. The irrigation areas for Phase 1 and 2 were determined by matching the maximum monthly irrigation demand for the designated set of properties to the monthly flow of RW that the ATP could produce. The monthly irrigation demands for the Phase 2 irrigation areas are shown in Figure 6-1.

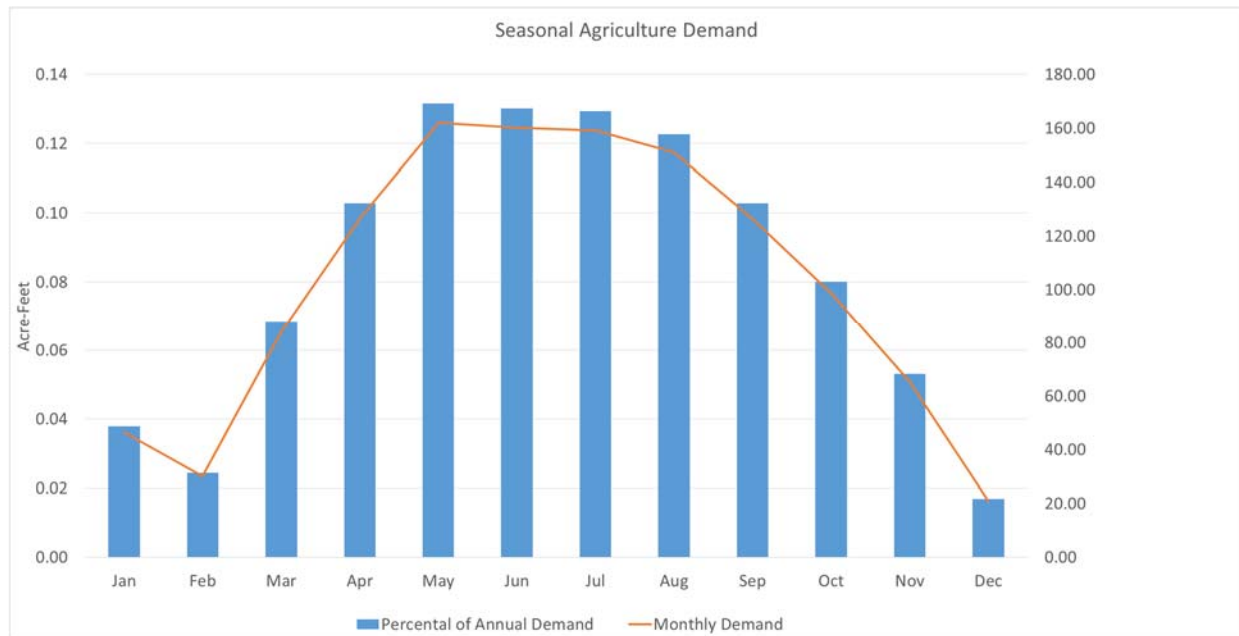


Figure 6-1. Seasonal Irrigation Demand

Figure 6-2 shows the parcels that could be served for Phase 1 and 2 of the RGSP. Phase 2 would include all the parcels from Phase 1 plus the additional parcels from Phase 2.

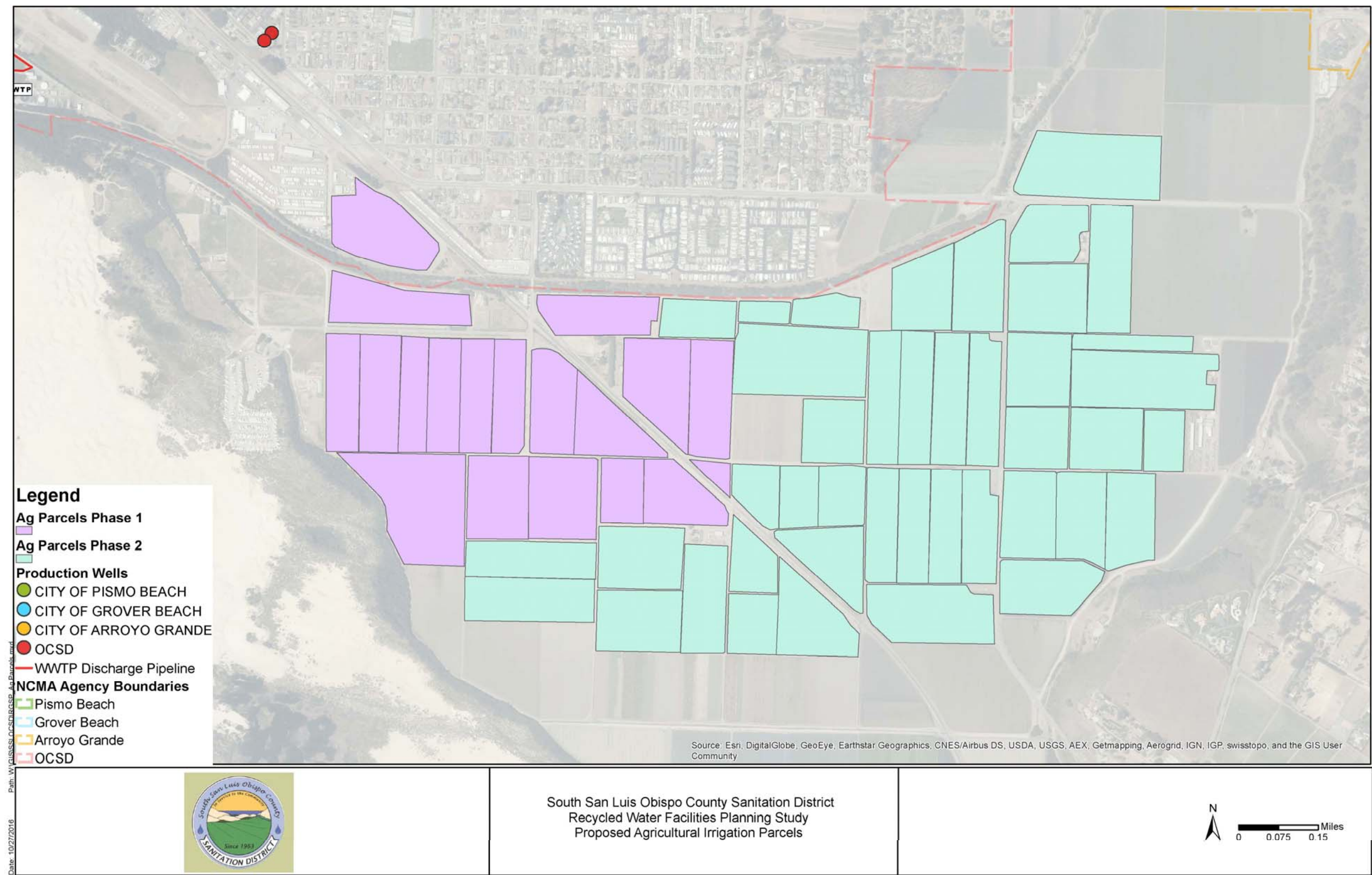


Figure 6-2. Proposed Agriculture Parcels for Irrigation

6.3 STAKEHOLDER OUTREACH

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

A kickoff workshop was conducted on January 26, 2015 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, Grover Beach, and Oceano CSD 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 District. A representative from the City of Grover Beach and Oceano CSD also attended the kickoff meeting.

In November 2015, the Pismo Beach City Council heard a status report on both the RGSP and the District's RW Study. At that point the City of Pismo Beach decided to split their project into Phases including the preparation of the necessary environmental documents and the preliminary design for an on-site and off-site RGSP using water from their WWTP. To aid in developing regional partnerships, the City of Pismo Beach held a regional stakeholder meeting in March 2016 with neighboring agencies to begin developing a framework for the project that will provide equitable water supply benefit for all of the participants.

For this Study, the first task was an Investment Analysis intended to determine the economic feasibility of the proposed Satellite Water Resource Recovery Facility (SWRRF). The Investment Analysis Technical Memorandum identified possible SWRRF treatment and beneficial reuse alternatives with corresponding cost estimates and potential costs savings for the District's Redundancy Project and included comparisons against other potential supplemental water supply alternatives. Based on the results of the Investment Analysis and the competitiveness of the SWRRF alternatives with other potential supplemental supplies, the City Council and the District's Board recommended an alternative to evaluate the construction of an offsite tertiary or advanced water treatment facility close to the District's WWTP that could treat its effluent for use as either agricultural irrigation, groundwater recharge, or both. This facility was envisioned to potentially be expanded to receive effluent from the PB WWTP.

A rescoping meeting was held on January 5th, 2016, to discuss the results of the preliminary scalping plant analysis and to discuss possible new directions for RW at the District. Representatives from the Cities of Arroyo Grande, Grover Beach, and Pismo Beach were invited to the workshop. Representatives from the Cities of Arroyo Grande and Grover Beach attended the rescoping meeting and supported the redefining of the scope to include the evaluation of recycled water facility that would treat both the City of Pismo Beach and the District's flows.

A second kickoff meeting was held on April 6th, 2016, after the study's scope was adjusted and revisited to focus on treating all of the District's flows instead focusing on a scalping plant. 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 District.

An alternatives development workshop was held on July 21, 2016, to develop RW project alternatives to be evaluated as part of this study. A representative from the City of Arroyo Grande was invited and participated in the workshop.

An alternatives evaluation workshop was held on September 1, 2016, to develop RW project alternatives to be evaluated as part of this study. A representative from the City of Arroyo Grande was invited and participated in the workshop.

7 PROJECT ALTERNATIVES ANALYSIS

7.1 ALTERNATIVES EVALUATED

To assist the District and other regional RGSP stakeholders in evaluating the recycled water alternatives for the RGSP, this Study includes evaluation of two primary alternatives: onsite and offsite ATP locations. These alternatives include:

- Alternative A: Development of an onsite ATP to provide RW for groundwater injection with the possibility of a Hybrid approach that would include agricultural irrigation
- Alternative B: Development of an offsite ATP to provide RW for groundwater injection with the possibility of a Hybrid approach that would include agricultural irrigation

Both alternatives include a Phased approach. Phase 1 is sized for flows from the PB WWTP only. Phase 2 is sized for the flows from both the PB WWTP and the District's WWTP as shown in Figure 7-1. The planning and design assumptions used in this study are included in Appendix E.

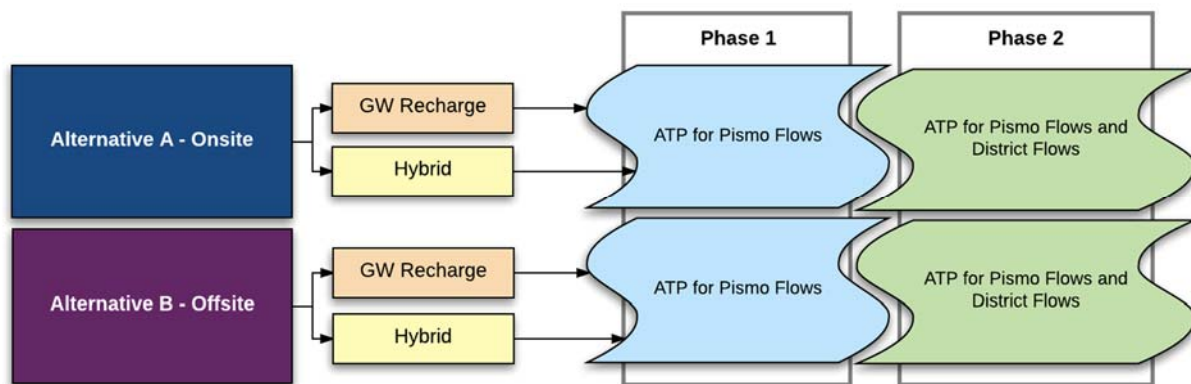


Figure 7-1. Alternatives A & B Phasing Structure

Both alternatives consist of injecting advanced treated RW into the SMGB using injection wells. The ATP required to produce the advanced treated RW is described in Section 5.2 on page 5-7. To develop the groundwater injection alternative, conceptual injection locations were selected based on the Hydrogeologic Assessment TM, both along the coast to provide a seawater intrusion barrier and inland to provide supplemental groundwater recharge. As described previously, the injection wells are located in the proximity of the municipal production wells for the RGSP stakeholder agencies, as shown Figure 7-3 and Figure 7-4, to maximize the benefit to the municipal agencies, who are envisioned to fund the construction of the project.

