SAN ELIJO
JOINT POWERS AUTHORITY

FINAL REPORT

2015 Facility Plan

for San Elijo Joint Powers Authority's San Elijo Water Reclamation Facility

April 2015

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SAN ELIJO
JOINT POWERS AUTHORITY

2015 FACILITY PLAN

for San Elijo Joint Powers Authority's San Elijo Water Reclamation Facility

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Contents

TABLES

FIGURES

1.1 INTRODUCTION

The purpose of this 2015 Facility Plan is to provide the San Elijo Joint Powers Authority (SEJPA) with a planning document that identifies and prioritizes potential improvements at the San Elijo Water Campus. The Water Campus consists of the San Elijo Water Reclamation Facility (SEWRF) including secondary treatment, tertiary treatment, and solids handling facilities for the incoming raw wastewater. Projects have been identified based on a comprehensive condition assessment of the installed assets at the SEWRF, a review of regulatory issues and potential changes, as well as potential process enhancements. The recommended projects have been reviewed with respect to cost and prioritized according to goals and standards set by SEJPA. Additional work has been performed to update the Wastewater Asset Management (WAM) database previously prepared for SEJPA.

1.2 REGULATORY REVIEW

As a part of this project, current and potential future regulations associated with wastewater and air quality issues were reviewed as they relate to the SEWRF. A detailed discussion is contained in Section 3. The construction and layout of the Administration and Operations Buildings were reviewed against the current building code with deficiencies noted.

1.3 SEWRF CONDITION ASSESSMENT

The condition assessment was performed over a two-day site visit by a team of process, structural, and electrical engineers and assisted by SEJPA staff. The assessment included visual observation of the installed assets as well as known deficiencies identified by staff. Additional meetings were held to review space needs and inspect the Administration and Operations Building with architects.

The WAM database was updated with new assets as noted through the condition assessment and a review of record drawings. The WAM database is used to track asset condition, field notes, photos, and condition rankings, remaining useful life estimates, criticality, vulnerability and overall risk. Risk scores are calculated as the product of criticality and vulnerability where vulnerability is the likelihood of failure and criticality is defined as the consequence of failure. Vulnerability is a function of the asset condition and remaining useful life. Criticality is a weighted score with each asset graded according to health and safety, economics, environmental, and community effects. High risk assets were identified for rehab or replacements and were grouped into larger capital improvement program (CIP) projects for additional evaluation and project cost estimating. The list of CIP projects are provided in Table 1.1. The table includes project scope, major drivers, and the estimated project cost.

Table 1.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
1	Land Outfall Replacement	• Replace the Land Outfall beneath the San Elijo Lagoon.	• Risk • Safety • Condition	$6.27
2	Buildings & Seismic Improvements	<u>Architectural/Structural</u> • New Administration Building, located near to plant entrance • New and/or Rehabilitated Operations Space • Provide seismic retrofit of roof-to-wall connections for the following: o Operations Building o Cogeneration Building o Chlorine Building	• Code Compliance • Risk • Safety • Condition	$7.00
3	Preliminary Treatment Upgrades	<u>Mechanical</u> • Install three mechanical bar screens. • Install duty/standby compactors • Install new screenings conveyor • Replace inlet gate and scum gate in Primary Sedimentation Basin No. 3 <u>Structural</u> • Repair and reline screenings channels • Add freeboard to channels • Repair and reline grit influent, grit bypass, and grit effluent channels • Replace channel covers • Replace grit chamber covers • Repair corrosion in Primary Sedimentation Basin No. 3 • Install fall arrest system	• Condition • Risk • Reduced Labor • Process Improvement • Safety	$2.37

Table 1.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
4	Electrical	<u>Electrical</u> • Replace Switchboard MS-2 in Cogeneration Bldg • Replace Odor Control Panel in Headworks • Complete and update Arc Flash Study and install AF labels on all panels	• Condition • Safety • Risk	$0.71
5	Dewatering Upgrades	<u>Mechanical</u> • Replace Belt Filter Presses • Replace feed pumps <u>Structural</u> • Evaluate and retrofit and repair hopper • Repair mezzanine and roof decking <u>Electrical</u> • Replace electrical equipment and controls	• Condition • Safety • Reduced Labor • Process Improvements	$1.79
6	Digester Improvements	<u>Mechanical</u> • Replace Sludge Circulation Pumps Nos. 2 , 3, and 5 • Replace heat exchangers • Consider heat exchanger replacement <u>Structural</u> • Replace Digester No. 2 floating cover • Concrete repair and lining in Digester No. 2 • Repair seals around cover in Digester No. 3 • Repair joint between cover and walls in Digester No. 4 • Perform more detailed inspection and repair of cracks on Digester Nos. 2, 3, and 4.	• Condition • Redundancy • Reduced Labor • Process Improvements	$1.66

Table 1.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
7	Aeration & Return Flow Upgrades	Mechanical • Install mixing in anoxic zones. • Install high efficiency blowers • Replace drain pump, provide shelf spare • Diffusers • Permanent Baffles • Install Return Flow Pump No. 4 • Replace discharge piping, all pumps. • Replace pump rails, all pumps. • Install fall arrest system	• Process Improvement • Energy Efficiency • Redundancy • Condition • Safety	$0.88
8	DAF Upgrades	Mechanical • Replace Pumps (3 total) • Replace DAF No. 2 Drive • Install Pressurization Pump No. 2 on DAF No. 2 • Implement co-thickening Structural • Coat mechanisms	• Condition • Reduced Labor • Process Improvement • Energy Efficiency	$0.44
9	SCADA	Electrical • Transition to single platform • Update SCADA software • Install SCADA system hardware (servers, historians, network attached storage, etc.) • Add missing equipment signals, alarms, etc. • Update Control Room workstation	• Condition • Risk • Operations Improvements	$1.08

Table 1.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
10	Secondary Upgrades	<u>Mechanical</u> • Replace scum troughs and reinstall at correct elevation. • Remove RAS Pump Nos. 1 and 2 • Install VFD on scum pump • Add mixing to RAS/WAS wet well • Install fall arrest system <u>Structural</u> • Repair and reline concrete in effluent boxes, RAS channel and effluent channel • Replace weir troughs and inlet baffles	• Condition • Process Improvement • Reduced Labor • Safety	$1.21
11	Site Improvements & Security	<u>Civil</u> • Replace open storm channels with storm pipes, or culverts to improve site access and use. • Replace site asphalt <u>Structural</u> • Improve fencing for proper height and climbing deterrents • Install climbing deterrent on block wall at gate • Improve video surveillance at critical areas • Consider intrusion alarms at major assets	• Site Improvements • Public Access • Community • Safety • Risk	$3.77
12	Tertiary Upgrades	<u>Mechanical</u> • Replace Reclamation Pumps Nos. 1-3 • Install Reclamation Pump No. 4 • Automate Valves • Install additional RO Membranes <u>Structural</u> • Install baffles in CCB	• Process Improvement • Additional disinfection capacity	$0.77

Table 1.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
13	Reuse Storage	<u>Mechanical</u> • Install Reuse Pump Station <u>Structural</u> • Modify FEB's for storage of reuse water	• Increase on-site storage • Operations Improvements	$3.88
14	Solar Upgrades, Phase II	<u>Electrical</u> • Install solar field	• Energy Efficiency	$0.20
15	Odor Control Improvements	<u>Mechanical</u> • Replace Scrubber No. 1 Recirculation Pumps Nos. 1 and 2 <u>Structural</u> • Replace Hypochlorite Storage Tank No. 2 • Replace Caustic Storage Tank No. 2 • Replace Caustic Storage Tank No. 1 <u>Electrical</u> • Add SCADA alarms for Recirculation Pumps	• Condition • Process Improvement	$0.21
16	Class A Biosolids	<u>Mechanical</u> • Produce Class A Biosolids using solar drying, heat drying, or three-phase digestion	• Process Improvements	$2.00
17	Cogeneration	<u>Mechanical</u> • Install cogeneration system	• Process Improvement • Energy Efficiency	$2.66
			10-YEAR TOTAL CIP PROJECT COST:	$36.90

1.4 CIP PROJECT PRIORITIZED LIST

The CIP Projects were prioritized using a "triple-bottom line" approach to evaluate and weight each project against the others for three main factors:

- Financial (30%): Implement cost effective projects and solutions. Maximize economic benefits for customers through cost-effective operations.
- Environmental (35%: Meet or exceed permit limits and minimize reportable offenses. Improve habitat and minimize impacts to the local and global environment.
- Social (35%): Maintain a high standard of work safety and protection and maximize community benefits through improved aesthetics and recreational uses.

The prioritized project list is shown on Table 1.2. The list provides each project's score according to the triple-bottom-line comparison and the project cost. The triple bottom line comparison tables are provided in Appendix B. Section 6 provides additional justification and evaluation of the top rated projects.

Table 1.2 Prioritized Project List

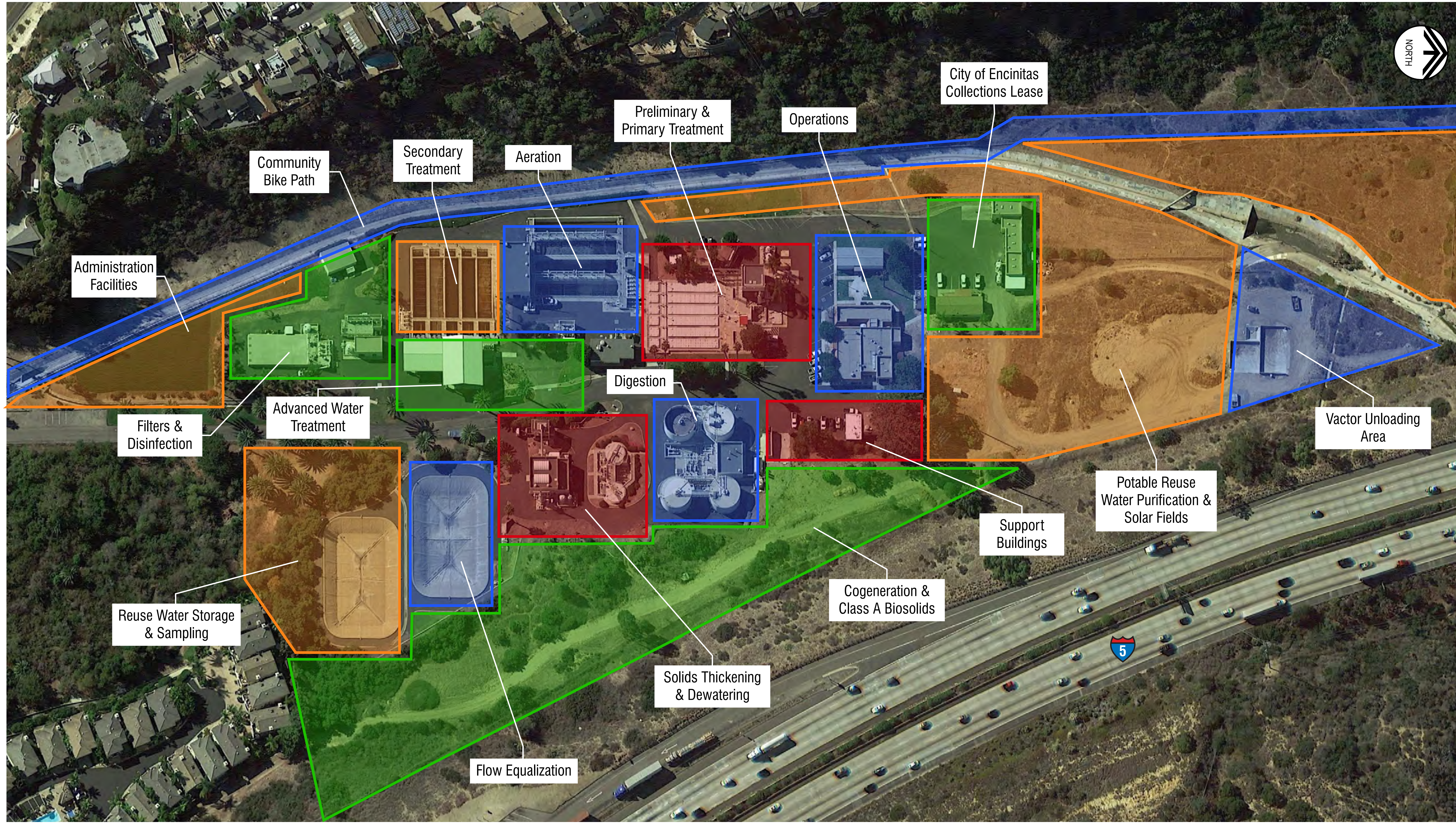
Weight	35%	35%	30%		
Potential Project/ Process Area	Social	Environmental	Financial	Total	Project Cost ($M)
Land Outfall Replacement	4.55	4.9	4.2	13.65	$6.27
Buildings & Seismic Upgrades	4.9	4.55	3.9	13.35	$7.00
Preliminary Treatment Upgrades	4.2	4.2	3.6	12	$2.37
Electrical Upgrades	3.5	3.15	2.7	9.35	$0.71
Dewatering Upgrades	2.45	3.15	3.3	8.9	$1.79
Digester Improvements	3.5	2.1	1.8	7.4	$1.66
Aeration Upgrades & Return Flow Upgrades	2.45	2.1	2.4	6.95	$0.88
DAF Upgrades & Co-Thickening	2.45	1.75	2.4	6.6	$0.44
SCADA	2.45	1.75	2.1	6.3	$1.08
Secondary Upgrades	1.75	2.8	0.9	5.45	$1.21
Site Improvements & Security	2.8	1.4	1.2	5.4	$3.77
Tertiary Upgrades	2.1	1.75	1.5	5.35	$0.77
Reuse Storage	1.75	1.75	1.2	4.7	$3.88
Solar Phase II	1.4	1.4	1.8	4.6	$0.20
Odor Control Improvements	0.7	1.4	0.6	2.7	$0.21
Class A Biosolids	0.35	1.05	0	1.4	$2.00
Cogeneration	0	0	0.6	0.6	$2.66
			TOTAL CIP PROJECT COST		$36.90

1.5 SITE MASTER PLAN

The San Elijo Water Campus site master plan is shown on Figure 1.1. The plan identifies process areas and CIP improvements throughout the SEWRF site. The plan also identifies potential future use for currently unused space. This includes the possibility of a brackish water or water reuse facility in the northern portion of the plant. The plan is meant to identify current and future land use around the SEWRF site.

1.6 IMPLEMENTATION SCHEDULE

Figure 1.2 provides the suggested 10-year implementation schedule. The schedule is shown according to SEJPA's fiscal calendar. Projects are spread-out in an attempt to keep the annual expenditure from fluctuating excessively. The first few years of the schedule have a higher capital expenditure due to the cost and critical nature of the first few projects – the Administration Building, the Land Outfall Replacement, Electrical Upgrades, and Preliminary Treatment Upgrades. After the first three years, the annual expenditure reduces to between $2.0 and $4.0 million per year.



SAN ELIJO WATER CAMPUS SITE MASTER PLAN

FIGURE 1.1

SAN ELIJO JOINT POWERS AUTHORITY
2015 FACILITY PLAN

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Project	Capital Cost	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
		Fiscal Year									
Land Outfall Replacement	$6.27	$2.51	$2.51	$1.25							
Buildings & Seismic Upgrades	$7.00	$2.80	$2.80	$1.40							
Preliminary Treatment Upgrades	$2.37	$1.19	$1.19								
Electrical Upgrades	$0.71	$0.36	$0.36								
Dewatering Upgrades	$1.79		$0.72	$1.07							
Digester Improvements	$1.66			$0.83	$0.83						
Aeration Upgrades & Return Flow Upgrades	$0.88			$0.22	$0.44	$0.22					
DAF Upgrades & Co-Thickening	$0.44				$0.22	$0.22					
SCADA	$1.08				$0.54	$0.54					
Secondary Upgrades	$1.21				$0.30	$0.61	$0.30				
Site Improvements & Security	$3.77	$0.05				$1.86	$1.86				
Tertiary Upgrades	$0.77					$0.19	$0.38	$0.19			
Reuse Stroage	$3.88						$0.97	$1.94	$0.97		
Solar Phase II	$0.20							$0.12	$0.08		
Odor Control Improvements	$0.21							$0.05	$0.10	$0.05	
Class A Biosolids	$2.00								$1.00	$1.00	
Cogeneration	$2.66									$1.33	$1.33
TOTAL CIP COST	**$36.9**	$6.90	$7.57	$4.78	$2.34	$3.64	$3.52	$2.30	$2.15	$2.38	$1.33

CIP PROJECT IMPLEMENTATION SCHEDULE

FIGURE 1.2

SAN ELIJO JOINT POWERS AUTHORITY
2015 FACILITY PLAN

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2.1 BACKGROUND

The SEWRF, a traditional secondary treatment facility with additional tertiary facilities, is owned and operated by SEJPA. The SEWRF was first put into service in 1966 with a capacity of 2 million gallons per day (mgd) of primary treatment for wastewater. In 1981, the SEWRF's capacity was increased to 2.87 mgd and in 1992; the plant's capacity was increased to 5.25 mgd with the addition of secondary treatment facilities. In 2000, the SEWRF was upgraded to include a 2.48 mgd tertiary treatment system for Title 22 recycled water treatment and distribution. In early 2013, SEJPA completed construction of the 0.5 mgd Advanced Water Purification (AWP) facility for enhanced Title 22 treatment. The current average daily wastewater influent flow is approximately 2.8 mgd.

Overall, the facility consists of a preliminary treatment system that includes two mechanical bars screens and a grit chamber. Screenings are compacted and grit is removed through two grit classifiers prior to disposal. Primary treatment includes six primary clarifiers. Two clarifiers are used for treatment and two are on standby, while the remaining two clarifiers from the original plant construction have been decommissioned. Primary effluent is equalized in one of two flow equalization basins (FEB). An FEB pump station and motor- operated valves are used to control flow to and from the aeration basins. The valves operate to direct primary effluent to the FEBs or the aeration basins. Two aeration basins are utilized for biological treatment, with one basin serving as standby to the duty basin. There is a third basin available for storage that has not been retrofitted with baffles, while a fourth basin exists for future use. The fourth basin currently has no piping or mechanical equipment installed. Two of six secondary clarifiers are used for final settling, with the remainder available as needed. Secondary effluent then continues to the reclamation facilities, or is combined with the City of Escondido's effluent for final disposal through the Land and Ocean Outfalls. The Land Outfall begins at the SEWRF, continues 3,300 feet underneath the San Elijo Lagoon, and ends at the beach just west of Highway 101. The Ocean Outfall then continues 8,000 feet into the Pacific Ocean to a depth of 150 ft. There are three effluent pumps available for pumping to the Ocean Outfall.

The recycled water facilities consist of flash mix chemical injection, four continuous backwash sand filters and a chlorine contact basin. A side-stream of secondary effluent is treated at the AWP, consisting of microfiltration membranes and reverse osmosis membranes. Filtered water and AWP water are blended prior to disinfection in the chlorine contact basin and final distribution offsite through three effluent pumps.

Solids removed from the primary clarifiers are sent directly to two operating digesters. Waste activated sludge is thickened in two dissolved air flotation (DAF) thickeners before being sent to the digesters. A third digester is used primarily for storage prior to dewatering. The original Digester No. 1 is no longer in service. The digester facilities include various feed and mixing pumps, heat exchangers, digester gas mixing pumps, compressors and two boilers. Digested solids are dewatered through two belt filter presses prior to final disposal and land application in Arizona.

Support facilities at the SEWRF include chemical facilities, a standby generator, an Administration Building, and an Operations Building. The existing facility is shown on Figure 2.1.

2.2 PREVIOUS REPORTS

In 2007, Carollo Engineers, Inc. (Carollo) prepared the Facility Plan for SEJPA. The report included a comprehensive condition assessment of the SEWRF facilities along with development of an asset management database using Carollo's WAM program. Each asset can be documented within the program along with photos, condition reports, and field notes from the inspecting engineers. The Facility Plan Report (2007 Report) included a number of near and long-term project recommendations to improve plant operations and replace or rehabilitate existing assets.

2.3 PURPOSE

The purpose of this 2015 Facility Plan is to update the condition assessment provided in the 2007 Report, update and improve the WAM database, and identify necessary asset replacement or rehabilitation. Asset repair or replacement projects will be grouped together to provide a list of recommended CIP projects to continue the successful operation of the SEWRF. Additional CIP projects will be identified through a review of safety and regulatory issues as well as potential plant optimization projects. An implementation schedule will be developed based on a determination of project importance and criticality in meeting SEJPA's wastewater and recycled water treatment goals.

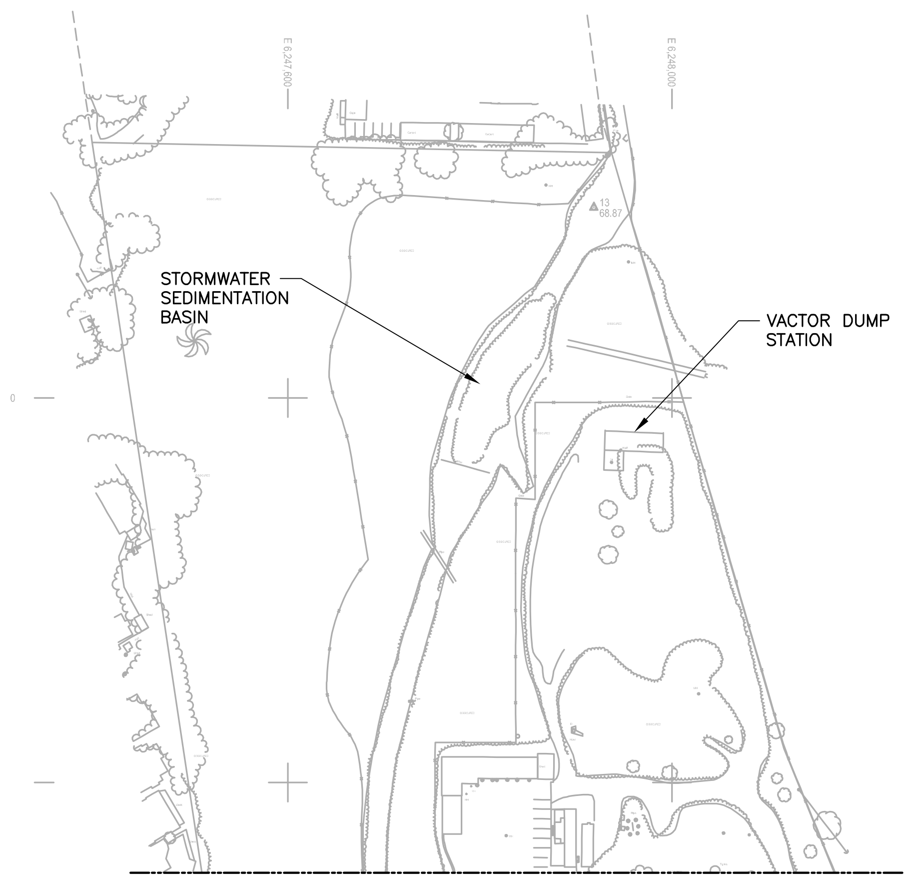
2.4 COST ESTIMATES

2.4.1 Basis of Cost Estimates

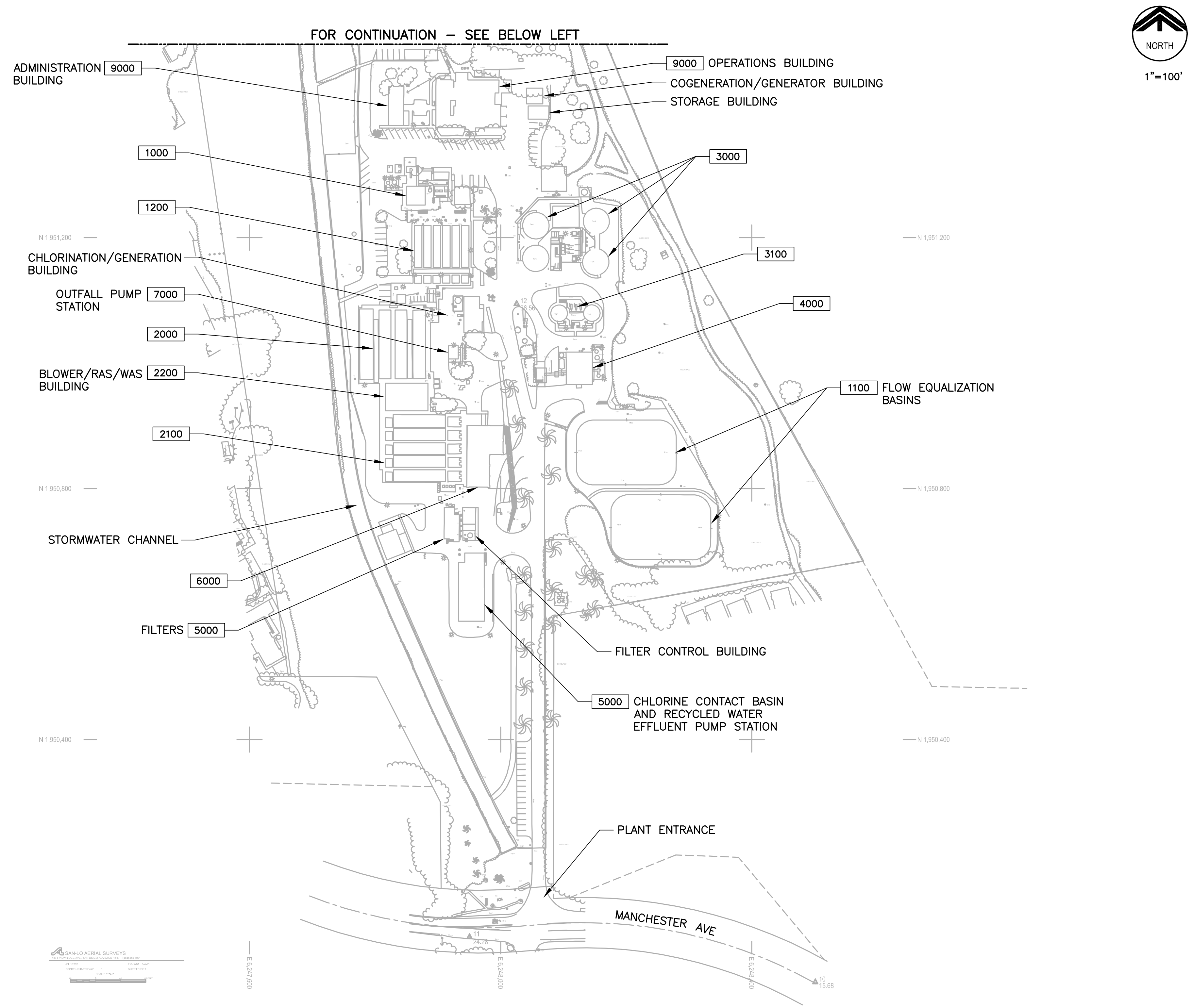
The cost estimates used to budget CIP projects are provided as a "budget estimate" as defined by the American Association of Cost Engineers (AACE). A budget estimate means that the expected accuracy range is accepted as somewhere in-between -20% to +30% of the actual cost. An estimating contingency has been applied to each estimate to capture items too minute in detail to be practically considered for a budget estimate. At least one of the following methods was used to develop cost estimates for projects:

- Pricing information from manufacturers.
- Analysis and review of cost curves projecting industry trends.
- Scaling of closely related project costs.
- Estimates of major construction costs such as demolition, piping, and earthwork, with appropriate contingencies based on the applied level of detail.

Operations and Maintenance (O&M) costs were not applied to each estimate, but rather applied where appropriate for project alternatives where O&M costs produced a significant difference. The Engineering News Record (ENR) Construction Cost Index (CCI) of 10,735 was used for the estimates that considered historical data. This CCI represents a factor for the typical cost of construction in Los Angeles as of April 2014.



SITE PLAN
1"=100'



SITE PLAN
1"=100'

PROCESS NUMBER	PROCESS AREA
1000	HEADWORKS
1100	FLOW EQUALIZATION
1200	PRIMARY SEDIMENTATION
2000	AERATION BASINS
2100	SECONDARY SEDIMENTATION
2200	RAS/WAS
3000	DIGESTERS
3100	DAF
4000	SLUDGE DEWATERING
5000	RECYCLED WATER
6000	AWP
7000	EFFLUENT/OUTFALL
8000	GENERATOR BUILDING
8100	MCC BUILDING
9000	SUPPORT FACILITIES (ADMIN/OPERATIONS)

SAN ELIJO WATER RECLAMATION FACILITY SITE PLAN

FIGURE 2.1

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2.4.2 Project Cost Factors

Project cost factors have been developed to account for certain unknowns in cost estimating and to develop overall replacement costs and CIP project costs. Replacement costs have been developed for each asset identified and tracked in the WAM database. The purpose of the replacement cost is to give a general level of understanding of the installed value of the SEWRF. The cost factors are provided in Table 2.1.

Table 2.1 Project Cost Factors

Cost Factors	Applied Contingency for Replacement Costs	Applied Contingency for CIP Project Costs
Demolition	10%	--
Ancillary Support	20%	--
Construction and Estimating Contingency	40%	25%
General Conditions	15%	15%
Contractor Overhead and Profit	15%	15%
Sales Tax	4%	4%
Engineer, Legal, and Administrative Costs	20%	20%

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The following section provides an overview of regulatory issues important to SEJPA. These issues primarily revolve around maintaining a safe working environment for both staff and the public while meeting all permit requirements. Additionally, there is an interest to look forward in terms of water quality regulations so that SEJPA can identify, investigate, and prepare for potential future water quality regulations. This may also allow identification of innovative treatment goals, such as potable reuse, and CIP projects that should be implemented to meet current or future regulations.

This section is broken up into three main sections:

1. Water Quality Regulations
2. Air Quality Regulations
3. Building Code Regulations

3.1 WATER QUALITY REGULATIONS

A variety of water quality regulations governs the reuse and disposal of SEJPA wastewater and treatment residuals. The discharge of treated wastewater or treatment residuals to surface waters is regulated by the California Regional Water Quality Control Board, San Diego Region (RWQCB) through the issuance of discharge permits, which implement state and federal water quality regulations. The reuse or disposal of biosolids generated by SEJPA treatment facilities is regulated by a combination of federal, state, and local laws and regulations.

Recognizing that existing and potential future water quality and biosolids regulations may significantly influence SEJPA wastewater facilities planning and reuse opportunities, this section:

- Summarizes existing permits that regulate SEJPA wastewater operations and the regulatory basis of state and federal requirements that govern the reuse and discharge of wastewater from the SEWRF,
- Summarizes requirements regarding the treatment, disposal, and reuse of liquid waste streams from plant processes, including advanced treatment facilities,
- Summarizes requirements regarding the treatment, disposal, and reuse of biosolids generated by conventional or advanced wastewater treatment,
- Summarizes requirements regarding the treatment and use of advanced treated (purified) recycled water, including potential additional uses of SEWRF recycled water for industrial and commercial uses, indirect potable reuse (IPR) and direct potable reuse (DPR), and
- Evaluates regulatory trends and identifies potential regulatory changes currently being evaluated by regulators that may impact SEJPA wastewater facilities planning.

3.1.1 Existing SEJPA Water Quality Regulation

3.1.1.1 Overview of Federal and State Water Quality Regulation

The federal Clean Water Act of 1972 (CWA) established the basic structure governing the discharge of wastewater to surface waters. The Clean Water Act, in part:

- Established the U.S. Environmental Protection Agency (EPA) as the federal agency with authority to regulate water quality in all surface waters, including ocean waters, bays, and estuaries, brackish waters, streams, rivers, lakes, and wetlands.
- Required EPA to establish nationwide water quality standards, which are based on water quality criteria, required to protect identified beneficial uses.
- Required states to adopt water quality standards to protect public health or welfare, enhance the quality of water, and implement CWA requirements.
- Established a nationwide system of NPDES (National Pollutant Discharge Elimination System) permits for regulating discharges of wastewater to surface waters.
- Required all wastewater dischargers to surface waters to obtain NPDES permits and comply with adopted water quality standards.
- Required periodic water quality assessments to identify waters not attaining established water quality standards, and established a process to clean up or restore such "impaired" waters.
- Required development of a national pretreatment program to regulate the discharge of industrial wastewater to public owned treatment works (POTWs).
- Allowed EPA to delegate NPDES permitting authority to states with qualified permit issuance, water quality standards, and enforcement programs.

EPA regulations implementing CWA water quality standards and permitting directives are established within Title 40, Parts 122-135 of the *Code of Federal Regulations* (40 CFR 122-135).

Water quality regulation in California precedes the formation of EPA and the Clean Water Act, and dates back to 1949 with the Dickey Act that established a statewide board and nine independent regional boards to regulate water pollution. The 1969 Porter-Cologne Water Quality Act (PCWQA) subsequently implemented the current State of California governance structure for regulating wastewater that consists of the State Water Resources Control Board (SWRCB) and nine RWQCBs. Unlike the federal CWA, which only addresses surface water, the PCWQA protects both ground and surface waters. To this end, the PCWQA requires RWQCBs to adopt regional water quality protection plans (Basin Plans) that:

- Identify designated beneficial uses for all ground and surface waters within the region,
- Establish water quality objectives to protect the beneficial uses, and
- Establish implementation policies to ensure attainment of water quality objectives.

The PCWQA also requires RWQCBs to regulate wastewater discharges to ground and surface waters through issuance of a state permit called "Waste Discharge Requirements" (WDRs). WDRs establish effluent discharge standards, operation provisions, and monitoring requirements necessary to ensure implementation of applicable ground and surface water quality objectives. PCQWA requirements are addressed within Division 17 of the *California Water Code* (Sections 13000 *et seq*.)

After the passage of the federal CWA, EPA empowered California, through the SWRCB and nine RWQCBs, to assume responsibility for:

- Establishing water quality standards pursuant to the Clean Water Act,
- Issuing NPDES permits and enforcing compliance,
- Performing periodic water quality assessments to identify "impaired" surface waters not meeting water quality standards, and
- Implementing the federal Total Maximum Daily Load (TMDL) program for reducing pollutant loads and restoring impaired waters.

Statewide Water Quality Plans. In accordance with this delegated authority, the State of California has established statewide water quality objectives for marine waters in the:

- Water Quality Control Plan, Ocean Waters of California (Ocean Plan),
- Water Quality Control Plan for Enclosed Bays and Estuaries of California, Part 1 Sediment Quality (Bays and Estuaries Plan), and
- Water Quality Control Plan for the Control of Temperatures in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan).

The SWRCB periodically reviews and updates its water quality plans. The current Ocean Plan was adopted in 2012, and the SWRCB is in the process of updating the plan. In addition to the state-developed water quality plans, EPA has within the *California Toxics Rule* (CTR) imposed federal water quality standards applicable to discharges to California inland surface waters and enclosed bays and estuaries.

Basin Plans. Each RWQCB has established surface and groundwater quality objectives in their respective Basin Plans. EPA has formally adopted surface water quality objectives established in the Ocean Plan and Basin Plans as federal water quality standards, subject to all of the protection and enforcements provisions of the CWA. RWQCBs are required to review and update their respective Basin Plans on a triennial basis.

Discharge Permits. NPDES permits issued by RWQCBs for regulating discharges to surface waters jointly serve as federal NPDES requirements and state WDRs, and address regulations (and requirements established thereto) within both the CWA and the PCWQA. NPDES permits are valid for five years, and dischargers must submit applications for renewal of NPDES permits 180 days prior to the listed NPDES permit expiration date. Dischargers are also required to submit applications for modifications of NPDES permits 180 days in advance of implementing proposed changes in treatment or discharge operations.

WDRs are issued pursuant to state requirements established in the PCWQA. WDRs do not have an expiration date, but may be reviewed or revised by the RWQCB at any time. As with NPDES permits; however, dischargers are required to submit applications for revision of WDRs 180 days in advance of proposed changes in treatment or discharge operations.

Technology-Based and Water Quality-Based Standards. NPDES permits implement applicable technology-based and water quality-based standards that are (1) promulgated by EPA pursuant to the CWA, (2) established in statewide water quality control plans, or (3) established in regional Basin Plans. Technology-based standards (federal secondary treatment standards are an example) are based on the performance of mandated treatment or control technologies. Water quality-based standards are based on ensuring an adequate receiving water quality to protect designated beneficial uses.

Effluent Limits and Performance Goals. RWQCBs are required to establish effluent concentration limits in NPDES permits to implement (1) applicable technology-based standards, and (2) water quality-based standards where there is a "reasonable potential" for the water quality-based standard to be exceeded. Exceedances of an Effluent Limitation represents a violation, and is subject to minimum mandatory penalties of $3,000 for each violation imposed by the RWQCB pursuant to Section 13385 of the *California Water Code*. The RWQCB may also impose additional administrative civil liability penalties over and above the minimum mandatory penalties.

RWQCBs implement non-enforceable performance goals for constituents deemed to not have a reasonable potential to be present in the discharger's wastewater. Such performance goals are established for constituents that (1) are rarely detected, or (2) are detected at concentration levels significantly below applicable water quality standards. Exceedances of a performance goal are not a violation, but may trigger the RWQCB to establish an enforceable effluent limitation for the constituent in a future NPDES permit update.