The Hybrid approach for Alternatives A and B will inject RW in to the SMGB year round, but part of the flow will be diverted to agricultural irrigation during months when there is irrigation demand. The RW diverted for irrigation will only require microfiltration, partial RO and disinfection and will be distributed to agricultural users south of the District WWTP. Since only part of the flow will be sent through RO and none of it is sent through the AOP process, the Hybrid approach will have reduced O&M costs. For this

study it was assumed that 40% of the irrigation water would be run through RO to achieve a maximum TDS of 500mg/l and total nitrogen of 5 mg/l (Cannon, November 2014). The flow schematic described is displayed in Figure 7-2.

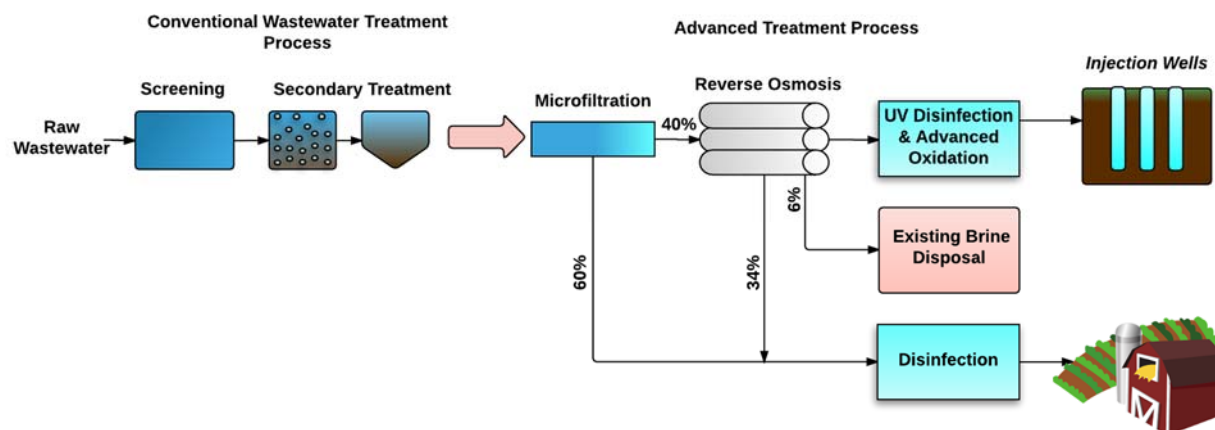


Figure 7-2. Hybrid Alternative with Partial RO Treatment

7.1.1.1 Recycled Water Production

The treatment design capacity selected for this Study is 1.4 MGD for Phase 1, and a total of 4.2 MGD for Phase 2. The treatment capacity for each of the alternatives was selected by analyzing the seasonal variability of the flow at both WWTP's and identifying a capacity value that would allow the ATP to capture yields equal to the AADF for each Phase of the project. The treatment capacity is higher than the AADF to allow the ATP to capture above average flows when flows exceed AADF to make up for the reduced production when flows drop below the AADF. The design treatment capacity is based on 1.4 MGD for Phase 1 and 4.2 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 1.4 and 4.2 MGD.

Actual RW production was estimated by taking the monthly flows from both the District and the PB WWTP and taking the average of all the average monthly flows from 2010 to 2015. Based on this, the average annual flow was calculated. The average annual flow was then reduced by the estimated recovery rates through MF and RO processes. For this Study, it is assumed the flows are the same for each day in a month. According to 2010-2015 flows, the result is an estimated average annual production of approximately 900 AFY for Phase 1 and 3,530 AFY for Phase 2 for GWR, and 943 AFY for Phase 1 and 3,658 AFY for Phase 2 for the Hybrid approach.

It should be noted 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.

Table 7-1 summarizes the RW available as a result of the RGSP.

Table 7-1. Recycled Water Available for Phase 1 & Phase 2

Groundwater Recharge			
	Current (AFY)	2040 Flows (AFY)	After Extraction (AFY)
Phase 1	900	-	657
Phase 2	-	3,530	2,577
Hybrid			
	Current (AFY)	2040 Flows (AFY)	After Extraction (AFY)
Phase 1	943	-	812
Phase 2	-	3,658	3,031

7.1.1.2 Potential Water Use

Both alternatives could provide a seawater intrusion barrier and groundwater recharge to the SMGB and would therefore benefit all of the NCMA agencies. As discussed in 6.1.1, it is estimated that each injection well could accommodate 200-300 AFY. 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. It is estimated that 73% of the water injected could be recovered at these municipal wells.

Pipelines will distribute advanced purified water to the injection wells for groundwater recharge. If a Hybrid approach is chosen, segments Irr-0 through Irr-3 will serve groups of irrigation customers to the south of the RGSP Stakeholders. To identify these potential customer groups, irrigation customers were screened to include the properties closest to the District member agencies that had a peak monthly demand that matched the amount of RW produced for Phases 1 and 2. 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.

Both Alternatives include the option to expand the RW use to a combination of GW recharge and agricultural irrigation. This is what is being referred to as the Hybrid approach. Table 7-2 shows the proposed total of properties and acreage that would be served for both Phases as well as the irrigation demand the RGSP will offset for each Phase.

Table 7-2. Agricultural Properties Served for Phase 1 & Phase 2

Phase 1	
Total Properties:	19
Total Acreage:	197 Acres
Total Demand:	395 AFY
Phase 2	
Total Properties:	61
Total Acreage:	616 Acres
Total Demand:	1231 AFY

7.1.1.3 Injection Wells

Both alternatives include four (4) wells for Phase 1 and a total of eleven (11) wells for Phase 2. Representative well locations are shown for each alternative later in this section. The locations of nine (9) of the wells are from the City of Pismo Beach's Hydrologic Assessment TM and are based on the setback distance from existing wells, a general consideration of drill site requirements, and the well spacing. The locations of the well by the intersection of 24th Street and the Pike and the well on south Elm Street were based on the setback distance from existing production wells, a general consideration of drill site requirements, and the well spacing. The placement of groundwater injection wells will be further refined based on the groundwater flow modeling efforts currently being performed for the RGSP.

The depths of the wells will depend on the depths of the localized aquifers, which range from 400-600 feet in depth. The injected zones and well 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 overlying aquifer. Conceptually, the monitoring well should be placed between the injection wells and production wells. The Groundwater Recharge Regulations require two monitoring wells for each injection well. There are several existing coastal monitoring wells in the vicinity, which may meet this requirement. For the purposes of this Study, 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.

7.1.2 Alternative A – Onsite GWR or Hybrid

Alternative A includes an onsite ATP at the District's existing WWTP. The ATP would treat PB WWTP flows as part of Phase 1 and then both the District and the PB WWTP flows as part of Phase 2. Representative well locations are shown in Figure 7-3 and Figure 7-4.