Antidegradation. Federal antidegradation regulations promulgated by EPA pursuant to the CWA require each state to adopt and implement policies consistent with maintaining existing beneficial uses. The overall intent of EPA's antidegradation policy is to:

- Insure that water quality necessary to support existing beneficial uses is maintained (Tier 1),
- Insure that, where water quality is better than required to maintain recreational and habitat uses, the existing high quality is maintained, unless through a public process, some lowering of water quality is deemed necessary to allow important economic or social development (Tier 2), and
- Identify and protect water bodies of exceptional recreational or ecological significance (Tier 3).

The State antidegradation policy is established by SWRCB Resolution No. 68-16, which applies to high quality waters (Tier 2 and Tier 3) and requires that the high quality of water be maintained unless water quality degradation:

- Will not unreasonably affect present and potential beneficial uses,
- Will not result in water quality lower than applicable standards, and
- Is consistent with maximum benefit to people of the state.

States have considerable flexibility in applying antidegradation policies. In general; however, analysis of compliance with antidegradation requirements is triggered when an activity is proposed that may have some effect on existing water quality. EPA has interpreted this to include any proposed increase in pollutant mass emissions from NPDES point source discharges.

3.1.1.2 San Diego Region Basin Plan

The San Diego RWQCB regulates water quality and wastewater discharges within a region that includes the portion of San Diego County that drains to the Pacific Ocean, and the southeast portions of Orange and Riverside County. Water quality standards for this region are established by the RWQCB within the *Water Quality Control Plan for the San Diego Basin* (Basin Plan). The Basin Plan establishes ground and surface water quality objectives for each watershed within the San Diego Region. The Basin Plan also establishes implementation policies that govern how NPDES permits and WDRs issued by the RWQCB implement the water quality objectives. The Basin Plan also incorporates applicable federal water quality standards (such as the CTR) and statewide policies and plans such as the Ocean Plan.

3.1.1.3 Public Health Regulations

In addition to implementing water quality regulation, the RWQCB is charged with implementing applicable requirements of local and state health agencies within NDPES permits or WDRs. The SWRCB Division of Drinking Water (DDW), which was formerly part of the California Department of Public Health, establishes health-related regulations governing the treatment and use of recycled water within Title 22, Division 4, Chapter 3 of the *California Code of Regulations* (Title 22 regulations). Title 22 regulations establish requirements governing:

- Allowable recycled water uses,
- The degree of recycled water treatment and disinfection required for each use,
- Treatment reliability requirements,
- Recycled water distribution and backflow prevention requirements,
- Recycled water site and notification requirements,
- Facilities design requirements, and
- Monitoring, testing, and reporting requirements.

The Title 22 regulations establish treatment, reliability, and disinfection requirements for each allowable recycled water use on the basis of the potential degree public contact with the recycled water. The highest category of recycled water, defined as "tertiary disinfected" recycled water, allows for unrestricted body contact. Table 3.1 summarizes treatment requirements for tertiary disinfected water.

Table 3.1 Title 22 Filtration and Disinfection Requirements for Tertiary Disinfected Recycled Water[1]

Category	Parameter	Requirement[1]
Filtration[3]	Type	• Conventional treatment consisting of coagulation, sedimentation, or filtration, or • Direct filtration (no coagulation or sedimentation)[2]
	Rate	Not to exceed: • 5 gpm/sq. ft. in mono, dual, or mixed media gravity or upflow or pressure filters • 2 gpm/sq. ft. in traveling bridge automatic backwash filters
	Turbidity	Not to exceed: • 2 NTU within any 24-hour period • 5 NTU more than 5 percent of the time in any 24-hour period • 10 NTU at any time
Disinfection[4]	CT[5]	450 mg-min/liter
	Modal contact time	90 minutes[6]
	Effluent coliform	Not to exceed: • A median of 2.2 organisms/100 milliliters (ml) during any 7 day period • 23 organisms per 100 ml in more than one sample per month • 240 organisms per 100 ml at any time

Notes
1. From Section 60301, Title 22, Division 4, Chapter 3 of the *California Code of Regulations.*
2. Direct filtration may be used instead of conventional treatment, provided that effluent filter turbidity does not exceed 2 NTU, influent turbidity is continuously monitored and does not exceed 5 NTU for more than 5 minutes nor 10 NTU at any time. Use of direct filtration lieu of conventional treatment will also require performance of pathogen studies for recycled water used in nonrestricted recreational impoundments.
3. As an option to the above, filtration can consist of microfiltration, ultrafiltration, nanofiltration or reverse osmosis treatment so that the turbidity of the effluent does not exceed 0.2 NTU more than 5 percent of the time in a 24-hour period or 0.5 NTU at any time.
4. As an alternative to the above, recycled water can be disinfected through a disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as poliovirus may be used for purposes of the demonstration.
5. Product of total chlorine residual and modal contact time measured at the same point.
6. Based on peak dry weather design flow.

Recycled water meeting Title 22 requirements for tertiary disinfected recycled water may be used for the highest degree of potential public contact, including use in:

- Irrigation of landscape vegetation on parks, playgrounds, or similar areas with high degree of public contact,
- Irrigation of agricultural crops (including food),
- Industrial applications,
- Flushing of toilets and urinals,
- Firefighting,
- Decorative fountains, and
- Non-restricted recreational impoundments.

In accordance with a 1996 Memorandum of Understanding between the SWRCB and health department, the RWQCB incorporates applicable Title 22 requirements in recycled water WDRs, and with assistance from DDW, enforces the Title 22 treatment and effluent standards established in the WDRs.

Through a delegation agreement with DDW, the County of San Diego Department of Environmental Health (DEH) regulates recycled water sites and users, and is in charge of approving recycled water sites, recycled water application and use, and cross-connection prevention.

3.1.1.4 Regulation of SEJPA Operations

Wastewater operations at SEWRF are currently regulated by two RWQCB permits. As shown in Table 3.2, SEJPA's discharge of treated wastewater to the ocean via the San Elijo Ocean Outfall (SEOO) is regulated under RWQCB Order No. R9-2010-0087 (NPDES CA0107999). RWQCB Order No. 2000-10 and Addendum No. 1 thereto regulate the production of recycled water at SEWRF and the purveyance of the SEWRF recycled water by the San Dieguito Water District, Santa Fe Irrigation District, City of Del Mar, and Olivenhain Municipal Water District.

NPDES Permit Requirements and Provisions. Order No. R9-2010-0087 implements applicable federal and state requirements and water quality policies through establishing effluent concentration limitations, effluent performance goals, receiving water limitations, discharge provisions and prohibitions, and monitoring and reporting requirements. Table 3.3 presents effluent concentration limits established in Order No. R9-2010-0087. All of the SEWRF effluent concentration limitations represent technology-based limitations. Effluent concentration limits for carbonaceous oxygen demand (COD) and total suspended solids (TSS) implement federal secondary treatment technology standards. Concentration limits for grease and oil, settleable solids, turbidity, and pH implement technology-based effluent limits established within the Ocean Plan. The SEWRF has achieved 100 percent compliance with the Effluent Limitations during the current NPDES permit period.

Table 3.2 RWQCB Permits Regulating SEJPA Wastewater Operations at the SEWRF

Type of Permit	NPDES	WDRs
Permit Number	R9-2010-0087[1] NPDES CA0107999	2000-10 and Addendum No. 1[2]
Regulated Dischargers	• SEJPA	• SEJPA[3] • San Dieguito Water District[4] • Santa Fe Irrigation District[4] • City of Del Mar[4] • Olivenhain Municipal Water District[4]
Wastewater Treatment	Secondary treatment[5]	Tertiary disinfected[6]
Discharge Facility	San Elijo Ocean Outfall	Regional recycled water "purple pipe" distribution system[7]
Receiving Water	Pacific Ocean	Groundwater
Permit Expiration Date	October 27, 2015	None
Maximum Allowable Discharge Flow	5.25 mgd (average monthly)	3.02 mgd (average monthly dry weather)

Notes
1. Order No. R902010-0087 was adopted by the RWQCB on September 8, 2010 and became effective on October 28, 2010.
2. Order No. 2000-10 was adopted by the RWQCB and became effective on March 8, 2000. Addendum No. 1 to Order 2000-10 was adopted by the RWQCB on March 13, 2013.
3. SEJPA regulated as producer of recycled water.
4. Regulated as a purveyor of recycled water.
5. Also allows for discharge of unused tertiary treated flows.
6. Recycled water that complies with SWRCB Division of Drinking Water (DDW) standards governing tertiary disinfected recycled water (per requirements established within Title 22, Division 4, Chapter 3 of the *California Code of Regulations*).
7. Includes recycled water non-potable ("purple pipe") distribution systems of the San Dieguito Water District, Santa Fe Irrigation District, City of Del Mar, and Olivenhain Municipal Water District.

Table 3.3 SEJPA Ocean Discharge Effluent Limitations[1]

		Limiting Concentrations		
Parameter	Units	Monthly Average	Weekly Average	Instantaneous Maximum
Carbonaceous Oxygen Demand (COD)[2]	mg/L	25	40	No standard
Total Suspended Solids[2]	mg/L	30	45	No standard
Grease and Oil[3]	mg/L	25	40	75
Settleable Solids[3]	ml/L	1.0	1.5	3.0
Turbidity[3]	NTU	75	100	225
pH[3]	pH units	Within 6.0 to 9.0 at all times		

Notes
1. From Table 7 (Effluent Limitations) of Order No. R9-2010-0087.
2. Federal secondary treatment technology-based limit.
3. Technology based limit established within Table 2 of the Ocean Plan.

NPDES Performance Goals - Protection of Aquatic Life. The Ocean Plan establishes water quality-based standards for a number of constituents for the protection of marine aquatic life and human health. In establishing NPDES requirements for the SEWRF, the RWQCB concluded that no reasonable potential exists for SEWRF exceedances of any of the Ocean Plan water quality-based standards. For this reason, Order No. R9-2010-0087 establishes non-enforceable performance goals for Ocean Plan water quality-based parameters in lieu of enforceable effluent standards. Table 3.4 presents Ocean Plan receiving water standards for the protection of marine aquatic life, and compares SEWRF effluent concentrations with performance goals of Order No. R9-2010-0087.

Ocean Plan receiving water standards are to be achieved upon completion of initial dilution under conditions of the "lowest average initial dilution within any single month of the year." The RWQCB evaluates initial dilution as part of each NPDES permit renewal, and uses a computer dilution model to estimate dilution under such minimum month conditions. As shown in Table 3.4, the RWQCB currently assigns a 237 to 1 minimum month initial dilution to the SEOO, based on permitted flows, projected effluent salinity and temperature, and prevailing oceanographic conditions.

The Ocean Plan establishes receiving water standards for both acute toxicity and chronic toxicity. The Ocean Plan requires the following toxicity testing:

> *Dischargers shall conduct chronic toxicity testing for ocean waste discharges with minimum initial dilution factors ranging from 100:1 to 350:1. The Regional Water Board may require that acute toxicity testing be conducted in addition to chronic as necessary for the protection of beneficial uses of ocean waters.*

On the basis of this requirement, Order No. R9-2010-0087 requires only chronic toxicity monitoring for the SEOO discharge, and imposes an effluent performance goal of 238 to implement the Ocean Plan chronic toxicity receiving water limit of 1.0 TUc, which is to be achieved upon completion of initial dilution. The Ocean Plan requires the following chronic testing protocol:

> *Toxicity monitoring requirements in permits prepared by the Regional Water Boards shall use marine test species instead of freshwater species when measuring compliance. The Regional Water Board shall require the use of critical life stage toxicity tests specified in this Appendix to measure TUc. For Point Sources, a minimum of three test species with approved test protocols shall be used to measure compliance with the toxicity objective. If possible, the test species shall include a fish, an invertebrate, and an aquatic plant. After a screening period, monitoring can be reduced to the most sensitive species.*

In accordance with these requirements, SEJPA monitors the discharge to the SEOO using *Macrocystis pyrifera* (Giant Kelp), *Atherinops affinis* (top smelt), and *Strongylocentrotus purpuratus* (urchin). Table 3.5 compares SEOO chronic toxicity monitoring data for 2011-2013 with the chronic toxicity performance goal established in Order No. R9-2010-0087. As shown in the table, the SEOO discharge complied with Ocean Plan toxicity standards by a wide margin. As a result, it is likely that the RWQCB will continue to establish non-enforceable performance goals for chronic toxicity in lieu of an enforceable effluent concentration limitation.

NPDES Performance Goals - Protection of Human Health. The Ocean Plan establishes water quality-based standards for a wide variety of toxic inorganic compounds and toxic organic chemicals. Standards are established for such toxic inorganic compounds as metals and cyanide. Regulated toxic organic chemicals include a variety of volatile organic compounds, base/neutral compounds, acid-extractable compounds, and chlorinated pesticides.

Table 3.4 SEWRF Compliance with Ocean Plan Receiving Water Standards for the Protection of Marine Aquatic Life

	Concentration in µg/l								
	Ocean Plan Receiving Water Concentration Standard[1]			Effluent Concentration Performance Goal in Order No. R9-2010-0087[2]			Maximum Reported SEWRF Effluent Concentration[3]		
Constituent	6-Month Median	Daily Max.	Instant. Max.	6-Month Median	Daily Max.	Instant. Max.	2011	2012	2013
Arsenic	8	32	80	1190[4]	6190[4]	18,300[4]	ND	ND	ND
Cadmium	1	4	10	238	952	2380	ND	ND	ND
Chromium VI	2	8	20	476	1900	4760	ND	ND	ND
Copper	3	12	30	240[4]	2380[4]	6670[4]	18.5	5.66[6]	14.6
Lead	2	8	20	476	1900	4760	ND	ND	ND
Mercury	0.04	0.16	0.4	9.4[4]	38[4]	95.1[4]	ND	ND	ND
Nickel	5	20	50	1190	4760	11,900	ND	ND	9.68[6]
Selenium	15	60	150	3570	14,300	35,700	17	ND	ND
Silver	0.7	2.8	7.0	129[4]	628[4]	1630[4]	ND	ND	ND
Zinc	20	80	200	2860[4]	17,100[4]	45,700[4]	21	19.2	32.1
Cyanide	1	4	10	238	952	2380	ND	ND	ND
Chlorine residual	2	8	60	476	1900	14,300	ND[5]	ND[5]	ND[5]
Ammonia (as N)	600	2400	6000	143,000	571,000	1,430,000	41,700	39,100	69,200
Non-chlorinated phenolics	30	120	300	7140	28,600	71,400	0.58[6]	ND	ND
Chlorinated phenolics	1	4	10	238	952	2380	ND[5]	ND[5]	ND[5]
Endosulfan	0.009	0.018	0.027	2.14	4.28	6.43	ND	ND	ND
Endrin	0.002	0.004	0.006	0.476	0.952	1.43	ND	ND	ND
HCH	0.004	0.008	0.012	0.952	0.159	2.86	ND	ND	ND

Notes

1. Receiving water standard established in Table 1 of Ocean Plan. Receiving water standards are to be implemented upon completion of initial dilution. NS indicates that no standard is established.
2. Effluent Performance Goal established in Table 8 of Order No. R9-2010-0087. Based on implementing the Ocean Plan Table 1 receiving water standard applying a minimum month initial dilution of 237 to 1.
3. Maximum reported SEWRF effluent concentration reported during calendar years 2011, 2012 and 2003. ND indicates the constituent was not detected.
4. Per requirements of the Ocean Plan, the RWQCB bases performance goals for arsenic, copper, mercury, silver and zinc on the basis of a 237 to 1 initial dilution and ambient ocean concentrations of 3 µg/l arsenic, 2 µg/l copper, 0.0005 µg/l mercury, 0.16 µg/l silver, and 8 µg/l zinc.
5. SEWRF effluent is not chlorinated prior to discharge to the SEOO.
6. Constituent was detected at a concentration above the Minimum Level but below the Method Detection Limit.

Table 3.5 SEWRF Compliance with Ocean Plan Chronic Toxicity Standards for the Protection of Aquatic Marine Life

	Chronic Toxicity (TUc)		
Date of Sample	*Macrocystis pyrifera*[1,2] (Giant Kelp)	*Atherinops affinis*[3] (Top smelt)	*Strongylocentrotus purpuratus*[4] (Urchin)
1/10/2011	31.25	31.25	31.25
4/28/2011	31.25	--	--
7/18/2011	31.25	--	--
10/17/2011	31.25	--	--
1/16/2012	31.25	--	--
4/9/2012	31.25	--	--
7/17/2012	31.25	--	--
10/23/2012	31.25	--	--
2/11/2013	31.25	31.25	31.25
4/23/2013	31.25	--	--
9/16/2013	31.25	--	--
11/18/2013	31.25	--	--
Effluent Performance Goal[5]	238	238	238

Notes
1. Laboratory determined that Giant Kelp was slightly more sensitive. All samples based on 24-hour composites. Listed date was date sample was collected from composite sampler.
2. Per Table III-1 of the Ocean Plan, Giant Kelp is tested for effects of percent germination and germ tube length.
3. Per Table III-1 of the Ocean Plan, top smelt is tested for effects of larval growth rate and percent survival.
4. Per Table III-1 of the Ocean Plan, urchin is tested for effects of percent normal development and percent fertilization.
5. Effluent Performance Goal established in Table 8 of Order No. R9-2010-0087. Based on achieving compliance with the Ocean Plan Table 1 chronic toxicity receiving water standard of 1.0 TUc upon completion of initial dilution at an assigned minimum month initial dilution of 237 to 1.

Table 3.6 presents Ocean Plan receiving water standards for the protection of human health (noncarcinogens) and compares SEWRF effluent concentrations with performance goals of Order No. R9-2010-0087. Table 3.7 presents Ocean Plan receiving water standards for the protection of human health for carcinogenic compounds.

As shown in the tables, only a few constituents were detected in the SEOO effluent during 2011-2013, and all detected compounds were at concentrations significantly below the applicable performance standard of Order No. R9-2010-0087. Each of the detected organic compounds are commonly found in municipal wastewater in trace concentrations, and included:

- Toluene, a common solvent and disinfectant, and
- Chlorinated methane compounds such as chloroform, chlorodibromomethane, dichlorobromomethane, and halomethanes.

Table 3.6 SEWRF Compliance with Ocean Plan Standards for the Protection of Human Health, Noncarcinogens

Parameter	Concentration (µg/l)				
	California Ocean Plan 30-day Average Receiving Water Concentration Standard[1]	Effluent Concentration Performance Goal in Order No. R9-2010-0087[2]	Maximum Reported SEWRF Effluent Concentration[3]		
			2011	2012	2013
Acrolein	220	52,400	ND	ND	ND
Antimony	1200	2.86 E+05	ND	ND	9.43[4]
Bis (2-chloroethoxy) methane	4.4	1050	ND	ND	ND
Bis (2-chloroisopropyl) ether	1200	2.86 E+05	ND	ND	ND
Chlorobenzene	570	1.36 E+05	ND	ND	ND
Chromium III	190,000	4.52 E+07	ND	ND	ND
Di-n-butyl phthalate	3500	8.33 E+05	ND	ND	ND
Dichlorobenzenes	5100	1.21 E+06	ND	ND	ND
Diethyl phthalate	33,000	7.85 E+06	ND	ND	ND
Dimethyl phthalate	820,000	1.95 E+08	ND	ND	ND
4,6-dinitro-2-methylphenol	220	52,400	ND	ND	ND
2,4-dinitrophenol	4.0	9520[5]	ND	ND	ND
Ethylbenzene	4100	9.76 E+05	ND	ND	ND
Fluoranthene	15	3,750	ND	ND	ND
Hexachlorocyclopentadiene	58	13,800	ND	ND	ND
Nitrobenzene	4.9	1170	ND	ND	ND
Thallium	2.0	476	ND	ND	ND
Toluene	85,000	2.02 E+07	ND	ND	0.18[4]
Tributyltin	0.0014	0.0333	ND	ND	ND
1,1,1-trichloroethane	540,000	1.29 E+08	ND	ND	ND

Notes
1. Receiving water standard (30-day average) established in Table 1 of the Ocean Plan for the protection of human health (non-carcinogens). Receiving water standards are to be implemented upon completion of initial dilution. NS indicates that no standard is established.
2. Effluent Performance Goal established in Table 8 of Order No. R9-2010-0087. Based on implementing the Ocean Plan Table 1 receiving water standard applying a minimum month initial dilution of 237 to 1.
3. Maximum reported SEWRF effluent concentration reported during calendar years 2011, 2012 and 2003. ND indicates the constituent was not detected.
4. Constituent was detected at a concentration above the Minimum Level but below the Method Detection Limit
5. Typographical error within Order No. R9-2010-0087. Correct value based on Ocean Plan standard should be 956.0.

Table 3.7 SEWRF Compliance with Ocean Plan Standards for the Protection of Human Health, Carcinogens

Parameter	Concentration (µg/l)				
	California Ocean Plan 30-day Average Receiving Water Concentration Standard[1]	Effluent Concentration Performance Goal in Order No. R9-2010-0087[2]	Maximum Reported SEWRF Effluent Concentration[3]		
			2011	2012	2013
Acrylonitrile	0.10	23.8	ND	ND	ND
Aldrin	0.000022	1.04	ND	ND	ND
Benzene	5.9	1400	ND	ND	ND
Benzidene	0.000069	0.0164	ND	ND	ND
Beryllium	0.33	7.85	ND	ND	ND
Bis (2-chloroethyl) ether	0.045	10.7	ND	ND	ND
Bis (2-ethylhexyl) phthalate	3.5	833	ND	ND	ND
Carbon tetrachloride	0.9	214	ND	ND	ND
Chlordane	0.00023	0.00547	ND	ND	ND
Chlorodibromomethane	8.6	2050	0.24[4]	0.47[4]	0.37[4]
Chloroform	130	30,900	0.66[4]	0.67[4]	2.3
DDT	0.00017	0.0405	ND	ND	ND
1,4-dichlorobenzene	18	4,280	ND	ND	ND
3,3'-dichlorobenzidene	0.0081	1.93	ND	ND	ND
1,2-dichloroethane	28	6660	ND	ND	ND
1,1-dichloroethylene	0.9	214	ND	ND	ND
Dichlorobromomethane	6.2	1480	ND	0.31[4]	0.36[4]
Dichloromethane	450	1.07 E+05	ND	ND	ND
1,3-dichloropropene	8.9	2120	ND	ND	ND
Dieldrin	0.00004	0.00952	ND	ND	ND
2,4-dinitrotoluene	2.6	619	ND	ND	ND
1,2-diphenylhydrazine	0.16	38.1	ND	ND	ND
Halomethanes	130	30,900	0.2[6]	ND	ND
Heptachlor	0.00005	0.0119	ND	ND	ND
Heptachlor epoxide	0.00002	0.00476	ND	ND	ND
Hexachlorobenzene	0.00021	0.05	ND	ND	ND
Hexachlorobutadiene	14	3330	ND	ND	ND
Hexachloroethane	2.5	595	ND	ND	ND
Isophorone	730	1.74 E+05	ND	ND	ND
N-nitrosodimethylamine	7.3	1740	ND	ND	ND

Table 3.7 SEWRF Compliance with Ocean Plan Standards for the Protection of Human Health, Carcinogens

Parameter	Concentration (µg/l)				
	California Ocean Plan 30-day Average Receiving Water Concentration Standard[1]	Effluent Concentration Performance Goal in Order No. R9-2010-0087[2]	Maximum Reported SEWRF Effluent Concentration[3]		
			2011	2012	2013
N-nitrosodi-N-propylamine	0.38	90.4	ND	ND	ND
N-nitrosodiphenylamine	2.5	595	ND	ND	ND
PAHs	0.0088	2.09	ND	ND	ND
PCBs	1.9 E-05	0.00452	ND	ND	ND
TCDD equivalents	3.9 E-09	9.28 E-07	ND	ND	ND
1,1,2,2-tetrachloroethane	2.3	547	ND	ND	ND
Tetrachloroethylene	2.0	476	ND	ND	ND
Toxaphene	0.00021	0.05	ND	ND	ND
Trichloroethylene	27	6430	ND	ND	ND
1,1,2-trichloroethane	9.4	2240	ND	ND	ND
2,4,6-trichlorophenol	0.29	69.0	ND	ND	ND
Vinyl chloride	36	8570	ND	ND	ND

Notes
1. Receiving water standard (30-day average) established in Table 1 of the Ocean Plan for the protection of human health (carcinogens). Receiving water standards are to be implemented upon completion of initial dilution. NS indicates that no standard is established.
2. Effluent Performance Goal established in Table 8 of Order No. R9-2010-0087. Based on implementing the Ocean Plan Table 1 receiving water standard applying a minimum month initial dilution of 237 to 1.
3. Maximum reported SEWRF effluent concentration reported during calendar years 2011, 2012 and 2003. ND indicates the constituent was not detected.
4. Constituent was detected at a concentration above the Minimum Level but below the Method Detection Limit.

Receiving Water Bacteriological Standards. Order No. R9-2010-0087 implements narrative and numerical receiving water standards established in the Ocean Plan. Prior to 2005, Ocean Plan body-contact recreational standards applied to ocean waters with a high potential for recreational use, including waters within:

- 1000 feet of the shore,
- The 30-foot depth contour, and
- Designated kelp beds.

In 2005, the Ocean Plan was revised (per direction from EPA) to also apply body-contact recreational standards to waters designated as REC-1 (body contact recreation) by the RWQCB. The San Diego Region Basin Plan generically lists REC-1 as a beneficial use of the Pacific Ocean, but does not distinguish between beneficial uses at recreational beaches or beneficial uses in deep waters far offshore. Because of this lack of specificity within the Basin Plan, EPA has interpreted the Basin Plan as applying Ocean Plan standards to all ocean waters at all depths within the three-mile state-regulated limit. As a result, EPA directed that all San Diego Region ocean outfall permits apply body contract receiving water bacteriological standards to all state-regulated waters outside the designated ocean outfall zones of initial dilution (ZIDs). In accordance with this directive, the RWQCB established a time schedule within Order No. R 9-2010-0087 that required SEJPA to achieve compliance with the Ocean Plan bacteriological receiving water standards by October 2015.

In response to this requirement, SEJPA in 2011 submitted a report entitled *REC-1 Compliance Work Plan, San Elijo Ocean Outfall* (SEJPA and City of Escondido, 2011) which evaluated offshore bacteriological receiving water monitoring data collected at seven shoreline "S" stations and seven near shore "N" stations. Figure 3.1 presents the location of the monitoring stations.

Figure 3.1 Location of SEOO Monitoring Stations

The 2011 report concluded that the SEOO discharge fully complies with Ocean Plan REC-1 standards. Monitoring data collected by SEJPA subsequent to this 2011 submittal continue to demonstrate compliance. Table 3.8 presents receiving water bacteriological standards of Order No. R9-2010-0087, and compares SEOO receiving water monitoring data from 2011-2013 with the standards. As shown in the table, the SEOO discharge complies with the Ocean Plan REC-1 bacteriological receiving water standards for all three pathogen indicator organisms.

Table 3.8 SEOO Compliance with Receiving Water Bacteriological Standards

Pathogen Indicator Organism	Number of Offshore Receiving Water Samples Collected During 2011-2013[1]	99th Percentile Value at Offshore Stations during 2011-2013[2] (organisms per 100 ml)	Compliance Parameter	Ocean Plan Standard[3] (organisms per 100 ml)	Percent Compliance with Standard During 2011-2013
Total coliform	504	240	Single Sample Maximum	10,000	100%
			30-Day Geometric Mean[4]	1000	> 99%[5]
Fecal coliform	504	23	Single Sample Maximum	400	100%
			30-Day Geometric Mean[4]	200	100%
Enterococcus	504	7	Single Sample Maximum	104	100%
			30-Day Geometric Mean[4]	35	> 99%[6]

Notes

1. Includes samples collected during 2011-2013 at seven offshore "S" stations located upcoast and downcoast from the SEOO discharge, and seven nearshore "N" stations located between the SEOO discharge point and the shore.
2. Listed 99th percentile of observed concentrations at the SEOO "S" and "N" stations during 2011-2013
3. Bacteriological receiving water standards established within Order No. R9-2010-0087 apply to all ocean waters within the state-regulated limit within three miles offshore. The above receiving water standards do not apply within the designated SEOO zone of initial dilution (ZID).
4. 30-day geometric mean of the five most recent samples at a given station. If only one sample is available, the 30-day geometric mean is applied to the single sample.
5. A total coliform concentration of 1600 per 100 ml was observed at Station N-7 in a November 2011 sample at the ocean surface. Because of the remoteness of the station to the SEOO discharge point and significant wet weather conditions that occurred during November 2011, it is concluded that the exceedances is not related to the SEOO discharge.
6. An Enterococcus concentration of 36 per 100 ml was recorded at Station N2 in a September 2012 sample at the ocean surface. Because the sample was collected at a time of maximum thermal stratification (and no exceedances were observed in the "S" stations near the SEOO discharge point), it can be concluded that the single sample exceedances of the 30-day mean standard is not associated with the SEOO discharge.

Receiving Water Physical/Chemical Standards. Order No. R9-2010-0087 also implements narrative and numerical Ocean Plan objectives governing:

- Physical receiving water characteristics, including light transmittance, impacts to aesthetics, and solids deposition;
- Chemical characteristics in receiving waters including ph, dissolved oxygen, nutrients;
- Chemical characteristics of sediments, including dissolved sulfides and toxic compounds; and
- The prohibition of impacts to benthic communities and the bioaccumulation of toxic compounds in fish or shellfish.

To address compliance with these receiving water requirements, the RWQCB implements a 12-month intensive ocean monitoring program during each 5-year NPDES term to assess offshore water quality, sediment quality, benthic biota, and fish and macroinvertebrates. The 12-month intensive program conducted per requirements of Order No. R9-2010-0087 is nearing completion. Results from this 12-month intensive program, along with results from prior 12-month intensive programs, demonstrates that the SEOO discharge complies with all applicable Ocean Plan receiving water requirements.

Pretreatment Requirements. Federal pretreatment standards established within 40 CFR 403 are based on a three-element strategy for controlling pollutant discharges from industries to public sewer systems:

- *Categorical Pretreatment Standards.* EPA establishes technology-based national categorical pretreatment standards that apply to specific categories of industries.
- *Prohibited Discharge Standards.* EPA establishes prohibited discharge standards that apply to all non-domestic sewer dischargers to insure against treatment and collection system problems related to safety, inhibition, interference, or bypass.
- *Local Limits.* Sewer agencies that are required to implement federal pretreatment programs are required to develop and enforce agency-specific local limits to ensure compliance with NPDES permit provisions and applicable biosolids requirements.

Due to its size and limited industrial base, SEJPA is not currently required to implement a pretreatment program in accordance with the requirements of 40 CFR 403. Order No. R9-2010-0087; however, requires SEJPA to comply with applicable federal pretreatment standards. Order No. R9-2010-0087 further requires SEJPA to conduct a survey of industrial users, to perform a priority pollutant scan of the SEWRF influent, and to submit a certification report to the RWQCB by December 1, 2014 that indicates whether the SEWRF is subject to requirements that mandate the development and implementation of an industrial waste pretreatment program.

Storm Runoff. Storm runoff from wastewater treatment facilities can be regulated either by a site-specific NPDES permit or by SWRCB Order No. 97-03-DWR (NPDES CAS 000001), the statewide general permit covering storm runoff from industrial facilities. The SEWRF is enrolled for coverage under SWRCB Order No. 97-03-DWQ. In accordance with the provisions of Order No. 97-03-DWQ, SEJPA has:

- Developed and implemented a Storm Water Pollution Prevention Plan that addresses best management practices to minimize pollution from storm runoff not captured and returned to the SEWRF treatment process, and
- Implemented a monitoring program that demonstrates the effectiveness of the plan and best management practices.

Recycled Water Permit Provisions. RWQCB Order No. 2000-10 and Addendum No. 1 thereto regulate the treatment of recycled water at the SEWRF. Order No. 2000-10 also establishes requirements for the distribution and use of recycled water by the Santa Fe Irrigation District, San Dieguito Water District, City of Del Mar, and Olivenhain Municipal Water District. The Order provides that SEWRF recycled water can be used by these agencies on use sites that have been approved by the DDW (which, as noted, has delegated reuse site approval to the County of San Diego DEH).

Order No. 2000-10 and Addendum No. 1 implement recycled water treatment, treatment reliability, and use standards for tertiary disinfected recycled water, as established by DDW within Title 22 of the California Code of Regulations. WDRs for the SEWRF also incorporate Title 22 recycled water bacteriological standards, turbidity, filter rate, and chlorine contact time standards.

Effluent Limits for Physical Parameters. In addition to implementing the Title 22 standards, Order No. 2000-10 establishes effluent limits for the following physical/chemical parameters:

- Biochemical oxygen demand (BOD),
- Total suspended solids (TSS) and
- Sodium Adsorption Ratio (SAR).

SEWRF tertiary treatment facilities have no difficulty in complying with effluent limits for BOD and TSS limits, as these limits are established at a 30-day average of 30 mg/L, with a daily maximum limit of 45 mg/L. The SAR limit of 6.5 is also not a compliance concern, as concentrations of calcium and magnesium in the regional potable water supply ensure that SAR values remain low in the SEWRF recycled water.

Effluent Limits for Mineral Constituents. Order No. 2000-10 establishes requirements for the use of SEWRF recycled water within a number of watersheds within the Carlsbad and San Dieguito Hydrologic Units, including:

- Solana Beach Hydrologic Area (HA 5.1),
- San Elijo Hydrologic Subarea (HSA 4.61),
- Batiquitos Hydrologic Subarea (HSA 4.51), and
- Encinas Hydrologic Area (HA 4.4).

The Basin Plan establishes groundwater quality objectives for TDS and mineral constituents on a watershed-by-watershed basis within the San Diego Region. The RWQCB has exempted areas east of Interstate 5 from such objectives due to lack of groundwater resources and influences of seawater intrusion. Within other areas of the SEWRF recycled water service area, the Basin Plan establishes groundwater quality objectives at concentrations ranging from:

- 1200 to 3500 for TDS,
- 400 to 800 mg/L for chloride,
- 400 to 600 mg/L for sulfate, and
- 0.75 to 1.0 mg/L for boron.

Table 3.9 presents mineral concentration limits for SEWRF recycled water established in Order No. 2000-10. As shown in the table, the concentration limits are largely established on the basis of the most stringent groundwater quality objective that exists within the SEWRF recycled water service area.

Table 3.9 SEWRF Recycled Water Effluent Limits for Mineral Constituents[1]

	Concentration (mg/L)	
Parameter	12-month Average	Daily Maximum
Total dissolved solids (TDS)	1200[2]	1300
Chloride	400	450
Sulfate	400	450
Manganese	0.15	--
Iron	0.3	--
Boron	0.75	--
Fluoride	1.0	--

Notes
1. Effluent Limitation from Discharge Specification A.1 of Order No. 2000-10.
2. 12-month average not to exceed 1200 mg/L or the imported water supply concentration plus the typical incremental increase added to the water supply from domestic use.

Addendum No. 1 to Order No. 2000-10 provides for advanced water purification (AWP) of a portion of the SEWRF recycled water using microfiltration and reverse osmosis (RO). In the absence of AWP, compliance with the mineral limits of Table 3.9 is largely dependent on the concentration of mineral concentrations in the potable supply served within the SEWRF tributary area. The AWP facilities provide SEJPA with the ability to control TDS in the recycled water supply in order to (1) conform to effluent limits in the WDRs, and (2) provide a recycled water supply with sufficiently low TDS to meet the demands of recycled water irrigation customers. Such TDS control is important, as increased water conservation within Southern California has resulted in higher incremental salinity concentration increases through domestic use. TDS differences between potable water and wastewater of 200 mg/L were common several decades ago. Incremental TDS differences between the potable supply and SEWRF influent wastewater have been observed to reach 400 mg/L within recent years.

While Addendum No. 1 to Order No. 2000-10 addresses the installation of AWP processes at the SEWRF, it should be noted that the current SEOO NPDES discharge permit does not address the discharge of RO reject to the SEOO. Modification of the SEWRF NPDES permit is required to address this oversight.

Consistency with State of California Recycled Water Policy. The 2009 State of California Recycled Water Policy (SWRCB, 2009) directs the SWRCB and RWQCBs to encourage recycled water use to the maximum extent possible. Recognizing that salt and nutrient loads from recycled water use may represent only a fraction of the salt and nutrient loads within a given watershed, the Recycled Water Policy requires the development of Salt and Nutrient Management Plans (SNMPs) to evaluate and manage salt and nutrient sources on a watershed-wide basis.

Addendum No. 1 to Order No. 2000-10 notes that SNMP guidelines approved by the RWQCB do not require development of SNMPs within small coastal basins in which municipal supply is not developed and which have existing Basin Plan groundwater quality objectives that are consistent with available recycled water supplies. In accordance with these SNMP guidelines, Addendum No. 1 exempts the SEJPA and its associated recycled water purveying agencies from having to develop an SNMP within the SEWRF service area. SEWRF recycled water operations are thus not impacted by SNMP-related requirements or compliance measures.

Recycled Water Nutrients. Addendum No. 1 to Order No. 2000-10 implements the current RWQCB strategy for regulating nutrients in recycled water. Recognizing that nutrients in recycled water can offset the need for fertilization, Addendum No. 1 requires that nutrient application rates (combined nutrients in the recycled water plus fertilization) not exceed vegetation nutrient demands. The intent of this RWQCB approach is to ensure that nutrient loads to each irrigation site are the same independent of whether potable water (not regulated by the RWQCB) or recycled water (regulated by the RWQCB) is used.