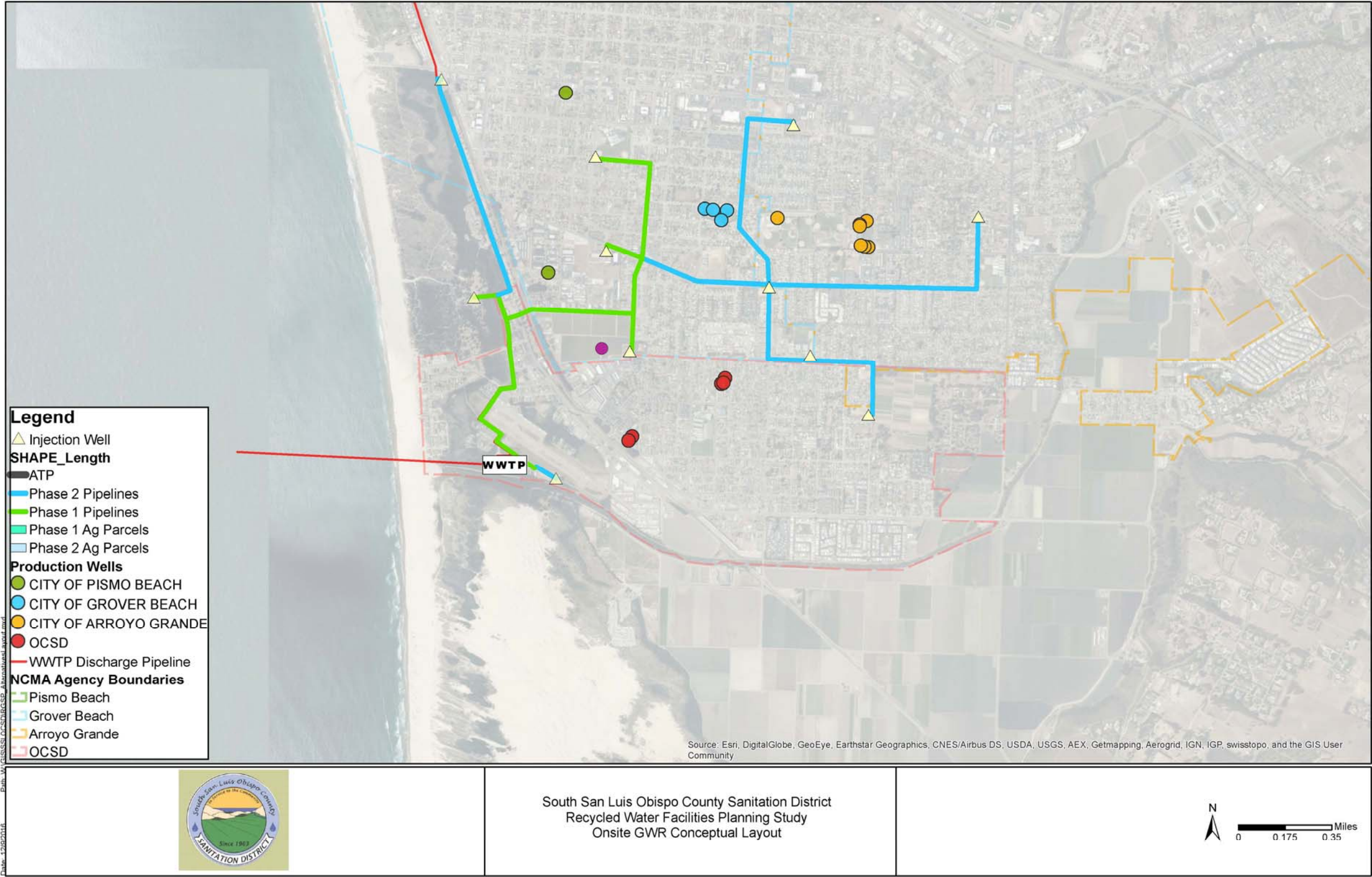


Figure 7-3. Alternative A - Onsite GWR Conceptual Layout

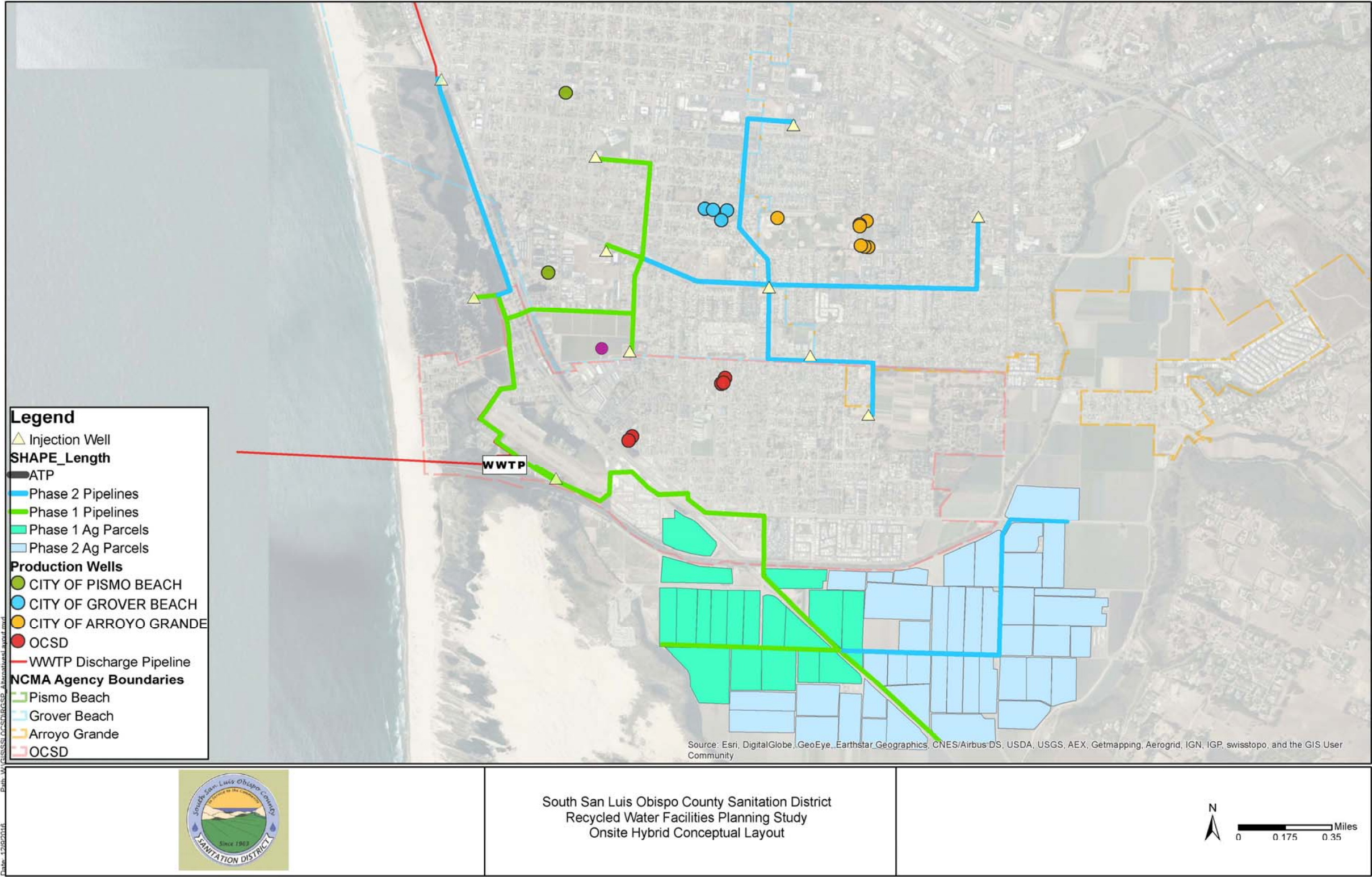


Figure 7-4. Alternative A - Onsite Hybrid Conceptual Layout

7.1.2.1 Storage, Pumping, & Distribution System

A summary of the potential RW use for each segment in Alternative A is presented in Table 7-7 and Table 7-3. As shown, the potential total RW use for agricultural irrigation in this Hybrid alternative is 395 AFY for Phase 1 and 1231 AFY for Phase 2 if all segments are constructed. This would provide service to 19 potential irrigation customers for Phase 1 and 61 potential irrigation customers for Phase 2. Figure 6-2 shows the locations of potential customers. The area is mostly a mix of rotational crops but also includes a strawberry field.

The alternative A pipeline is broken into additive segments (A0 through A15). The sizes and lengths for each pipeline segment are summarized in Table 7-4 below. The Irrigation lines (Irr0 through Irr3) are Hybrid only included for the Hybrid alternative.

Table 7-3. Storage, Pumping, & Distribution Summary for Onsite Alternative A

GWR	AADF (MGD)	Injection Wells	Storage	Pump Station to ATP	Effluent/ Brine PS	GW Recharge PS		Total Length of Pipeline
Phase 1	1.1	4	0.26 MG	-	-	50 hp	-	2.5 miles
Phase 2	4.1	11	1.03 MG	-	-	150 hp	-	6.8 miles
Hybrid	AADF (MGD)	Injection Wells	Storage	Pump Station to ATP	Effluent/ Brine PS	RW PS	Ag Irrigation PS	Total Length of Pipeline
Phase 1	1.1	4	1.05 MG	-	-	50 hp	73 hp	5.4 miles
Phase 2	4.1	11	4.12 MG	-	-	150 hp	162 hp	11.0 miles

Table 7-4. Onsite Alternative A Pipeline Segments for Phase 1 and Phase 2

Phase 1 Segments	Length (ft)	Size (in)	Phase 2 Segments	Length (ft)	Size (in)
A0	2,556	12	A0	2,556	12
A1	513	16	A1	513	16
A5	799	6	A2	4,804	6
A6	476	6	A3	3,976	16
A7	505	6	A4	5,539	6
A9	880	6	A5	799	6
A10	1,128	10	A6	476	6
A14	3,072	6	A7	505	6
Irr0	8,808	18	A8	2,616	10
Irr1	2,674	8	A9	880	6
Irr3	3,512	10	A10	1,128	10
			A11	2,267	8
			A12	99	6
			A13	2,366	6
			A14	3,072	6
			A15	4,544	6
			Irr0	8,808	18
			Irr1	2,674	8
			Irr2	7,183	12
			Irr3	3,512	10

7.1.2.2 Estimated Costs

Unit costs associated with Alternative A include the WWTP upgrade to FAT, a storage reservoir, booster pumps, pipelines, and injection wells. Capital and O&M costs were calculated for all components. These costs are summarized in Table 7-5 and detailed unit cost calculations are provided in Appendix G.

Table 7-5. Unit Costs for Alternative A

	Phase 1	Phase 2 ¹	Phase 1	Phase 2
	Onsite A - Groundwater Recharge	Onsite A - Groundwater Recharge	Onsite A - Hybrid	Onsite A - Hybrid
Total Capital	\$24,900,000	\$59,300,000	\$35,300,000	\$78,000,000
Annualized Capital	\$1,620,000	\$3,860,000	\$2,300,000	\$5,070,000
Annualized O&M	\$910,000	\$3,380,000	\$800,000	\$2,620,000
Total Annualized Cost	\$2,530,000	\$7,240,000	\$3,100,000	\$7,690,000
Yield (Before Injection)	900 AFY	3,530 AFY	943 AFY	3,658 AFY
Cost/AF (Before Injection)	\$2,800	\$2,100	\$3,300	\$2,100
Yield (After Injection)	657 AFY	2,577 AFY	812 AFY	3,031 AFY
Cost/AF (After Injection)	\$3,900	\$2,800	\$3,800	\$2,500
¹ Phase 2 costs represent total cost, not an additive cost				

7.1.3 Alternative B – Offsite Groundwater Recharge and Hybrid

Alternative B includes groundwater recharge with the option for Hybrid approach that includes agriculture irrigation along with groundwater recharge, similar to Alternative A. Alternative B differs from Alternative A because it includes an offsite ATP instead of building the UF/MF, RO, and AOP processes at the District WWTP. The offsite alternative will require an additional pump station and pipeline to route the flows from the District WWTP to the ATP, as well as a pipeline to return brine and other residuals back to District WWTP for disposal in the outfall. Additionally, include in Alternative B are costs associated with purchase of property for the offsite alternative and construction of supporting facilities (i.e. office building, lab space, etc.). Representative well locations are shown in Figure 7-5 and Figure 7-6.