In conformance with this requirement, SEJPA has coordinated with recycled water purveying agencies to address incorporating provisions within each agency's recycled water rules that notify recycled water users of the nutrient value in recycled water so that fertilization rates can be adjusted appropriate to vegetation demands.

3.2 REGULATION OF LIQUID WASTE STREAMS

3.2.1 Overview

Wastewater treatment processes may generate a number of liquid waste streams. In general, no specific state or federal regulations address liquid waste streams that are returned back to the onsite liquid or solids treatment process flow stream. While WDRs and NPDES permits describe the specific treatment processes and associated waste return streams, no specific flow, quality, or operational requirements are established for these waste streams. Existing unregulated liquid waste streams from primary and secondary processes at SEWRF, in part, include:

- Primary sludge (directed to onsite digestion/solids handling facilities),
- Primary clarifier scum (recycled back to the primary influent channel or decanted and hauled to a landfill),

- Return activated sludge from secondary clarifiers (returned to the aeration basins),
- Waste activated sludge from secondary clarifiers (directed to onsite solids handling/treatment facilities), and
- Scum/floatables from secondary clarifiers (recycled back to the primary influent channel or decanted and hauled to a landfill).

Tertiary and AWP processes may generate a number of waste streams, including tertiary filtration backwash, ultrafiltration/microfiltration backwash, and reverse osmosis reject. While such in-plant process and return streams are unregulated, it should be noted that each NPDES permit or set of WDRs address a specific facility design. Any significant change in the methods of wastewater treatment or the handling of in-plant wastewater streams would require submission of a Report of Waste Discharge in application for modified requirements within the NPDES permit or WDRs.

Offsite Discharge of Waste Streams. Because all current SEWRF liquid waste streams are returned back to the plant for treatment, existing SEJPA discharge permits do not establish any specific regulations or requirements regarding the flow, quality, or management of these streams. In planning future SEJPA wastewater facilities, however, SEJPA could consider facility plans that involve offsite transport or disposal of treatment process liquid waste streams. Table 3.10 summarizes how such potential offsite liquid waste streams would be regulated.

Discharges from conventional treatment processes (including tertiary treatment) are unlikely to meet state or federal standards for direct discharge to ocean outfall, discharge to surface waters, or discharge to offsite reuse. Additionally, these types of waste streams are easily incorporated back into the SEWRF liquid or solids treatment process streams. A number of offsite disposal options, however, may exist for such AWP liquid waste streams as AWP backwash or RO reject.

3.2.1.1 AWP Backwash

As noted, AWP backwash flows may be directed back into the SEWRF treatment process without entailing any additional regulation.

Discharge of Waste Streams to the Outfall. It may also prove possible to discharge AWP backwash flows to the SEOO without the need for additional treatment. Depending on the nature of the process, it is possible that backwash water from AWP facilities such as microfiltration or ultrafiltration may comply with Ocean Plan technology-based standards for pH, turbidity, suspended solids, and settleable solids (see Table 3.11). Backwash flows complying with the Ocean Plan technology-based standards would be eligible for discharge to the ocean outfall without further treatment, provided that SEJPA applies for and receives RWQCB approval for revision of the SEOO NPDES permit to accommodate the backwash discharge.

Table 3.10 Regulation of Future Liquid Waste Streams that are Transported or Discharged Offsite[1]

Destination of Future Liquid Waste Stream[1]	Type of Waste Stream	Means of Regulation
Directed to Offsite Treatment at a Different POTW	Any type	• Regulated by the offsite POTW as an industrial discharger pursuant to federal pretreatment regulations established in 40 CFR 403. • Addressed in WDRs issued to receiving POTW.
Directed to Private Offsite Treatment Facility	Any type	• SEJPA WDRs modified to note that waste stream is directed offsite. • Offsite treatment of waste stream would be addressed in WDRs issued to the private treatment facility.
Discharged to Ocean Outfall	RO reject or AWP backwash	• Requires modification to SEJPA NPDES permit. • Must achieve compliance with EPA and Ocean Plan technology-based effluent standards prior to initial dilution.
Discharge to Brackish Surface Waters	RO reject or AWP backwash	• Requires new and separate NPDES permit. • Must achieve compliance with Basin Plan surface water standards, *California Toxics Rule* receiving water standards, and EPA technology-based standards. • Must address compliance with any TMDLs established by the RWQCB that address 303(d) impaired constituents.
Discharge to Groundwater	Any type	• Requires WDRs for groundwater discharge. • Discharge must comply with Bain Plan groundwater quality objectives. • Discharge must demonstrate adequate groundwater hydraulics.
Non-Potable Recycled Water Use	Not applicable	• Not allowed pursuant to regulations established Title 22, Division 4 of the *California Code of Regulations.*

Note

1. Currently all SEWRF liquid waste streams are recycled back into the wastewater treatment process stream or are treated by onsite solids treatment/handling facilities. The above table indicates how any liquid waste streams directed offsite as part of future wastewater facilities planning may be regulated.

Table 3.11 Ocean Plan Technology-Based Effluent Standards[1]

Parameter	Units	Limiting Concentrations: Monthly Average	Weekly Average	Instantaneous Maximum
Grease and Oil	mg/L	25	40	75
Suspended solids	mg/L	No standard	See note[2]	No standard
Settleable Solids	ml/l	1.0	1.5	3.0
Turbidity	NTU	75	100	225
pH	pH units	Within 6.0 to 9.0 at all times		

Notes
1. From Table 2 of the Ocean Plan. The Ocean Plan technology-based Table 2 effluent standards apply to all discharges from industries or POTWs for which Effluent Limitation Guidelines (e.g., federal categorical pretreatment standard) have not been established pursuant to Sections 302, 303, 304, and 306 of the CWA.
2. Dischargers shall, as a 30-day average, remove 75 percent of suspended solids from the influent stream before discharging wastewaters to the ocean, except that the effluent limitation to be met shall not be lower than 60 mg/L. RWQCBs may recommend that the SWRCB, with the concurrence of EPA, adjust the 60 mg/L effluent concentration limit to suit the environmental and effluent characteristics of the discharge.

Discharge of Waste Streams to Surface Waters. A combination of stringent standards established in the Basin Plan and CTR render it unfeasible to consider discharging AWP backwash to brackish or inland surface waters. It would be nearly impossible (even after implementation of special treatment) to demonstrate that an AWP backwash discharge could comply with the Basin Plan total nitrogen standards. Compliance with CTR receiving water standards would also be problematic. Additionally, future uncertainties associated with the scheduled development of future TMDLs (and associated future waste load allocation restrictions) for San Elijo Lagoon add to the unfeasibility of this disposal option.

As a result of these regulatory constraints, the only potential alternatives for disposing of AWP backwash are:

- Direct backwash back into the SEWRF treatment stream (unregulated),
- Discharge to the ocean via the ocean outfall (regulated by SEOO NPDES permit), or
- Discharge to an offsite treatment facility (regulated through WDRs applied to the offsite facility and/or industrial discharge pretreatment standards).

3.2.1.2 RO Reject

It is not feasible to recycle RO reject back into the SEWRF treatment train, as such a practice would result increasing TDS concentrations within the treatment process train and in the associated demineralized recycled water flows. The conventional practice in California is to discharge RO reject to (1) the ocean via municipal ocean outfalls or (2) brackish surface waters. Virtually all San Diego Region municipal ocean outfall NPDES permits (including the SEOO NPDES permit) establish requirements governing the co-mingling of brine or RO reject with treated municipal effluent, including:

- South Orange County Wastewater Authority (SOCWA) Aliso Creek Ocean Outfall,
- SOCWA San Juan Creek Ocean Outfall,
- Oceanside Outfall,
- Encina Ocean Outfall,
- SEOO, and
- City of San Diego Point Loma Ocean Outfall.

While the existing NPDES permits for the SEWRF and City of Escondido Hale Avenue Resource Recovery Facility do not currently include provisions for the discharge of RO reject, RO reject is currently discharged to the SEOO via the City of Escondido Industrial Brine Collection System, including discharges of up to:

- 0.07 mgd of RO reject from the Stone Brewing Company, pursuant to Order No. R9-2012-0006 (NPDES CA0109258), and
- 1.4 mgd of cooling tower blowdown from the San Diego Gas and Electric Palomar Energy Center, pursuant to Order No. R9-2012-0015 (NPDES CA0109215).

RO Reject and Ocean Plan Compliance. RO treatment results in most toxic organic and inorganic constituents being removed from the RO feed water and concentrated in the RO reject. While most San Diego Region outfalls feature a blend of municipal treated wastewater with RO reject, several factors combine to ensure that all existing San Diego Region ocean outfall discharges maintain compliance with toxic inorganic and organic receiving water standards established in Table 1 of the Ocean Plan. These countering effects include:

- A significant portion of toxic inorganic and organic compounds are removed by conventional treatment or RO pretreatment before undergoing RO treatment, resulting in low RO feedwater concentrations,
- Because AWP and RO divert secondary flows that otherwise would be discharged to the ocean, mass emissions of toxic constituents in RO reject are less than mass emissions that would occur if secondary effluent (not receiving AWP or RO treatment) were to be discharged to the ocean, and
- RO reject typically comprises only a portion of the overall outfall discharge.

As documented within Tables 3.4, 3.5, 3.6, and 3.7, SEWRF secondary effluent achieves compliance with Ocean Plan receiving water standards for the protection of aquatic habitat and human health by significant margins. As a result, RO reject flows at SERWF are not projected to represent a threat to compliance with Ocean Plan receiving water standards. Confirming this, the City of San Diego conducted extensive monitoring of RO reject as part of City's Water Purification Demonstration Project (City of San Diego, 2013). Concentrations of all toxic constituents in the City of San Diego RO reject complied with Ocean Plan standards even without the need for blending or initial dilution.

Effects on Initial Dilution. The Southern California Salinity Coalition (SCSC, 2014) assessed issues associated with discharging RO reject to municipal ocean outfalls and presented a survey of the use of RO to treat brackish groundwater and recycled water in Southern California. Typical RO reject TDS concentrations from such treatment ranged from 4000 to 8000 mg/L (SCSC, 2014). While such salinity levels are significantly below the salinity of seawater, increased salinity concentrations associated with RO reject would make the outfall discharge plume less buoyant than if the outfall discharge were exclusively comprised of treated municipal wastewater.

The initial dilution assigned to an outfall is important in the determination of NPDES effluent concentration limits and performance standards. Ocean Plan receiving water standards are to be achieved upon completion of initial dilution. In establishing effluent limitations and performance goals, the RWQCB applies the assigned outfall minimum month initial dilution to calculate the effluent concentration limit required to achieve the receiving water standard upon initial dilution. Thus, while Ocean Plan receiving water standards are uniform statewide, each outfall will be assigned Ocean Plan-based NPDES effluent limitations or performance goals in proportion to the minimum month initial dilution assigned to the outfall.

Conventional ocean outfalls achieve significant initial dilution through (1) mixing effects associated with the outward momentum of discharged wastewater through outfall ports, and (2) buoyant effects, as the wastewater plume is less dense than ambient seawater due to lower salinities and higher temperatures. Blending RO reject into the outfall wastewater stream can increase salinities and reduce plume buoyancy. Any reduction in outfall initial dilution would translate to proportionally more stringent NPDES effluent concentration limits or performance goals.

While the potential exists for RO reject to reduce outfall initial dilution, discharge plume density is primarily a function of temperature difference between discharged wastewater and the ambient deep ocean water. Demonstrating this, the City of Escondido (2009) assessed impacts of discharging cooling tower brine to the SEOO, and concluded that initial dilution in the outfall would be increased, as positive buoyant effects associated with the temperature of the cooling tower effluent were significantly greater than the negative effects associated with increased salinity. A second study of the SEOO conducted by Black and Veatch (2013) used a computer initial dilution model to assess dilution effects associated with the discharge of RO reject to the SEOO from a proposed City of Escondido AWP project. The study concluded that replacing a significant portion of the current City of Escondido treated wastewater flow with RO reject in the SEOO would result in approximately a 25 percent decrease in initial dilution.

As noted, the SEWRF discharge to the SEOO complies with Ocean Plan receiving water standards by significant margins. While discharging RO reject to the SEOO may result in minor reduction in initial dilution, such a reduction should not translate to any potential for non-compliance with Ocean Plan receiving water standards, NPDES effluent concentration limitations, or NPDES performance goals. In noting that discharges of RO reject may result in minor reductions in assigned initial dilutions, SCSC (2014) concluded that municipal outfalls represent a preferred alternative for the disposal of RO reject.

3.3 BIOSOLIDS REGULATION

Currently, SEJPA maintains one contractor for biosolids disposal in Arizona, with landfill disposal in California representing a second potential option. This section reviews federal, state, and local regulations related to biosolids production and use.

3.3.1 Overview

A complex and overlying array of federal, State of California, State of Arizona, and local regulations govern the production of biosolids at SEJPA, operations by its disposal contractors, and landfill regulations. Complicating the issue, while both the State of Arizona and State of California biosolids regulatory programs incorporate federal minimum biosolids standards, EPA has delegated regulatory authority to the State of Arizona Department of Environmental Quality (ADEQ) as the biosolids enforcement authority within Arizona. ADEQ thus jointly implements and enforces federal and State of Arizona biosolids regulations. EPA has not delegated similar enforcement authority to the State of California, and EPA remains the principal enforcement authority of federal biosolids regulations within California, while the State of California and local governments maintain respective regulatory authority over state and local regulations.

3.3.2 Federal Standards

Federal standards governing biosolids production and use are promulgated by EPA in 40 CFR 503. Federal standards governing landfill disposal of biosolids and wastewater treatment screenings are established in 40 CFR 257-258.

The 40 CFR 503 Standards establish minimum national requirements that govern land application, surface disposal, and incineration of biosolids. The 40 CFR 503 standards address:

- Pollutant limitations within biosolids,
- Reduction of pathogens in biosolids,
- Reduction of vector attraction,
- Biosolids use as a function of pollutant limitations, level of pathogen reduction, and level of vector reduction,
- Site management practices, and
- Other public health protection requirements.

The Part 503 standards address a variety of biosolids reuse/disposal alternatives, including:

- Land application of biosolids to condition soil or fertilize vegetation (Subpart B of 40 CFR 503),
- Surface disposal of biosolids in monofills, surface impoundments, waste piles, disposal sites, or dedicated beneficial use sites (Subpart C of 40 CFR 503),
- Incineration of biosolids (Subpart E of 40 CFR 503), and

- Storage of biosolids (placement of biosolids on lands for 2 years or less).

Biosolids Classifications. The 40 CFR 503 regulations identify three general classes of biosolids. Class A biosolids are essentially free of pathogens at the time of land application, and may be used for almost any land application use. Per 40 CFR 503, Class A biosolids:

- Meet Part 403 pollutant ceiling concentration limits shown in Table 3.12,
- Meet the Class A pathogen density limits shown in Table 3.13,
- Implement any of the Class A pathogen reduction alternatives shown in Table 3.13, and
- Implement any of the Vector Reduction Options shown in Table 3.14.

Class A biosolids that meet both the ceiling concentration limits and pollutant concentration limits of Table 3.12 are classified as Exceptional Quality (EQ) biosolids. EQ biosolids can be used for virtually any use without site restrictions, imposition of management practices, or the need to track pollutants or application rates.

Class B biosolids have sufficiently low levels of pathogens such that, when applied to soils, essentially become pathogen free after a period of time. Class B biosolids must:

- Meet Part 403 ceiling concentration limits shown in Table 3.12,
- Meet the Class B pathogen density limits shown in Table 3.13,
- Implement any of the Class B pathogen reduction alternatives shown in Table 3.13, and
- Implement any of the Vector Reduction Options 9 or 10 of Table 3.14.

Land Application Requirements. Land application involves the use of biosolids to either condition soils or to fertilize crops or vegetation. Land application can occur through surface spreading, spreading, and tilling, or injection directly below the surface.

Subpart B of the 40 CFR 503 standards establishes minimum federal land application requirements on the basis of biosolids quality, pathogen reduction, vector reduction. The highest quality biosolids involve virtually no site restrictions, mandated management practices, or requirements governing tracking pollutants or application rates. Increasing site restrictions and management requirements are imposed for biosolids with a reduced quality or reduced degree of pathogen or vector reduction. Four options are available for complying with 40 CFR 503 land application requirements, including:

- Exceptional Quality (EQ),
- Pollutant Concentration,
- Cumulative Loading, and
- Annual Loading.

Table 3.12 Biosolids Concentration Limits

	Allowable Biosolids Concentration (mg/kg dry weight)		Land Application Loading Rate (kg/hectare)		Concentration mg/kg (wet weight)
Parameter	Ceiling Concentration Limits for Land Applied Biosolids[1]	Pollutant Concentration Limits for Land Applied Biosolids[1]	Annual Pollutant Loading Rate[2]	Cumulative Pollutant Loading Rate[2]	State of California Wet Weight Total Threshold Limit Concentration[3] (TTLC)
Antimony	--	--	--	--	500
Arsenic	75	41	41	2.0	500
Barium	--	--	--	--	10,000
Beryllium	--	--	--	--	75
Cadmium	85	39	39	1.9	100
Chromium	3000	1200	3000	150	2500
Chromium VI	--	--	--	--	500
Cobalt	--	--	--	--	8,000
Copper	4300	1500	1500	75	2,500
Lead	840	300	300	15	1,000
Mercury	57	17	17	0.85	20
Molybdenum	75	--	--	--	3,500
Nickel	420	420	420	21	2,000
Selenium	100	36	36	5.0	100
Silver	--	--	--	--	500
Thallium	--	--	--	--	700
Vanadium	--	--	--	--	2,400
Zinc	7500	2800	2800	140	5,000
Applies to:	All biosolids	Bulk biosolids and bagged biosolids	Bulk biosolids	Bagged Biosolids	All biosolids, including landfilled biosolids

Notes
1. Federal numerical biosolids concentration limits established in 40 CFR 503.13.
2. Federal loading rate limits promulgated by EPA in 40 CFR 503.13.
3. State of California toxic waste numerical limits set forth in Title 22, Division 4.5, Chapter 11, Article 3, Section 66261.24 of the *California Code of Regulations*. TTLC values represent concentrations of the elements, not compounds.

Table 3.13 Biosolids Pathogen Reduction Requirements[1]

Class	Pathogen Density Limits	Alternative	Pathogen Reduction Process
Class A	Total coliform density must be less than 1000 organisms per gram of dry solids[2] or: Density of *Salmonella sp,* bacteria must be less than 3 organisms per 4 grams of dry solids[2]	Alternative 1	*Thermally Treated Biosolids* Thermally treat biosolids to 50° C or higher for (A) 20 minutes or longer for biosolids with 7 percent solids or greater, (B) 15 seconds or longer for biosolids in the form of small particles and heated by contact or heated fluid, (C) at least 15 seconds but less than 30 minutes for biosolids with less than 7 percent solids, and (D) 30 minutes or longer for biosolids with less than 7 percent solids. Not necessary under this alternative to verify the reduced levels of viruses or helminth ova.
		Alternative 2	*Biosolids Treated in High pH-High Temperature Process* Implement heating and pH control that (1) maintain 25° C for 72 hours and maintain pH> 12, (2) maintain 52° C for 12 hours and maintain pH>12, or (3) air dry to over 50 percent solids after 72 hours of elevated pH. Not necessary under this alternative to verify the reduced levels of viruses or helminth ova.
		Alternative 3	*Biosolids Treated in Other Processes* Implement comprehensive monitoring to demonstrate virus removal to less than 1 plaque-forming unit per 4 grams of dry solids and removal of viable helminth ova to less than 1 per 4 grams of dry solids.
		Alternative 4	*Biosolids Treated in Unknown Processes* Testing of each batch of biosolids to demonstrate virus removal to less than 1 plaque-forming unit per 4 grams of dry solids and removal of viable helminth ova to less than 1 per 4 grams of dry solids.
		Alternative 5	*Use of Processes to Further Reduce Pathogens (PFRPs)* Class A PFRPs include: (1) composting at 55° C for 15 days or longer, (2) heat drying to reduce moisture content to 10 percent or lower and achieve a biosolids temperature of 80° C, (3) heat treatment at 180° C for 30 minutes, (4) thermophilic aerobic digestion in an aerobic environment at 55° C for 10 days, (5) beta ray irradiation at 1.0 megarads at 20° C, (6) gamma ray irradiation at 20° C, or (7) Pasteurization at 70° C or higher for 30 minutes or longer.
		Alternative 6	*Use of Process Equivalent to PRFP* Use of process determined by the permitting authority to be the equivalent of PRFP.

Table 3.13 Biosolids Pathogen Reduction Requirements[1]

Class	Pathogen Density Limits	Alternative	Pathogen Reduction Process
Class B	Fecal coliform density less than 2 million per gram of dry solids[3]	Alternative 1	*Monitoring of Indicator Organisms* Test for fecal coliform density at the time of biosolids use or disposal to demonstrate that coliform densities are less than 2 million per gram of dry biosolids.
		Alternative 2	*Use of PFRP* Class B PFRPs include: (1) aerobic digestion, where biosolids are aerated and maintained at mean cell residence time and temperature between 40 days at 20° C and 60 days at 15° C, (2) air drying for minimum of 3 months there the ambient temperature is above 0° C for two of the months, (3) anaerobic digestion where biosolids are maintained at mean cell residence time and temperature between 15 days at 35° C and 60 days at 20° C, (4) composting at 40° C or higher for 5 days with 55° C for a four hour period during the 5 days, (5) lime stabilization to raise pH to 12 for 2 hours contact.
		Alternative 3	*Use of Process Equivalent to PRFP* Use of process determined by the permitting authority to be the equivalent of PRFP.

Notes
1. Federal pathogen reduction options promulgated by EPA in 40 CFR 503, Subpart D.
2. Requirement to be met when the biosolids are used or disposed, when the biosolids are prepared for land application.
3. Requirement based on geometric mean of seven samples at the time of use or disposal.

Table 3.14 Vector Attraction Reduction Options

Option	Vector Attraction Reduction Options for Land Application[1,2]
Option 1	Reduce the mass of volatile solids by a minimum of 38 percent.
Option 2	Demonstrate vector attraction reduction with additional anaerobic digestion in a bench-scale unit.
Option 3	Demonstrate vector attraction reduction with additional aerobic digestion in a bench-scale unit.
Option 4	Meet a specific oxygen uptake rate for aerobically treated biosolids.
Option 5	Use aerobic processes at greater than 40° C (average temperatures 45° C) for 14 days of longer.
Option 6	Add alkaline materials to raise the pH under specified conditions.
Option 7	Reduce moisture content of biosolids that do not contain unstabilized solids from other than primary treatment to at least 75 percent solids.
Option 8	Reduce moisture content of biosolids with unstabilized solids to at least 90 percent.
Option 9	Inject biosolids beneath the soil surface within a specified time, depending on the level of pathogen treatment. Class A biosolids must be injected within 8 hours of the pathogen reduction process.
Option 10	Incorporate biosolids applied to or placed on the land surface within specified time periods after application to or placement on the land surface. Class A biosolids must be applied to the land within 8 hours of the pathogen reduction process.

Notes
1. Federal vector attraction reduction options promulgated by EPA in 40 CFR 503, Subpart D.
2. For Class A biosolids, vector attraction reduction must be met after or concurrent with pathogen reduction to prevent growth of pathogenic bacteria.

Table 3.15 summarizes requirements and restrictions associated with these four land application options. As shown in the table, no restrictions exist on Class A biosolids that comply with both the federal pollutant concentration and ceiling concentration limits. As a result, significantly fewer restrictions exist on the use of Class A or EQ biosolids than Class B biosolids.

Table 3.16 summarizes general site restrictions associated with Class B biosolids. As shown in both Table 3.15 and Table 3.16, significantly fewer restrictions exist on the use of Class A or EQ biosolids than Class B biosolids.

Table 3.15 Land Application Compliance Options[1]

Land Application Compliance Option	Distribution Method	Class	Meet Pollutant Concentration Limits[2]	Vector Reduction Option[3]	Site Restrictions on Land Application[4]	Pollutant Tracking Required[5]	Other Restrictions
EQ	Bag or Bulk	Class A	Yes[6]	1 - 8	No	No	None
Pollutant Concentration	Bulk only	Class A	Yes[6]	9 or 10	No	No	Management Practices[7]
		Class B	Yes[6]	1 - 10	Yes	No	Management Practices[7]
Cumulative Loading	Bulk only	Class A	No[8]	1 - 10	No	Yes	Management Practices[7]
		Class A	No[8]	1 - 10	Yes	Yes	Management Practices[7]
Annual Loading	Bag only	Class B	No[8]	1 - 8	No	Yes	Labeling[9] and Management Practices[7]

Notes
1. Summary of requirements established in 40 CFR 503, Subpart D.
2. See Table 3.12 for applicable pollutant concentration limits.
3. See Table 3.14 for vector reduction options.
4. See Table 3.16 or site restrictions for Class B biosolids.
5. Required tracking of pollutants and tracking of land application rates.
6. Complies with both the pollutant concentration limits and ceiling concentration limits presented in Table 3.12.
7. Management practices include implementing proper application procedures and rates and ensuring that applied solids do not impact surface waters or habitat.
8. Complies with the ceiling concentration limits, but not the pollutant concentration limits shown in Table 3.12.
9. Labeling requirements must include instructions of use, information on the nitrogen content, and requirements to ensure that maximum application rates are not exceeded.

Table 3.16 Site Restrictions for Land Applied Biosolids

	Site Restrictions	
Use	Class A Biosolids	Class B Biosolids
Food Crops that Touch Biosolids	No restriction	• Not to be harvested for 14 months after application of biosolids.
Below Ground Food Crops	No restriction	• Not to be harvested for 20 months after application when biosolids remain on the land surface for 4 months or longer prior to incorporation into the soil. • Not to be harvested for 38 months after application when biosolids remain on the land surface for 4 months or less prior to incorporation into the soil.
Food Crops that Do not Touch Biosolids	No restriction	• Not to be harvested for 30 days after application of biosolids.
Animal Grazing	No restriction	• Access restricted to 30 days after application of biosolids.
Turf Growing	No restriction	• No harvesting for 1 year after application of biosolids.
Public Access	No restriction	• Access restricted to 1 year for lands with high potential for public exposure. • Access restricted to 30 days for lands with low potential for public exposure.

Note
1. Federal site restrictions for Class B biosolids promulgated by EPA in 40 CFR 503, Subpart D.

Surface Disposal Requirements. Surface disposal involves placing biosolids on land for permanent disposal at monofills, surface impoundments, waste piles, dedicated disposal sites, or dedicated beneficial use sites. Subpart C of the 40 CFR 503 standards address requirements for surface disposal, and establish:

- General requirements for surface disposal sites,
- Pollutant limits for surface disposal,
- Management practices for site operators,
- Operational standards for reduction of pathogens and vector attraction, and
- Monitoring and reporting requirements.

Biosolids applied at disposal sites must meet one of the Class A or Class B pathogen reduction requirements (see Table 3.13). Land disposed biosolids must also meet either:

- One of the land application vector reduction options (see Table 3.14), or
- A daily cover of soil or other material must be placed over applied biosolids at the end of each operating day.

The 40 CFR 503 regulations also establish special pollutant limits for arsenic, chromium, and nickel that apply to surface disposal sites that do not have liners or leachate collection systems. In the absence of any site-specific pollutant limits established by the permitting authority, biosolids applied to lands must comply with minimum land disposal pollutant concentration standards established within Part 503. Table 3.17 summarizes the land disposal biosolids limits for arsenic, chromium, and nickel.

Table 3.17 Pollutant Limits for Land Disposal

Distance of Applied Biosolids from Land Disposal Property Boundary (meters)	Maximum Biosolids Pollutant Concentration (mg/kg)		
	Arsenic	Chromium	Nickel
0 to < 25	30	200	210
25 to <50	34	220	240
50 to <75	39	260	270
75 to < 100	46	300	320
100 to < 125	53	360	390
125 to < 150	62	450	420
>150	73	600	420

Note

1. From 40 CFR 503.232. Applies to land disposal sites without liners or leachate collection systems. The above limits apply to sites that do not have site-specific pollutant limits for arsenic, chromium, and nickel established by the permitting authority. If such site-specific permit limits are established, the site-specific limits govern.

Landfill. Federal requirements governing landfills are established within 40 CFR 258, and include requirements governing landfill design, site restrictions, operations and site management, groundwater monitoring and protection, and site closure/post-closure. Federal regulations provide that municipal solid waste facilities may at their discretion accept nonhazardous biosolids, but that the type and volume of biosolids applied within the landfill is to be taken into account in determining potential site-specific risks to groundwater quality.

Offsite Transfer for Treatment. The Part 503 regulations allow transfer of biosolids to a permitted offsite biosolids treatment facility, such as another POTW. Both the POTW receiving the biosolids and the NPDES discharger providing the biosolids must submit EPA Form 2S to identify the volume and character of the transferred biosolids, along with a description of the onsite and offsite biosolids processing, pathogen reduction treatment, and vector attraction reduction treatment.

3.3.2.1 State of Arizona Regulation

SEJPA, along with many other Southern California POTWs, relies on contractors who transport and land apply biosolids to sites in Arizona. As noted, EPA has delegated authority for permitting and enforcement of federal 40 CFR 503 standards within Arizona to the Arizona Department of Environmental Quality (ADEQ). In addition to implementing federal biosolids regulations, ADEQ's Biosolids Management Program implements state biosolids requirements established within Title 18, Chapter 9, Article 10 of the *Arizona Administrative Code*. The ADEQ Biosolids Program, in part, includes requirements for:

- The treatment, transportation, land application, and management of biosolids,
- Wastewater treatment works, and
- Management practices and application of biosolids to reclamation sites.

ADEQ enforces the federal biosolids concentration and application limits established by 40 CFR 503 (see Table 3.12). ADEQ has also adopted the Class A and Class B pathogen reduction alternatives (see Table 3.13) and vector attraction reduction options (see Table 3.14) established within 40 CFR 503. ADEQ further has adopted the Class B site restrictions (see Table 3.16) imposed within 40 CFR 503 and has incorporated federal biosolids application, record-keeping, monitoring, and reporting requirements. In addition to implementing the federal biosolids regulations, ADEQ implements requirements governing the transport of biosolids within the state.

Any entity generating, transporting, or applying biosolids in Arizona (including contractors accepting biosolids from California POTWs) must register the activity with ADEQ. Biosolids activities can be regulated by ADQ under:

- Site-specific Arizona Pollutant Discharge Elimination System (AZDES) permits, or
- The ADEQ "General Permit for Treatment Works Treating Domestic Sewage as Biosolids for Land Application (AZGP2013-001).

Coverage under the General Permit involves filing a Notice of Intent, and applications for site-specific permits involve submitting EPA NPDES Form 2S. Either option requires the applicant to provide ADEQ with information that demonstrates compliance with federal biosolids quality, pathogen reduction, vector reduction, and site management requirements established within 40 CFR 503.

3.3.2.2 State of California Regulation

EPA has not delegated 40 CFR 503 biosolids permitting and enforcement to the State of California, and remains the primary authority for enforcing federal biosolids standards within the state. The State of California; however, imposes several overlays to the EPA regulation of biosolids in the form of:

- Regulatory standards governing landfills promulgated within Title 27, Division 2, Chapter 1 of the *California Code of Regulations*.

- Regulatory standards governing toxic or hazardous substances, including state (TTLC) standards (see Table 3.12) and soluble threshold limit concentrations standards established in Title 22, Chapter 11, Article 3, Section 662614 of the *California Code of Regulations*.
- CalRecycle (formerly California Integrated Waste Management Board) which, in coordination with applicable local enforcement agencies, implements solid waste regulations, processes and issues solid waste disposal site permits, monitors and enforces compliance with solid waste regulations, and addresses site mitigation and closure issues.
- Local enforcement agencies (e.g., municipalities and counties), which regulate operation and closure of solid waste management facilities.
- Regulation of biosolids land application through SWRCB Order No. 2004-012-DWQ, which governs the discharge and use of biosolids to land for use as a soil amendment, implements 40 CFR 503 pollutant and ceiling concentration standards, and establishes additional site management and discharge specifications governing the use of Class B biosolids at regulated sites.
- Site-specific RWQCB regulation of landfills, land application sites, and composting sites through the issuance of WDRs.
- RWQCB regulation of POTWs through requirements established within NPDES permits or WDRs.

RWQCB Order No. R9-2010-0087 recognizes this overlay of federal, state, and local requirements, and places responsibility on SEJPA to ensure compliance with application requirements: Special Provision C.5.d of the Order states:

> C.5.d Management of all solids and sludge must comply with all applicable requirements of 40 CFR Parts 257, 258, 501 and 503; CWA Part 405(d), and Title 27, CCR, including all monitoring, record keeping and reporting requirements. Since the State of California (e.g., SWRCB and RWQCBs), has not been delegated the authority by the EPA to implement the sludge program, enforcement of sludge requirements of CFR Part 503 is under USEPA's jurisdiction. Once sludge leaves a facility, it is subject to all applicable local, state, and federal laws and regulations.

Local Regulation. Local enforcement agencies and landfill operators may establish additional local requirements governing application of biosolids. Within San Diego County, significant variation exists as to whether landfills accept biosolids, how much is accepted, what water content and biosolids processing parameters are required, and how the biosolids are utilized. Local jurisdictions are free to impose landfill or land application regulations that are more stringent than federal standards. Chapter 8.129 of the *Riverside County Code*, for example, prohibits the land application of Class B biosolids within the County of Riverside.

While landfills within the state are allowed to make use of Class A biosolids as alternative daily cover to spread over landfilled materials at the end of each day, local restrictions, limit this practice to a few sites within the state.

3.4 REGULATION OF ADVANCED PROCESSES

In addition to the current non-potable recycled water operations implemented by SEJPA, a range of potential future facilities planning opportunities may be available as a result of advances in wastewater treatment and reliability, advances in monitoring technology, increasing data bases on public health risks, and improved regulator understanding. This section summarizes regulations applicable to these opportunities.

3.4.1 Policies Encouraging Recycled Water Use

Both the SWRCB and RWQCB have adopted policies that are directed toward encouraging and supporting recycled water use. The SWRCB Recycled Water Policy establishes statewide-recycled water goals of:

- Increasing the use of recycled water over 2002 levels by 1 million acre-feet by 2020 and 2 million acre-feet by 2030,
- Increasing the use of recycled water use over 2007 levels by 500,000 acre-feet by 2020 and 1 million acre-feet by 2030,
- Increasing the amount of water conserved by urban and industrial users by 20 percent by 2020, and
- Substituting as much recycled water for potable water as possible by year 2030.

In 2013, the RWQCB adopted a strategic plan called the *San Diego Water Board Practical Vision* (Practical Vision). Chapter 5 of the RWQCB Practical Vision addresses a strategy for achieving sustainable local water supply. The Practical Vision States:

> *Reducing the Region's dependence on imported water is needed to improve water quality within and outside of our Region and to reduce greenhouse gas emissions associated with the transport of water. The creation of a sustainable local water supply includes three aspects: the environmentally responsible use of groundwater and surface water, the creation of new sources of fresh water such as, desalination, indirect potable reuse and direct use of recycled water, and conservation efforts to reduce water demand.*

The State Recycled Water Policy recognizes that it will not be possible to meet the State of California recycled water targets simply by expanding existing non-potable "purple pipe" systems. In Southern California, for example, recycled water agencies have already accessed most of the large irrigation sites near recycled water facilities. Additionally, costs to expand non-potable service areas significantly increase as economies of scale are lost for servicing smaller sites and distribution system costs increase with distance from the recycled water plant. Potable reuse, on the other the hand, opens up significantly larger use opportunities while obviating the need for expansion of non-potable distribution systems. Three general types of potential potable reuse include:

- Indirect potable reuse (IPR) using groundwater recharge,
- IPR using reservoir augmentation, and
- Direct potable reuse (DPR).

Statewide regulations have already been implemented for IPR/groundwater recharge. The process has been initiated for the development of regulations for IPR/reservoir augmentation and assessing the feasibility of permitting DPR.

3.4.2 Status of California IPR/Groundwater Recharge Regulation

Regulations governing groundwater replenishment using recycled water became effective on June 18, 2014. While groundwater replenishment opportunities in the SEWRF service area are limited, the regulations present a framework, which may be followed for the development of future IPR/reservoir augmentation and DPR regulations.

The regulations, established within Title 22, Chapter 4, Division 3 of the *California Code of Regulations*, establish requirements for IPR/groundwater recharge projects that include:

- General requirements for recycled water agencies, including the need for a source control program, a monitoring program to demonstrate compliance with regulated chemicals,
- General requirements for water agencies developing the groundwater supply, including developing an emergency supply plan, performing background groundwater quality monitoring, and performing a source assessment,
- Requirements governing the degree of required treatment as a function of recharge methodology, size of recharge operation relative to available diluent water, groundwater hydrology, and underground travel times.

3.4.2.1 Pathogen Reduction Goals

IPR/groundwater recharge projects are required to achieve a combined reduction (pathogen reduction occurring through wastewater treatment, groundwater storage, and subsequent treatment of groundwater) of:

- 12-log (10^{12}) reduction in enteric virus,
- 10-log (10^{10}) reduction in *Giardia* cyst, and
- 10-log (10^{10}) reduction in *Cryptosporidium* oocyst.

3.4.2.2 Treatment Requirements

The regulations require that IPR/groundwater recharge treatment shall incorporate at least three separate treatment processes that achieve a minimum 1-log reduction in pathogen indicators, and that each individual process cannot be credited with more than 6 log reduction of any pathogen. The IPR/groundwater regulations address two types of treatment:

- Full advanced treatment (FAT), and
- Treatment conforming to Title 22 criteria for tertiary disinfected recycled water.

Full advanced treatment includes RO treatment of 100 percent of the recycled water flow and advanced oxidation (such as ozone/hydrogen peroxide or ultraviolet/hydrogen peroxide treatment) of 100 percent of the flow. RO treatment is required to achieve a minimum sodium chloride rejection of 99 percent, and an average (nominal) rejection of no less than 99.2 percent. Additionally, during the first 20 weeks of full-scale operation, no more than 5 percent of the samples shall contain a total organic carbon (TOC) concentration in excess of 0.25 mg/L. Advanced oxidation is to achieve either:

- 0.5 log removal of each selected indicator compound from the following groups: hydroxy aromatic, amino/acylamino aromatic, nonaromatic with carbon double bonds, deprotonated amine, alkoxy polyaromatic, alkoxy aromatic, and alkyl aromatic, and
- 0.3 log removal (50 percent) of each selected indicator compound from the following groups: saturated aliphatic and nitro Aromatic.

3.4.2.3 Groundwater Retention and Travel Time

In determining compliance with the overall pathogen reduction goals, the regulations provide that IPR/groundwater recharge projects shall be credited with virus reduction for each month of demonstrated underground retention time, as follows:

- 1.0 log reduction if an added tracer is used to validate the retention,
- 0.67 log reduction if an intrinsic tracer is used to validate retention,
- 0.5 log reduction of modeling is used to validate retention, and
- 0.25 log reduction if an analytical method is used to validate retention.

The regulations also establish limits on the amount of recycled water that can contribute to groundwater supply wells. For projects that provide FAT, the amount is based on

$$TOC = \frac{0.5\ mg/l}{RWC}$$

where: TOC is the concentration of the AWP product water, and
RWC is the quantity of applied recycled water divided by the sum of applied recycled water plus credited diluent water.

For projects involving FAT that achieve a TOC of less than 0.5 mg/L, the regulations allow (after a demonstration period) 100 percent of the withdrawn groundwater to be of recycled water origin.

3.4.3 Indirect Potable Reuse - Reservoir Augmentation

Currently, no statewide regulations exist governing the use of highly treated AWP product water to augment supplies in potable water surface reservoirs. DDW; however, initiated the process for developing statewide IPR/reservoir augmentation regulations in accordance with directives of Section 13565 of the *California Water Code*.

Pending implementation of statewide IPR/reservoir augmentation regulations, DDW retains its authority to review and approve projects and water sources on a project-by-project basis.

3.4.3.1 City of San Diego IPR/Reservoir Augmentation Concept

To date, City of San Diego San Vicente Reservoir project is the only IPR/reservoir augmentation project that has been reviewed and conceptually approved by DDW. DDW has been participating in the review of the City's IPR/reservoir augmentation studies for nearly 25 years, and DDW's conceptual approval of the City of San Diego project is instructive on the direction DDW is likely to take in formulating statewide IPR/reservoir augmentation regulations.

The City of San Diego developed its initial IPR/reservoir augmentation concept in the early 1990s, and after a comprehensive review process, received concept DDW approval in 1994. Although never implemented, this initial concept formed the basis for the more comprehensive City of San Diego Water Purification Demonstration Project (WPDP), which the City initiated in 2009. The WPDP feasibility effort evaluated an IPR/reservoir augmentation project involving the discharge of 15,000-acre-feet per year of AWP product water to the 240,000-acre-foot-capacity San Vicente Reservoir. Objectives of the WPDP included:

- Demonstrate the feasibility of an AWP facility to reliably produce purified water that complies with all drinking water standards.
- Implement a monitoring plan for Constituents of Emerging Concern (CECs) that is tailored to the tributary sewer service area of the North City WRF.
- Demonstrate monitoring techniques and reliability measures to monitor the performance and reliability of AWP facilities.
- Develop data required to support a modeling assessment of reservoir water quality.
- Evaluate regulatory requirements and compliance needs.
- Assess energy consumption and develop energy conservation opportunities.
- Develop recommendations for design, operation, and reliability of a full-scale facility.
- Develop a cost estimate for a full-scale facility.
- Educate the public about the WPDP through community outreach, informational materials, and AWP facility tours.
- Demonstrate the feasibility of an AWP Facility to reliably produce purified water that complies with all drinking water quality standards.

To support the WPDP, the City constructed a pilot scale AWP facility that featured two separate RO treatment trains to evaluate membranes from two RO manufacturers, and two alternative pretreatment trains to assess performance of ultrafiltration and microfiltration. The WPDP also featured a year-long comprehensive monitoring program that evaluated pilot plant feed water and product water quality. On the basis of the results of the feasibility studies, the City finalized its proposed IPR/reservoir augmentation concept, and in 2012 submitted a request to DDW entitled *Proposal to Augment San Vicente Reservoir with Recycled Water*, that proposed the following IPR/reservoir project elements:

- A wastewater source control program for the North City WRF service area similar to that approved by DDW for the Orange County Groundwater Replenishment System,
- North City WRF treatment that includes flow equalization, full nitrification, and recycled water that complies with Title 22 filtration requirements,
- AWP that involves RO and advanced oxidation treatment meeting applicable DDW specifications,
- Implementation of a reliability program that features real-time monitoring to identify and react to treatment failure by diverting non-spec water in less than the 10 hours it takes to convey AWP product water to San Vicente,
- Reservoir storage at San Vicente that achieves a 12 month mean hydraulic retention time and a minimum 100 to 1 dilution of purified water in ambient reservoir water, and implements short-circuiting provisions including the discharge of purified water above the thermocline and withdrawal from below the thermocline, and
- Conventional potable water treatment of withdrawn reservoir water, and the ability to take the reservoir offline at any time.

DDW approved the City's proposed IPR/reservoir augmentation concept in correspondence dated September 7, 2012. Subsequent to that date, the City has coordinated with DDW and implemented studies to assess expansion of the proposed IPR/reservoir augmentation concept to include higher flows and a second reservoir (Otay Reservoir).

3.4.3.2 DDW Regulation of IPR/Reservoir Augmentation

As noted, Section 13565 of the *California Water Code* establishes the process for the DDW's development of IPR/reservoir augmentation regulations. The process entails:

- The establishment of an Advisory Group by January 14, 2014,
- The establishment of an Expert Panel by February 14, 2014, and
- The preparation of a report summarizing recommended IPR/reservoir augmentation public health findings and recommended requirements by June 14, 2016.

To date, DDW has convened both the Advisory Group and Expert Panel, and DDW has presented an initial regulatory framework for the Expert Panel's consideration that is based on the approach used by DDW in the site-specific concept approval of the City of San Diego IPR/reservoir augmentation project. This concept involves:

- As required in IPR/groundwater recharge projects, require combined pathogen removal from wastewater treatment, AWP, reservoir storage, and potable water treatment of:
  - 12-log reduction in enteric virus,
  - 10-log reduction in *Giardia* cyst, and
  - 10-log reduction in *Cryptosporidium* oocyst.

- Establish reservoir retention requirements to (1) distinguish IPR/reservoir augmentation from DPR, (2) provide time to respond to treatment anomalies and off-spec product water, and (3) provide an environmental buffer that provides for additional pathogen inactivation or constituent decay.

On the basis of experience gained in the review of the City of San Diego IPR/reservoir augmentation project, DDW has presented (see Table 3.18) initial suggestions on potential IPR/reservoir augmentation requirements for the initial consideration of the IPR/DPR Expert Panel. The tentative regulatory approach presented to the Expert Panel is based on achieving the same level of public health protection afforded by the IPR/groundwater recharge regulations.

Table 3.18 Tentative IPR/Reservoir Augmentation Criteria Presented to IPR/DPR Expert Panel[1]

Category	Tentative IPR/Reservoir Augmentation Requirement
Reservoir Operating History	The reservoir must be in operation as an approved surface water source for 5 years
Reservoir Operator	The public water system using the reservoir must have sufficient control and influence over the reservoir to meet assigned IPR parameters
Treatment	RO and advanced oxidation (FAT)
Diluent Water	Reservoir water suitable for diluent credit must be runoff or imported water approved as a surface source or be comprised of compliant IPR product water
Reservoir Dilution	Achieve one of the following at all times: • 100:1 dilution[2] • 60-day recycled water retention[3] • 10:1 dilution[2] and 30-day retention[3] • 10:1 dilution[2], and 1-log reduction of each organism[4]
Short-Circuiting Prevention	Discharge AWP water above thermocline and withdraw from below the thermocline when the thermocline is present
Virus Reduction Credit for Storage	1.0 log reduction in virus is credited for each month water is retained in the reservoir[5]

Notes
1. Initial suggested reservoir criteria presented by DDW for the consideration of the IPR/DPR Expert Panel at the Panel meeting of June 14, 2014. Criteria may be significantly modified by the Expert Panel before adoption.
2. Defined as dilution of 1-day of IPR product water into 99 parts of ambient reservoir water that is comprised of approved diluent water plus previously discharged IPR product water that complies with all discharge specifications.
3. Defined as T_2, the elapsed time at which two percent of any volume of discharged IPR water has been abstracted.
4. Demonstrate additional treatment to achieve a supplemental 1-log reduction in each enteric virus, *Giardia* cyst, and *Cryptosporidium* oocyst.
5. Reduction credits for other organisms may be approved.

3.4.3.3 NPDES Compliance Issues

The discharge of AWP purified water to a surface water reservoir is subject to NPDES permit regulation pursuant to 40 CFR 122. Such a NPDES permit would implement applicable DDW requirements, CTR standards, and Basin Plan water quality objectives.

EPA establishes CTR standards for the protection of aquatic habitat and the protection of human health. Table 3.19 presents CTR standards for the protection of aquatic habitat. As shown in the table, CTR standards for cadmium, chromium, copper, lead, silver and zinc are established as a function of receiving water hardness. Table 3.20 presents CTR standards for toxic organic constituents for the protection of human health.

Pilot testing by the City of San Diego WPDP demonstrated that AWP using RO/advanced oxidation complies with the CTR standards for the protection of aquatic habitat and human health.

One CTR constituent, however, may warrant special attention. As shown in Table 3.20, the CTR standard for N-nitrosodimethylamine (NDMA) is 0.000069 µg/l. With this stringent standard, while RO treatment may remove a majority of any NDMA present, even a small trace of NDMA in the SEJPA influent may cause the CTR limit to be exceeded. Monitoring of NDMA within the SEJPA influent using stringent detection limits will be required to determine whether or not NDMA represents an issue of concern.

An IPR/reservoir augmentation discharge would also be subject to Basin Plan water quality standards. Compliance with Basin Plan mineral concentration objectives will be assured within an IPR/reservoir augmentation project as the RO process results in significant reduction in mineral concentrations. Nitrate should represent the only Basin Plan compliance parameter of concern. The Basin Plan implements the following biostimulation objective for nitrogen and phosphorus:

> *Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those of which stimulate algae and emergent plant growth. Threshold total Phosphorous (P) concentrations shall not exceed 0.05 mg/L in any stream at the point where it enters any standing body of water. A desired goal in order to prevent plant nuisances in streams and other flowing waters appears to be 0.1 mg/L total P. These values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorous are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1 shall be used.*

Complying with the phosphorus "desired goals" of the biostimulation objective should not present a problem for AWP purified water. Pilot AWP testing implemented by the City of San Diego as part of the City's WPDP indicates that AWP can reduce phosphorus concentrations in purified water to near zero. Nitrate, on the other hand, is not fully removed by AWP. City of San Diego WPDF pilot testing indicates that nitrate concentrations can be reduced to approximately 0.8 mg/L.

Table 3.19 California Toxics Rule Standards for the Protection of Aquatic Habitat

Toxic Inorganic Parameter	Concentration (µg/l) Standard for Protection of Aquatic Habitat[1] Instantaneous Maximum[2]	4-Day Average[3]
Metals and Cyanide		
Arsenic	340	150
Cadmium	4.3[4]	2.2[4]
Chromium III	550[4]	180[4]
Chromium VI	16	11
Copper	13[4]	9[4]
Lead	65[4]	2.5[4]
Mercury	1.4	0.77
Nickel	470	52
Selenium	NS[3]	5.0
Silver	3.4[4]	NS[3]
Thallium	NS[3]	NS[3]
Zinc	120[4]	120[4]
Cyanide	22	5.2
Acid Extractable Compounds		
Pentachlorophenol	340	150
Chlorinated Pesticides		
Aldrin	3.0	NS
gamma BHC (Lindane)	0.95	NS
Chlordane	2.4	0.0043
4,4'-DDT	1.1	0.001
4,4'-DDD	NS	NS
4,4'-DDE	NS	NS
Dieldrin	0.24	0.056
alpha Endosulfan	0.22	0.056
beta Endosulfan	0.22	0.056
Endosulfan Sulfate	NS	NS
Endrin	0.086	0.036
Endrin Aldehyde	NS	NS
Heptachlor	0.52	0.0038
Heptachlor Epoxide	0.52	0.0038
PCBs	NS	0.014
Toxaphene	0.73	0.0002

Notes

- NS indicates that no standard has been established for the listed constituent.

1. *California Toxics Rule* (40 CFR 131). Values rounded to two significant figures. Actual discharge concentration standards will be established in the NPDES permit established by the RWQCB. The above table reflects the probable discharge standards based on existing CTR standards (40 CFR 131.38). The above probable standards do not take into account potential mixing zone dilution credits that may be available.
2. Based on CTR instantaneous (criteria maximum concentration) for the protection of aquatic habitat.
3. Based on CTR 4-day average (criteria continuous concentration) for the protection of aquatic habitat.
4. Standards quality criteria for cadmium, chromium III, copper, lead, silver, and zinc are dependent on receiving water hardness. (CTR limits become more stringent with lower hardness, and less stringent with higher hardness concentrations.) The above values are based on a receiving water hardness of 100 mg/L.

Table 3.20 California Toxics Rule Standards for the Protection of Human Health - Toxic Organic Constituents

Constituent	Concentration (µg/l) Standard for the Protection of Human Health for the Consumption of Water Plus Organisms[1] (Monthly Average)	Constituent	Concentration (µg/l) Standard for the Protection of Human Health for the Consumption of Water Plus Organisms[1] (Monthly Average)
Toxic Inorganic Constituents		Acid Extractable Compounds	
Antimony	14	2-chlorophenol	120
Arsenic	0.018	2,4-dichlorophenol	93
Copper	1300	2,4-dimethylphenol	540
Lead	50	2-methyl 4,6-dinitrophenol	13.4
Mercury	0.05	2,4-dinitrophenol	70
Nickel	610	Pentachlorophenol	0.28
Selenium	170	Phenol	21,000
Thallium	1.7	2,4,6-trichlorophenol	2.1
Zinc	9100	Base Neutral Compounds	
Volatile Organic Compounds		Acenaphthene	1200
Acrolein	320	Anthracene	9600
Acrylonitrile	0.059	Benzidene	0.00012
Benzene	1.2	Benzo (a) anthracene	0.0044
Bromoform	4.3	Benzo (a) pyrene	0.0044
Carbon tetrachloride	0.25	Benzo (b) fluoranthene	0.0044
Chlorobenzene	680	Benzo (k) fluoranthene	0.0044
Chlorodibromomethane	0.41	Bis (2-chloroethoxy) ether	0.031
Dichlorobromomethane	0.56	Bis (2-chloroisopropyl) ether	1400
1,2-dichloroethane	0.38	Bis (2-ethylhexyl) phthalate	1.8
1,1-dichloroethylene	0.057	Butyl benzyl phthalate	3000
1,2-dichloropropane	0.52	2-chloronaphthalene	1700
1,3-dichloropropene	10	Chrysene	0.0044
Ethylbenzene	3100	Dibenzo (a,h) anthracene	0.0044
Methyl bromide	48	1,2,-dichlorobenzene	2700
Methylene chloride	4.7	1,3,-dichlorobenzene	400
1,1,2,2-tetrachloroethane	0.17	1,4,-dichlorobenzene	400
Tetrachloroethylene	0.8	3,3,-dichlorobenzidene	0.04
Toluene	6,800	Diethyl phthalate	23,000
1,2 trans-dichloroethylene	700	Dimethyl phthalate	313,000

Table 3.20 California Toxics Rule Standards for the Protection of Human Health - Toxic Organic Constituents

Constituent	Concentration (µg/l) Standard for the Protection of Human Health for the Consumption of Water Plus Organisms[1] (Monthly Average)	Constituent	Concentration (µg/l) Standard for the Protection of Human Health for the Consumption of Water Plus Organisms[1] (Monthly Average)
1,1,2-trichloroethane	0.60	Di-n-octyl phthalate	2700
Trichloroethylene	2.7	2,4-dinitrotoluene	0.11
Vinyl chloride	2.0	1,2-diphenylhydrazine	0.04
Chlorinated Pesticides		Fluoranthene	300
Aldrin	0.00013	Fluorene	1300
alpha BHC	0.0039	Hexachlorobenzene	0.00075
beta BHC	0.014	Hexachlorobutadiene	0.44
gamma BHC (Lindane)	0.019	Hexachlorocyclopentadiene	240
Chlordane	0.00057	Hexachloroethane	1.9
4,4'-DDT	0.00059	Ideno 1,2,3-cd Pyrene	0.0044
4,4'-DDD	0.00059	Isophorone	8.4
4,4'-DDE	0.00083	Nitrobenzene	17
Dieldrin	0.00014	N-nitrosodimethylamine	0.00069
alpha Endosulfan	110	N-nitrosodi-n-propylamine	0.005
beta Endosulfan	110	N-nitrosodiphenylamine	5.0
Endosulfan Sulfate	110	Pyrene	960
Endrin	0.76	1,2,4-trichlorobenzene	260
Endrin Aldehyde	0.76	Dioxans and Difurans	
Heptachlor	0.00021	2,3,7,8-TCDD	1.3E-008
Heptachlor Epoxide	0.00010		
PCBs	0.00017		
Toxaphene	0.00073		

Note
1. Actual discharge concentration standards will be established in the NPDES permit established by the RWQCB. The above table reflects the probable discharge standards based on existing CTR standards (40 CFR 131.38) for the protection of human health. The above probable standards do not take into account potential mixing zone dilution credits that may be available.

While the Basin Plan biostimulation objective states that "analogous threshold values have not been set for nitrogen compounds" and "natural ratios of nitrogen to phosphorus are to be determined by surveillance and upheld", CWA Section 303(d) impaired water listings implemented by the RWQCB and EPA since the early 2000s have interpreted the Basin Plan nutrient objectives as establishing a numerical total nitrogen objective of:

- 1.0 mg/L within flowing waters,
- 0.5 mg/L for waters entering a standing water body, and
- 0.25 mg/L within standing waters.

Recognizing that such a strict interpretation may impact the feasibility of IPR/reservoir augmentation, the City of San Diego in 2012 submitted to the RWQCB a proposal entitled *Proposed Regional Water Quality Control Board Compliance*. Under the City's proposed compliance approach, compliance with the Basin Plan biostimulatory objectives for IPR/reservoir augmentation would be achieved through:

- Complying with the Basin Plan numerical limits for total phosphorus through AWP treatment,
- Maintaining total nitrogen concentrations in the AWP purified water of 1.0 mg/L or less, and
- Demonstrating that the AWP purified water discharge would result in high N:P ratios within the reservoir, which would minimize the potential for biostimulation through a "limiting nutrient" approach.

The City of San Diego submittal also requested RWQCB feedback on any additional state or federal regulations or policies that would constrain RWQCB's ability to issue a NPDES permit for a IPR/reservoir augmentation discharge to a reservoir on the 303(d) impaired water list.

In a response dated February 7, 2013, the RWQCB agreed with the City's proposed approach, and indicated that the Basin Plan:

> *Biostimulatory Substances water quality objective allows the San Diego Water Board the flexibility to assess N:P ratios on a site-by-site basis and establish project-specific N:P ratios for any given receiving water in lieu of a 10: 1 N: P ratio.*

The RWQCB further acknowledged that IPR/reservoir augmentation NPDES permit could be issued without the need for Basin Plan modification or 303(d) impaired water de-listings. It should be noted that, while the RWQCB has indicated that IPR/reservoir augmentation can be implemented without the need for 303(d) impaired water de-listings, the San Diego County Water Authority and its reservoir-owning member agencies have initiated an effort to coordinate with the RWQCB to select and implement a strategy for removing water storage reservoirs from the 303(d) impaired water list.

3.4.3.4 Direct Potable Reuse

Direct potable reuse (DPR) is the concept under which recycled water is treated to a sufficiently high and redundant degree with a sufficiently robust amount of testing to ensure that the created potable supply will achieve the same degree of public health protection as conventional potable water supplies. Figure 3.2 illustrates the DPR concept.

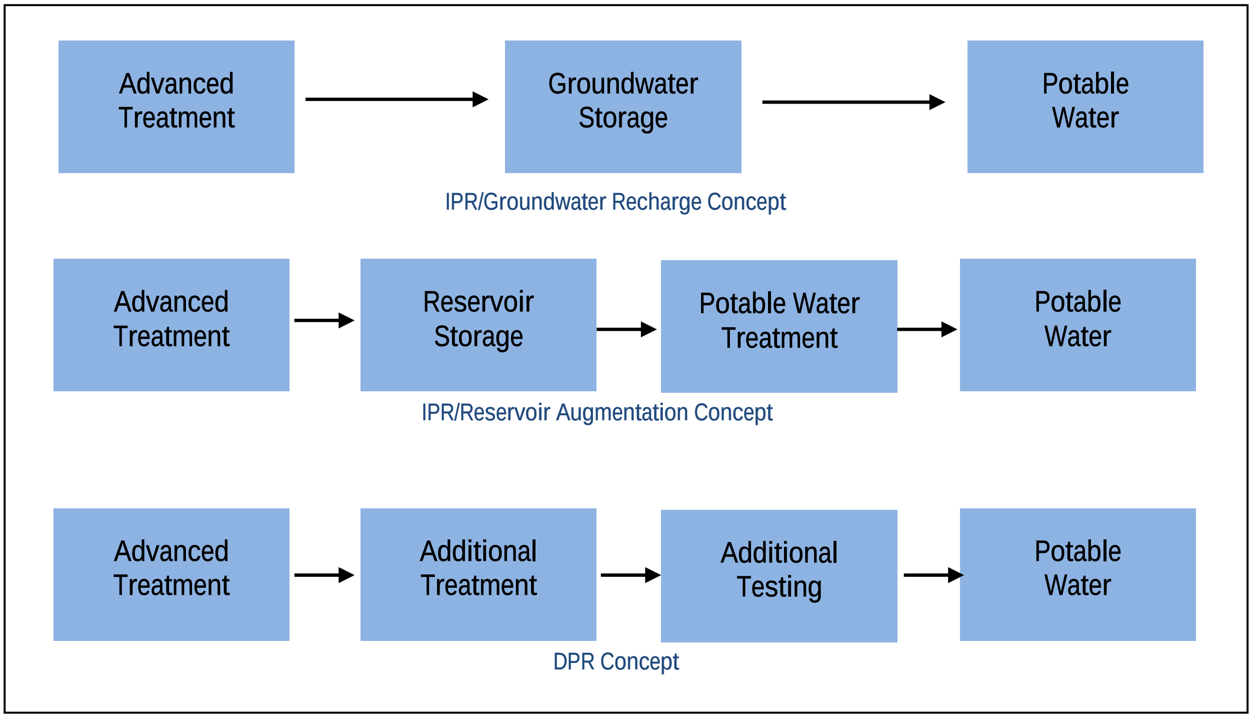


Figure 3.2 Comparison of IPR and DPR Concepts

As noted, DDW has established advanced treatment and groundwater storage requirements and parameters within GRR. Additionally, DDW has established site-specific IPR/reservoir augmentation requirements for one project (City of San Diego) and is in the process of developing requirements governing the degree of advanced treatment and reservoir storage required to implement IPR/reservoir augmentation.

Section 13560-13569 of the *California Water Code* requires the SWRCB and DDW to investigate and report to the Legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse (DPR). As with IPR/reservoir augmentation, the law directs that an Expert Panel to be convened to:

- Assess what, if any, additional areas of research are needed to be able to establish uniform water recycling criteria for direct potable reuse;
- Advise DDW on public health issues and scientific and technical matters regarding development of uniform water recycling criteria for indirect potable reuse through surface water augmentation, and
- Advise DDW on public health issues and scientific and technical matters regarding the feasibility of developing uniform water recycling criteria for direct potable reuse.

As noted, the IPR/DPR Expert Panel and Advisory Group have initiated their review of IPR/DPR issues. The DPR approach the panel is likely to take is to (1) develop recommended draft IPR/reservoir augmentation regulations that areas protective of public health as the IPR/groundwater recharge regulations, and (2) determine if it is feasible for additional treatment and testing to achieve an equivalent degree of reliability and safety allowing for DPR. If DPR is determined to be feasible, it is likely that the Expert Panel DPR concept will be based requiring supplemental treatment, improved treatment redundancy, improved real-time monitoring of treatment performance indicators, increased monitoring frequency, short-term storage to allow time for quality testing to be completed, and/or more robust post treatment testing.

Section 13565 of the California Water Code directs DDW to prepare a report summarizing the findings of the Expert Panel by June 16, 2016.

3.4.3.5 Environmental Enhancement

The concept of using highly treated recycled water to support recreational use in non-potable lakes has been implemented by the Padre Dam Municipal Water District since the 1960s. The Santee Lakes, which are filled exclusively with recycled water, represent a major regional recreational asset within San Diego County.

Recognizing the success of the Padre Dam operation, the RWQCB in 1998 issued *Staff Report on Stream Enhancement and Reclamation Potential, 1988 through 2015* (Stream Enhancement Study). The Stream Enhancement Study proposed that highly treated recycled water could be used to augment stream flow and stabilize stream water quality by offsetting impacts associated with low-flow urban runoff. The Stream Enhancement Study noted that the Basin Plan biostimulation water quality objective for nitrogen represented the prime impediment to the use of recycled water for stream augmentation.

To encourage the use of recycled water for environmental enhancement, the RWQCB in 1990 added language to the Basin Plan that allowed an alternative method of complying with the above Basin Plan nitrogen narrative objective. The alternative method allowed the RWQCB to deem a discharge in compliance with the nitrogen objective provided that the discharge included best available treatment economically achievable coupled with implementation of a watercourse management plan to address potential nutrient effects.

As noted in the IPR/reservoir augmentation discussion, however, the RWQCB and EPA in recent years have interpreted the Basin Plan biostimulatory objective as establishing a numerical total nitrogen objective of 1.0 mg/L for flowing waters. In accordance with this interpretation, the RWQCB, SWRCB, and EPA in the early 2000s began listing surface waters as impaired pursuant to Section 303(d) of the CWA on the basis of noncompliance with these numerical nitrogen limits. Several such water bodies (see Table 3.21) have been listed within the SEWRF service area.

While recycled water treated with RO may achieve compliance with the 1.0 mg/L total nitrogen objective for flowing waters, the 303(d) impaired water listings complicate the use of RO treated recycled water for environmental enhancement. First, the 303(d) impaired listings require the RWQCB to implement TMDLs, which identify sources contributing to the impairment and implement pollutant load reductions on the sources to achieve the established water quality standards. Through this TMDL process, the RWQCB may choose to reduce total nitrogen allocations for recycled water stream discharges to significantly less than 1.0 mg/L. Additionally, for waters in which the TMDL waste load allocation process is completed, no remaining waste load allocation may be available for assignment to future recycled water stream discharges.

Table 3.21 Category 5 303(d) Impaired Water Bodies and Scheduled TMDLs[1] SEWRF Recycled Water Service Area

Watershed	Stream or River	Impaired Area	Pollutant	Year Listed	Scheduled TMDL Completion
904.51	Cottonwood Creek (San Marcos Creek watershed)	1.9 miles	DDT	2006	2019
			Sediment toxicity	2006	2019
			Selenium	2010	2019
			Manganese	2006	2019
			Nitrogen	2010	2021
			Sulfates	2010	2019
	Encinitas Creek	3 miles	Selenium	2010	2019
			Toxicity	2010	2019
	San Marcos Creek	19 miles	DDE	2006	2019
			Phosphorus	2006	2019
			Sediment toxicity	2006	2019
			Selenium	2010	2021
904.61	San Elijo Lagoon	330 acres	Eutrophic	1996	2019
		150 acres	Indicator bacteria	1996	2015
			Sedimentation/siltation	1996	2019
904.62	Escondido Creek	26 miles	DDT	2006	2019
			Enterococcus	2010	2019
			Fecal coliform	2010	2019
			Manganese	2006	2019
			Phosphate	2006	2019
			Selenium	2006	2019
			Sulfates	2006	2019
			Total dissolved solids	2006	2019
			Total nitrogen	2010	2019
			Toxicity	2010	2019

Note
1. Category 5 303(d) listings represent impaired waters where development of a Total Daily Maximum Load (TMDL) is required. The above listings were approved by the State Water Resources Control Board on August 4, 2010 and approved by the U.S. Environmental Protection Agency on October 11, 2011.

Finally, unlike reservoirs where a limiting nutrient approach is allowed to achieve compliance with Basin Plan objectives, nutrient loads from storm runoff and urban runoff are outside the control of the operating agency, and render the limiting nutrient approach impractical for flowing streams. For these reasons, recycled water stream flow augmentation or environmental enhancement does not appear to represent a feasible option for SEJPA within the current regulatory framework.

3.4.3.6 Wet Weather Disposal

While year-round or seasonal recycled water stream flow augmentation is not feasible, opportunities may exist for discharging excess recycled water to surface waters during periods of extreme wet weather. The RWQCB is currently evaluating NPDES permit applications from two dischargers proposing intermittent wet-weather discharge of Title 22 recycled water during periods of extreme hydrologic conditions. The two applicants include:

- The City of San Diego, who proposes to discharge up to 30 mgd of tertiary disinfected recycled water that is dechlorinated from the North City WRF to San Clemente Canyon for a short period (less than 6 hours) during extreme hydrologic events.
- The City of Escondido, who proposes to discharge up to 9 mgd of tertiary disinfected recycled water that is dechlorinated from the Hale Avenue Resource Recovery Facility to Escondido Creek during extreme hydrologic events when Escondido Creek flows exceed 300 cubic feet per second and San Elijo Lagoon is open to tidal flushing.

Nutrient concentrations in both proposed discharges would exceed the Basin Plan 1.0 mg/L goal for total nitrogen flowing waters, but a number of factors exist for both proposed discharges which would prevent subsequent biostimulation, including:

- The proposed discharges would occur during times of peak storm runoff where a majority of the discharged nutrients would be flushed to the ocean.
- The discharges would occur during winter/spring periods when the potential for biostimulation is limited due to reduced temperature and sunlight.
- Opportunities are available to each discharger to implement mitigation that includes assuring "net zero" mass emissions of nutrients through subsequent diversion of nutrient-laden low-flow runoff to the sewer during non-storm periods.

RWQCB has not taken action on either application to date. While the RWQCB may deny the permit applications, it may also consider approval of the applications subject to confirming that issuance of NPDES permits for such brief wet-weather discharges (1) is consistent with EPA and RWQCB interpretation of Basin Plan biostimulatory objectives, (2) is not impacted by 303(d) impaired water listings, and (3) is consistent with other RWQCB and EPA policies.

It will be necessary for SEJPA to monitor the progress of these two NPDES applications to assess whether wet-weather intermittent discharge of Title 22 recycled water is feasible.

3.4.3.7 Opportunities for AWP

Neither the proposed San Elijo nor Escondido discharges feature the use of AWP. If such AWP were to be provided, opportunities for securing a NPDES permit for intermittent wet weather discharge to surface waters would be significantly increased. As noted, pilot plant testing of AWP facilities as part of the City of San Diego WPDP demonstrate that AWP featuring RO can achieve total nitrogen concentrations of 1.0 mg/L or less - a concentration that complies with the most strict interpretation of the Basin Plan biostimulatory objective. As a result, provided that the discharge was consistent with requirements imposed by any TMDLs developed for downstream impaired waters, it is probable that an intermittent wet-weather discharge to surface waters involving the use of AWP product water (1) would be consistent with the Basin Plan and (2) could be permitted by the RWQCB through issuance of a NPDES permit.

3.5 FUTURE REGULATORY ISSUES/TRENDS

This section addresses future regulatory issues and potential regulatory trends that may influence SEJPA wastewater facilities planning.

3.5.1 Issues Affecting Ocean Discharge

Current NPDES requirements for the SEOO established within Order No. R9-2010-0087 expires on October 27, 2015. SEJPA will be required to submit a Report of Waste Discharge in application for NPDES renewal by May 1, 2015 (180 days in advance of the expiration date). On the basis of the performance of the SEOO discharge during the current NPDES period, it is probable that the renewed NPDES permit will continue the application of non-enforceable performance goals (instead of enforceable effluent limitations) to implement Ocean Plan Table 1 receiving water standards. It is also probable that the RWQCB will continue the NPDES permitting trends of:

- Requiring one year of intensive ocean/sediment monitoring within each five-year NPDES period, and
- Encouraging SEJPA participation in and coordination with regional monitoring efforts to implement the RWQCB policy of focusing regional monitoring resources on addressing the health of regional waters, as opposed to focusing on compliance-based monitoring.

A number of potential future regulatory issues may affect the discharge of SEWRF treated wastewater to the SEOO.

3.5.1.1 NPDES Renewal Issues

While no significant changes in effluent limits, performance goals, or monitoring strategies are probable within the upcoming NPDES permit period, the 2015 renewal of SEOO NPDES requirements will provide an opportunity for SEJPA to address and resolve:

- REC-1 compliance and
- Outfall disposal of RO reject.

While SEJPA monitoring data consistently show compliance with Ocean Plan REC-1 bacteriological standards, it is advisable for the SEJPA NPDES application to demonstrate this compliance so that the RWQCB can make a finding of compliance within the renewed NPDES permit. Such a finding should obviate the need for additional RWQCB-imposed studies or provisions relative to REC-1 compliance in receiving waters.

As noted, while Addendum No. 1 to Order No. 2000-10 acknowledges implementation of AWP facilities at SEWRF (including RO), the SEOO NPDES permit currently does not include provisions allowing RO reject to be disposed of in the SEOO. The 2015 NPDES renewal application should include a request for modification of NDPES requirements to accommodate the discharge of RO reject from the SEWRF to the SEOO.

3.5.1.2 Pretreatment Regulation

POTWs are required to implement EPA-approved industrial discharge pretreatment programs when their total design flows are greater than 5 mgd and the POTWs receive industrial pollutants that could pass through or interfere with POTW operations. As noted, SEJPA is not currently required to implement an EPA-approved pretreatment program. Instead, SEJPA is required during each five-year NPDES permit period to survey its service area for industrial users, monitor the SEWRF influent for the presence of toxic compounds, and certify whether any condition exists that would mandate SEJPA's development of a pretreatment program. Future conditions that could trigger the RWQCB or EPA to mandate SEJPA's development of an EPA-approved pretreatment program include:

- Significant expansion of SEWRF treatment capacity,
- Relocation or establishment of any industry within the SEWRF tributary area that is subject to federal Categorical Pretreatment standards promulgated within 40 CFR 403, or
- The presence of toxic compounds in the SEWRF influent in sufficient amounts to cause persistent noncompliance with NPDES discharge limitations or biosolids standards.

3.5.1.3 Proposed Regulation of Hypersaline Discharges

The SWRCB updates the Ocean Plan on a triennial basis. Current Ocean Plan modifications in progress include amendments directed toward controlling trash discharged to the ocean and amendments to regulate hypersaline discharges.

The SWRCB has released proposed amendments to the Ocean Plan governing the seawater desalination intake structures and the discharge of hypersaline RO reject. (SWRCB, 2014) The proposed amendments would:

- Establish requirements governing seawater desalination intake structures to minimize entrainment and impingement,
- Establish salinity objectives for the discharge of hypersaline brines from seawater desalination facilities, and
- Implement best site, design, technology and mitigation features in discharge facilities

Hypersaline discharges targeted by the proposed Ocean Plan modifications contain salinity concentrations significantly in excess of ambient seawater. As a result, such hypersaline discharges may be negatively buoyant compared to ambient seawater.

As noted herein, typical salinity concentration of AWP RO reject are significantly less than ambient seawater. As a result, the proposed Ocean Plan modifications governing hypersaline discharges should not affect SEJPA facilities plans regarding RO treatment or the discharge of RO reject into the SEOO.

3.5.1.4 *Draft Toxicity Policy*

The SWRCB in 2000 adopted the *Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy, or SIP), which established uniform methodology for implementing criteria established by EPA in the CTR. The SWRCB revised by the SWRCB 2005 and directed SWRCB staff to develop draft toxicity control provisions.