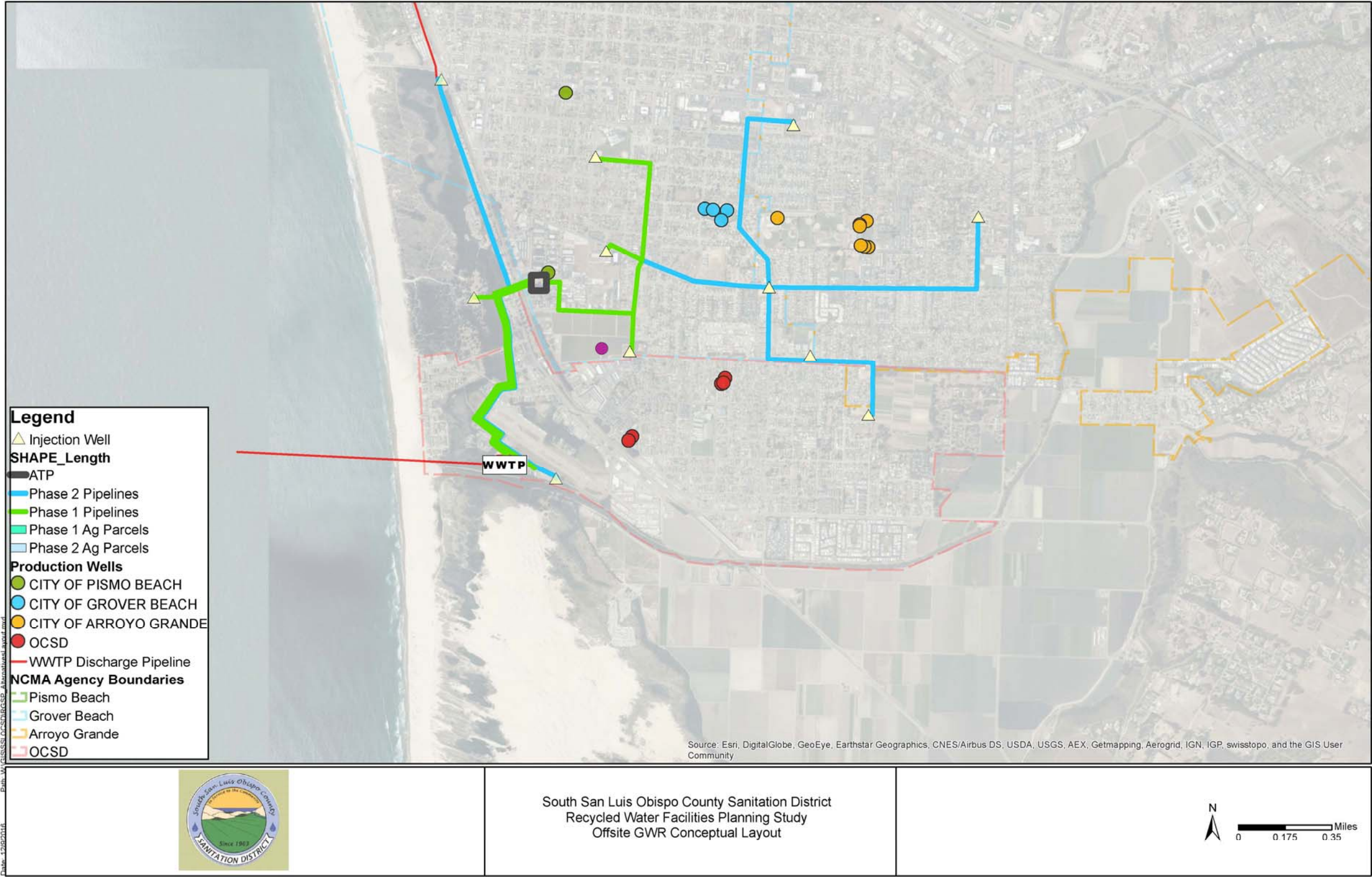


Figure 7-5. Alternative B – Offsite GWR Conceptual Layout

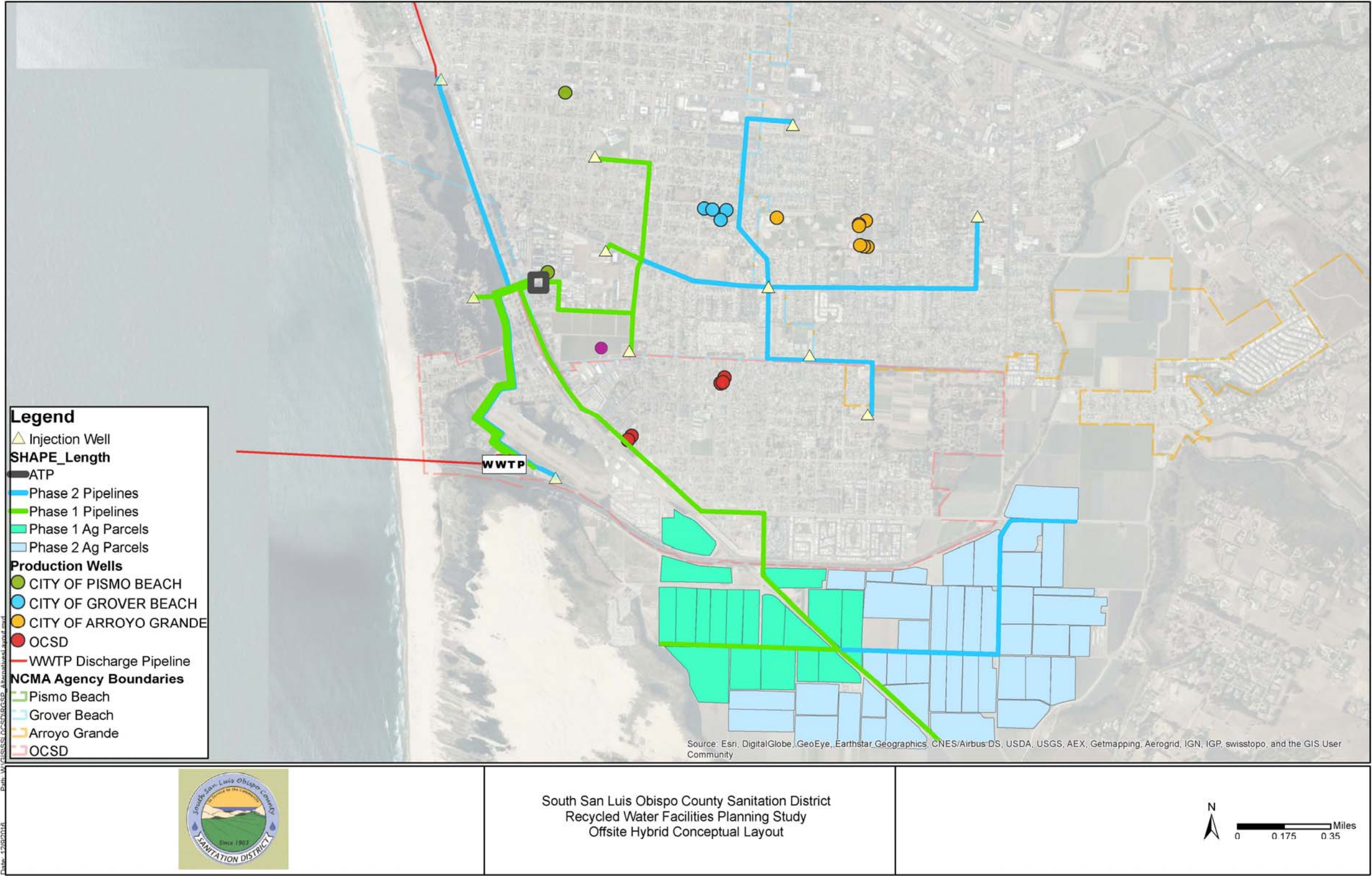


Figure 7-6. Alternative B – Offsite Hybrid Conceptual Layout

7.1.3.1 Storage, Pumping, & Distribution System

Similar to Alternative A, Alternative B pipeline is broken into additive segments (B-1 through B-15). The pump stations and pipeline summaries are shown in Table 7-6. The sizes and lengths for each pipeline segment are summarized in Table 7-7 below. The irrigation lines (Irr0 through Irr3) are only included for the Hybrid alternative.

Table 7-6. Storage, Pumping, & Distribution Summary for Offsite Alternative B

GWR	AADF (MGD)	Injection Wells	Storage	Pump Station to ATP	Effluent/ Brine PS	GW Recharge PS		Total Length of Pipeline
Phase 1	1.1	4	0.26 MG	12 hp	3 hp	40 hp	-	3.7 miles
Phase 2	4.1	11	1.03 MG	35 hp	8 hp	120 hp	-	8.8 miles
Hybrid	AADF (MGD)	Injection Wells	Storage	Pump Station to ATP	Effluent/ Brine PS	RW PS	Irrigation PS	Total Length of Pipeline
Phase 1	1.1	4	1.05 MG	12 hp	3 hp	40 hp	9 hp	6.9 miles
Phase 2	4.1	11	4.12 MG	35 hp	8 hp	120 hp	20 hp	13.4 miles

Table 7-7. Offsite Alternative B Pipeline Segments for Phase 1 and Phase 2

Phase 1 Segments	Length (ft)	Size (in)	Phase 2 Segments	Length (ft)	Size (in)
To ATP	5,229	16	To ATP	5,229	16
B0	430	10	B0	430	10
B1	2,312	12	B1	2,312	12
B5	799	6	B2	4,541	6
B6	498	6	B3	4,968	6
B7	252	8	B4	5,545	6
B9	857	6	B5	799	6
B10	1,077	12	B6	498	6
B14	3,072	6	B7	252	8
To Outfall	5,229	8	B8	2,599	10
Irr0	10,653	18	B9	857	6
Irr1	2,674	8	B10	1,077	12
Irr3	3,512	10	B11	2,267	8
			B12	99	6
			B13	2,366	6
			B14	3,072	6
			B15	4,544	6
			To Outfall	5,229	8
			Irr0	10,653	18
			Irr1	2,674	8
			Irr2	7,183	12
			Irr3	3,512	10

7.1.3.2 Estimated Costs

Unit costs associated with Alternative B include site acquisition, construction of an offsite ATP and support facilities, a storage reservoir, booster pumps, pipelines, and injection wells. Capital and O&M cost were calculated for all components. These costs are summarized in Table 7-8 and detailed unit cost calculations are provided in Appendix G.

Table 7-8. Unit Costs for Alternative B

	Phase 1	Phase 2 ¹	Phase 1	Phase 2
	Offsite B - Groundwater Recharge	Offsite B - Groundwater Recharge	Onsite B - Groundwater Recharge & Ag Irrigation	Onsite B - Groundwater Recharge & Ag Irrigation
Total Capital	\$29,700,000	\$66,500,000	\$41,300,000	\$86,500,000
Annualized Capital	\$1,930,000	\$4,330,000	\$2,690,000	\$5,630,000
Annualized O&M	\$970,000	\$3,490,000	\$860,000	\$2,930,000
Total Annualized	\$2,900,000	\$7,820,000	\$3,550,000	\$8,560,000
Yield (Before Injection)	900 AFY	3,530 AFY	943 AFY	3,658 AFY
Cost/AF (Before Injection)	\$3,200	\$2,200	\$3,800	\$2,300
Yield (After Injection)	657 AFY	2,577 AFY	812 AFY	3,031 AFY
Cost/AF (After Injection)	\$4,400	\$3,000	\$4,400	\$2,800
¹ Phase 2 costs represent total cost, not an additive cost				

7.2 NON-RECYCLED WATER ALTERNATIVE

WSC reviewed and compiled previously completed studies that identified various non-recycled water supply options. 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 7-9. All unit costs were escalated to August 2016 dollars using the ENR Construction Cost Index.

Table 7-9. Non-recycled Water Supply Unit Cost

Supply	Source	Unit Cost (\$/AF)
Surface Water	Lopez Lake Spillway Raise Project (Stetson 2012) (Stetson Engineers Inc., 2013)	\$1,370
Ocean Water	South San Luis Obispo County Desalination Funding Study (Wallace 2008) (Wallace Group, 2008)	\$3,112
Potable Water	Nipomo Community Services District SWP Supply Analysis (Boyle 2007) (Boyle, 2007)	\$2,162 to \$2,664
Note: Unit cost from each reference are escalated to Aug 2016 based on ENR Construction Cost Index. Financing assumptions applied by each study are not reconciled.		

7.3 WATER CONSERVATION/REDUCTION ANALYSIS

The cities of Arroyo Grande, Grover Beach, and Pismo Beach are required to reduce water use by 20% by the year 2020 to comply with Senate Bill x7-7 (SB7). The unit used to measure compliance with water conservation reduction targets is water use in gallons per capita per day (gpcd). Each city's Urban Water Management Plan (UWMP) describes the SB7 analysis in more detail. In 2015, each agency's gpcd was well below their 2020 reduction target as a result of multiple factors including increased conservation efforts and measures. OCSD is not required to meet the UWMP and SB7 requirements due to it serving less than 3,000 connections and delivering less than 3,000 AFY, but it does implement conservation

programs nonetheless. Each of the District member agencies' conservation efforts are summarized in the following sections.

7.3.1 Arroyo Grande Conservation Efforts

In order to meet conservation targets, the City of Arroyo Grande 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 water conservation efforts of the City have been successful; the ongoing programs have decreased water use to 113 gpcd in 2015, which well below its 153 gpcd target.

7.3.2 Grover Beach Conservation Efforts

In June 2014, the City of Grover Beach declared a Stage III Water Shortage that requires all water customers to reduce their water usage by 10%. Many of the prohibitions that had previously been voluntary during the two years of the Stage II Water Shortage Declaration became mandatory with the Stage III declaration. The declaration also provides the City with the authority to impose penalties for failure to comply with the water reduction or use prohibitions. The water use for 2015 was 90 gpcd, which is well below its 113 gpcd target.