In response to this requirement, SRWCB staff prepared a draft *Policy for Assessment and Control* (Toxicity Policy) that proposes to amend Chapter 4 (Toxicity Control Provisions) of the SIP. The most recent version of the SWRCB's proposed Toxicity Policy was released in 2012, and proposes to:

- Establish statewide standards for acute and chronic toxicity in inland surface waters and enclosed bays and estuaries,
- Require toxicity monitoring in all statewide NPDES permits regulating non-point source discharges to inland surface waters and enclosed bays and estuaries,
- Require use of the "test of significant toxicity" (TST) to assess the whole effluent toxicity measurements of wastewater effects on the ability of test organisms' to survive and grow,
- Establish test procedures and thresholds for determining a " reasonable potential" for whether toxicity effluent limitations are required in NPDES permits,
- Allow use of marine test organisms for assessing toxicity in brackish waters with TDS concentrations in excess of 1000,
- Require that failure of a single test triggers violations and accelerated monitoring, and
- Provide RWQCBs with flexibility in assigning acute toxicity limits in permits and allowing for the use of mixing zones.

The SWRCB to date has received substantial public comment on the proposed numeric limits and monitoring provisions of the draft Toxicity Policy. If adopted, the Toxicity Policy would supersede Section 4 of the SIP. As written, the Toxicity Policy could result in the imposition of TST-based toxicity effluent limits and monitoring protocols on IPR/reservoir augmentation projects.

3.5.1.5 *Test of Significant Toxicity (TST) Protocols for Ocean Discharges*

In 2010, USEPA endorsed the peer-reviewed TST two-concentration hypothesis testing approach in *National Pollutant Discharge Elimination System Test of Significant Toxicity Implementation Document* (EPA 833-R-10-003, 2010). EPA (2010) identified the TST hypothesis testing approach as being more reliable in identifying toxicity than the NOEC hypothesis-testing (no observable effects concentration) approach implemented in the *California Ocean Plan*. EPA (2010) also states that the TST results are:

- More transparent than the point estimate model approach used for acute toxicity in the California Ocean Plan, and

- Superior for addressing statistical uncertainty when used in combination with EPA's toxicity test methods.

The TST's null hypothesis for chronic toxicity is:

- H0: Mean response ("In-stream Waste Concentration" in % effluent) ≤ 0.75 mean response (Control).

As part of the TST protocol, results obtained from a single-concentration chronic toxicity test are analyzed using the TST approach and an acceptable level of chronic toxicity is demonstrated by rejecting the null hypothesis and reporting "pass". For chronic toxicity, the instream waste concentration in % effluent is computed by dividing 100 by the assigned initial dilution. For the 237:1 initial dilution assigned to the SEOO discharge, this would translate to a chronic toxicity "instream waste concentration" of 0.45%.

The TST's null hypothesis for acute toxicity is:

- H0: Mean response ("In-stream Waste Concentration" in % effluent) ≤ 0.80 mean response (Control).

Results obtained from a single-concentration acute toxicity test are analyzed using the TST approach and an acceptable level of acute toxicity is demonstrated by rejecting the null hypothesis and reporting "pass." For acute toxicity, the "instream waste concentration in % effluent" is computed by dividing 1000 by the assigned initial dilution. For the 237:1 initial dilution assigned to the SEOO discharge, this would translate to an acute toxicity "instream waste concentration" of 4.54%.

EPA has been implementing the TST testing protocols within all NPDES ocean discharge permits as they are reissued as part of the current 5-year renewal cycle, and it is anticipated that the TST testing protocols will be incorporated into the upcoming renewal of the SEJPA NPDES permit.

3.5.1.6 SWRCB Nutrient Policy

The SWRCB has initiated the process to develop a Nutrient Policy for inland surface waters, excluding inland bays and estuaries. As part of this process, the SWRCB has distributed initial scoping documents and solicited stakeholder input. Initial scoping documents indicate that the SWRCB is considering:

- Whether to develop and establish statewide nutrient objectives,
- Whether the objectives should be narrative in nature or numerical,
- The basis on which numerical nutrient objectives, if applicable, would be established,
- Whether to establish statewide procedures for implementing any established nutrient objectives, and
- Whether to establish statewide requirements on nutrient monitoring.

As part of this assessment, two numerical approaches are being considered by the SWRCB:

- The Ecoregion Numeric Endpoint approach developed by EPA, which divides the state into ecoregions and proposes to impose 25th percentile nutrient values from collected monitoring data within each ecoregion as representing non-impacted reference conditions, and

- The California Nutrient Numeric Endpoint approach, which involves an evaluation of risk relative to beneficial uses to control excess nutrient loads necessary to achieve objectives consistent with the EPA Ecoregion numeric endpoint approach.

Regardless of which approach is implemented, nutrient regulation in the San Diego Region (including nutrient regulation of IPR/reservoir augmentation projects) is unlikely to be significantly impacted as the San Diego Region Basin Plan already imposes stringent numerical nutrient limits.

3.5.1.7 CEC Monitoring and Regulation

The SWRCB has initiated two expert panel efforts to address constituents of emerging concern. In accordance with the provisions of the Recycled Water Policy, the SWRCB in 2010 convened a CEC Advisory Panel to evaluate CEC monitoring needs associated with recycled water use, including groundwater recharge, indirect potable reuse, and non-potable landscape irrigation. The CEC Advisory Panel (Drewes et al., 2010) presented their recommendations in 2010. As part of these recommendations, the Advisory Panel:

- Developed a framework for prioritizing and selecting CECs for recycled water monitoring programs.
- Developed a recommended short list of monitoring parameters, including (1) health-based toxicologically relevant indicators and performance-based indicators (CECs that could be used as surrogate parameters for evaluating treatment removal effectiveness).
- Presented guidance on interpreting and responding to monitoring results.
- Identified future research and information collection needs.

Recommended health-based monitoring parameters included 17 beta-estradiol, caffeine, and triclosan. Turbidity, chlorine residual, and total coliform were recommended as surrogate parameters useful for indicating probable removal of CECs through wastewater treatment.

Many questions addressed by the recycled water CEC Advisory Panel are also relevant to the ambient environment. The David and Lucile Packard Foundation partnered with the Southern California Coastal Water Research Project to support a second panel to address issues associated with CECs in the oceans and estuaries that receive discharge of treated municipal wastewater effluent and storm water. The panel evaluated potential sources and effects of CECs and provided recommendations on monitoring focused on evaluating the highest potential for CECs to cause effects in the receiving waters. The panel's final report (Schlenk et al., 2012) recommended a risk-based framework for CEC monitoring that entailed:

- Developing monitoring trigger levels for CECs that pose the greatest potential risk to aquatic systems based on published effects concentrations.
- Compiling measured or predicted environmental concentrations for which monitoring trigger levels could be estimated.
- Identifying CECs that present the greatest potential for risk by comparing measured data with monitoring trigger levels.

- Applying the framework to (1) a wastewater effluent dominated inland (freshwater) waterway; (2) a coastal embayment that receives wastewater and storm water; and (3) an offshore discharge of wastewater.

Using this framework, the panel recommended monitoring for the following CECs in effluent dominated freshwater systems:

Hormones:	17-beta estradiol, estrone, and cis-androstene-dione
Insecticides:	bifenthrin, permethrin, chlorpyrifos, and fipronil
Pharmaceuticals:	ibuprofen, bisphenol A, galaxolide, diclofenac, and triclosan

These same CECs (except for diclofenac and ibuprofen) were identified for monitoring in coastal embayments. No aqueous phase CECs were identified for monitoring near ocean outfalls. The panel recommended that the State incorporate the CEC monitoring into the various existing statewide, regional, and local NPDES monitoring programs.

3.5.1.8 Habitat Designation

Key SEJPA facilities are located within two protected habitats, which are subject to a variety of recreational, and development restrictions. The SEOO is located within the Swami's State Marine Conservation Area (SMCA). The Swami's SMCA extends from the mean high tide line to three miles offshore over an area of approximately 12.65 square miles. Title 14, Section 632(138) of the *California Code of Regulations*, prohibits the taking of living marine resources within the SMCA except for shoreline hook and line fishing and spear fishing of designated species, but allows for:

> *Beach nourishment and other sediment management activities and operation and maintenance of artificial structures inside the conservation area is allowed pursuant to any required federal, state and local permits, or as otherwise authorized by the Department* [of Fish and Wildlife].

Under this provision, SEJPA is authorized to implement required NPDES monitoring (including benthic monitoring) and perform repair and maintenance work along the SEOO.

The land outfall is located within the San Elijo Lagoon SMCA, which extends throughout the lagoon. The San Elijo Lagoon SMCA is designated a "no take" SMCA. Under this designation, the taking of all living marine resources is prohibited except for take pursuant to activities authorized under subsection Title 14, Section 632(b)(139)(D) of the *California Code of Regulations*, which allows for:

> *Operation and maintenance, maintenance dredging, habitat restoration including sediment deposition, research and education, and maintenance of artificial structures inside the conservation area is allowed pursuant to any required federal, state and local permits, or activities pursuant to Section 630, or as otherwise authorized by the department*.

While operation and maintenance of existing SEJPA facilities is allowed (including emergency access), the habitat designations may significantly increase the difficulty and complexity in future SEJPA facilities planning that involves replacement or upgrade of the SEOO and/or land outfall. Such replacement or upgrades would likely require:

- CWA Section 401 water quality certifications issued by the RWQCB,
- CWA Section 404 permits issued by U.S. Army Corps of Engineers, and
- Associated required consultations with the U.S. Fish and Wild Service, National Marine Fisheries Service, and California Department of Fish and Wildlife.

3.5.1.9 Climate Change Issues

In 2009, California adopted a statewide Climate Adaptation Strategy that summarizes climate change impacts and recommends adaptation strategies relating to public health, biodiversity and habitat, ocean and coastal resources, agriculture, forestry, transportation, and energy. The California Natural Resource Agency, in coordination with other state agencies, is in the process of updating this strategy. The State is also developing an Adaptation Planning Guide to provide a decision-making framework intended for use by local and regional agencies for addressing risks caused or exacerbated by climate change. Specific climate change issues addressed within this strategy that warrant future SEJPA facilities planning attention include:

- Effects of projected rises in seawater levels on SEJPA wastewater treatment and conveyance facilities and wastewater collection facilities of SEJPA member agencies,
- Potential effects of seawater level changes on inflow and infiltration into wastewater collection systems tributary to the SEWRF, and
- Changes in regional hydrology, which may affect wet weather peak, flow hydraulics and peak flow-sizing considerations for wastewater conveyance and treatment facilities.

3.5.1.10 Monitoring Trends

Chapter 2 of the RWQCB Practical Vision addresses monitoring and assessment. The Practical Vision calls for a change in the past RWQCB practice of focusing monitoring on individual discharges to an approach that focuses on monitoring to:

- Assess the safety and health of receiving waters,
- Identify unsatisfactory conditions and the causes of the conditions, and
- Determine the effect of management or corrective actions.

In parallel with adopting the monitoring recommendations within the Practical Vision, the RWQCB in 2012 adopted Resolution No. 2012-0069, which implemented the "question-based" framework addressed within the Practical Vision. The *Framework for Monitoring and Assessment in the San Diego Region* (RWQCB, 2012) proposed that regional monitoring resources be directed toward addressing the following questions:

M1: Conditions Monitoring and Assessment (Is the water safe and healthy?)
M2: Stressor Identification Monitoring (What pollutants are causing the problem?)
M3: Source Identification Monitoring (What is the source of the stressor pollutants?)
M4: Performance Monitoring (Are implemented corrective actions effective?)

The RWQCB has been implementing this framework in new and updated NPDES permit monitoring programs. To implement the concepts expressed within the RWQCB monitoring framework, SEJPA in 2013 submitted to the RWQCB a list of suggested proposed revisions to the monitoring and reporting provisions of Order No. R9-2010-0087. While the RWQCB has not acted on these recommendations to date, it is anticipated that RWQCB staff will coordinate with SEJPA staff as part of the process to renew the SEJPA NPDES permit to address these (and other) opportunities for implementing monitoring program modifications that (1) increase the efficiency and effectiveness of SEJPA's monitoring resources, and (2) implement the concepts expressed within the RWQCB monitoring framework.

3.5.2 Issues Affecting Non-Potable Recycled Water Use

As noted, the SWRCB Recycled Water Policy and the RWQCB Practical Vision support the expanded use of recycled water. While the policies support recycled water use, the policies do not implement any concrete measures that eliminate or reduce the current burden of recycled water regulation. The policies, however, will result in the governing boards of the SWRCB and RWQCB being favorably inclined to support well-reasoned recycled water projects, including indirect potable reuse projects.

3.5.2.1 Nutrient Regulation

As noted, Order No. 2000-10 implements the current RWQCB strategy for regulating nutrients, which requires that nutrient application rates (combined nutrients in the recycled water plus fertilization) not exceed vegetation nutrient demands. Under this approach, recycled water producers are required to coordinate with recycled water purveyors to notify users of the nutrient value in recycled water so that fertilization rates can be adjusted appropriate to vegetation demands.

In another nutrient-related development, per recommendations presented within the 2012 SWRCB Onsite Wastewater Treatment Policy, the San Diego RWQCB has initiated an environmental review process to revise Basin Plan nitrate groundwater objectives to 10 mg/L (as nitrogen, or 45 mg/L as NO_3) within 44 local groundwater basins. (RWQCB, 2014) While Basin Plan nitrate objectives are already at 45 mg/L (as NO_3) within the SEWRF recycled water service area, the proposed region-wide RWQCB action would likely result in less future RWQCB attention and focus on nutrient impacts associated with recycled water irrigation.

Finally, as previously indicated, Addendum No. 1 to Order No. 2000-10 exempts SEJPA and its associated recycled water purveying agencies from having to develop an SNMP within the SEWRF service area. It is thus unlikely that future SEWRF recycled water operations will be impacted by SNMP-related requirements or compliance measures.

3.5.2.2 *Monitoring Trends*

The monitoring framework adopted by the RWQCB under their Practical Vision was directed toward assessing impacts to surface water regimes and habitat. The RWQCB groundwater monitoring approach is likely to continue to be focused on a more simplified approach of collecting groundwater quality data and comparing the data with applicable Basin Plan groundwater quality objectives and DDW drinking water standards.

Recycled water WDRs adopted by the RWQCB, however, have generally not included groundwater monitoring components, except in circumstances (e.g., Order No. R9-2003-0123 for the City of San Clemente; Order No. R9-2010-0032 for the City of Escondido) where recycled water concentration limits were, in part, based on groundwater assimilative capacity. Adoption of the RWQCB Practical Vision is not anticipated to alter this trend.

3.5.2.3 *Water Conservation*

State, regional, and local efforts have focused on a multi-element approach that includes (1) public education on in-home and outside-the-home water practices for conserving water, (2) encouraging or requiring installation of water-efficient plumbing fixtures and appliances, and (3) implementing recommended or mandated water conservation measures. Such water conservation efforts have had a marked effect on wastewater per capita generation rates within the SEJPA service area. Additionally, as noted, increased water conservation within Southern California has resulted in higher incremental salinity concentration increases through domestic use.

While heightened emphasis is placed on water conservation during extended droughts, it is probable that a significant portion of the in-home water conservation gains achieved during the past decade will be sustained indefinitely, due to increased water efficiency of fixtures and appliances and ongoing public education. As a result, current trends of reduced per capita flow contributions and increased influent wastewater salinity are projected to continue.

3.5.2.4 *Water Supply Changes*

In addition to being influenced by water conservation, salinity concentrations in SEWRF influent wastewater may also be affected by changes in regional potable water supplies. Imported water distributed to member agencies by the San Diego County Water Authority (regional water wholesale agency) has typically been comprised of a blend of water from the State Water Project and Colorado River. Environmental constraints, however have limited water diversions to the State Water Project during low flow or drought conditions. While drought conditions also stress the availability of Colorado River supplies, the Water Authority through a transfer agreement with the Imperial Irrigation District has been able to improve the San Diego County's access to Colorado River supplies. As a result of these factors, it is likely that Colorado River water will comprise a significant portion (sometimes all) of the future imported water supplies distributed by the Water Authority. Water quality implications of this include:

- Probable higher source water TDS concentrations, as TDS concentrations in Colorado River supplies typically range from 500 to over 750 mg/L (often double the TDS concentration of State Water Project supplies), and
- Lower source water concentrations of nutrients, as Colorado River water typically contains lower concentrations of nitrogen and phosphorus than State Water Project supplies.

Offsetting potential TDS in the imported supplies, however, the San Diego County Water Authority and its member agencies are scheduled to begin taking delivery in 2016 of up to 50,000 acre-feet of desalinated seawater produced at the Carlsbad Desalination Facility. Delivery of water from this facility to the SEJPA tributary area is projected to have two minor influences on SEWRF wastewater quality. First, the desalination facility is to produce a supply with an average TDS concentration of 500 mg/L, a concentration that is less than the 500 to 750 mg/L TDS concentrations within SDCWA water supplies in recent years. TDS concentrations in SEWRF influent are likely to decrease with delivery of desalinated seawater, with the degree of reduction depending on imported water TDS and the ratio of imported to desalinated water served within the SEWRF tributary area.

Second, the desalinated water is projected to contain slightly softer water (e.g., lower concentrations of calcium and magnesium relative to sodium) than current imported water supplies. This slightly softer water, however, is not projected to result in any adverse effect on compliance with SEWRF SAR effluent limits, however, due to (1) the desalinated water will comply with applicable SAR limits, and (2) calcium and magnesium concentrations in imported supplies will further reduce SAR values when desalinated is blended into the regional water delivery system.

3.6 AIR QUALITY REGULATORY REVIEW

Air quality within San Diego County is under the regulatory control of the San Diego County Air Pollution Control District (APCD). The APCD has developed and continues to modify the Rules and Regulations (R&R) in accordance with the United States Environmental Protection Agency (EPA) and the California Air Resources Control Board (ARB) legislation.

District Rule 10 provides the roadmap for obtaining permits within San Diego County. Facilities are required to obtain permits for any operations or equipment that emit or is capable of emitting air contaminants. Air contaminates can be dust, mists, fumes, vapors, odors or gases. Some operations that are considered to have a minimal emission potential have been exempted from permit requirements and are listed with District Rule 11. Improvement in San Diego Air Basin has “slowed” development of more strict regulatory requirements. SEJPA has maintained several Permit-To-Operate (PTOs) throughout their years of operation, which includes overall plant permits and permits for odor control scrubbers #1 and #2.

Several exemptions are cited within District Rule 11, including the following:

- Wastewater treatment, water reclamation, and wastewater pump stations with capacities less than 1 mgd.
- Existing boilers (installed prior to March 25, 2010) operating on natural gas with a heat input rating of less than 5 million Btu per hour.
- Existing boilers (installed prior to March 25, 2010) operating on all other types of fuels including digester gas with a heat input rating of less than 1 million Btu per hour.
- New boilers (effective March 25, 2010) below 600,000 Btu per hour.

- Internal combustion engines with a brake horsepower of less than 50.
- Ozone generating equipment

SEJPA has equipment and/or processes above the exemption thresholds noted above and therefore require APCD permits. Several APCD regulations specific to the SEJPA operations include the generation of odors from wastewater treatment plant operations, operations of boiler and flare systems (as part of the anaerobic digester), emergency internal combustion engines, as well as the overall treatment plant itself.

Existing permitted sources will maintain current PTO conditions for at least the next five years. New rule making typically has a five to seven year development period.

New Source Review (NSR) is required for all new facilities, including replacement in like kind. The specific review and assessment steps are provided in Rule 20. The existing SEJPA equipment has been in operation since the 1980's and most recently 1990's. The remaining life of the current facility is being evaluated as part of the site assessment study. Prior to any replacement of existing air contaminate generating equipment, determination of the APCD replacement requirements is recommended. Several processes (such as boilers and flares) would require new APCD permitting. Boiler Rule 69.2.1 Small Boilers, Heaters and Steam Generators has reduced the permitting threshold to 600,000 Btu per hour and sales and installation of boilers must meet the emission standards as cited in Rule 69.2.1. The effective date of Rule 69.2.1 was March 25, 2010.

Several wastewater treatment plants within San Diego County have replaced their simple candle flares with very low emission enclosed type flares. The capital and associated on-going source testing costs, as well as periodic and variable excess gas production has resulted in difficulties in maintaining permit compliance.

Greenhouse Gasses (GHG), including carbon dioxide, methane, and nitrogen oxides, continues to be a focus at the State level. California Assembly Bill 32 has set the framework to track and tax the generation and release of greenhouse gas emissions. GHG are associated with consumption of natural gas, fossil fuels, and indirect emissions from purchase of electricity off the San Diego Gas & Electric (SDGE) grid. Generation and beneficial use of digester gas is considered a benefit in the GHG industry. Renewable resources (solar, hydropower, digester gas) are considered environmentally positive.

<u>Near-term Strategies:</u>

- Maintain the current operating permits for the treatment plant, odor scrubbers, emergency internal combustion engine generator, and other permitted equipment.
- Replacement of boilers and digester gas flare stack in the future will require APCD permitting as well as the annual permit fees, annual source testing, and the associated record keeping as currently implemented on the existing permits. SEJPA should determine the APCD requirements for the new equipment prior to replacement.
- Upgrade or replacement of the odor control scrubber will require NSR and new PTOs. SEJPA should determine the APCD requirements for the new equipment prior to replacement.

- GHG impacts are uncertain at this time for small wastewater treatment plants. Although SEJPA has anaerobic digesters, the relatively small digestion gas generation limits the potential "beneficial use" technologies.

3.7 BUILDING CODE REGULATIONS

As part of the condition assessment, an architectural review of the Administration and Operations Building was performed to assess code compliance deficiencies, current office layout and space needs, and any additional space that would enhance the current facilities. The current facilities are shown in Figure 1. The codes that are referenced to evaluate the project's code compliance are the California 2008 Building Energy Efficiency Standards by the California Energy Commission (CEC), the California Building Code (CBC,) and the CBC Chapter 11B for Americans with Disabilities Act (ADA). The CBC is a building code that dictates life and safety measures and how it pertains to the construction and the circulation of a building to make sure the building is safe for occupant use. Additional observations are made regarding site safety and security.

A preliminary workshop was conducted on July 8th, 2014 to collaborate with SEJPA staff and retrieve as much data as possible, and to verify project needs. The workshop included a thorough review of each building, building spaces, and space use. The following sections document the workshop discussion, inspection, and observations.

3.7.1 Operations Building

3.7.1.1 California 2008 Building Energy Efficiency Standards

The plant resides in Cardiff-by-the-Sea, which is in climate zone 7 per the CEC. This building is built from single wythe masonry. Single wythe masonry can only provide thermal resistance up to a maximum value of 2 per ASHRAE 90.1. The building does not have any other form of wall insulation. The CEC prescribes the thermal resistance of the wall to be a minimum R-16 or a U-Value not to exceed 0.059. The CEC prescribes the roof to have a thermal resistance of R-26 or a U-value not to exceed 0.039. The building is deficient for thermal resistance requirements.

The CEC also prescribes requirement for windows. The window U-value required is 0.47. To achieve a value of 0.47, the windows are typically 1" wide, insulated panels with a 1/2" air space and 1/4" outer glass panels. The outer panel is usually tinted and is Low-E. The Solar Heat Gain Coefficient value required is 0.46. The windows are also required to have labels for inspections and certification purposes. The building is deficient in this aspect.

The CEC also has stringent requirement for HVAC and lighting systems. The CEC is continually updating the standards for energy efficiency and the new standards are expected to be released this year. The technology for HVAC systems and lighting systems evolve every year. Based on the year of construction and general observations, it is assumed that the building is also deficient in HVAC and lighting systems.

3.7.1.2 2013 California Building Code (CBC)

The main operation faciliity has two entries. The main entry on the south side of the building and show below, has a steep slope forcing the entry to have a minimum of one other entry to have provisions that meet the American with Dissabilities Act of 1990 (ADA).

The west entry has been retrofitted to have ADA access. The west entry is open and an expansion to the facility is clearly visible from the ceiling. The ceiling, as shown on the picture below, shows extreme signs of corrosion. Since the building is considered to be occupied at this point, this portion of the facility should have sprinklers to ensure the building is equipped with fire suppression per CBC.

Due to the phased construction of the Operations Building over many years, there are portions of the building that do not meet seismic code. This includes the wall to ceiling connections.

3.7.1.3 Occupancy

The operations building facility occupancy is determined by its use. The office space and the laboratory are considered a Type 'B' occupancy. According to the CBC, the allowed occupancy is one person per 100 per square feet. The conference room and the lunchroom are considered to be "Type A" occupancies, with the allowed occupancy defined as one person per 15 square feet. The shop space is considered a Type 'F' occupancy with an allowed occupancy of one person per 300 square feet. The estimated maximum allowable occupancy load per CBC Section 1004.1.2 in the Operations Building is 40 occupants for Type 'A' occupancy, 34 occupants for Type 'B', and 4 occupants for Type 'F' occupancy.

3.7.1.4 ADA (2013 CBC Chapter 11B)

The building overall does not meet ADA requirements. It is deficient in many areas including approaching the facility and accessibility within the facility. The approach to the entrance must not be steeper than a 1:12 (12 feet of distance for every 1-foot or rise). The ramp into the facility, the west entrance, is currently 1:9, which is steeper than allowed. At the point the ramp changes direction a landing that is a minimum 60" x 60" is required for maneuverability. The width of ramp must be at least 48” wide. The handrail must have 12” extensions at each termination. The ramp must have a guide curb on the surface that must be a minimum of 2” high. The entry ramp is deficient in all of these areas.

3.7.1.5 Detailed Observations

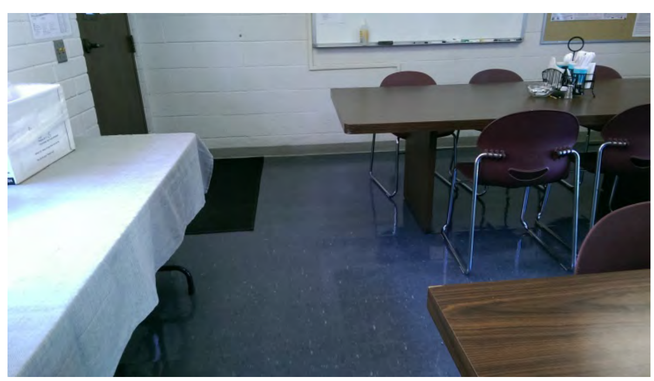
The following sections document the detailed deficiencies noted in each room and area of the Operations Building. Photos are provided to document observed deficiencies.

3.7.1.6 Conference Room Deficiencies

CBC: For “A” assembly type occupancies, per Table 1004.1.1., 15 net square feet per person is required. With the current area of 300 square feet, a maximum of 20 people are allowed to occupy the space. The room currently occupies 22 to 25 people.

ADA: The room requires a 36-inch continuous path of travel for ADA access. In addition, the room requires a 5-foot diameter turn around space. The existing cabinets are 36-inches tall; the height of the cabinets must not exceed 34 inches. The room is deficient in these areas.

3.7.1.7 Lunch Room Deficiencies



CBC: The room’s current size is 340 square feet, allowing for a maximum of 22 people to occupy the space. The exterior door in the room does not meet egress requirement for building code.

ADA: The room does not have any counter space that is 34-inches high to meet ADA. The room must have at least one 5-foot diameter turn around space. The aisles must be at least 36 inches wide while the tables are occupied. The clearance in front of the interior door must have at least 48 inches of clearance for side approach access or 60 inches minimum for forward approach access. The exterior door has the same access requirement as the interior door. The room is deficient in these areas.

3.7.1.8 ADA Restroom Deficiencies

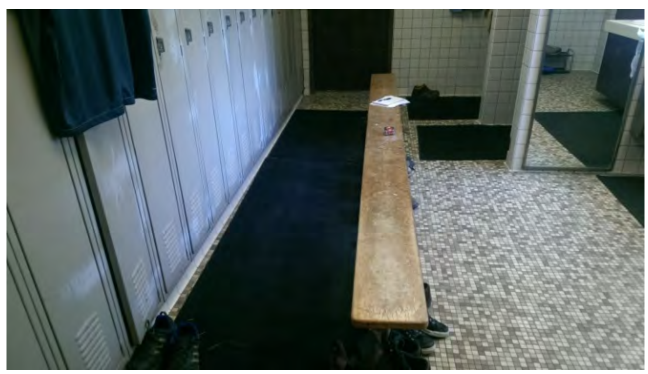
CBC: The last room to be added to the operations building is the ADA restroom. The door must open fully to meet egress requirement per building code. The door does not currently open fully.

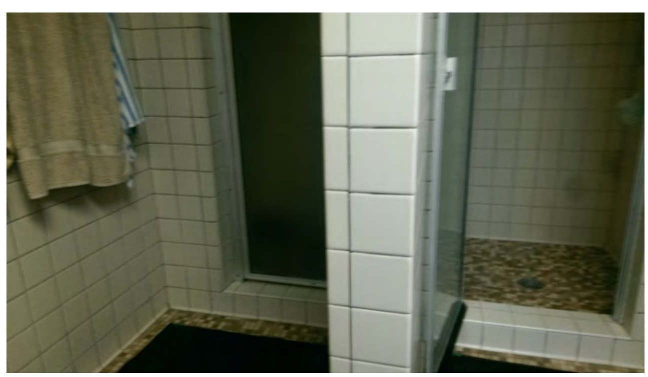
ADA: The restroom must have 48-inches of clearance for a side approach or 60 inches of clearance for a forward approach for accessing the restroom. The restroom must have at least 48 inches of clearance inside the restroom for egress. The restroom requires at least one 5-foot diameter turnaround space. The front of the water closet requires a minimum of 48 inches of clearance between it and the opposing wall. The room is deficient in these areas.

3.7.1.9 Locker Room Deficiencies

ADA: The locker room must have 48 inches of clearance for a side approach or 60 inches of clearance for a forward approach for accessing the restroom. The restroom must have at least 48 inches of clearance inside the restroom for egress. The bench must be at least 36 inches away from the locker or may be directly adjacent to the lockers for accessibility.

The locker room must contain at least one shower that meets ADA requirements. The shower must have at least 60 inches of clearance in front of the shower for maneuverability. The opening into the shower must be a minimum of 36 inches wide. The inside of the shower must be a minimum of 36 inches by 60 inches. The shower is not allowed to have a curb. The maximum threshold at the shower is 1/2-inch with a 1/4-inch tapered slope for entry. The shower must have an ADA approved folding seat. The shower must have an approved ADA showerhead. The shower controls must meet accessibility requirements. The shower requires grab bars.





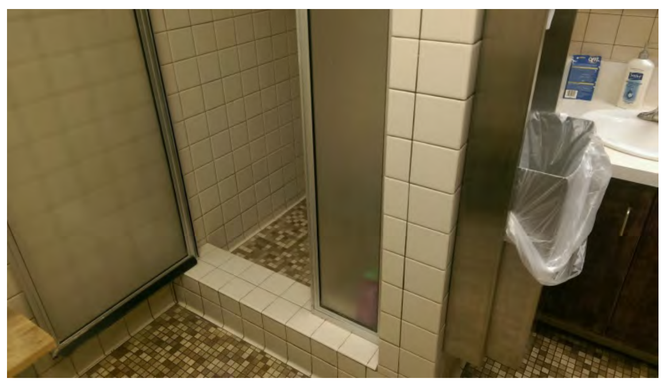
The lavatory height must be a maximum of 34-inches high. A minimum of one lavatory must have knee space. Soap dispensers and hand sanitizers must not exceed 48-inches in reach height. The locker room is deficient in these areas.

3.7.1.10 Men's Restroom Deficiencies

ADA: The restroom stall has a minimum width of 60-inches and a 60-inch minimum depth in front of the water closet. The forward approach into the stall requires a minimum width of 60 inches and 48 inches in front of the water closet; the door must swing out. The maximum mounting height of a toilet paper dispenser is 18 inches above the floor.

The restroom must have 48 inches of clearance for a side approach or 60 inches of clearance for a forward approach for accessing the restroom. The restroom must have at least 48 inches of clearance inside the restroom for egress. A 5-foot diameter turnaround must be within the space.

The lavatory is allowed to be a maximum of 34 inches high. The lavatory is required to have knee space. The maximum reach for items and dispensers for the lavatory is 48 inches high. The restroom is deficient in these areas.



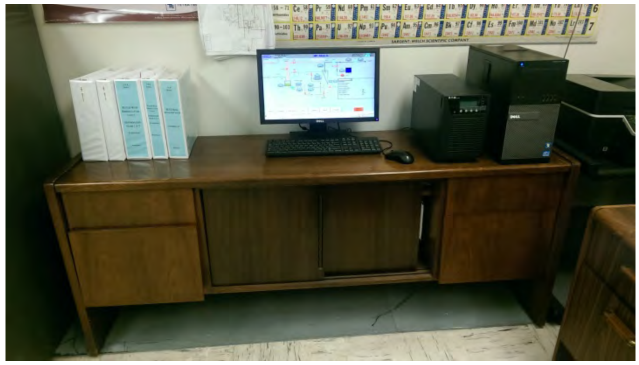
3.7.1.11 Women's Restroom Deficiencies

ADA: The restroom room must have 48 inches of clearance for a side approach or 60 inches of clearance for a forward approach for accessing the restroom. The restroom must have at least 48 inches clearance inside the restroom for egress. A 5-foot diameter turnaround must be within the space.

A minimum of one shower must meet ADA requirements. Refer to the locker room section for the shower requirements.

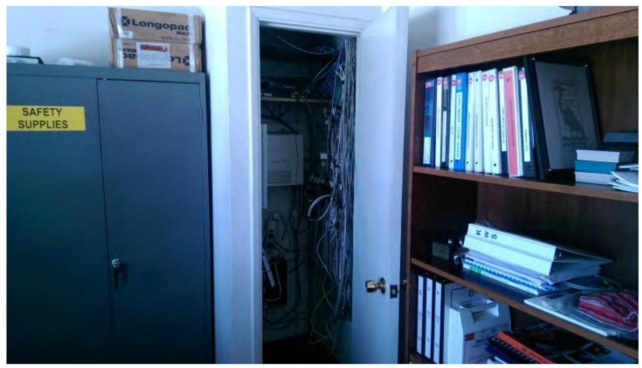
The restroom must meet ADA requirements for at least one lavatory and on restroom stall. Refer to the men's restroom section for ADA requirements for lavatory and the restroom stall. The restroom does not meet any of the requirements listed.

3.7.1.12 Control Room Deficiencies



ADA: The control room must have 48 inches of clearance for a side approach or 60 inches of clearance on the latch side for accessing adjacent rooms. An existing concrete pad in the room prevents this access.

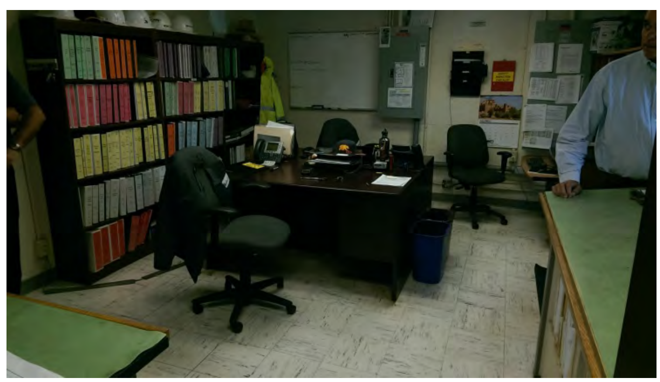
At least one workspace in the room must be provided to allow a maximum height of 34 inches and it must also provide knee space. The adjacent station meets the knee space requirement but exceeds the reach height requirements.



CBC: The corner office is situated between the control office and a workstation room. The room should not have an interior room that may require maintenance by personal or be of a higher hazard than that of the intervening room. Refer to IBC section 1014.2.1.

Egress from the office must egress directly into a corridor or outside to meet exiting requirements. The adjacent control room and the adjacent workstation are considered intervening rooms. The current path egress from this room may be considered a life and safety hazard.

3.7.1.13 Workstation Room Deficiencies



CBC: This room is currently being utilized as an intervening room for egress. Per CBC Section 1014.2.1 intervening spaces are not allowed for egress purposes.

ADA: A minimum 36-inch continuous path of travel that reaches all areas must be provided in this room. The clearance in front of the interior door must have at least 48 inches clearance for side approach access or 60 inches minimum for forward approach access. On the latch side of the door, a minimum of 18 inches adjacent to the door must be unobstructed. On the non-latch side of the door, a minimum of 12 inches adjacent to the much be unobstructed. The workstation room does not meet the requirements noted.

3.7.1.14 Laboratory Room Deficiencies

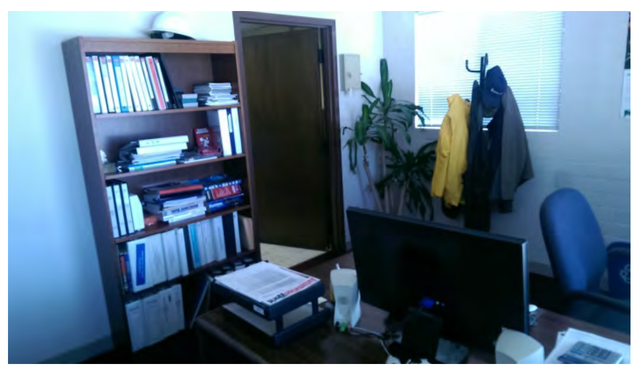
CBC: The laboratory has a means of egress that meets egress requirements per building code. Although the room meets existing requirements, the room's current location does not have direct access and has poor access circulation. The entry to the room is typically through an intervening office. This access is a code violation if it is ever used for egress.

Laboratories have standards and guidelines that are dictated under ANSI/ AIHA Z9.5 Laboratory Ventilation, Federal Register OSHA, NFPA 45 and ASHRAE. The ventilation hoods must meet current standards of 100 feet per second per OSHA regulations. The ventilation hood must exhaust and not re-circulate into the space per NFPA 45.