7.3.3 OCSD Conservation Efforts

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. OCSD's conservation efforts have been between 25-30% in comparison to 2013, and exceeded the Governor's goal of 25% statewide reduction in water use. Overall consumption has declined to approximately 85 gpcd after the implementation of drought conservation rates in April 2015 (Fugro Consultants, 2016).

7.3.4 City of Pismo Beach Conservation Efforts

In order to meet conservation targets the City of Pismo Beach has pursued multiple new water use efficiency measures and actions in addition to its existing programs. Some of the measures and actions implemented include mandatory water use restrictions and multiple water conservation incentive programs including the first-in-the-State waterless urinal mandate and a 0.5 gallon per minute restroom aerator retrofit requirement. The water conservation efforts of the City of Pismo Beach have been successful; the ongoing programs have decreased water use to 201 gpcd in 2015, slightly below its 204 gpcd target.

7.4 NO PROJECT ALTERNATIVE

A "No Project" alternative would include no treatment upgrades to the District'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.

The effects of the "No-Project" alternative include limiting the water supplies of the NCMA agencies to their current groundwater and any available Lopez Water or State Water. The risk of seawater intrusion into the groundwater basin would remain. Additionally, the "No Project" alternative includes continuing

to use potable water for agricultural irrigation. Local irrigation customers would not gain a second, more reliable, supply for irrigation.

The No Project Alternative does not meet the Study's goals because it does not create a resilient water supply, provide an opportunity to educate the public and project stakeholders, and it does not allow the District to coordinate with other local RW efforts.

7.5 ALTERNATIVES ANALYSIS

7.5.1 Quantitative Analysis Summary

The total estimated treatment capital and O&M cost for each of the alternatives is presented in Table 7-10. Note that the unit costs (\$/AF) are based on the estimated RW production and yield of each alternative rather than the capacity of the treatment system itself and assumes a 5% interest rate for financing. A visual representation of the Capital Costs, O&M, and Yield are shown in Figure 7-7 for Phase 1, and Figure 7-8 for Phase 2.

Table 7-10. Full Advanced Treatment Capital Cost, O&M, and Yield

Phase 1				
	Onsite A - Groundwater Recharge	Onsite A - Hybrid	Offsite B - Groundwater Recharge	Offsite B - Hybrid
Total Capital	\$24,900,000	\$35,300,000	\$29,700,000	\$41,300,000
Annualized Capital	\$1,620,000	\$2,300,000	\$1,930,000	\$2,690,000
Annualized O&M	\$910,000	\$800,000	\$970,000	\$860,000
Total Annualized	\$2,530,000	\$3,100,000	\$2,900,000	\$3,550,000
Yield (Before Injection)	900 AFY	943 AFY	900 AFY	943 AFY
Cost/AF (Before Injection)	\$2,800	\$3,300	\$3,200	\$3,800
Yield (After Injection)	657 AFY	812 AFY	657 AFY	812 AFY
Cost/AF (After Injection)	\$3,900	\$3,800	\$4,400	\$4,400
Phase 2				
	Onsite A - Groundwater Recharge	Onsite A - Hybrid	Offsite B - Groundwater Recharge	Offsite B - Hybrid
Total Capital	\$59,300,000	\$78,000,000	\$66,500,000	\$86,500,000
Annualized Capital	\$3,860,000	\$5,070,000	\$4,330,000	\$5,630,000
Annualized O&M	\$3,380,000	\$2,620,000	\$3,490,000	\$2,930,000
Total Annualized	\$7,240,000	\$7,690,000	\$7,820,000	\$8,560,000
Yield (Before Injection)	3530 AFY	3658 AFY	3530 AFY	3658 AFY
Cost/AF (Before Injection)	\$2,100	\$2,100	\$2,200	\$2,300
Yield (After Injection)	2,577 AFY	3,031 AFY	2,577 AFY	3,031 AFY
Cost/AF (After Injection)	\$2,800	\$2,500	\$3,000	\$2,800

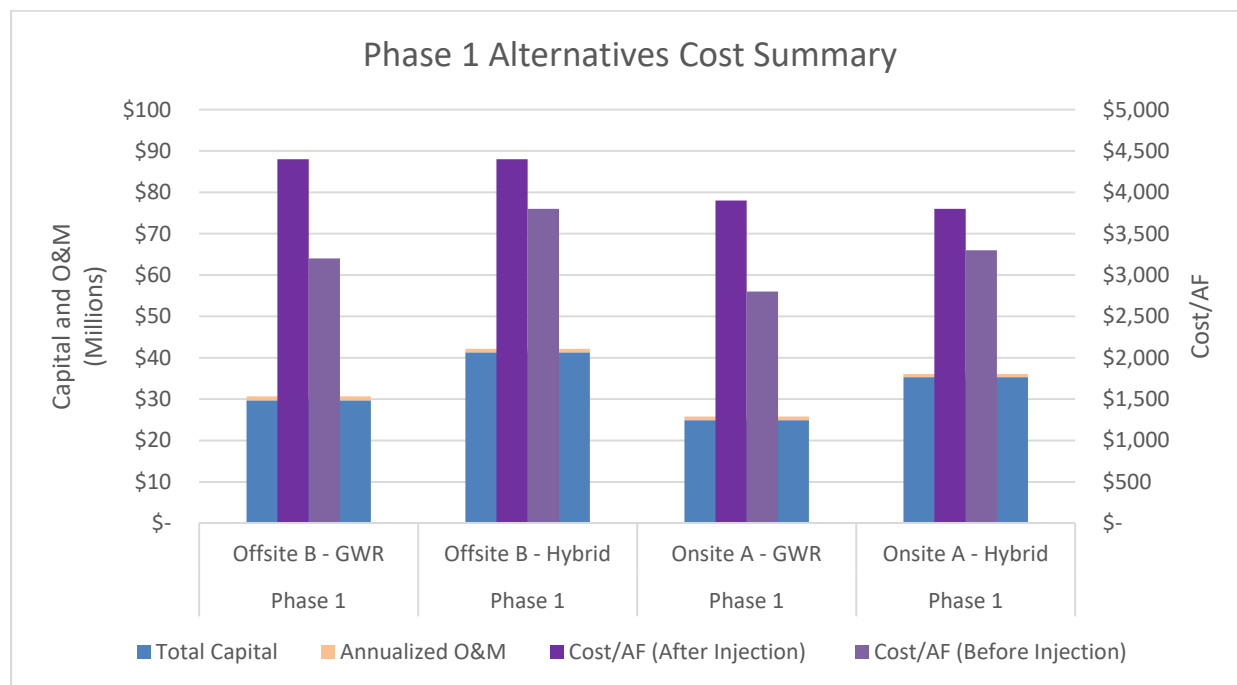


Figure 7-7. Phase 1 Cost Graph

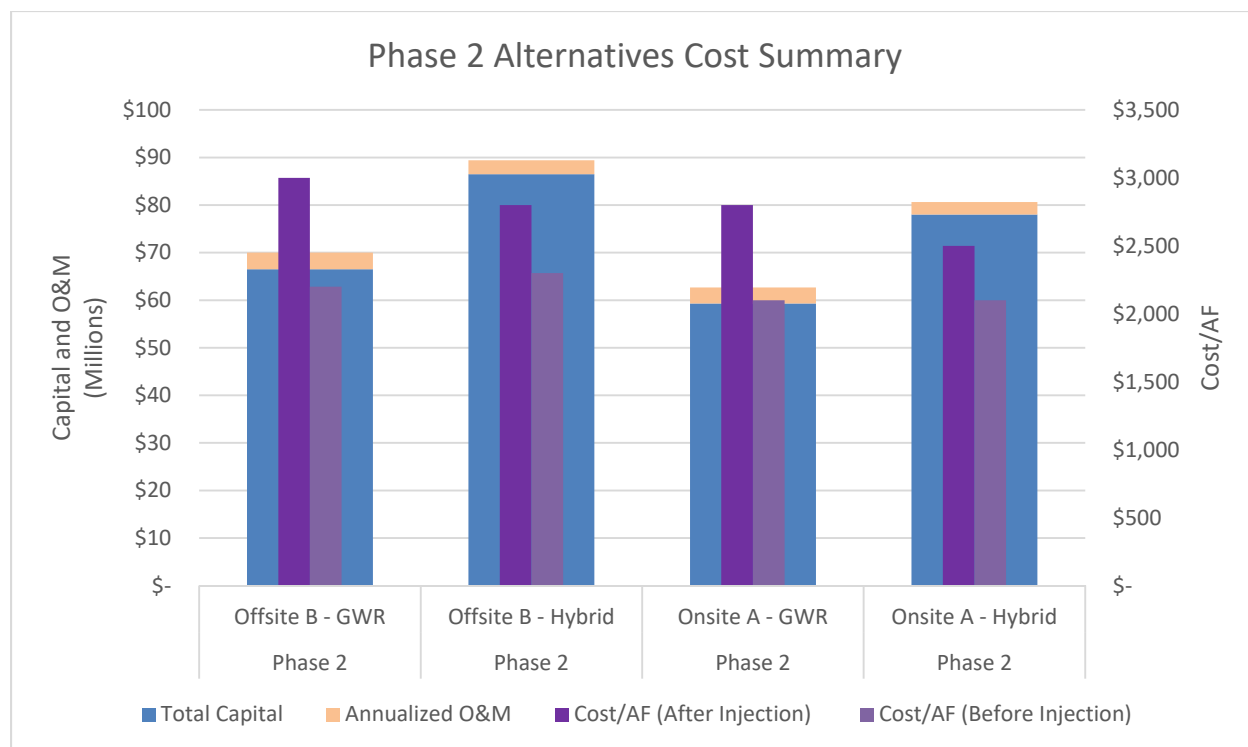


Figure 7-8. Phase 2 Cost Summary Graph

7.5.2 Alternative Ranking Criteria and Scoring Results

For the qualitative component of the alternative analysis, each alternative was compared and ranked on the basis of qualitative criteria. Each alternative received a score between 1 and 3, with three being the highest score and 1 being the lowest score.

The recommendations from this analysis were not decided based solely on the lowest cost or the highest qualitative score. Both quantitative and qualitative criteria were considered and the recommendations were developed based on which options provide the best value for the region RGSP Stakeholders.

For the Qualitative analysis, each alternative was screened using the following screening criteria:

- Community Impact, Construction Complexity
- Flood Risk
- Ease of Operation/Maintenance Requirements
- Energy Requirements/Greenhouse Gas Emissions
- Operational and Beneficial Use Flexibility
- Governance
- Ability to Phase
- Permitting Uncertainty/Complexity

Each criteria has a corresponding scoring approach. 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. Table 7-11 shows the results for the qualitative analysis. As mentioned earlier, the alternatives were not evaluated solely upon their quantitative or qualitative scores, but were evaluated based on both findings. The cost per AF was also included in Table 7-11 as a reference to better compare the alternatives based on value.

Table 7-11. Alternatives Qualitative and Quantitative Ranking

	Assigned Scores					Weighted Scores			
	A		B			A		B	
Qualitative/Non-Economic Criteria	Onsite GWR	Onsite Hybrid	Offsite GWR	Offsite Hybrid	Weight	Onsite GWR	Onsite Hybrid	Offsite GWR	Offsite Hybrid
Community Impact/Construction Complexity	3	2	2	1	3	9	6	6	3
Flood risk	2	2	3	3	1	2	2	3	3
Ease of Operation/Maintenance Requirements	3	2	2	1	1	3	2	2	1
Energy Requirements/Greenhouse Gas Emissions	2	3	1	2	1	2	3	1	2
Operational and beneficial use Flexibility	1	2	2	3	3	3	6	6	9
Governance	3	2	2	1	3	9	6	6	3
Ability to Phase	1	2	2	3	3	3	6	6	9
Permitting Uncertainty/Complexity	1	1	3	3	3	3	3	9	9
Total (Non-Economic/Qualitative)	16	16	17	17		34	34	39	39
Cost/AF (Phase 2, Before Injection)						\$2,100	\$2,100	\$2,200	\$2,300
Cost/AF (Phase 2, After Injection)						\$2,800	\$2,500	\$3,000	\$2,800

7.5.3 Findings

Both the onsite and offsite alternatives meet the goal of diversifying the RGSP Stakeholders water supply portfolio by developing a local, resilient water supply and providing a new source of recharge to the SMGB.

7.5.3.1 Onsite Alternative Pros and Cons

With the onsite alternatives, less infrastructure is required to convey secondary effluent from the existing WWTPs to the ATP, reducing capital and O&M costs. Additionally, there is no additional cost to purchase property for the ATP for the onsite alternatives.

However, while the onsite alternatives require less conveyance infrastructure and have lower unit costs, there may be regulatory constraints that could limit the District and the RGSP Stakeholders from obtaining the necessary permits to develop FAT upgrades at the existing District WWTP site. Ongoing discussion with the Coastal Commission regarding infrastructure upgrades at the District WWTP site will help inform the District and its RGSP Stakeholders on the viability of the onsite alternatives.

7.5.3.2 Offsite Alternative Pros and Cons

With the offsite alternatives, the District will have fewer regulatory constraints associated with obtaining the permits to develop the ATP facilities. However, the offsite alternatives require more infrastructure to convey secondary effluent from the existing WWTPs to the ATP, increasing capital and O&M costs. Also, there will be the additional cost of purchasing property for the offsite ATP.

7.5.3.3 Groundwater Recharge Only

In comparison to the hybrid alternatives, the groundwater recharge alternatives have a lower capital cost because infrastructure to convey recycled water to the agriculture irrigation customers is not required. One additional advantage of the groundwater recharge alternatives is that all of the water treated through the FAT process will have a better water quality than the Hybrid alternatives, and will provide a greater long term benefit to the basin water quality.

However, the groundwater recharge alternatives have a higher O&M cost due to the need to treat all of the water through the FAT process. Also, it was assumed that 27% 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. Additional hydrogeologic investigation being performed for the RGSP will help to compare the benefits to the groundwater basin from groundwater recharge versus offsetting groundwater pumping through delivery of recycled water to agriculture irrigation customers.

7.5.3.4 Groundwater Recharge and Agriculture Irrigation

In comparison to the groundwater recharge alternatives, even with the increased capital costs the hybrid alternatives have lower unit costs (i.e. \$/AF) due to the increase yield assumed for the agriculture irrigation alternatives and the lower O&M costs associated with tertiary treatment.

The Hybrid alternatives have a higher total annualized cost (i.e. sum of annual capital repayment and O&M costs) due to the additional infrastructure required to deliver the water to agricultural customers. One additional consideration is that while the Hybrid alternatives could present the opportunity for lower unit costs (i.e. \$/AF), developing a framework for ensuring that benefiting agencies and individuals are contributing to the cost of the project is more complicated than in the groundwater recharge only alternatives, therefore it may make the hybrid alternatives more difficult to implement.

7.6 RECOMMENDATIONS

Both the onsite and offsite alternatives meet the goal of diversifying the RGSP Stakeholders water supply portfolio by developing a local, resilient water supply and providing a new source of recharge to the SMGB. Based on the results of the alternatives analysis, it is recommended that the District and the RGSP Stakeholders move forward with an Environmental Impact Report (EIR) that evaluates both the onsite and offsite options.

8 IMPLEMENTATION PLAN

The District and the RGSP stakeholders will need to address the following project components in implementing the RW project. Additional work is being completed as part of the RGSP and will help the participating agencies better understand the advantages and disadvantages of the onsite and offsite locations. Table 8-1 below outlines the ongoing and upcoming initiatives and the lead agency that will allow the RGSP Stakeholders to complete the RGSP.

Table 8-1. RGSP Near Term Initiatives Timeline

	RGSP Initiative	Intended Outcome	Lead Agency(ies)	Completion Timeline
Near Term	Expanded EIR	Provide the RGSP stakeholders with the necessary environmental documents to ensure CEQA compliance. Provide additional environmental impact information needed to complete the SWRCB State Revolving Fund and other funding applications.	City of Pismo Beach, District	2017
	Letters of Intent (LOI)	Support letters from the RGSP stakeholders stating a desire to work together to develop a phased groundwater recharge and extraction project.	RGSP Stakeholders	Q1 2017
	Phase 1A of Groundwater Model	Construction, calibration and utilization of a hydraulic model to analyze injection and extraction scenarios for flows from the PB WWTP.	City of Pismo Beach	Q4 2016
	Phase 1B of Groundwater Model	Expand the Phase 1A hydrogeologic model support analysis of recharge and extraction scenarios for the PB and District WWTPs.	City of Pismo Beach, District	Q3 2017
	Offsite RGSP Site Identification	Identify of potential locations for the offsite ATP and allow RGSP Stakeholders to develop purchase/option agreements with property owners for preferred site(s).	City of Pismo Beach, District	Q2 2017

Table 8-2. RGSP Long Term Initiatives Timeline

Long Term	RGSP Initiative	Intended Outcome	Lead Agency(ies)	Completion Timeline
	Governance Discussion	Development of a governance framework for the RGSP	RGSP Stakeholders	2017/2018
	RGSP Site Procurement	Procure locations suitable for an offsite ATP (if selected as preferred location) and associated injection wells.	District, City of Pismo Beach	2018
	Test Injection Well	Design and build a test injection well and associated monitoring wells to help inform the RGSP final design.	City of Pismo Beach, District	2017
	Phase 2 of the Groundwater Model	Update and expand the hydrogeologic model to potentially include the Bulletin 118 fringe areas to provide a tool for developing comprehensive water management strategies and assisting with SGMA compliance.	NCMA Agencies, NMMA Parties, SLO County	2018
	Water Quality Sampling	Sample effluent water from the PB WWTP and develop estimates of anticipated District WWTP effluent quality, after the Redundancy Project, to determine the anticipated water for the Phase 1 and Phase 2 ATP influent.	District, City of Pismo Beach	Ongoing
	SNMP/Antidegradation Analysis	Develop a SNMP/Antidegradation Analysis to demonstrate that injected effluent will not detrimentally impact SMGB beneficial uses	District, City of Pismo Beach	2017
	WDR and/or WRR Permits	Submit a Report of Waste Discharge to the RWQCB and an Engineering Report to CCRWQCB and DDW	District	2018
	Infrastructure Permits	Obtain permits to construct the recommended project	District	2018
	Change Petition	Obtain approval from the SWRCB in accordance with the CWC sections 1210-1212	District	2018

8.1 PRELIMINARY AND FINAL DESIGN

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

8.1.1 Groundwater Modeling

This Study relies on the findings from a conceptual groundwater mounding model that was developed for the City of Pismo Beach RW Study. The model included the 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 Study. The quantity of recharged water at each injection well, number of wells required, percent of water recoverable, groundwater extraction impacts on the mounding and the pressure heads that can be developed from injection presented in this Study are preliminary. These are

critical values that will be further refined through groundwater modeling for detailed design of an injection well field.

The groundwater modeling effort will be broken down into Phase 1A, Phase 1B, and Phase 2. The modeling was phased due to breakdown of the model boundaries and the funding efforts. The District and the City of Pismo Beach will collaborate through the NCMA. The phased implementation plan for the groundwater model plan is shown in Figure 8-1.

Phase 1A of the groundwater model is currently being completed and includes evaluation of injection and extraction scenarios for PB WWTP flows. Development of a groundwater model with a larger extent and additional hydrogeologic analysis, will be undertaken as part of the Phase 1B model. The Phase 1B model will include identification of a larger network of injection wells and evaluation of injection and extraction of flows from both the PB and the District WWTPs.

NCMA-NMMA Groundwater Model Phased Implementation Plan

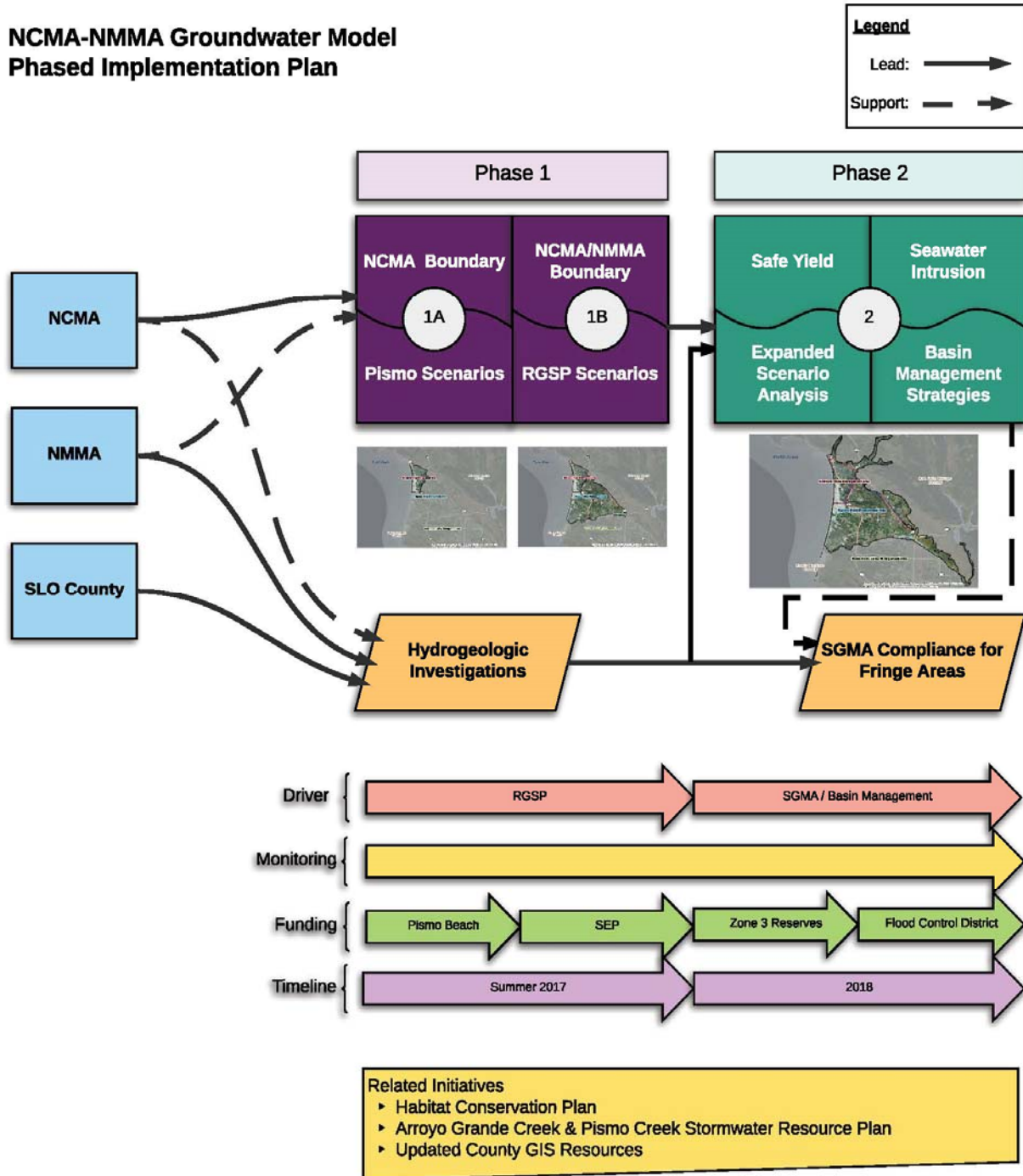


Figure 8-1. Groundwater Modeling Phased Implementation Plan

8.1.2 Test Injection Well

The installation and testing of a "test" injection well in conjunction with measurement of 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 and the site selection analysis from Phase 1 of the RGSP. The test injection well could be designed for long term use and incorporated into the final project.