The current laboratory casework has significant signs of corrosion. Although the building code has no significant requirements on corroding surfaces, the laboratory furniture and equipment should be considered for replacement.

ADA: The internal laboratory circulation is a good representation of clearances required for furniture throughout the facility. The access aisles are adequate width and have adequate turning radii per ADA requirements.

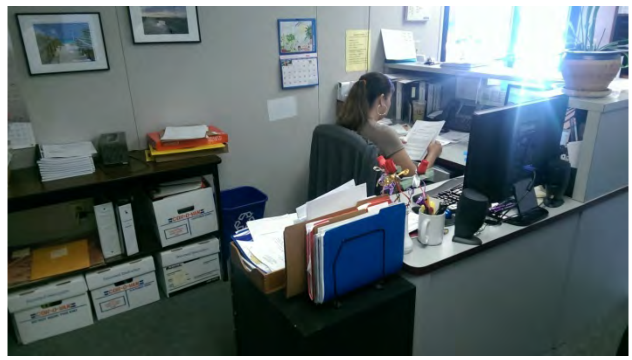
3.7.1.15 General Office Design

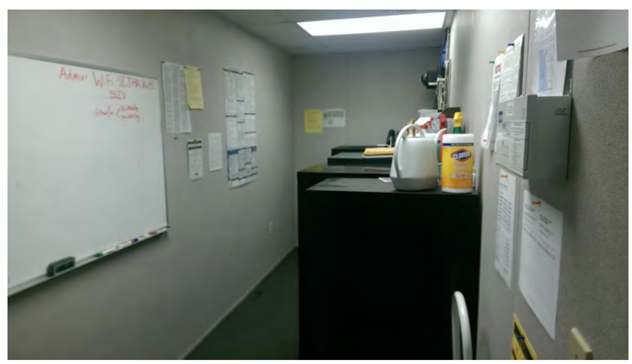


CBC: The CBC classifies offices as Type B or business use occupancy. Per CBC Table 1004.1.2, a maximum of one occupant per 100 square feet or a 10' x 10' office. In the case that more employees need to occupy a building, the square footage of the adjacent circulation space can be used to make up the allowed square footage per occupant. The existing layout prevents having multiple people occupy the same office or repurposing existing space for additional office space.

3.7.2 Administration Facility

3.7.2.1 General Observations





2013 California Building Code (CBC):

The current Administration Building is a modular building that is not physically attached to a foundation. Under Section 3103 of the CBC, this facility would qualify as a temporary structure. Structures that exceed 120 square feet shall not be erected, operated, or maintained without obtaining a building permit from the building official. The building's main entry is also the only means of egress. The entry is achieved by a set of stairs, a landing, and a door. The entry does not comply with ADA requirements into a facility.

The building is occupied and per CBC Section 2902, the minimum plumbing fixtures required is (1) water closet, (1) lavatory, (1) drinking fountain, and (1) service sink. The facility is lacking these facilities.

Per CBC Section 1018, corridors have special requirements. One of the requirements is that all corridors have a fire resistance rating in accordance with CBC Table 1018.1. The corridor has specific width ratios that classify the space as a corridor. This ratio may consider the supply room in the administration building a corridor. Corridors have a maximum travel distance of 20 feet. The facility lacks 60-inch diameter minimum turnaround spaces in each space. The facility lacks a continuous 36-inch (minimum) width access aisles and proper turning radii to due to the congestion of furniture.

The Administration building stair entrance is made out of wood. The type of species for the wood is unknown. The entrance clearly shows signs of termite infestation. The stairs may have to be replaced at some time in the near future, but the extent of the termite residency is unknown. The suspicion is that the termites may have migrated into the administration building frame system. Careful consideration will have to be taken when any future work occurs to properly treat wood when it is exposed or whether exposing wood can be avoided.

3.7.2.2 Occupancy

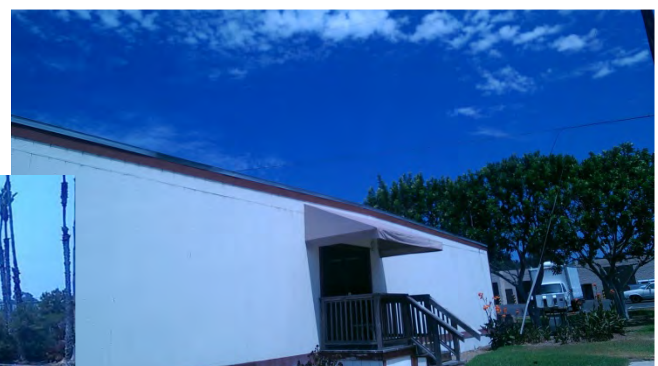
The administration building occupancy is considered Type "B" occupancy, and the estimated maximum allowable occupancy load per CBC Section 1004.1.2 is 8 occupants.

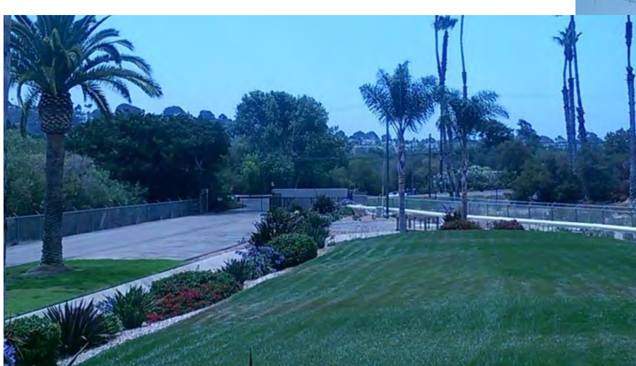
3.7.3 Operations Building and the Administration Facility Safety Observations

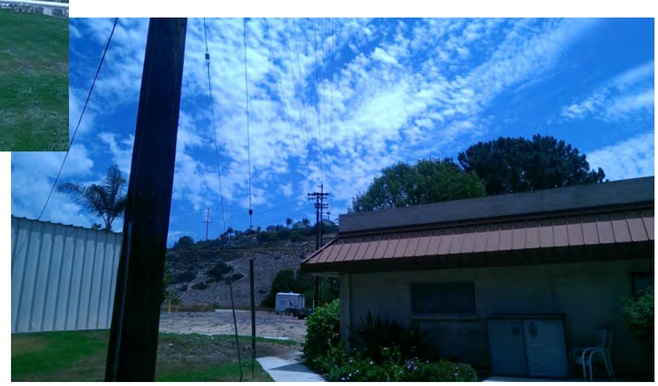
The administration building currently is situated under high voltage overhead power lines. The same high voltage lines pass slightly over the corner edge of the operations building roof. Typically, structures are not allowed to be built directly under the lines at grade level and for a specified distance vertically and diagonally. The location of these power lines are a potential safety or fire hazard.

3.7.4 Site Security

Site Security is important to note because the current location of the operations building and the administration building at the rear of the site can leave the site vulnerable. Since September 11, 2001, the Federal Government has taken strong measures to protect the water and wastewater systems sector under the Homeland Security Act. Consideration should be taken to evaluate and implement the Water Sector-Specific Plan as published by the Environmental Protection Agency and the U.S. Department of Homeland Security's National Infrastructure Protection Plan. In addition to this evaluation, relocation of the operations/ administration facility to the head of the plant should be implemented to develop a strong protection initiative.







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4.1 INTRODUCTION

This Section provides an overview of the condition assessment performed at the SEWRF. Asset condition is reviewed by process area and a discussion of the WAM database update is provided. Finally, the asset risk assessment is provided with discussion on the assessment basis and a review of critical assets.

4.2 METHODOLOGY

4.2.1 Preparation

Prior to visiting the site to perform the condition assessment, the inspection team was provided with record drawings and previous planning and design reports. The existing WAM database was compared against the available documents. New assets were identified and added to the database, while replaced or demolished assets were removed. The WAM database was then used to produce condition assessment forms for the team. Specific forms were prepared for each engineering discipline (process/mechanical, structural, electrical/instrumentation). The forms included common questions specific to each engineering discipline and used to identify potential condition issues for each asset.

4.2.2 Condition Assessment

The SEWRF condition assessment took place on April 22 and 23, 2014. The Carollo inspection team was joined by a group of SEJPA staff made available to answer questions, provide asset maintenance and replacement history, and provide additional general information important to the project. The SEJPA staff and Carollo team members that were involved are provided in Table 4.1 and Table 4.2, respectively.

Table 4.1 SEJPA Staff Members

Staff Member	Role
Michael Thornton, P.E.	General Manager
Christopher Trees, P.E.	Director of Operations
Paul Kinkel	Director of Finance and Administration
Dale Kreinbring	Chief Plant Operator
Mike Henke	Mechanical Systems Supervisor
Casey Larsen	Systems Integration Supervisor

Table 4.2 Carollo Condition Assessment Team Members

Team Member	Title
Jeff Weishaar, P.E.	Project Manager
Daniel Baker, P.E.	Asset Management Specialist
James Doering, P.E.	Structural
Troy Hedlund, P.E.	Electrical/Instrumentation
Farshad Malek, E.I.T.	Staff Engineer

Beginning at the head of the plant and continuing in the direction of process flow, the inspecting team reviewed and evaluated each asset respective to their discipline. Notes and photos were documented and asset conditions were scored on a scale of 1 to 5 with a “1” being consistent with “Pristine; as if brand new” and a “5” meaning “unserviceable; replacement needed.” The Asset Condition Ranking Scale, shown in Table 4.3, is the product of an industry standard derived from the International Infrastructure Management Manual (IIMM). The “Percent Requiring Rehabilitation” value in the table reflects the percent of the assets worth that would need to be spent to bring the asset to a pristine, like new condition.

Additional field visits occurred after the initial condition assessment to review critical assets in more depth. This included a one day review of space needs for the Administration and Operations Building, a one day visit to review the L and Outfall alignment and potential condition assessment testing technologies, and a half-day review of the odor scrubbers.

Table 4.3 Asset Condition Ranking Scale

Ranking	Name	Description[1]	Percent Requiring Rehabilitation[1][2]
1	Very Good	Pristine, brand new	0%
2	Good	Performing well, routine maintenance only	0-10%
3	Fair	Requires increased maintenance	11-20%
4	Poor	Rehabilitation or replacement needed	21-50%
5	Very Poor	Unserviceable (replacement needed)	>50%

Notes
1. Adapted from the International Infrastructure Management Manual.
2. Percent of the value of the asset needed to return the asset to a condition one.

4.3 WAM ASSET INVENTORY AND SOFTWARE

The Wastewater Asset Management (WAM) database developed by Carollo Engineers was used to help develop the previous 2007 Report, and updated for this 2015 Facility Plan. The WAM database is used to store asset information and condition, including condition scores, photos, and notes. Additional information including replacement cost, criticality, vulnerability, and risk scores are also included in the database.

The WAM database is organized by process area and manages asset data within multi-disciplinary sections. Discipline sections, available for each asset, include:

- Mechanical/Electrical/Instrumentation/Piping,
- Structural/Architectural, and
- Civil/Sitework notes for each asset or component.

In each of the discipline sections, there are three tabs available to store information. The tabs, which are the same for all disciplines, include a Main tab, Component Information tab, and a Photo tab. The Main tab includes condition assessment data including the condition score, installation year, replacement value, and useful life categories. The Component Information tab includes the questionnaire information from the condition assessment forms as well a field for tracking comments. Figures 4.1 through 4.4 provide an overview of the available screens in WAM, using Barscreen No. 2 as an example component asset.

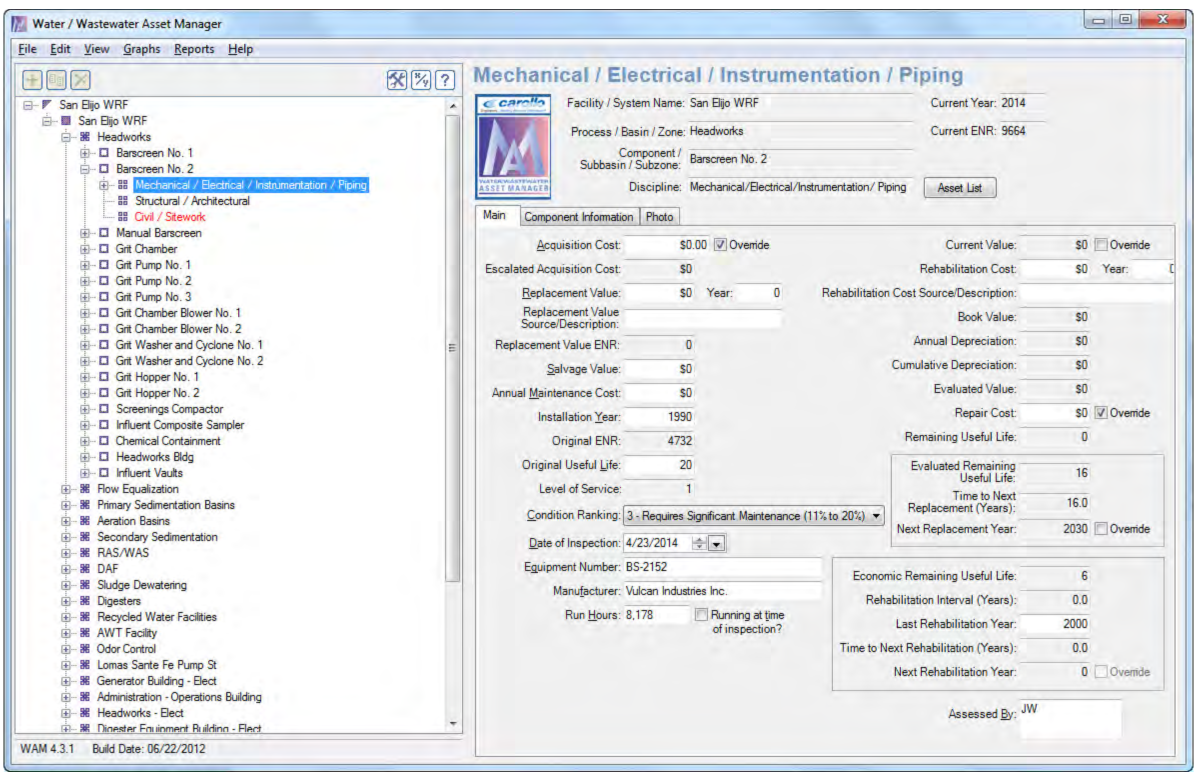

Figure 4.1 Main Section of Mechanical/Electrical/Instrumentation/Piping Discipline Data for Barscreen No. 2

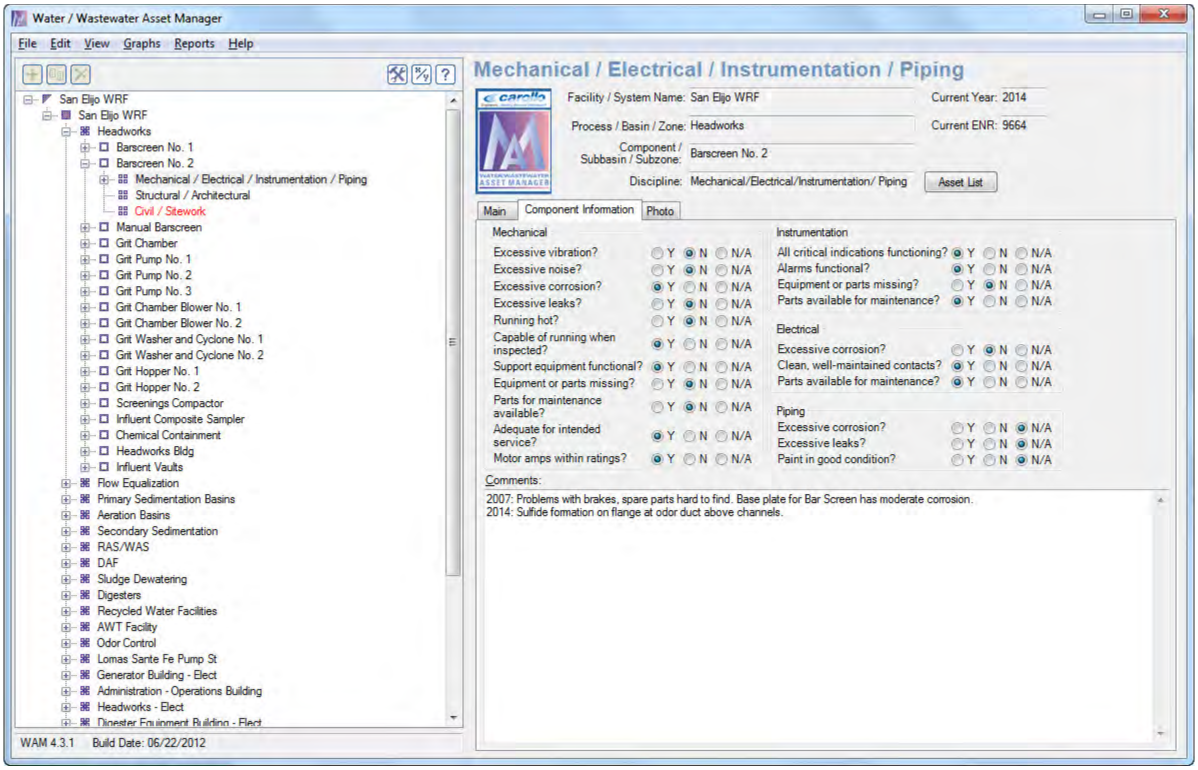

Figure 4.2 Component Section of Mechanical/Electrical/Instrumentation/Piping Discipline Data for Barscreen No. 2

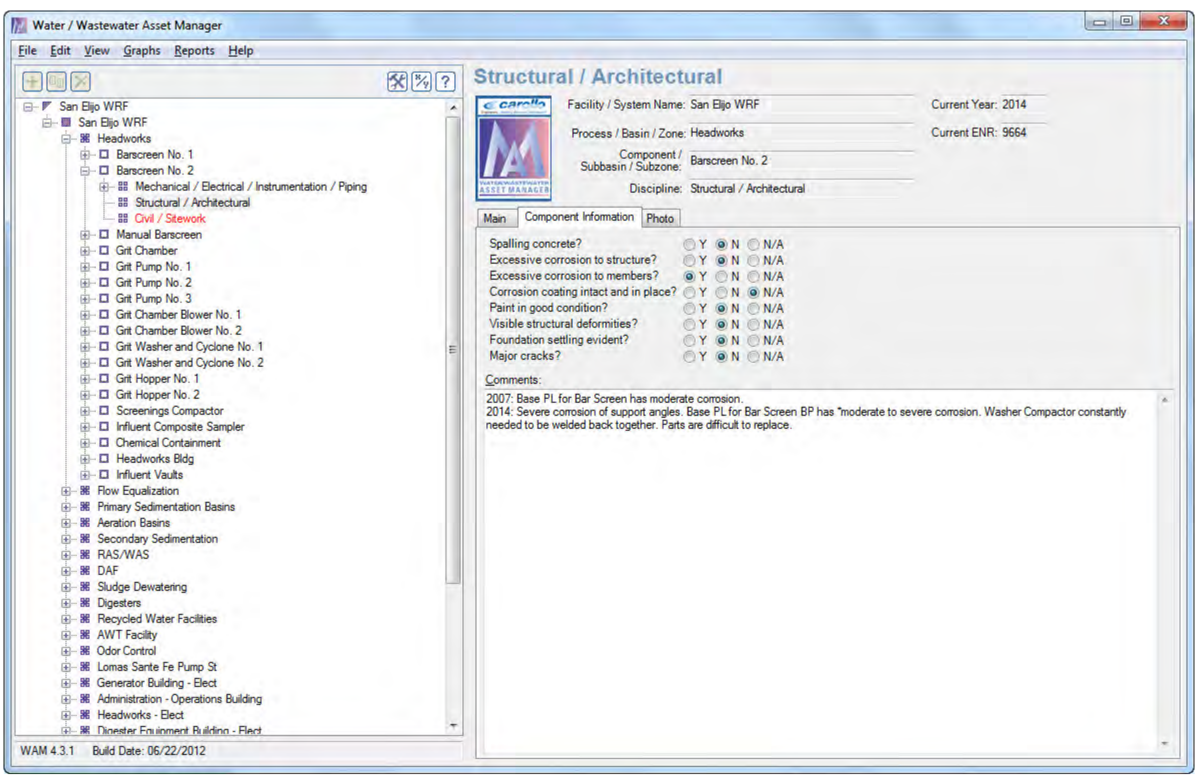

Figure 4.3 Component Section of Structural / Architectural Discipline Data for Barscreen No. 2

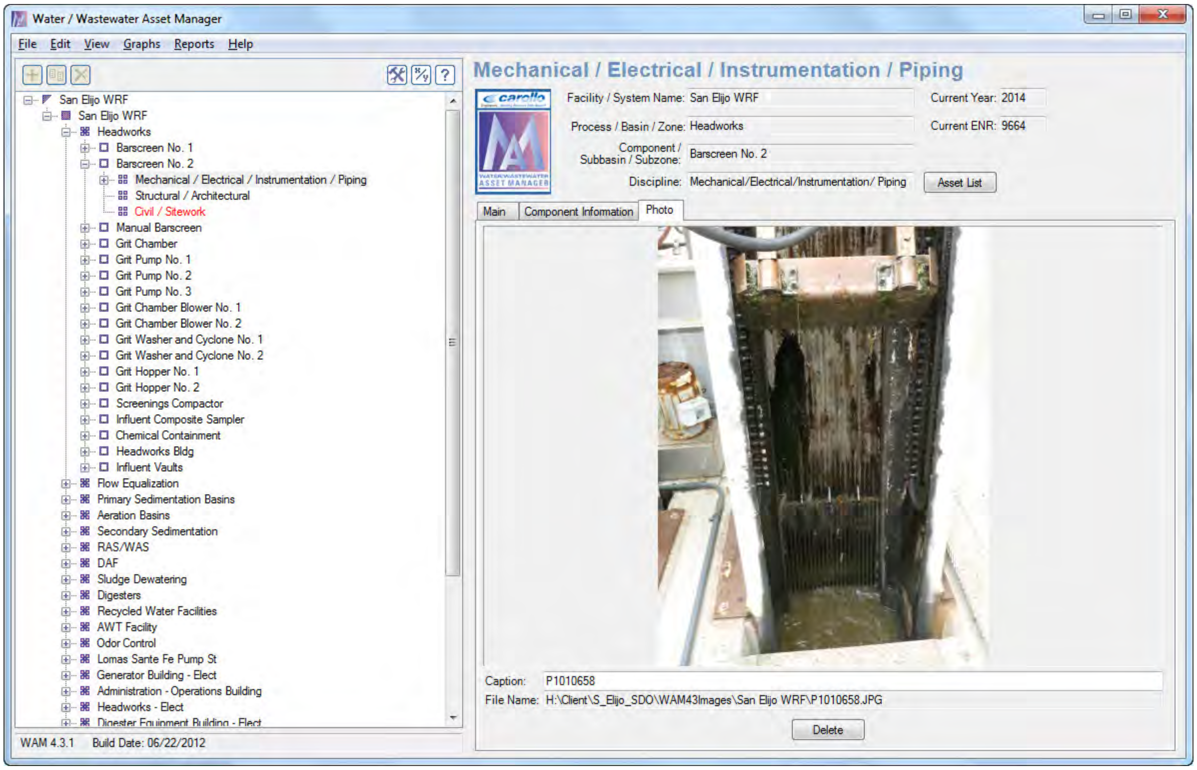

Figure 4.4 Photo Section of Mechanical/Electrical/Instrumentation/Piping Discipline Data for Barscreen No. 2

The asset inventory in WAM was also checked against the asset inventory in SEJPA's eMaint Computerized Maintenance Management System (CMMS) component list to ensure that there was consistency in both databases in regards to equipment and their associated ID numbers. A step-by-step process was then developed by Carollo Engineers to exchange data between the eMaint and WAM databases for the purpose of synchronization between asset inventories.

4.4 CONDITION ASSESSMENT FINDINGS

4.4.1 Headworks

The headworks at the SEWRF consists of three barscreens (two automatic and one manual), a single screenings compactor, two grit washer/cyclones, two grit hoppers, three grit pumps, two grit blowers, and a single grit chamber. The bar screens, installed in 1990, were determined to be in ageing condition and in need of replacement. Structurally, the bar screens exhibit signs of moderate to severe corrosion throughout. Operationally, rocks and bricks have periodically jammed the bar screens, which requires staff to use the manual barscreen and manually rake screenings. The screenings compactor is becoming less reliable and demanding more labor to keep it operating. The auger has recently broken and there is no redundancy when the machine is out of service. The location of the screen discharge into the auger causes rags to wrap and bind the auger rather than getting compacted.

The grit washer/cyclones sit above the grit on the second floor of the Headworks building. One is duty while the other serves as a backup. The cyclones do not present any urgent issues. Minor corrosion is evident on both of the washers and on the discharge of Cyclone No. 1. The grit hoppers show signs of de-lamination, moderate to severe corrosion, and heavily corroded anchor bolts. The hopper gates are no longer operated as they tend to periodically jam with a difficult and dangerous procedure involved to clear the jam.

The grit pumps are located in a vault to the east of the Headworks building. All three are in good working condition. It is recommended that spare parts be stocked to alleviate potential setbacks should one of the pumps require maintenance. The grit chamber blowers are located inside the Headworks building. Both are running smoothly, but show minor corrosion on their piping and motor silencers.

The grit chamber itself is in good operating condition, but there are structural issues that require attention. The grit influent and effluent channels show signs of concrete corrosion and lining failure. The grit chamber aluminum cover has severe corrosion with multiple holes in the cover. It is recommended to install a physical barrier between the aluminum covers and the grit chamber as a temporary fix until the covers can be replaced. The grit effluent channel and primary clarifier influent channel has significant concrete corrosion, and the gate frames are in need of replacement.

4.4.2 Primary Sedimentation Basins

The Primary Sedimentation Basins include two scum pumps, two sludge pumps, a sludge grinder, and six basins each equipped with a sludge collection mechanism and scum collector.

Primary Sedimentation Basins No. 1 and No. 2 are out of service since they are not needed any more. Both basins have areas of moderate to severe corrosion along the drive rails as well as on the concrete of the north and south walls. With severely corroded scum and influent gates, Primary Sedimentation Basin No. 3 was being repaired at the time of inspection. Primary Sedimentation Basins No. 4, No. 5, and No. 6 are operating under good condition with new chains, sprockets, and flights. The sludge and scum collectors are in good condition and continue to operate reliably. The scum pumps are in good condition with minor issues that do not threaten operation. The sludge grinder and the two primary sludge pumps were installed within the last five years and show no areas of concern.

The Return Flow Pump Station is located south of the primary sedimentation basins, operating with three submerged return flow pumps that pump belt filter press filtrate, washwater from the AWP facility, and other plant drainage back to the primary influent. The submerged pumps could not be closely inspected. They were noted by plant staff to be operating in good condition, but considerable corrosion is still visible on the discharge pipes and pump rails. Space for a fourth pump exists and staff noted a capacity concern due to the added flow from the AWP. A study of current and future flows is recommended.

4.4.3 Flow Equalization

Flow equalization at the SEWRF includes two Flow Equalization Basins (FEB), a splitter box, and a Flow Equalization Pump Station. The Flow Equalization Pump Station includes five vertical turbine pumps and two motor operated valves (MOV).

New covers were installed for each of the equalization basins in early 2014. New check valves have been added to each of the five flow equalization pumps, all of which were operating in good condition upon inspection. The FEB Control Building is in good condition overall, but shows minor settlement on the north side of the building that faces the primary sedimentation basins. Abandoned electrical equipment remains to be cleaned out, but the existing electrical equipment was determined to be in good condition. The VFDs for the pumps and MCC-J are missing arc flash labels. The PLC control panel has several openings that require cover plates to reduce the risk of shock hazard.

4.4.4 Aeration Basins

There are four aeration basins in total, six blowers, a drain well and drain pump. Air inlet to the blowers is filtered through two filters. Basin No. 1 is not operated while Basin Nos. 2 and 3 are fitted with baffle walls to create selector zones. Basin No. 4, which was constructed for future use, is not fitted with diffusers or piping.

Aeration Blower Nos. 1 and 2 were tagged out and being used for their spare parts, while Blower No. 5 has been removed. Blower Nos. 3 and 4 are operating but are reportedly reaching the end of their useful lives and are difficult to maintain. Blower No. 6 is the most recently installed blower and was operating without issue. The drain pump in the drain well was inaccessible during the assessment as it was submerged, but rehabilitation or replacement is forecasted as corrosion can be seen on the discharge pipe and on the pump rail.

4.4.5 Secondary Sedimentation

There are five secondary sedimentation basins at the SEWRF, each equipped with sludge and scum collectors. The secondary sedimentation basins are reported to operate well but do show some signs of corrosion. The weir troughs, inlet baffles, effluent drop boxes, and the return activated sludge (RAS) channel all show signs of moderate to severe corrosion and are in need of rehabilitation. The scum collectors are all in poor condition, with issues ranging from corroded shafts to leaking valves and gaskets. Additionally, the scum collectors are installed at the wrong elevation and do not effectively move scum without substantial operator effort. Automation of the scum trough tipping system is recommended.

4.4.6 RAS/WAS

The Blower Building contains five RAS pumps, two waste activated sludge (WAS) pumps, and a secondary scum pump. Two of the five RAS pumps are missing VFD units and are not operable. The remaining three RAS pumps and the two WAS pumps are in good working condition. The secondary scum pump operates on a float without a VFD, and can also be used as a backup WAS pump. However, the pump is oversized for pumping to the DAFs and must be manually throttled when used in this manner. WAS Pump No. 1 is undersized, and an order for replacement has been issued to improve system redundancy and reliability.

4.4.7 DAF Thickening

The dissolved air flotation (DAF) system thickens WAS prior to digestion. The SEWRF uses two DAF tanks, each equipped with a rotating mechanism and a recirculation/pressurization system. A polymer feed pump is installed in the Sludge Dewatering Building. The mechanism for DAF No. 1 and DAF No. 2 are both recommended for recoating. The DAF No. 2 drive is still original, and in need of leak repair on the top of the shaft. All three of the thickened sludge pumps are reaching the end of their useful lives. The pumps are aged, the belt drives are beginning to fail, and spare parts are difficult to stock.

4.4.8 Sludge Dewatering

The Sludge Dewatering Facility includes three belt filter press feed pumps located near the digesters, a dewatered solids conveyor on the first floor, two belt filter presses installed on a raised mezzanine, and two adjacent sludge cake hoppers in a tower just outside of the second floor. The building roof deck and the mezzanine framing are in poor condition, showing moderate to severe corrosion. The belt filter press drive motors and belts fail regularly due to corrosion issues. Electrical gear in the building has severe corrosion. The control panel was corroded shut preventing interior inspection. The three belt filter press feed pumps are in poor condition as well, and in need of replacement. The speed of the pumps must be adjusted manually, and one of the pumps will stop running altogether when operated at low speed. Spare parts are also becoming difficult to find. The sludge cake hoppers have small through-wall corrosion and minor corrosion on framing, valves, and anchor bolts.

4.4.9 Digesters

The digestion system at the SEWRF consists of four digesters, two digester mix pumps, four heat exchangers, five sludge circulation pumps, four gas compressors, two boilers, two waste gas flares. Digester No. 1 and its associated equipment have been taken offline. The digester exhibits severe corrosion and spalling at both manholes, and moderate corrosion on the cover plate in the center of the roof. Digester No. 2 has a floating cover while the others all have concrete domes. The floating cover guides are out of alignment and corrosion is evident on the cover itself. During inspection, the cover was low enough for the digester lining to be visible. The lining is failing in multiple locations. The manhole access cover at Digester No. 3 is severely corroded and the center cover seal appears to have failed. The cold joint connecting the walls to the dome on Digester No. 4 also appears to have failed.

Heat Exchanger No. 1 serving Digester No. 1 was not in service at the time of inspection. The remaining three heat exchangers were online. Heat Exchanger Nos. 3 and 4 are in need of re-piping. Boiler No. 1, which uses methane, is in good working condition. Boiler No. 2 uses natural gas and is undersized, providing a lack of redundancy.

The hot water supply pumps are in excellent condition. Sludge Circulation Pump No. 4 was recently replaced with a Vaughan chopper pump in 2012 and has since been running well. The remaining sludge circulation pumps are anticipated to be replaced with new chopper pumps once they begin to fail as spare parts are becoming increasingly difficult to find. The gas compressors and waste gas burners are all in good working condition, however instances of minor corrosion were noted on some components. Gas Compressor No. 3 shows minor corrosion on its silencer. Gas Compressors Nos. 4 and 5 show minor corrosion on their belt covers, and have had new silencers and blowers installed in 2010.

4.4.10 Recycled Water Facilities

Secondary effluent at the SEWRF is sent to the advanced water treatment process or the recycled water facilities where it is filtered prior to disinfection. The recycled water facilities at the plant consist of a filter feed wet well, three filter feed pumps, an alum storage tank, a flocculator, two air compressors, two submersible backwash pumps, four continuous backwash sand filters, and a control building. The components of the recycled water system, most of which were installed in 2000, are in good working condition.

The filters appear in good condition, though the internals were not visible during the assessment. The filter feed pumps were all in good condition with no deficiencies noted during the inspection. The process control enclosures atop the filters showed signs of UV damage due to a lack of sun protection. It is recommended that shade be provided for the enclosures to ensure the longevity of the electrical components. The alum storage tank can also be shaded to protect and prevent the coating and temperature of the tank from being negatively affected by the sun.

The Recycled Water Control Building is in good shape, with no immediate structural concerns. The door on the south end of the building however is severely corroded, and the interior partition wall may need to be checked for lateral support. The electrical components inside of the control building, including the reclaimed water pump variable frequency drives, all appear to be in good condition.

4.4.11 Advanced Water Purification Facility

The Advanced Water Purification (AWP) facility was installed at the SEWRF in early 2013. The AWP treats a side stream of secondary effluent though microfiltration (MF) and RO membranes.

The MF system consists of four feed pumps, two MF trains (A and B), two bleach dosing pumps, two coagulant chemical feed pumps, a CIP tank, and various chemical feed and instrumentation panels. The RO system consists of three booster pumps, a break tank to store MF product water and control flow to the two RO trains (A and B), a CIP tank and pump, and various chemical feed and instrumentation panels. No major concerns were uncovered during the condition assessment. The MCC for the AWP facility requires a serial converter in order to allow the power monitor to become integrated with the SCADA system.

4.4.12 Disinfection Facilities

The disinfection facilities include the chlorine contact basin, sodium hypochlorite storage and feed equipment, and a mixer. The distribution pumps are also installed at the end of the chlorine contact basin. The interior of the contact basin was not inspected as the basin was in operation during the assessment. The exterior of the tank was in good condition with no notable issues of concern. The sodium hypochlorite storage tank was noted to exhibit moderate corrosion on the anchor plates. The chemical metering pumps were in good condition although a sun shade should be installed over the pumps. The reclaimed water pumps should be considered for replacement or a re-build. Reclaimed Water Pumps Nos. 1 and 2 appear to have some minor vibration issues that will only get worse over time. The soft starter for Reclaimed Water Pump No. 2 is recommended for replacement and a crack was noted at the shroud of Reclaimed Water Pump No. 3. Overall, the pumps are at least seventeen years old and have never been refurbished, according to plant staff. The rapid mixer had previously shown signs of moderate corrosion inside of the motor enclosure, but has since been repaired.

4.4.13 Odor Control

There are two odor control facilities installed at the SEWRF. One is installed near the Headworks Building and treats foul air pulled from the Headworks Facilities, Grit Chambers, Grit Building, and Primary Sedimentation Basins. The second is installed near the Dewatering Building and treats foul air from the Dewatering Building, under the FEB covers, and DAF thickeners. Each facility includes a packaged odor tower, a caustic storage tank, a scrubber fan, and two scrubber recirculation pumps. The scrubber in the dewatering building is equipped with a sodium hypochlorite storage tank and an associated pump, which have been abandoned. SEJPA is able to operate Scrubber No. 2 without using chemicals. Scrubber No. 1 still uses caustic but no longer uses sodium hypochlorite. The use of reclaimed water, with a chlorine residual, has allowed staff to move away from using sodium hypochlorite in the scrubber. The scrubber recirculation pumps at the headworks are nearing the end of their useful lives, as repair parts are available but just as costly as a new pump. Scrubber No. 1 recirculation pumps have seals that are failing and show evidence of calcium buildup. Neither pump has a fail alarm linked with SCADA. Scrubber No. 2 recirculation pumps are considered to be in good working condition.

As part of this project, Carollo Engineers and DHK Engineering provided an odor assessment in response to a single point permit violation of hydrogen sulfide levels at Scrubber No. 1. The assessment focused on scrubber operation, performance, and a review of the damper balancing. The assessment found the scrubber to be in good condition and provided recommendations to improve performance. Refer to the report for additional information.

4.4.14 Plant Power/Critical Electrical Components

The electrical components at the SEWRF are mostly in good condition. A recent project was completed in 2012 to upgrade most of the electrical gear associated with the headworks and primary treatment processes. The new gear was located in a new building adjacent to the primary sedimentation basins. The project also installed a new switchgear for the main service entrance and new automatic transfer switches in the Generator Building. Another project, underway during the course of preparing this report, has replaced the aging standby power generators with one single unit, sized to handle all of the plant standby power load. The main areas of concern include the Odor Scrubber No. 1 control panel, which is severely corroded. Replacement parts for Main Switchboard MS-2 are difficult to find and the breakers are difficult to remove. In MCC-L, Reclaimed Pump No. 2 soft starter needs replacement, and the Reclaimed Water PLC should be retrofitted with a backup battery power supply.