8.1.3 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 analyzed per the requirements of the District'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 District member agencies' drinking water supplies and the addition of constituents between the drinking water distribution system and the secondary effluent. It is recommended that additional sampling be conducted on the drinking water supplies and wastewater on a quarterly basis. Table 8-3 includes a list of parameters and recommended detection limits.

Table 8-3. 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		

8.2 PERMITTING REQUIREMENTS

8.2.1 Tentative Water Recycling Requirements of the CCRWQCB

In order to implement a RW project, the District will need to obtain a Waste Discharge Requirement (WDR) and/or Water Reclamation Requirement (WRR) permit. The District will need to submit a Report of Waste Discharge to the RWQCB 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, and
 - 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 8-4. Figure 8-2 illustrates the anticipated CCRWQCB permitting process required.

Table 8-4. 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

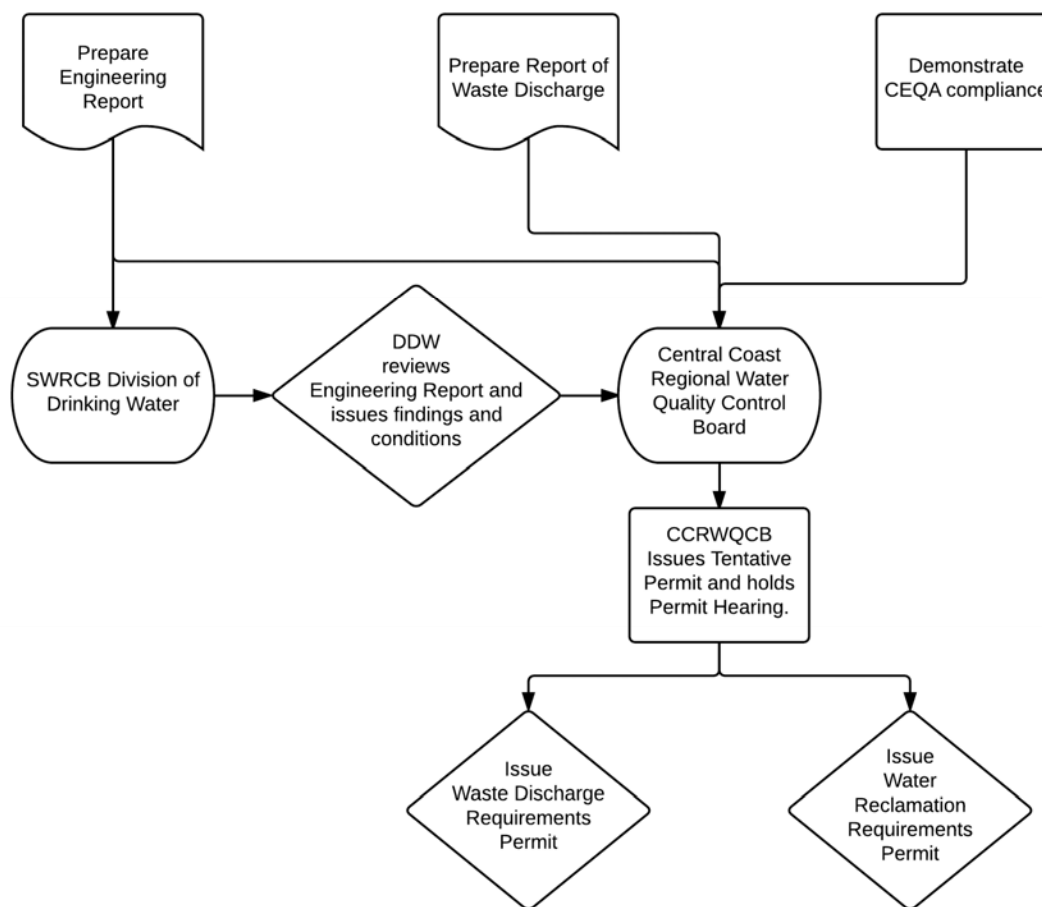


Figure 8-2. CCRWQCB Permitting Process

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

- Actively maintain and implement an industrial pretreatment and pollutant source control programs. 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.

8.2.2 Infrastructure Permits

It is anticipated the District will need to obtain multiple permits to construct the recommended project including, but not limited to, the following:

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

8.2.3 Salt and Nutrient Management Plan

It is anticipated a SNMP will be developed by the NCMA in conjunction with the permitting process for the RGSP. The SNMP will consider Basin Plan water quality objectives, existing groundwater quality data and the assimilative capacity of the basin. The SNMP findings would not likely impact permit requirements for the GRRP project because full AWT effluent water quality is better than the water quality objectives and may even be identified as a mitigation measure. However, an anti-degradation analysis will likely be required to evaluate the potential impact of the RGSP on groundwater quality within the basin. The SNMP will include an implementation plan and monitoring program to meet the SNMP's goals and objectives. The monitoring plan should be coordinated with the current basin monitoring efforts as well as any additional monitoring required for the GRRP.

8.2.4 Change Petition

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

8.3 ENVIRONMENTAL DOCUMENTATION REQUIREMENTS (CEQA)

In accordance with the California Environmental Quality Act (CEQA), it is anticipated the District will prepare an Initial Study (IS). A RGSP Environmental Impact Report (EIR) would include the offsite and onsite alternatives mentioned in this Study, saving the District from the expense of a separate EIR.

Since the District will also apply for CWSRF funds, it is anticipated that they will prepare a CEQA-Plus document.

8.4 BENEFICIARIES

The beneficiaries of this Study, and any RW project that results, include potable water customers of the District member agencies 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, NCMA agencies water customers benefit from the reduced risk of seawater intrusion, which maintains access to and reliability of the existing groundwater supplies.

Wastewater disposal for the District's wastewater customers is currently being achieved effectively through treatment and discharge to the ocean. However, similar to inland discharges, ocean outfall water quality requirements will likely continue the trend of increased stringency as new issues are identified and regulated. As a result, it is feasible that increasing treatment levels (nutrients being one) in the future may be required for ocean outfall wastewater discharge. In this situation, the wastewater customers would also receive benefits from the treatment upgrades proposed by the recommended project.

8.5 COORDINATION AND GOVERNANCE

Through the RGSP, the District member agencies have begun to collaborate on the process of developing a regional water recycling project with the development of an LOI and the kickoff of EIR cost sharing discussions. It is recommended that District continue these discussions with the interested agencies regarding cost sharing of the fixed and variable RW project costs and the technical and legal basis for return flow accounting and allocation within the NCMA.

8.6 PUBLIC OUTREACH

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

Some public outreach has already been done for the RGSP such as the creation of a project website, which is currently underway.

8.7 IMPLEMENTATION SCHEDULE

A preliminary implementation schedule is presented in Figure 8-3.

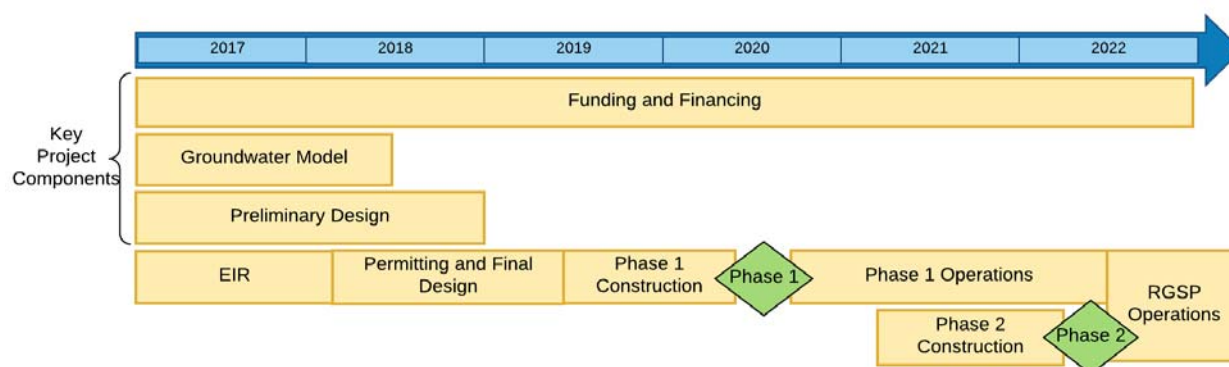


Figure 8-3. Preliminary Implementation Schedule

9 CONSTRUCTION FINANCING PLAN

9.1 FUNDING OPPORTUNITIES

Planning a recycled water program and building recycled water infrastructure requires a significant upfront capital investment. Additionally, adequate funding for annual O&M is necessary to ensure successful operation. Developing and implementing a recycled water 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 project unit costs presented in Table 1-4 on page 1-7 are based on borrowing 100% of the project cost at 5% interest for a 30-year term, to provide a conservative estimate of project costs. 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 9-1 and Figure 9-2 illustrate the range of annualized unit costs based on varying interest rates for the onsite and offsite groundwater recharge alternatives. The figures also illustrate the difference in unit cost for the RGSP for Phase 1 (900 AFY total yield, 657 AFY recoverable) and for Phase 2 (3,530 AFY total yield, 2,577 AFY recoverable).

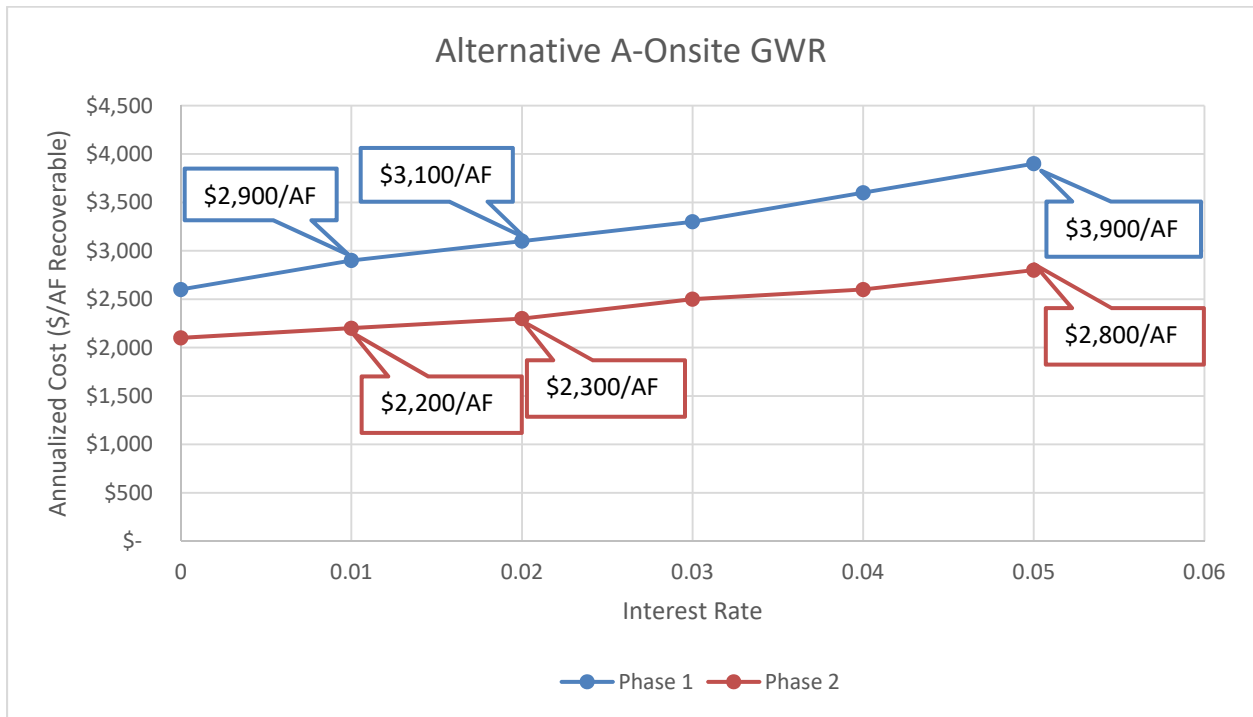


Figure 9-1. Interest Rate and Unit Cost Comparison for Alternative A

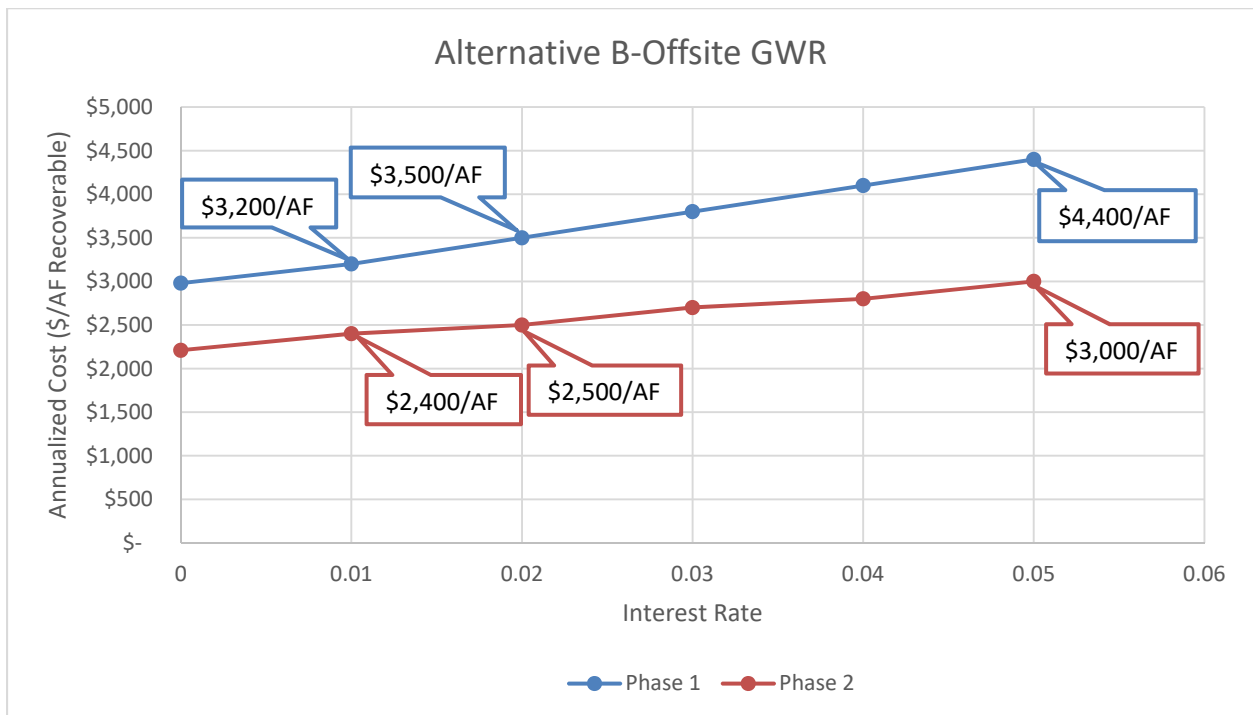


Figure 9-2. Interest Rate and Unit Cost Comparison for Alternative B

Pursuing RW project funding will require an upfront investment by the Project Team, and grant funding is anticipated to be highly competitive. The recommended recycled water project is anticipated, however, to be attractive to grant funding agencies because it meets several objectives commonly prioritized by a number of funding programs as it would;

- Rely upon and strengthens local and regional partnerships;
- Develop a new, local, sustainable water supply that benefits regional communities;
- Improve water supply reliability; and
- Improve groundwater basin quality.

The following section presents potential grant and loan funding opportunities that may be available for a future RW project, including the recently approved 2014 California Water Bond (Proposition 1).

9.1.1 Grant and Loan Programs

Funding opportunities for recycled water projects are available from several state and federal sources, including the SWRCB, Department of Water Resources (DWR), United States Bureau of Reclamation (USBR), USDA, California Energy Commission (CEC), and the U.S. Environmental Protection Agency (EPA). Several of these programs are responsible for administering the funds made available by the 2014 Water Bond (Proposition 1). Funding programs are available to fund project activities from preliminary planning to construction. A summary of eligible funding programs is presented in Table 9-1.

Table 9-1. Eligible Funding Programs

Funding Program	Applicability to District & City of Arroyo Grande	Available Funding	Project Deadlines	DAC Eligibility	Application Schedule	Reimbursable Funds Prior to Start Date	Required Documents
WFRP-Construction Grant/Loan Program	Funding for construction of water recycling projects	Grants up to 35% up to maximum of \$15 million. Loans/financing available for 100% of eligible costs. Repayment term up to 30 years. Interest rate is set to half of the most recent General Obligation bond rate.	Total eligible project capacity shall be delivered within 5 calendar years of operation from the date of Initiation of Operations 50% of eligible project capacity must serve existing users	A small DACs may receive up to 40% in grants up to \$20 million ¹	Applications are accepted on a continuous basis	The applicant may satisfy the local match requirement through other sources, including its own revenues, for example, where it has incurred and paid costs for studies and other directly associated planning and design incurred prior to the grant award date	CEQA
CWSRF-Wastewater Treatment Projects and Recycling Funding	Low interest financing for wastewater treatment facilities. Construction of publically owned treatment facilities. Wastewater treatment, local sewers, sewer interceptors, water reclamation, storm water treatment, combined sewers	30-year financing term at interest rate set to half of the most recent General Obligation bond rate ²	No specific project timeline. Projects prioritized by "Readiness to proceed"	No preference/requirement for DAC	Applications are accepted on a continuous basis	Applicants may start construction prior to the effective date of the financing agreement, but will not receive reimbursement of construction costs incurred prior to the effective date, and are not guaranteed financing approval and an executed financing agreement.	CEQA+
USDA Rural Development-Water & Waste Disposal Loan & Grant Program	Funding for acquisition, construction or improvement of sewer collection, transmission, treatment and disposal facilities.	Up to 40-year financing term with fixed interest rates dependent on median household income and need for project. State or local match of 25% required. Grants may be combined with loans.	No specific project timeline.	DAC preferred/no requirement for DAC. Financing terms dependent on community MHI.	Applications are accepted on a continuous basis	Any costs including design, engineering during construction, construction, legal fees and land acquisition incurred prior to the date of award must be submitted to the USDA in writing to be considered for reimbursement.	NEPA
USBR WaterSMART Water and Energy Efficiency Grant	Project can demonstrate a benefit to an endangered threatened species, and reduce water and energy consumption. Would support alternatives for groundwater recharge	Funding Group I: Up to \$300,000 up to two years. Funding Group II: Up to \$1,500,000 up to three years	2 Years for Funding Group I. 3 Years for Funding Group II	No preference/requirement for DAC	Deadline has passed for 2016 grants. Application released between October-December, and due approximately 3 months after release date. Applicants should receive funding by summer of the following year	Any costs including design, construction plans, environmental compliance costs incurred prior to the date of award may be submitted for consideration for reimbursable expense	NEPA
USBR WaterSMART Title XVI Water Reclamation and Reuse Program	Funding for construction of projects that reclaim and reuse. Reclaimed water can be used for a variety of purposes such as environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation, or recreation	Financing for construction projects is less than \$20 million or 25% of total project cost. Funding for projects approved by congress and sponsored by congressman. 6 years since last construction authorization.	Typically, 24-36 months to complete tasks in agreement ⁵	No preference/requirement for DAC	Deadline has passed for 2016 grants. Application released between October-December of this year. Applications due approximately 3 months after release date. Applicants should receive funding by summer of the following year	Any costs including design, construction plans, environmental compliance costs incurred prior to the date of award may be submitted for consideration for reimbursable expense	NEPA
USBR WaterSMART Title XVI Water Reclamation and Reuse Program	Funding for planning/feasibility study for recycled water project. Reclaimed water can be used for a variety of purposes such as environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation, or recreation	Federal share for 50% of Feasibility Study	Typically, 18 months to complete tasks in agreement ³	No preference/requirement for DAC	Deadline has passed for 2016 grants. Applications likely to be released in January of 2016	Any costs including design, construction plans, environmental compliance costs incurred prior to the date of award may be submitted for consideration for reimbursable expense	NEPA
Integrated Regional Water Management (IRWM) - Implementation Grant Program	Provides funding for implementation projects that support integrated water management	Minimum local funding match of 25%	No specific time to completion listed. Project must be implementation ready to apply for funding	MHI<80% of Statewide annual MHI	Deadline has passed for 2016 grants. Applications for 2017 likely to be due August 2016, and awarded January 2017	Reimbursable funds after effective date are for engineering, design, land and easement, legal fees, preparation of environmental documentation, environmental mitigation, and project implementation. Grant application preparation prior to effective date is reimbursable	CEQA
I-Bank Infrastructure State Revolving Fund	Provide financing for infrastructure and economic development projects	\$50,000 - \$25 million. Most recent interest rates between 2-3%	No specific time to completion listed. Project must be implementation ready to apply for funding	No DAC requirement; staff may adjust interest rate based on factors including MHI on a case by case basis	Continuous application process		CEQA

Notes:

1. Eligible communities include those with a population <20,000. Disadvantaged Communities (DAC) are those with MHI<80% of Statewide MHI. Severely DACs are those with MHI<60%.

2. Current CWSRF interest rate is 1.7%, 10 year range of 2.5% to 3%. No funding limit.

3. Extensions are allowed on a case-by-case basis.

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APPENDIX A. INVESTMENT ANALYSIS TECHNICAL MEMORANDUM

APPENDIX B. THE DISTRICT NPDES PERMIT

APPENDIX C. THE CITY OF PISMO BEACH NPDES PERMIT

APPENDIX D. HYDROGEOLOGIC ASESMENT REPORT

APPENDIX E. PLANNING AND DESIGN ASSUMPTIONS

APPENDIX F. REGULATORY OVERVIEW

APPENDIX G. COST MODEL