4.4.15 Effluent/Outfall

The ocean outfall pumping station is located near the center of the plant. It contains a wet well, three effluent pumps (with space for four), and an effluent composite sampler. No issues were identified during the assessment. Staff reports the pumps to operate well, and the wet well concrete is in good condition. There is space for a fourth pump to be installed. Previous consideration has been given to installing a smaller horsepower pump to reduce electrical demand when pumping through the outfall. However, the frequency and duration of pumping is low enough that it is doubtful the electrical savings would outweigh the cost of the pump installation.

The Escondido Regulator Structure located on the opposite side of Manchester Avenue was also evaluated as part of the condition assessment. No major issues of concern were noted by plant staff, and no deficiencies were determined during the assessment. Shallow puddles and spots of minor corrosion on the concrete floor slab in the center of the structure suggest water leakage from the metal covers directly above. All piping and equipment, however, appear to be well coated and in good working order.

4.4.16 Buildings

The Administration and Operations Buildings are both currently serving their intended functions. Notable deficiencies' and concerns for the building were previously covered under Section 3. The buildings exhibit potential code compliance issues related to occupancy and general access. The Administration Building lacks a permanent foundation and high-voltage power lines are installed above the building. There is also a lack of proper fire safety and exit signage throughout the buildings.

It was also noted that the asphalt pavement around the area and the plant in general is in need of repair. Implementing a regularly scheduled asphalt repaving and sealing maintenance item is recommended. Repairs and resealing every five years is recommended.

4.5 RISK ASSESSMENT

Capital improvement planning for rehabilitation and replacement activities is based on lowering the risk exposure of the SEWRF to maintain SEJPA's vision. The magnitude of risk that SEJPA is exposed to by each asset at the SEWRF is estimated (and quantified) by taking the product of two metrics: vulnerability and criticality. Vulnerability, defined as the possibility of failure, is based on asset condition and performance. Criticality is defined as the consequence of failure. As a result of the SEWRF condition assessment and with consideration of asset criticalities, Carollo and SEJPA have worked together to make the resulting risk determinations. The resulting risk scores (by assets) are automatically calculated in Carollo's WAM program. The following sections describe the variables used in assessing risk and the approach used to determine final scoring.

4.5.1 Original Useful Life

The Original Useful Life (OUL) of an asset represents the amount of time it is estimated to function properly under standard maintenance before becoming unserviceable. The estimated lives of each asset were based upon both technical experience and industry trends, and were subject to review by SEJPA in order to account for any trending equipment deficiencies that might exist throughout the plant. The OULs used in the risk assessment are shown in Table 4.4. The OULs were used in conjunction with the condition scores to produce an evaluated remaining useful life for each component, resulting in a projected replacement year and vulnerability rating for each component.

Table 4.4 Original Useful Life

Category	Original Useful Life
Chemical Equipment	15
Civil/Sitework	50
Electrical	30
HVAC	15
Instrumentation	15
Mechanical	20
Pump - Wastewater	15
Structural - Concrete	50
Structural - Fiberglass	25
Structural - Plastic	10
Structural - Steel	25
Valve	35

4.5.2 Remaining and Evaluated Remaining Useful Life Estimates

The Remaining Useful Life Estimate (RUL) is a straight line calculation of the years remaining based on the installation date, original useful life, and the current year. A separate estimate, called the evaluated remaining useful life (EvRUL) is calculated for each component based on the OUL and the condition scores. The EvRUL ignores the original installation date of the asset, and is calculated according to the following:

EvRUL = Condition Fraction x Original Useful Life

The Condition Fraction is based on the condition score, as shown in Table 4.5. For example, if a pump installed in 2000 has an OUL of 20 years and was given a condition score of “3,” it would have a straight RUL 6 years as opposed to a calculated EvRUL of 16 years. The EvRUL is typically a more representative estimate of the true remaining useful life of an asset, as it is based on the current observed condition of the asset, and recognizes that most assets will outlive their original useful life with proper maintenance.

Table 4.5 Condition Fractions

Condition Rating	Condition Fraction
1	1
2	0.9
3	0.8
4	0.6
5	0.1

4.5.3 Vulnerability Assessment

The vulnerability of an asset is defined as ten times the inverse of the evaluated RUL. The inverse is multiplied by ten to bring the vulnerability rating to a ten-point scale to match the same ten-point scale used in the criticality assessment.

Many of the assets with the highest vulnerability include those that are no longer operating because of condition, such as RAS Pump Nos. 1 and 2, Aeration Blower Nos. 1 and 2, Digester No. 1, and the chemical storage tanks associated with Odor Scrubber No. 2. In-service assets with high vulnerability scores are many of the assets noted previously to be in poor condition. This includes the belt filter presses, the mechanical barscreens, the screenings compactor, the return flow pumps, the Secondary Sedimentation Basin scum collectors, the thickened sludge pumps, and the Digester Sludge Circulation Pumps Nos. 2, 3, and 5.

4.5.4 Criticality Assessment

The criticality of each asset is an essential element to evaluate the consequence of asset failure throughout the facility. Four criticality categories were selected for SEJPA's assets. Table 4.6 presents the criticality matrix used to rate each asset.

Table 4.6 Criticality Matrix

Criticality Ranking Scale			
Criticality Category	Weight	Description	Rating
Health and Safety of Public and Employees	30%	No injuries or adverse health effects	1
		No lost-time injuries or medical attention	4
		Lost-time injury or medical attention	7
		Potential for loss of life	10
Financial Impact	20%	Absorbed within budget line item (< $10,000)	1
		Requires Purchasing Agent approval ($10,000 to $50,000)	4
		Requires General Manager approval ($50,000 to $100,000)	7
		Requires Board approval, new borrowing, or impacts rates (> $100,000)	10
Impact on Environment or Regulatory Compliance	30%	100% compliance with permits & no impact on environment	1
		Violation but no enforcement action &/or minor impact on environment	4
		Violation with minor enforcement action &/or moderate impact on environment	7
		Enforcement action with fines &/or major impact on environment	10
Effect on Service to Customers	20%	No impacts on service delivery; Redundant asset available or service restored in < 2 hours	1
		Minor disruption; Service restored in 2 to 8 hours	4
		Short-term impact and/or substantial disruption; Service restored in 8 to 24 hours	7
		Long-term impact and/or area-wide disruption; Not able to restore service for > 24 hours	10

Assets of most critical importance, based on the criticality assessment include the ocean and land outfall pipes at the top of the list. Additional critical assets include the effluent pumps, the various treatment basins, and the plant electrical gear.

4.5.5 Risk Assessment

The risk of asset failure considers the criticality, condition, and remaining life of each asset, and was used to help prioritize the need for asset rehabilitation or replacement. Risk is calculated as:

Risk = Vulnerability x Criticality

The resulting risk assessment has produced a list of priority assets that should be considered for replacement. These assets are used as the basis of creating capital improvement projects. Assets are grouped together according to process area or functionality to form larger projects that can then be compared to other CIP projects to determine budgeting and implementation needs. These assets are shown in Table 4.7 and listed according to process area. The list has been trimmed to remove out of service assets that will not be returned to service such as Aeration Blower Nos. 1 and 2 and Digester No. 1. CIP projects are identified in Section 5 and ranked in Section 6.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Headworks	Barscreen No. 1	4	$701,000	4.33	Replace	Condition.
Headworks	Barscreen No. 2	4	$701,000	4.33	Replace	Condition.
Headworks	Screenings Compactor	4	$210,000	3.08	Replace	Corrosion. Lacks controls. Lacks redundancy.
Headworks	Grit Chamber	4	$321,000	2.23	Rehab	Influent & effluent channels require repair. Chamber concrete requires repair. New cover required. Replace cover channel cover rebates and stop plate guides.
Headworks	Manual Barscreen	3	$28,000	0.80	Replace	Install new mechanical unit to improve plant operations.
Primary Sedimentation Basins	Return Flow Pump No. 1	3	$70,000	3.08	Rehab	Discharge pipe and pump rails require replacement due to corrosion. Pump No 4 should be installed.
Primary Sedimentation Basins	Return Flow Pump No. 2	3	$70,000	3.08	Rehab	Discharge pipe and pump rails require replacement due to corrosion. Pump No 4 should be installed.
Primary Sedimentation Basins	Return Flow Pump No. 3	3	$70,000	3.08	Rehab	Discharge pipe and pump rails require replacement due to corrosion. Pump No 4 should be installed.
Primary Sedimentation Basins	Primary Sedimentation Basin No. 3	3	$1,288,000	1.90	Rehab	Repair localized concrete corrosion. Replace influent and scum gate.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Aeration Basins	Aeration Blower No. 1	5	$281,000	14.00	Remove	Not operating. Being used for parts. Remove until new unit needed due to age of other units or increased demands.
Aeration Basins	Aeration Blower No. 2	5	$281,000	14.00	Remove	Not operating. Being used for parts. Remove until new unit needed due to age of other units or increased demands.
Aeration Basins	Aeration Blower No. 3	4	$281,000	4.58	Remove	End of useful life. Replace with high efficiency blower.
Aeration Basins	Aeration Blower No. 4	4	$281,000	4.58	Replace	End of useful life. Replace with high efficiency blower.
Aeration Basins	Aeration Basins Drain Pump	4	$56,000	1.78	Replace	Operational issues reported by staff. Shelf spare needed.
Aeration Basins	Aeration Filter Bank No. 1 - South	3	$14,000	1.00	None	Units are oversized based on current demands.
Aeration Basins	Aeration Filter Bank No. 2 - North	3	$14,000	1.00	None	Units are oversized based on current demands.
Secondary Sedimentation	Secondary Basin No. 1 Scum Collector	4	$42,000	3.08	Replace	Corrosion and installation issues. Correct installed elevation for better scum capture. Tippers should be automated.
Secondary Sedimentation	Secondary Basin No. 2 Scum Collector	4	$42,000	3.08	Replace	Corrosion and installation issues. Correct installed elevation for better scum capture. Tippers should be automated.
Secondary Sedimentation	Secondary Basin No. 3 Scum Collector	4	$42,000	3.08	Replace	Corrosion and installation issues. Correct installed elevation for better scum capture. Tippers should be automated.
Secondary Sedimentation	Secondary Basin No. 4 Scum Collector	4	$42,000	3.08	Replace	Corrosion and installation issues. Correct installed elevation for better scum capture. Tippers should be automated.
Secondary Sedimentation	Secondary Basin No. 5 Scum Collector	4	$42,000	2.33	Replace	Corrosion and installation issues. Correct installed elevation for better scum capture. Tippers should be automated.
Secondary Sedimentation	Secondary Sedimentation Basin No. 1	3	$1,859,000	1.38	Rehab	Repair corrosion at drop boxes. Repair and coat or replace effluent launders. Repair corrosion in RAS channel.
Secondary Sedimentation	Secondary Sedimentation Basin No. 2	3	$1,859,000	1.38	Rehab	Repair corrosion at drop boxes. Repair and coat or replace effluent launders. Repair corrosion in RAS channel.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Secondary Sedimentation	Secondary Sedimentation Basin No. 3	3	$1,859,000	1.38	Rehab	Repair corrosion at drop boxes. Repair and coat or replace effluent launders. Repair corrosion in RAS channel.
Secondary Sedimentation	Secondary Sedimentation Basin No. 4	3	$1,859,000	0.70	Rehab	Repair corrosion at drop boxes. Repair and coat or replace effluent launders. Repair corrosion in RAS channel.
Secondary Sedimentation	Secondary Sedimentation Basin No. 5	3	$1,859,000	0.70	Rehab	Repair corrosion at drop boxes. Repair and coat or replace effluent launders. Repair corrosion in RAS channel.
RAS/WAS	RAS Pump No. 1	5	$70,000	14.67	Remove	Not operating. Being used for parts. Remove until new unit needed due to age of other units or increased demands.
RAS/WAS	RAS Pump No. 2	5	$70,000	14.67	Remove	Not operating. Being used for parts. Remove until new unit needed due to age of other units or increased demands.
RAS/WAS	Secondary Scum Pump No. 1	3	$28,000	1.33	Replace	Serves as backup WAS pump but is undersized for that service. Replace with larger unit on VFD.
DAF	Thickened Sludge Pump No. 1	3	$56,000	2.58	Replace	Age and operational issues. Spare parts are hard to find. Consider alternative technology.
DAF	Thickened Sludge Pump No. 2	3	$56,000	2.58	Replace	Age and operational issues. Spare parts are hard to find. Consider alternative technology.
DAF	Thickened Sludge Pump No. 3	3	$56,000	2.58	Replace	Age and operational issues. Spare parts are hard to find. Consider alternative technology.
DAF	DAF No. 2 Drive	4	$238,000	2.33	Rehab	Drive is original. Replace prior to failure. Coat mechanism.
DAF	DAF Compressor No. 1	3	$14,000	2.13	Remove	Remove or keep as spare once new Pressurization Pump is installed at DAF No. 2.
DAF	DAF Compressor No. 2	3	$14,000	2.13	Remove	Remove or keep as spare once new Pressurization Pump is installed at DAF No. 2.
DAF	DAF No. 1 Drive	3	$238,000	1.75	Rehab	Coat mechanism.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Sludge Dewatering	Sludge Cake Conveyor	5	$351,000	36.50	Replace	Underway. New conveyor scheduled for delivery in December of 2014.
Sludge Dewatering	B.F.P. No. 1	4	$1,122,000	5.58	Replace	Age and condition. Consider alternative technologies.
Sludge Dewatering	B.F.P. No. 2	4	$1,122,000	5.58	Replace	Age and condition. Consider alternative technologies.
Sludge Dewatering	Sludge Cake Hopper	4	$701,000	5.47	Rehab	Structural rehab needed with seismic evaluation. Consider installing full size scale (currently only have rear-axle scale).
Sludge Dewatering	Belt Filter Press Feed Pump No. 1	4	$70,000	5.11	Replace	Age. Better controls are needed to improve operations. Parts are difficult to find outside of plant workshop. Consider alternative technologies.
Sludge Dewatering	Belt Filter Press Feed Pump No. 2	4	$70,000	5.11	Replace	Age. Better controls are needed to improve operations. Parts are difficult to find outside of plant workshop. Consider alternative technologies.
Sludge Dewatering	Belt Filter Press Feed Pump No. 3	4	$70,000	5.11	Replace	Age. Better controls are needed to improve operations. Parts are difficult to find outside of plant workshop. Consider alternative technologies.
Sludge Dewatering	Sludge Dewatering Bldg	4	$1,532,000	1.53	Rehab	Check connections at roof and walls. Repair mezzanine and corrugated roof deck corrosion. Repair corrosion around windows and louvers.
Sludge Dewatering	Hydraulic Power Unit No. 1	3	$7,000	1.00	Rehab	Requires coating.
Sludge Dewatering	Hydraulic Power Unit No. 2	3	$7,000	1.00	Rehab	Requires coating.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Digesters	Digester No. 1	5	$2,081,000	5.60	None	Asset is in need of extreme rehab but is not used under current operations. Consider rehab due to operational needs (increased solids and redundancy).
Digesters	Boiler No. 2	3	$281,000	4.38	Replace	Increased maintenance for siloxane removal. Undersized for demands, which create redundancy issues. Cannot run on digester gas.
Digesters	Heat Exchanger No. 2	3	$140,000	3.06	Rehab	Rehab/clean to improve heat transfer. Replace if cleaning has no effect.
Digesters	Heat Exchanger No. 3	3	$140,000	3.06	Rehab	Rehab/clean to improve heat transfer. Replace if cleaning has no effect.
Digesters	Heat Exchanger No. 4	3	$140,000	3.06	Rehab	Rehab/clean to improve heat transfer. Replace if cleaning has no effect.
Digesters	Sludge Circulation Pump No. 2	3	$28,000	2.58	Replace	Replace. Corrosion and spare parts difficult to find. New pump should be chopper style.
Digesters	Sludge Circulation Pump No. 3	3	$28,000	2.58	Replace	Replace. Corrosion and spare parts difficult to find. New pump should be chopper style.
Digesters	Sludge Circulation Pump No. 5	3	$28,000	2.58	Replace	Replace. Corrosion and spare parts difficult to find. New pump should be chopper style.
Digesters	Digester No. 2	4	$2,081,000	2.03	Rehab	New floating cover and guides. Interior coating. Consider fixed cover.
Recycled Water Facilities	Reclaimed Water Pump No. 3	3	$281,000	3.08	Rehab	Rehab pump and motor due to corrosion and cracking at the motor shroud.
AWP Facility	Sodium Hypochlorite Tank	4	$98,000	2.47	Repair	Structural repairs needed around tank. Tank pad spalling and concrete cracks are evident. Sunshade needed for pumps. Consider interior lining to prevent additional concrete corrosion.

Table 4.7 Priority Assets that Should be Considered for Replacement

Process Name	Component Name	Condition	2014 Replacement Cost	Risk	Project	Comments
Odor Control	Hypochlorite Storage Tank No. 2	5	$98,000	8.80	Replace	Age and condition.
Odor Control	Caustic Storage Tank No. 2	5	$42,000	6.40	Replace	Age and condition.
Odor Control	Scrubber No. 1 Recirculation Pump No. 1	4	$28,000	2.78	Replace	Age, condition. Lacks alarms to SCADA. Consider mechanical seals on pumps to reduce water usage.
Odor Control	Scrubber No. 1 Recirculation Pump No. 2	4	$28,000	2.78	Replace	Age, condition. Lacks alarms to SCADA. Consider mechanical seals on pumps to reduce water usage.
Odor Control	Caustic Tank No. 1 (from Hypochlorite)	3	$42,000	1.70	Replace	Age.
Generator Building - Elect	Switchboard MS-2	3	$550,000	3.29	Replace	Age, replacement parts difficult to find. Breakers difficult to remove.
Administration - Operations Building	Electrical Service Equipment	4	$110,000	3.22	Replace	Age and condition.
Headworks - Elect	Odor Control System LCP ORH	3	$42,000	2.04	Replace	Age and condition.
Dewatering Building - Elect	Dewatering Building Control Panel	3	$70,000	1.29	Replace	Age, severely corroded.
Reclaimed Water Control Building - Elect	MCC-L	3	$281,000	3.17	Rehab	Replace Pump No. 2 soft starter.
Reclaimed Water Control Building - Elect	PLC Control Panel	3	$140,000	2.79	Rehab	Install UPS and SPD.
Effluent/Outfall	Land Outfall Pipe	4	$7,500,00	3.33	Replace	Perform various testing methods to determine structural condition of pipe. Identify best replacement method

5.1 INTRODUCTION

This section develops scope and cost for potential projects to be included in the CIP. Projects are identified based on the results of the condition assessment and regulatory analysis previously presented. Project alternatives are evaluated where needed including life cycle cost analyses. Project cost estimates are determined according to the presented scope.

5.2 PRELIMINARY TREATMENT UPGRADES

The Preliminary Treatment Upgrades will address capacity and mechanical concerns at the Headworks, confined space entry at the primary sedimentation basins, as well as corrosion issues in the grit inlet and effluent channels, the grit chambers, and the primary clarifier influent channel. As noted previously, concrete corrosion is evident throughout the channels and the grating rebate and covers are in poor condition. The grit chamber cover has significant through-wall corrosion in a number of places and it should be replaced.

Beyond the corrosion issues, there are operational issues associated with mechanical bar screens and washer compactor that should be addressed. The existing screening facility is crowded with limited space between the two mechanical bar screens and a large compactor directly behind both units. The compactor has a tendency to become clogged and requires constant attention from staff. There is also a manual bar screen installed as an emergency backup to the mechanical screens. Raking the screen is difficult and labor intensive. Installing a third mechanical screen is preferred.

Addressing the various channel repairs will require a pumped bypass. In order to reduce the bypass length and cost and improve the headworks layout, it is recommended that a new screenings area be constructed next to the existing facility. This will allow the bar screens to be more accessible and the new channel can be sized to address hydraulic concerns for the existing channel during wet weather events. Replacing the bar screens in place and repairing the channels will require a temporary screenings facility and temporary pumping, both to the temporary facility, and around the grit and primary influent channels. Construction of a new facility would provide a better use of funds and reduce temporary pumping systems. Additionally, the existing channels can then be repaired and serve as emergency channels during wet weather events to improve hydraulics. It is also recommended that the primary clarifier scum gates be replaced in Clarifier Nos. 3 through 6. The bypass offers the opportunity to replace the gates rather than waiting for additional corrosion and potential failure. Primary Sedimentation Basin Nos. 1 and 2 have been permanently taken out of service, but may still be used as storage tanks during wet weather events.

Installation of a fall arrest system is also recommended to allow safe access to the primary sedimentation basins. The fall arrest system would consist of permanent base plates or wall mounted sleeves installed along the basins. A portable davit crane can then be installed at the necessary location. Tie-off anchors are recommended at each location as well, so that staff remaining above the basins can be properly protected from falling. There are six primary sedimentation basins, each 66 feet in length and 11 feet in width. With davit plates staggered at 22 feet apart along each wall, seven davit plates are needed to service all of the basins with a maximum reach of 25 feet. The staggered formation allows for five of the davit plate installations to service either of two basins, while the remaining two installations allow access to the outer basins from the perimeter.

The estimated project cost is presented in Table 5.1.

Table 5.1 Preliminary Treatment Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$10,000
Bypass Pumping/Screening	$116,000
New Concrete Channels	$66,000
Existing Concrete Repairs	$117,000
New Channel Covers	$60,000
Bar Screens	$413,000
Screenings Compactor	$158,000
Conveyor	$67,000
Slide Gates	$16,000
Grit Chamber Cover	$25,000
Fall Arrest System	$18,000
Electrical	$51,000
Instrumentation	$32,000
General Conditions	$172,000
Subtotal	$1,321,000
Contingencies, Contractor OH&P, Taxes	$654,000
Total Estimated Construction Cost	$1,975,000
Engineering & Admin. Fees	$395,000
Total Estimated Project Cost	$2,370,000

One consideration for the overall plant layout is that the new facility will encroach into the existing roadway. Removing or relocating the Administration Building will allow the road to extend around the new facility and maintain access for larger vehicles.

5.3 RETURN FLOW UPGRADES

The Return Flow Pump Station is critical in collecting process drain flows from around the plant. Based on the condition assessment and SEJPA staff comments, there is concern that the pump station is slightly under sized since the AWP waste flow was added. The return flow upgrades will install a fourth submersible pump into the wet well. This will ensure adequate capacity in the wet well to handle the recently added flow from the AWP. New discharge pipe and pump guide rails are recommended for the three existing pumps, as severe corrosion is evident. The project cost estimate is provided in Table 5.2.

Table 5.2 Return Flow Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$5,000
Return Flow Pump No. 4	$23,000
Pipe Upgrades	$24,000
Electrical	$6,000
Instrumentation	$4,000
General Conditions	$10,000
Subtotal	$72,000
Contingencies, Contractor OH&P, Taxes	$36,000
Total Estimated Construction Cost	$108,000
Engineering & Admin. Fees	$22,000
Total Estimated Project Cost	$130,000

Note that this project can be combined with the Preliminary or Aeration Upgrades projects. Alternatively, SEJPA could elect to self-perform this work.

5.4 AERATION UPGRADES

This project will implement mixing within the anaerobic and swing zones of the aeration basins. SEJPA staff currently has installed a temporary pump recirculation system; however, a permanent system is desired. Mixing can be provided either through submerged mixers or through large bubble diffusers. The anoxic zones of each aeration basin are approximately 25 feet wide by 8 feet long (totaling to 32 feet in length), with an average water depth of 20 feet. Additionally, the aeration drain pump should be replaced and a shelf spare provided to ease maintenance needs and allow the pump to be removed and serviced properly.

Similar to the Preliminary Upgrades Project, installation of a fall arrest system is recommended at the aeration basins. There are four aeration basins, each 112 feet in length. Two of the four basins are 20.5 feet in width and the other two basins are 22 feet in width. With davit mounting plates configured in a staggered formation, 16 feet apart, fifteen davit plates are needed to service all four aeration basins with a maximum reach of 27 feet. The staggered formation allows for nine of the davit plate installations to service either of two basins, while the remaining six installations allow access to the outer basins from the perimeter. Sections of handrail will be replaced with gates to allow access into the basin.

As part of the aeration upgrades, an evaluation of high-speed turbo blowers were performed as a replacement option for the existing multistage blowers. There are multiple blowers currently installed including one 100 horsepower (hp), 1,200 cubic feet per minute (cfm) multistage blower, two 125 hp, 1,670 cfm multistage blowers, and one 10 hp, 300 cfm positive displacement blower used to provide channel air. There are additional blowers installed that are currently not operated and are used for spare parts. Blower operation is somewhat complicated, but is designed to maximize efficiency. During low air demand periods, currently only the single 100 hp blower operates to provide aeration and channel air. As demand rises, the 10 hp blower will turn on to provide channel air and a motor operated valve closes to separate the channel and aeration air systems. As the aeration air demand peaks, a 125 hp blower will turn on and the 100 hp blower will shut down. As demand decreases, the system then operates in reverse order. While the 100 hp blower is fairly new, the 125 hp blowers are older and, as noted above, spare parts are salvaged from redundant blowers to maintain the operating blower. Replacement of the older blowers is recommended. A turbo blower will offer the advantage of more turn down capability and higher efficiency. The increased turn down capacity will simplify the blower operation and the channel blower will no longer be necessary.

High efficiency turbo blowers, such as the Neuros Turbo Blower, utilize turbine technology developed originally for the aerospace industry. The blower is a combined turbine and motor with an air bearing to reduce friction. The blower utilizes suction air for cooling and does not require oil lubrication. The advanced bearing design allows for very high impeller speed. The units include integrated variable frequency drives, inputs for dissolved oxygen sensors and controls. Neuros claims that the only maintenance required is changing of the air filter. Turndown to 45 percent capacity or more is possible with efficiency maintained over the entire range. The blower offers the additional advantage of a smaller footprint compared to single and multi-stage centrifugal blowers.

A comparison of positive displacement and high-speed turbo blowers has been prepared. Table 5.3 provides the capacity, noise, and footprint for each unit assuming a design capacity equal to the existing 125 hp blower and the 10 hp channel blower. The evaluation assumes the 100 hp blower will remain as a standby unit to the new blowers. The blower is fairly new and does not require replacement at this time. It is also assumed that the channel blower will remain installed for redundancy.

To determine the applicability and advantages of new blowers, an estimate of the aeration air demand was determined. A simple model was created to determine air demand related to biological oxygen demand (BOD) loading, nitrogen loading, effluent dissolved oxygen (DO) concentration, and mixing requirements for each basin. The model input criteria are provided in Table 5.4. Criteria are presented for current and future conditions. The future condition assumes 0.5 mgd of additional flow from the City of Del Mar.

Air requirement is calculated simply as the flow multiplied by the load (BOD, nitrogen, and DO) divided by the oxygen transfer efficiency (OTE). The OTE is dependent on many factors including the diffuser system, wastewater characteristics, diffuser submergence, basin configuration, and site conditions. While standard OTE's are available for diffuser systems in clean water, actual OTE's will vary from site to site.

Table 5.3 Comparison of Positive Displacement and Turbo Blowers

Criteria	Unit	Existing 125 HP Blowers(1)	Existing 10 HP Blowers(1)	Turbo Blowers(2)
Number	each	2	1	2
Maximum Flow, each	scfm	1,670	300	1,345
Minimum Flow, each	scfm	1,000	300	615
Efficiency @ Maximum	%	70%	60%	85.5%
Total Motor Horsepower	HP	125	10	75
Footprint				
Length	ft	7	5	5
Width	ft	3	2	2.5

Notes
1. Size, capacity, and footprint for existing blowers obtained from SEJPA blowers. Efficiency is a typical value.
2. Information provided by Neuros.

Table 5.4 Aeration Air Demand Design Criteria

Criteria	Unit	Current	Future
Flow			
Average Day	mgd	2.8	3.2
Maximum Month	mgd	3.0	3.5
Peak Flow Factor	---	1.8	1.8
Influent BOD			
Average Day	mg/L	128	128
Maximum Month	mg/L	165	165
Effluent BOD	mg/L	6	6
Total Nitrogen Removed	mg/L	5	5
Effluent D.O.	mg/L	2	2
Mixing Requirement	$scfm/ft^2$	0.12	0.12
Basin Area	ft^2	2,875	2,875

A determination of the actual OTE was beyond the scope of this project. Air requirements were calculated by first determining the actual oxygen requirements, expressed as pounds of oxygen per day. A conservative, standard OTE of 0.25 percent per foot of submergence was used in the model for the existing ceramic dome diffusers. An actual OTE to standard OTE ratio was then applied to determine the actual OTE and calibrate the model. The model was considered calibrated when the air requirements compared to comments made by the SEJPA staff that an average day requires between 1,000 and 1,200 scfm during peak flow. The model results are provided in Table 5.5.

Table 5.5 Aeration Air Demand Modeling Results

		Current Flows		Future Flows	
Criteria	Unit	Average Day	Max Month	Average Day	Max Month
BOD Oxygen Required(1)	lb O_2/ day	2,820	3,938	3,324	4,595
Nitrogen Oxygen Required	lb O_2/ day	534	572	629	667
Effluent DO Oxygen Required	lb O_2/ day	82	88	97	103
Total Oxygen Required	lb O_2/ day	3,436	4,598	4,050	5,365
Diffuser Submergence	ft	19	19	19	19
SOTE per Submergence	%/ft	2.5	2.5	2.5	2.5
SOTE	%	47.5	47.5	47.5	47.5
AOTE/SOTE Factor	%	25	25	25	25
AOTE(2)	%	11.88	11.88	11.88	11.88
Air Flow Rate for Loadings(3)(4)	scfm	1,155	1,545	1,360	1,800
Minimum Air Flow for Mixing(4)	scfm	345	345	345	345

Notes
1. Assumes BOD utilization factor of 0.9 pounds oxygen per pound of BOD.
2. AOTE = SOTE/(AOTE/SOTE Factor).
3. Air Flow Rate = Oxygen Required/AOTE/(1,140*0.075*0.232), where:
   1140 = minutes per day time conversion factor
   0.075 = specific weight of air (lbs/ft^3) at atmospheric pressure (14.7 psi), standard temperature (68°F), and relative humidity of 36 percent, and
   0.232 = weight fraction of oxygen in air (lb O_2/lb air).
4. Design airflow should be the maximum of mixing or loading requirement.

Based on the model results and the 300 scfm required for channel air, two 75 hp blowers, rated at 1,345 scfm each, are recommended. Table 5.6 and 5.7 provides a comparison of the annual power costs for the existing and proposed blower systems under current and future conditions, respectively. The analysis assumes one maximum month condition per year and the channel air blower operates 50 percent of the time.

Table 5.6 Aeration Air Demand Current Annual Power Cost

		Existing Blowers		New Blower
Criteria	Unit	Multistage Blower	Channel Air Blower	Turbo Blower
Power Cost per Blower	$/kWh	0.125	0.125	0.125
Annual Power Cost per Blower				
Average	$/yr/ blower	$62,200	$2,700	$54,500
Max Month	$/yr/ blower	$7,500		$6,500
Total Annual Power Cost	$/yr	$72,400		$ 61,000

Notes
1. Blower horsepower assumes multistage blower efficiency of 70 percent and Turbo blower efficiency of 80 percent.
2. Motor efficiency of 95 percent.

Table 5.7 Aeration Air Demand Future Annual Power Cost

		Existing Blowers		New Blower
Criteria	Unit	Multistage Blower	Channel Air Blower	Turbo Blower
Power Cost per Blower	$/kWh	0.125	0.125	0.125
Annual Power Cost per Blower				
Average	$/yr/ blower	$73,300	$2,700	$64,200
Max Month	$/yr/ blower	$8,700		$7,600
Total Annual Power Cost	$/yr	$84,700		$71,800

Notes
1. Blower horsepower assumes multistage blower efficiency of 70 percent and Turbo blower efficiency of 80 percent.
2. Motor efficiency of 95 percent.

The results show that installation of the new blower will provide significant savings of approximately $11,000 per year compared to the annual power costs of the existing blowers under current conditions. The savings increases to almost $13,000 under future conditions. However, the decision to implement the project must also consider the cost to install the new blowers.

The capital and life cycle cost for implementing each alternative is provided in Table 5.8. The life cycle cost considers a 20-year life cycle at six percent interest. The analysis assumes the future condition for annual costs considering that the additional City of Del Mar flow has been approved by both agencies and is an impending addition.

Table 5.8 Aeration Alternatives Life Cycle Analysis

	Alternative 1 Existing Blowers	Alternative 2 New Turbo Blower
Project Cost	$ 367,000	$ 450,000
Annual Power Cost	$ 84,700	$ 71,800
Present Worth of Annual Power Cost	$ 972,000	$ 823,000
Total Present Worth Cost	$ 1,339,000	$ 1,273,000
Annualized Cost	$ 117,000	$ 111,000

The alternative analysis shows that life cycle costs are within 6 percent of each other, suggesting there is not a significant difference between the alternatives. Installing the new blowers will provide a lower annual cost; at a slightly higher capital cost. The higher capital cost is attributed to additional pipe modifications to install the new blowers and modifications to the aeration control strategies in the PLC and SCADA systems. The analysis is based on the current electric utility rate of 12.5 cents per kilowatt-hour. Increased electrical costs could also alter the analysis.

Installation of the turbo blower is recommended for implementation on a near-term basis. This alternative provides energy benefits, reduces plant noise, and will reduce plant maintenance and overall labor requirements for the aeration process.

It should be noted that the air demand estimating approach taken here has been simplified. A detailed review of operating data, as well as a more advanced approach to determining airflow requirements should be performed as part of any design project. It is recommended that staff visit Southern California installations of turbo blower to assess operation and performance as part of the preliminary design effort.

Table 5.9 provides a project cost estimate to implement aeration upgrades, including mixer installation, replacement of the drain pump, replacement of the stop logs in the primary effluent channel, and turbo blower installation.

Table 5.9 Aeration Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$10,000
Mixers	$100,000
Turbo Blower	$180,000
Drain Pumps	$7,000
Piping	$10,000
Stop Logs	$15,000
Fall Arrest System	$24,000
Electrical	$10,000
Instrumentation	$10,000
General Conditions	$55,000
Subtotal	$421,000
Contingencies, Contractor OH&P, Taxes	$208,000
Total Estimated Construction Cost	$629,000
Engineering & Admin. Fees	$126,000
Total Estimated Project Cost	$755,000

As noted above, the primary advantages of the Aeration Upgrades Project are improved energy efficiency, reduced maintenance, and improved process performance and staff safety.

5.5 SECONDARY UPGRADES

Secondary treatment upgrades include recommended replacement of the corroded effluent weir troughs and inlet baffles and concrete repair and relining of the concrete effluent boxes, return activated sludge (RAS) channel, and the secondary clarifier effluent channel. Mechanical upgrades include replacement of the scum troughs, with the new troughs with automated tippers installed at the correct elevations for proper scum capture and removal. Installation of a VFD on Scum Pump No. 1 is recommended.

As noted for the primary sedimentation basins and aeration basins, installation of a fall arrest system is recommended at the aeration basins. There are five secondary sedimentation basins, each 120 feet long and 20 feet wide. There are two walkways between Basin Nos. 2 and 3 and between Basin Nos. 4 and 5. Wall mounted davit sleeves can be installed on either side of the walkways and the on outer walls of Basin Nos. 1 and 5. A total of 12 sleeves would be installed for mounting the portable davit post and safety tie-off post for access to each basin.

The project cost estimate is provided in Table 5.10.

Table 5.10 Secondary Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$30,000
Concrete Channel Repairs	$228,000
Inlet Baffles	$99,000
Weir Troughs	$120,000
Scum Troughs	$63,000
Fall Arrest System	$20,000
Secondary Scum Pump No. 1 VFD	$5,000
Electrical	$16,000
Instrumentation	$9,000
General Conditions	$88,000
Subtotal	$677,000
Contingencies, Contractor OH&P, Taxes	$335,000
Total Estimated Construction Cost	$1,012,000
Engineering & Admin. Fees	$202,000
Total Estimated Project Cost	$1,214,000

The Secondary Upgrades Project will reduce maintenance labor, improve process performance, and prolong asset life.

5.6 DAF UPGRADES

Recommended upgrades to the DAF facility includes replacement of DAF Drive No. 2, replacement of the thickened sludge pumps, installation of Pressurization Pump No. 2 for DAF No. 2, and coating of the mechanisms in DAF No. 1 and No. 2. Installation of Pressurization Pump No. 1 is dependent on the successful operation of Pressurization Pump No. 2 at DAF No. 2. The pump installation has had mixed results and required unexpected maintenance. If the pressurization pump operation is not successful, it is recommended that the DAF No. 1 compression tank and blower be replaced due to age, and a new compression tank and blower be installed in DAF No. 2. The project cost estimate is provided in Table 5.11.

In addition to the DAF equipment upgrades, this project investigated thickening of primary sludge as a means to improve the digester and dewatering processes. Currently, primary solids are stored briefly in the primary sedimentation basin hoppers before being pumped to the digesters. The solids are kept thin with a solids content of 1 to 2 percent solids. Industry standard is approximately four percent and can be as high as six percent. Thickening of the primary solids in a stand-alone process would require a significantly high capital investment. Suitable technologies include gravity thickeners and gravity belt thickeners. A gravity thickener, with a redundant unit, would require a fairly large amount of space. A gravity belt thickener requires a building enclosure to protect the equipment and contain odors. An alternative to primary thickening is co-thickening of the primary sludge and waste activated sludge in the existing DAF units. A summary of current DAF performance and expected performance under co-thickening are provided in Table 5.11.

Table 5.11 DAF Performance

Parameter	Unit	Current Operations, WAS only		Co-Thickening, WAS + Primary Sludge	
		Average	Max Month	Average	Max Month
DAF Units	EA	1	1	1	1
WAS Flow Rate	gpd	106,384	130,000	122,321	149,500
WAS Solids	ppd	3,320	4,115	3,818	4,732
Primary Flow Rate	gpd	27,824	43,900	31,998	50,485
Primary Solids	ppd	4,224	5,273	4,858	6,064
Total Flow	gpd	134,208	173,900	154,339	199,985
Total Solids	ppd	7,544	9,388	8,676	10,796
Solids Loading Rate	$lb/hr/ft^2$	1.15	1.43	1.32	1.64
Hydraulic Loading Rate	gpm/ft^2	0.89	0.99	0.94	1.05

The table shows that operating a single DAF to co-thicken both sludges falls within standard hydraulic loading rates of 0.5 to 2.0 gpm/ft^2. For co-thickening, standard solids loading rate is between 0.6 to 1.2 pounds per hour per square foot of DAF surface area. These values assume no polymer addition for coagulant aid. Use of a polymer increases acceptable loading rates to 2 $lb/hr/ft^2$. Effective co-thickening will likely require dilution of the primary solids to keep the sludge fresh, minimize gasification within the DAF, and limit biological activity. A dilution rate of between 4:1 and 6:1 should be effective and will maintain hydraulic loading rates below 2.0 gpm/ft^2. Additionally, proper mixing of the sludges is important to maintain stable solids concentration in the DAF inlet. This also leads to consistent polymer dosing.

Advantages of co-thickening include process improvements for both digestion and dewatering. Digester solids retention time will increase as the hydraulic loading rate from the DAF decreases due to the thicker sludge. The thin primary sludge is the primary driver of hydraulic loading rates to both the digesters and the dewater process. The primary sludge flow rate is highly variable in order to maintain the blanket depth in the basins. Co-thickening will result in a more stable flow out of the DAF. The hydraulic loading rate to the dewatering facility will decrease and may result in lower operating times.

Disadvantages that must be considered include increased odors in the DAF. This will place a higher demand on the odor scrubber. Polymer usage is likely to increase and grit is more likely to accumulate in the underflow system. Thickened sludge pumps should be designed to handle the expected grit.

Modifications necessary to implement co-thickening would include installation of new primary sludge piping from the digester area to the DAF splitter box. A low speed mixer, installed in the splitter box, can be used to properly mix the incoming flows.

Pilot testing for co-thickening in an existing DAF is recommended. Pilot testing will establish the performance of the DAF units, identify the primary sludge dilution ratio and required polymer dosing, and reveal any additional modifications that may be necessary. If pilot testing is unsuccessful, an alternate technology such as a rotary drum thickener, should be considered for thickening of the primary sludge separate from the DAF.

Table 5.12 DAF Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$15,000
Coat Mechanisms	$30,000
DAF No. 2 Drive	$12,000
Pressurization Pump No. 2	$13,000
Thickened Sludge Pumps	$50,000
Primary Sludge Piping	$50,000
Primary & WAS Sludge Mixer	$20,000
Electrical	$17,000
Instrumentation	$7,000
General Conditions	$32,000
Subtotal	$245,000
Contingencies, Contractor OH&P, Taxes	$121,000
Total Estimated Construction Cost	$366,000
Engineering & Admin. Fees	$73,000
Total Estimated Project Cost	$439,000

The DAF Upgrades Project will address condition issues at the process area and prolong the overall facility operating life. Co-thickening will provide process improvements for the thickening process, digestion, and dewatering. This project could be combined with the Digester Improvements or Dewatering Upgrades project.

5.7 DIGESTER IMPROVEMENTS

This project includes improvements to the installed digestion assets in order to maintain performance, prolong asset life, and ensure proper solids treatment. The project scope includes replacement of Sludge Circulation Pump Nos. 2, 3, and 5 with chopper pumps and replacement of Boiler No. 2 with a unit properly sized for the heat demands. Additional discussion with SEJPA staff indicates that the boiler may actually be adequately sized. There is more of a concern that the heat is not properly transferred at the heat exchangers. SEJPA is currently in the process of cleaning the heat exchangers to attempt to remove sludge building inside the pipe. Failure to see an improvement in the heat will be grounds to replace the heat exchangers. Structural improvements include replacement of Digester No. 2 floating cover with a fixed cover, Digester No. 2 concrete repair and lining, repairing the center cover seals and replacing the manhole cover at Digester No. 3, repairing the cold joint between the roof deck and walls of Digester Nos. 3 and 4 and performing crack injection repairs at all three operating digesters. Note that the digested sludge pumps are replaced under the Dewatering Upgrades project in Section 5.9. Table 5.13 provides the project cost estimate for the Digester Improvements project. The cost assumes replacement of the three heat exchangers. The effectiveness of the heat exchangers and boiler should be investigated during the preliminary design phase.

Table 5.13 Digester Improvements Cost Estimate

Item	Cost Estimate
Demolition	$45,000
Digester No. 2 Cover	$350,000
Digester No. 2 Concrete Repairs & Lining	$140,000
Digester Crack & Sealant Repairs	$65,000
Heat Exchangers	$135,000
Sludge Circulation Pumps Nos. 2, 3, and 5	$45,000
Electrical	$21,000
Instrumentation	$11,000
General Conditions	$121,000
Subtotal	$928,000
Contingencies, Contractor OH&P, Taxes	$459,000
Total Estimated Construction Cost	$1,387,000
Engineering & Admin. Fees	$277,000
Total Estimated Project Cost	$1,664,000

Implementation of the Digester Improvements Project will ensure proper process operation and prolong the life of the installed assets.

5.8 COGENERATION

The Phase II Digester Improvements Project considers the benefits of cogeneration for the digesters. Cogeneration can provide energy benefits, if it is shown to be a cost effective solution. A payback period of less than 20 years is generally considered cost effective. This payback can be difficult to obtain for smaller wastewater treatment plants like SEJPA. The SEWRF has had cogeneration in the past. Three 30 kilowatt (kW) microturbines were installed in 2001. The microturbines are still onsite but have reached their useful life and are no longer operated due to excessive maintenance needs.

For this report, a cogeneration analysis was completed. The analysis considers existing gas production as well as the potential increase in gas flow due to the additional 0.5 mgd of flow expected from the City of Del Mar. The digester gas projections are reported in Table 5.14. These values are used to size the cogeneration equipment and in the cost-effective analysis.

Table 5.14 Digester Gas Production

	Current	Future(1)
Average Influent Flow (mgd)	2.8	3.3
Gas Production (kcf/d) (2)	58	69

Notes
1. Assumes 0.5 mgd from City of Del Mar.
2. kcf/d – Thousand Cubic Feet per Day.

The new flow will provide approximately 11 thousand cubic feet per day of additional digester gas. This is calculated based on the current gas production of 20 kcf/d per million gallons of flow.

The cogeneration analysis was performed using a standard electrical rate of $0.125 per kilowatt-hour (kWh) with an average daily demand of 7,136 kWh/d. The rate was determined by a review of the four main electrical meters from historical billing information for the period of May 2013 through April 2014. According to staff discussions, the SDG&E rate has been increasing over the last two years and will continue to increase as SDG&E implements approved rate schedule increases.

5.8.1 Heat Demands and Sources

A new cogeneration system would include heat recovery to heat the anaerobic digesters. A basic heat supply/demand model has been created to estimate the digester heat demand. This model can be used to project heat demands considering the available heat supply, sludge temperature, air temperature, and season. This model has been used to project the coldest month heat demand. This demand is compared to the projected available heat. If the available supply is less than the demand, the existing boilers will need to operate to make up the deficit. This cost will be included in the cost effective analysis.

The summer and winter heat demands are reported in Table 5.15 for current and future demands. The calculations assume a digester operating temperature of 95 degrees F. Heat demands are based on three operating digesters.

Table 5.15 Projected Digester Heat Demands (BTU/day) (1)

	Current		Future	
	Ave. Day	Max Month	Ave. Day	Max Month
Summer	618,000	681,000	672,000	747,000
Winter	796,000	876,000	865,000	959,000

Note
1. BTU – British Thermal Units

Current heat sources include the two boilers. The available heat is reported in Table 5.16.

Table 5.16 Existing Digester Heat Sources

	Boiler No. 1 (1)	Boiler No. 2 (1)
Heat Output (BTU/hr)	1,139,100	1,709,000

Note
1. Rating is based on natural gas input. Output is reduced based on boiler efficiency and for lower methane content in digester gas.

5.8.2 Cogeneration Alternatives

Three cogeneration alternatives have been developed along with a "no cogeneration" alternative and are explained below. All of the alternatives include gas conditioning equipment to prevent fouling of the equipment. Digester gas must be scrubbed in a fuel treatment system to remove moisture, siloxanes, and hydrogen sulfide (H_2S). The level of fuel treatment required depends on the amount of contaminants in the digester gas and the type of cogeneration technology. Fuel cells and microturbines require more robust fuel treatment systems. Siloxanes must be removed at a higher rate and the treatment system must include redundant equipment. H_2S is not as directly damaging to reciprocating engines and microturbines as fuel cell technologies. However, the presence of H_2S can significantly impact the economics associated with removing siloxanes.

5.8.2.1 Alternative 1 – No Cogeneration

This is the do nothing approach. Under this alternative, the existing boilers, operating on digester gas, would continue to provide digester heat. Digester gas would continue to be used for digester mixing and excess gas will be flared. There is no capital costs associated with this alternative.

5.8.2.2 Alternative 2 – Reciprocating Gas Engine

This alternative would install a single 335 kW engine-generator system. Reciprocating engines, developed more than 100 years ago, were the first of the fossil fuel-driven distributed generation technologies. Reciprocating engines can be found in applications ranging from fractional horsepower units to over 3-megawatts (MW) per unit.

The engine jacket water and exhaust heat from reciprocating engines is recovered in heat exchangers and used to provide heat for digester heating and/or facility hot water heating. The four leading reciprocating engine suppliers offer modern high efficiency biogas fueled units. These manufacturers include Waukesha, Caterpillar (MWM), and GE-Jenbacher. These engines convert approximately 39 to 40 percent (as a percentage of fuel input energy) to electrical output and approximately 40 percent to recoverable heat from engine jacket water and exhaust. The overall efficiency of these reciprocating engines is approximately 80 percent.

Reciprocating engines have the greatest emissions of the evaluated cogeneration technologies. Currently, exhaust emissions controls are not required by the San Diego Air Pollution Control District.

5.8.2.3 Alternative 3 – Microturbines

This alternative would install three new 65 kW Capstone microturbines. This alternative would be similar to the microturbines installed at the plant. Microturbines are essentially small gas turbines operating at very high speed to produce power and heat. Currently, there are several commercial manufacturers offering microturbine power generating units. However, only two manufacturers, Ingersoll Rand and Capstone, have experience utilizing digester gas as a fuel source.

Microturbines typically convert 30 percent of fuel input energy to electrical output and 27 to 30 percent to recoverable exhaust heat, for a total overall efficiency of approximately 60 percent. Microturbines have the smallest footprint of all of the evaluated technologies.

Microturbines are an extremely low-emission technology. Currently microturbines can be installed in any air district in the US without added emissions control equipment requirements. This is expected to continue to be the case for the foreseeable future.

5.8.2.4 Alternative 4 – Fuel Cells

Alternative 4 would install a single 300 kW fuel cell. Fuel cells utilize the hydrogen present in digester gas as a fuel source through an electrochemical process. The process converts the elemental carbon and hydrogen from methane into carbon dioxide and water. In the process, electrons are released and captured as direct current (DC) electricity. The fuel cells convert approximately 47 percent of the input fuel energy to electrical energy. At least 22 percent of the input fuel energy can be recovered from exhaust heat. The fuel cells provide a total conversion efficiency of approximately 69 percent. This efficiency is higher than microturbines and more power can be generated.

As fuel cells utilize the digester gas methane via an electrochemical process, fuel cells produce significantly less pollutant byproducts than combustion technologies. Fuel cells produce approximately 1/100th the emissions generated by engine-generators. There is no emission controls required for fuel cells.

5.8.2.5 Alternatives Analysis

The financial assumptions used in the economic analysis are presented in Table 5.17.

Table 5.17 Criteria and Financial Assumptions

Present Worth Year	2014
First Year of Evaluation	2016
Project Duration, years	20
Inflation (Capital Costs)(1)	3.0%
Inflation (Fuel and Electricity Costs)(1)	.0%
Inflation (O&M Costs)(1)	3.0%
Gross Discount Rate(2)	6.0%
Digester Gas Lower Heating Value, BTU/scfm(3)	600
Engine-Blower Availability Percentage	90%
Microturbine Availability Percentage(4)	95%
Fuel Cell Availability Percentage(4)	98%
O&M Rate for Microturbine Alternatives, $/kWh(5)	$0.025
O&M Rate for Engine Alternatives, $/kWh(5)	$0.025
O&M Rate for Fuel Cell Alternatives, $/kWh(5)	$0.054
O&M Rate for Fuel Treatment System, $/kWh(5)	$0.010
Average Natural Gas cost $/therm	$0.78
Green Power Credit $/kWh	$0.005

Notes
1. Inflation percentages are based on local average inflation rates.
2. Established for entire evaluation.
3. The range of LHV of digester gas is 60-65 percent.
4. Availability percentages are based on information available on maintenance costs provided by equipment suppliers.
5. The O&M rate for each alternative is based on average industry rates.

The economic analysis for current and future conditions is presented in Tables 5.18 and 5.19, respectively. The table also presents the annual emissions estimated as a result of using the digester gas in the flares and each cogeneration technology. Emissions account for the cogeneration technology plus any additional heat supplied by the boilers. The results of the analysis suggest the engine generator would have the lowest life cycle cost compared to the other cogeneration alternatives. However, even under the future condition, the engine generator alternative does not achieve less than a 20-year life cycle cost. Based on the analysis, there are some triggers that could make the reciprocating engine-generator alternative a viable energy reduction strategy:

Table 5.18 Economic Analysis for Cogeneration Alternatives, Current Conditions

Alternative	No Cogeneration; Boilers Only Facility	335-kW Engine Generator Unit	Three 65-kW Microturbine System	300-kW Fuel Cell System
Annual Emissions (lbs/yr)	2,279	639	1,576	757
Estimated Cogeneration System Project Cost	$0	$3,414,000	$3,316,000	$8,065,000
Estimated SGIP Grant Funding	$0	($750,000)	($488,000)	($1,620,000)
Estimated Net Project Cost	$0	$2,664,000	$2,828,000	$6,445,000
Present Worth of Energy Costs	$5,294,000	$2,952,000	$3,886,000	$3,618,000
Total 20-Year Present Worth Costs	$5,294,000	$5,616,000	$6,714,000	$10,063,000
Present Worth of Net Benefit Compared to No Cogeneration System	-	($322,000)	($1,420,000)	($4,769,000)
Payback Period of Cogeneration System, years	-	20+	20+	20+

Table 5.19 Economic Analysis for Cogeneration Alternatives, Future Conditions

Alternative	No Cogeneration; Boilers Only Facility	335-kW Engine Generator Unit	Three 65-kW Microturbine System	300-kW Fuel Cell System
Annual Emissions (lbs/yr)	2,869	639	1,576	800
Estimated Cogeneration System Project Cost	$0	$3,414,000	$3,316,000	$8,065,000
Estimated SGIP Grant Funding	$0	($750,000)	($488,000)	($1,620,000)
Estimated Net Project Cost	$0	$2,664,000	$2,828,000	$6,445,000
Present Worth of Energy Costs	$5,294,000	$2,673,000	$3,607,000	$3,339,000
Total 20-Year Present Worth Costs	$5,294,000	$5,337,000	$6,435,000	$9,784,000
Present Worth of Net Benefit Compared to No Cogeneration System	-	($43,000)	($1,141,000)	($4,490,000)
Payback Period of Cogeneration System, years	-	20	20+	20+

1. **Increased Flows.** Increased influent flow would provide additional solids for digestion and additional digester gas. While a fats, oil, and grease (FOG) receiving station could be considered, it should be noted that the Encina Wastewater Authority is currently installing a FOG receiving station and it would potentially be difficult to compete for the resource. FOG would also require capital cost. An increase in influent flow may provide a better trigger, and at no additional cost to SEJPA.

   a. An increase of 1 mgd above current flows would provide a payback period of 17 years.

   b. An increase of 1.5 mgd above current flows will provide a payback period of 15 years.

2. **Increasing Energy Costs.** SEJPA has noted that electrical costs are continuing to rise as SDG&E implements an approved rate increase. An increase in electrical cost, coupled with increased flows, will also improve the cogeneration payback according to the following:

Flow Increase (mgd)	Digester Gas Flow (scfm)	Utility Rate ($/kWhr)			
		$0.125	$0.13	$0.135	$0.14
0.5	47	20	18.5	17.5	16.5
1.0	54	17	16	15	14
1.5	61	15	14	13	12.5

The table shows how an increase in both flow and electrical cost can make cogeneration attractive at the SEWRF. SEJPA should consider what payback period is attractive enough to implement the project. The life cycle costs are based on available grant funding through the Self-Generation Incentive Program (SGIP). The program is currently extended through 2015. Continuation of the program would be necessary to achieve the payback periods listed here.

5.9 DEWATERING UPGRADES

Due to the condition of the existing dewatering building and the belt filter presses, rehabilitation is recommended in order to maintain proper solids dewatering. Upgrades are needed to address the aging belt filter presses (BFP), the mezzanine corrosion, repairs to the dewatered sludge hopper, replace the aged feed pumps, update the facility electrical gear, and improve odor handling. New dewatering equipment should consider replacement of the BFP or installing screw presses as an alternative technology. New equipment has been sized based on existing solids data presented in Table 5.20, as well as the increased solids expected from the Del Mar flows.

Table 5.20 Dewatering Flows and loads

Current	Average	Max Month
Solids to Dewatering (ppd)	4,629	6,881
Flow to Dewatering (gpd)	37,000	55,000
Concentration from Digestion (%TS)	1.5	1.5
Hours of Operation (hrs/day)	8	8
Future		
Solids to Dewatering (ppd)	5,323	7,913
Flow to Dewatering (gpd)	42,550	63,250
Concentration from Digestion (%TS)	1.5	1.5
Hours of Operation (hrs/day)	8	8

Dewatering equipment has been sized assuming an operational period of 8 hours per day, seven days a week. The number of units are calculated such that all units are operating under maximum month demands, while there is some redundancy under average day conditions. As noted previously, implementing co-thickening of the primary sludge and WAS sludge will decrease the hydraulic loading rate. While unit sizing is based on the solids loading rate, the operational time may decrease based on the hydraulic loading rate. The analysis used here is based on current flow conditions. A brief discussion of each technology is provided below.

5.9.1 Belt Filter Presses

SEJPA currently uses a Belt Filter Press (BFP) for dewatering of digested sludge. BFPs employ moving porous belts to continuously dewater solids. The process consists of three distinct phases. In the first phase, polymer is mixed with the solids for conditioning purposes. In the second phase, conditioned solids are distributed across the gravity drainage section through which water freely drains through porous belts, thickening the solids prior to entering the pressure phase. In this third phase, the solids are pressed between two belts and rollers to produce the dewatered cake. The dewatered cake is then discharged and conveyed for ultimate use/disposal. The separated water (filtrate) generated is collected and recycled to the head of the plant for further treatment. Recycled water is used in a spray-wash system to clean any residuals left on the belts to maintain porosity. The high water use reduces recycled water available for off-site use by customers.

BFP’s generally require more oversight compared to a screw press to ensure optimal performance. Odor hoods are typically installed over the open machinery to reduce odors. The large amount of washwater use, can produce a fairly humid environment and lead to corrosion issues. This is evident in the existing Dewatering Building at the SEWRF. BFP’s typically have a higher hydraulic capacity compared to screw presses.

Belt widths of 1 meter, 1.5 meter, and 2 meters are generally used, although machines using belts up to 3 meters can be manufactured. Units are also available with a 2- or 3-belt design. With the more common 2-belt design, speed and pressure are applied at the same rate to both the drainage and pressure zones, which does not allow for independent optimization of each zone if variations of feed solids are experienced. The 3-belt design is used to dewater thinner sludges that are less than 1.5 percent solids with an additional gravity zone added to the standard two zones of a BFP. This analysis assumes two, two-meter BFPs with a 3-belt design.

5.9.2 Screw Press

For a screw press, solids are loaded into the bottom of the unit where they pass through a continually decreasing volume due to an enlarging cone screw. This increases the pressure along the length of the screw press, separating the solids from the liquids and forcing the liquid through the screen. The separated water (pressate) is collected and discharged at the bottom of the screw press while the dewatered cake is discharged at the end of the screw press. Pressate is returned to the liquid treatment process. Screw presses are available in two different styles – horizontal and inclined.

The screw press is gaining popularity in municipal wastewater treatment plants (WWTP) due to its mechanical simplicity, which allows it to be operated virtually unattended. Huber and FKC are two reputable manufacturers. Due to their enclosed configuration, screw presses, similar to centrifuges, contain odors better than BFPs. The expected polymer dosage required is similar to a BFP. Benefits of the screw press include a decrease in required maintenance, lower power consumption, and fewer mechanical parts. Cake solids concentrations are comparable to a BFP.

Based on solids data, two units from either Huber or FKC will meet demands. The design of each unit is slightly different from each manufacturer. The FKC units are horizontal and slightly longer while the Huber units are installed at a slight angle. A preliminary design study should be conducted to explore the advantages and disadvantages of each unit and which might best fit SEJPA's needs and best fit in the existing dewatering building.

5.9.3 Alternatives Analysis

Cost estimates for BFP or screw presses are provided below in Table 5.21. For the BFP, the project scope includes replacement of the mezzanine structure and installation of foul air hoods over each unit. For the screw presses, the mezzanine can be removed; however, reconfiguration of the conveyor will likely be necessary. Both alternatives include the common upgrade needs previously discussed.

The cost analysis shows the project costs to be fairly similar, and either technology will be suitable for implementation. SEJPA is interested in installing screw presses due to their ability to run unattended. A detailed preliminary study is recommended, including pilot testing, to further evaluate performance and life cycle cost analysis. Polymer and electrical use will vary between technologies and manufacturers. One screw press unit has been pilot tested at the SEWRF. The unit, manufactured by PWTech, produced cake solids averaging 21 percent solids using 12 pounds of polymer per dry ton of solid produced. Solids capture was 95 percent or better. The results are consistent with screw press performance. Preliminary design should provide pilot testing for other vendors and the final design specifications should include guaranteed performance parameters for percent solids, polymer use, and solids capture. Penalties for failure to meet the requirements should be included as well. Additional studies are also needed to further evaluate structural modifications/rehabilitation associated with the building and sludge hopper.

Table 5.21 Dewatering Project Cost Estimate

Description	Belt Filter Press	Screw Press
Demolition	$50,000	$50,000
Building Structural Repairs	$45,000	$45,000
New Mezzanine	$100,000	$0
Belt Filter Press or Screw Press	$580,000	$530,000
Pumps	$27,000	$27,000
Conveyor Modifications	$0	$65,000
Odor Control Upgrades	$54,000	$14,000
Piping and Valves	$7,000	$25,000
Electrical Upgrades	$49,000	$62,000
Instrumentation	$36,000	$50,000
General Conditions	$142,000	$130,000
Subtotal	1,090,000	$998,000
Contingencies, Contractor OH&P, Taxes	$540,000	$494,000
Total Estimated Construction Cost	1,630,000	$1,492,000
Engineering & Admin. Fees	$326,000	$298,000
Total Estimated Project Cost	$1,956,000	$1,790,000

5.10 CLASS A BIOSOLIDS

Biosolids at the SEWRF currently meet Class B classification through digestion and dewatering. The solids are sent to Arizona for land application. This is a common practice for many Southern California wastewater treatment providers and often is the most cost effective solution. Hauling costs are typically around $55 to $60 per dry ton. Class B biosolids generally contain detectable pathogen levels and are not allowed in many parts of California for land application. Class A biosolids, with no detectable pathogens, have fewer restrictions for commercial reuse and land application. Many agencies have implemented or began planning for Class A biosolids as a potential reuse commodity. Long term planning, in the event that Arizona ceases to accept Class B biosolids similar to parts of California, is a prudent strategy for SEJPA to consider.

The 2007 Report identified two alternatives for producing Class A biosolids, including three-phase digestion and sludge drying via a dryer facility. These alternative are still acceptable technologies. For the purposes of this report, a third alternative, solar drying, is reviewed.

Solar dryers use radiated heat in a glasshouse in combination with ventilation and a sludge turnover mechanism to dry biosolids through an aerobic process to meet Class A criteria. Each greenhouse is constructed of galvanized steel framing with polycarbonate double walls and roof. The dryer mechanism is constructed of stainless steel and travels on a geared track. Ventilation, along with temperature controls is included. The mechanism, shown below, acts to spread and continuously mixes the dewatered sludge to eventually create dried granular biosolids at over 90 percent solids content.

Cost effective and reliable operation of the solar dryer requires stabilized biosolids with a solids content above 15 percent. Unstabilized biosolids, which can be treated in the units, will produce excessive odors that must be treated prior to discharge and thus adds cost for odor scrubbers. The working environment within the units is also more challenging. Wetter biosolids require more heat, time, and larger units, which makes the drying process less cost effective.

The amount of energy input to the units is directly related to the solar radiation available. In cooler climates, floors of the units are heated with hot water to assure process reliability when outside temperatures are below freezing or on cloudy days. Because SEJPA is located in southern California, already stabilizes the solids to Class B, and reliably has dewatered solids concentrations above 20 percent, it is an optimal candidate for solar drying. The final product is over 90 percent total solids and can be directly land applied or bagged for distribution. Additional testing is required with solar drying to assure Class A biosolids per RFC 503.C are met compared with other Class A stabilization methods such as composting or three-stage digestion.

Units are sized based on local temperatures and projected solids loading. Based on dewatered solids data and projecting to include solids from the additional 0.5 mgd of flow expected, four Huber Solar dryers are required each unit 420 feet long and 36 feet wide. SEJPA also has available digester gas that could be utilized to provide additional heat and reduce the number of units required. The purchase price of each unit is $1.25 million. Implementation of solar drying at SEJPA, including dryer installation, electrical connections, site work, and biosolid storage is $10 million. This could be reduced to $6 to $8 million if enough digester gas is available to reduce the number of dryer units. The overall cost is comparable to the heat drying facility proposed in the 2007

Report and significantly more than the cost of implementing three-phased digestion. A summary of costs for the three alternatives are provided in Table 5.22.

Table 5.22 Class A Biosolids Alternatives Cost Comparison

Item	Estimated Project Cost
Three-Phase Digestion	$2 million
Heat Drying Facility	$10 million
Solar Drying Facility	$8-$10 million

Three-phase digestion provides a lower project cost due to the existing installed digestion facilities. Expanding to meet Class A requires less capital improvements compared to the other alternatives. A more detailed analysis will be required to evaluate overall life cycle costs. The solar drying facility will have limited electrical use compared to the other alternatives, but it is unlikely to offset the high capital cost.

5.11 ODOR CONTROL IMPROVEMENTS

Through the course of the condition assessment, it was noted that the odor reduction facilities (ORF) were operating well with no major issues. However, it was noted that the facilities have not been thoroughly inspected in over 10 years. Additional questions were raised regarding the overall capacity of ORF No. 1 at the headworks area. The ORF No. 1 provides odor control for the preliminary and primary treatment areas. ORF No. 2 at the solids thickening and dewatering facilities appears to have some in balances, such as lacking the ability to control flow splitting at the dewatering building. While the condition assessment identified recommended improvements based on asset conditions that are detailed in the next section, there is an overall recommendation to implement a more detailed study to evaluate the scrubber capacities, identify additional capacity needs, if any, and optimize the flow balancing. A planning budget of $25,000 is recommended for the study.

Additional improvements related to asset condition are recommended for the odor control facilities. This includes replacing ORF No. 1 Recirculation Pump Nos. 1 and 2 due to poor condition, replacement of Caustic Storage Tank No. 1. Hypochlorite Storage Tank No. 2 and Caustic Storage Tank No. 2, related to ORF No. 2, have been taken out of service. Chemicals are not used at ORF No. 2. The tanks are near the end of their useful life and should be removed. The tanks have been left empty for some time. Gaskets and other components are likely dried out and no longer of any use. Attempting to put the tanks back in service without significant rehabilitation will likely result in leaks. Table 5.23 provides the estimated project cost.

Table 5.23 Odor Control Improvements Cost Estimate

Item	Cost Estimate
Tank Demolition	$25,000
Recirculation Pumps	$15,000
Caustic Storage Tank No. 1	$31,000
Electrical	$6,000
Instrumentation	$10,000
General Conditions	$13,000
Subtotal	$100,000
Contingencies, Contractor OH&P, Taxes	$50,000
Total Estimated Construction Cost	$150,000
Odor Study	$25,000
Engineering & Admin. Fees	$30,000
Total Estimated Project Cost	$205,000

Implementation of this project will address condition concerns related to the identified assets. The overall project will ensure safe chemical storage and ensure proper operation of the ORF facilities.

5.12 TERTIARY UPGRADES

While in fairly good condition, some upgrades to the recycled water, AWP and recycled water pump station facilities are recommended. These upgrades will ensure that the facilities continue to operate properly and produce high-quality recycled water that is a revenue source for SEJPA.

The recycled water distribution pumps require replacement due to their overall age. It may be possible to rebuild the pumps as a cost savings measure, but replacement is recommended here for cost considerations. Additionally, the three pumps currently serve as one duty pump to each reservoir and one swing pump. A fourth pump is recommended to allow each reservoir to be fed by a duty and standby pump. Pipe modifications will also be required to install the fourth pump. In addition to the pipe modifications, the pump valves should be automated. In order to switch the pump service, operators must manually operate the valves. Automating the valves will allow operators to control the pump station from the SCADA control room. These upgrades will improve redundancy and reduce operator and maintenance needs at the pump station.

Improvements to the AWP include installing additional membranes to the reverse osmosis skid. The skid has space for more membranes to increase capacity by 0.5 mgd. Increasing the capacity will allow SEJPA to produce more recycled water to meet customer demand. A final recommendation related to increasing production is to investigate and implement means to increase the chlorine contact basin (CCB) capacity. Previous work has been done to increase the capacity using dye testing. The use of computational fluid dynamics (CFD) modeling can be used to size and locate baffles to improve mixing and the overall basin efficiency resulting in a higher capacity. Note that basin efficiency is used in calculating the overall CT value, which is directly related to basin capacity. The CFD modeling should cost between $25,000 and $50,000 depending on the number of alternatives explored.

The costs for the Tertiary Upgrades are summarized in Table 5.24 below.

Table 5.24 Tertiary Upgrades Cost Estimate

Item	Cost Estimate
Reclaimed Water Pumps (4 total)	$120,000
Pipe Modifications	$15,000
Valve Operators	$12,000
RO Membranes	$100,000
CCB Baffles	$75,000
Electrical	$19,000
Instrumentation	$8,000
General Conditions	$52,000
Subtotal	$400,000
Contingencies, Contractor OH&P, Taxes	$198,000
Total Estimated Construction Cost	$598,000
CFD Modeling Study	$50,000
Engineering & Admin. Fees	$120,000
Total Estimated Project Cost	$768,000

5.13 REUSE STORAGE

Increasing on-site storage of either recycled water or a future potable water supply is an important concept for SEJPA. There is limited onsite storage for recycled water outside of the recycled water pump station. As the potential for direct or in-direct potable reuse in the San Diego area increases, SEJPA is continuing to investigate the possibility of a potable reuse facility on-site. Considering SEJPA's proximity to the lagoon, a brackish water treatment facility is also a possibility. These factors all support the need to increase on-site storage even though the need may not be immediate.

The 2007 Master Plan evaluated the use of one Flow Equalization Basin (FEB) for storage of recycled water. Each FEB has a volume of 700,000 gallons. Currently, only one FEB is required to equalize flow. The 2007 Master Plan calculated the required storage volume at 460,000. As flows increase due to Del Mar and other potential new sources, the required storage volume can be expected to increase. In order to maximize the storage volume of each basin, it was previously recommended to replace the sloped walls with straight vertical walls. This increases storage in each FEB to approximately 1.76 million gallons. In addition to the previous recommendations, SEJPA should consider splitting the primary effluent FEB into two separate, but smaller, FEB's. This would allow one basin to be taken down for cleaning while still maintaining flow equalization for the plant. Additional modifications include pipe modifications to hydraulically separate the FEB's. New covers will be needed to account for the change in basin volume and shape.

The FEB converted to recycled/potable water storage will require additional modifications including a membrane or gunite floor, pipe modifications, level measurement and SCADA monitoring and a new pump station to deliver water off-site, either to a distribution system or to a reservoir. The project cost to provide storage for reuse water is provided in Table 5.25.

Table 5.25 Reuse Storage Cost Estimate

Item	Cost Estimate
Demolition	$25,000
FEB Covers	$400,000
Wall Modifications	$700,000
Basin Conversion to Recycled Water	$100,000
Pump Station Structure	$250,000
Pumps	$150,000
Piping & Mechanical	$150,000
Electrical	$75,000
Instrumentation	$30,000
General Conditions	$282,000
Subtotal	$2,162,000
Contingencies, Contractor OH&P, Taxes	$1,070,000
Total Estimated Construction Cost	$3,232,000
Engineering & Admin. Fees	$646,000
Total Estimated Project Cost	$3,878,000

5.14 ELECTRICAL UPGRADES

The electrical system at the SEWRF was recently upgraded under the 2012 Electrical Upgrades Project. This project addressed the electrical gear related to the headworks and primary treatment processes. Additionally, during the course of this project, SEJPA also replaced the existing standby power generators with a new unit sized to handle the entire plant demand. However a few assets remain that are recommended for replacement due to age and condition. This includes Switchboard MS-2 and the Odor Control Panel in the Headworks Building. Both of these units are reaching the end of their useful lives and should be replaced. Additionally, it was noted that some electrical gear is missing arc flash labels. A coordination study should be performed so that the arc flash labels can be installed.

Implementing this project will promote safe working conditions by installing up-to-date electrical gear and identifying proper safety gear associated with working in or around the electrical equipment.

Table 5.26 Electrical Upgrades Cost Estimate

Item	Cost Estimate
Demolition	$15,000
Switchboard MS-2 Replacement	$300,000
Odor Control Panel Replacement	$30,000
General Conditions	$52,000
Subtotal	$397,000
Contingencies, Contractor OH&P, Taxes	$196,000
Total Estimated Construction Cost	$593,000
Engineering & Admin. Fees	$119,000
Total Estimated Project Cost	$712,000

5.15 SCADA UPGRADES

The existing SEWRF SCADA System is comprised of a network of distributed programmable logic controllers (PLC's) located at various unit processes around the plant all of which are connected to the plant SCADA system via either fiber optic connection or wireless radio link. With the exceptions of the SCADA computers and the main PLC in the Operations Building, all SCADA system hardware, including distributed PLC's, control panel devices, fiber optic cables, and wireless radios, are in good working condition and serving their intended functions.

To address the issue of the outdated SCADA computers and main PLC in the Operations Building, SEJPA staff has completed some preliminary work to re-design the Control Room in the Operations Building, which will include:

1. Building modifications to re-configure the control room to add more desktop space for SCADA computers.
2. Replace existing SCADA operator consoles with new console furniture.
3. Replace existing SCADA computers with new computers representing current technology.
4. Installation of new SCADA network hardware including SCADA license servers and historians.
5. Consolidate new SCADA network hardware equipment and SEJPA IT, phone, and security equipment into a single, new enclosure located inside the Control Room where access to the equipment can be better controlled.

In addition to the physical modifications to the SCADA system and Control Room, SEJPA is also investigating options related to their current SCADA software package, which is Wonderware InTouch Version 10.1. In parallel with the Wonderware InTouch SCADA system, which monitors and controls the majority of the plant processes, SEJPA utilizes Allen-Bradley RSView SCADA software, operating on a stand-alone SCADA computer, to monitor the AWP process. Currently, the InTouch and RSView SCADA systems are entirely separate and share no information. Specifically, SEJPA is investigating two options to consolidate the InTouch and RSView systems into a single, updated SCADA software platform:

1. Maintain the Wonderware InTouch software package and upgrade to version 10.5. This would allow for the existing InTouch SCADA screens and programming to be migrated into the new version; however, new SCADA screens and monitoring & control functionality would need to be developed for the AWP system that is currently utilizing the RSView software.

2. Utilize Allen-Bradley RSView SCADA software for all plant processes. This would allow for the existing RSVIEW SCADA screens and programming associated with the AWP system to be migrated into the new SCADA software system, however new SCADA screens and monitoring & control functionality would need to be developed for all plant processes other than the AWP system. SEJPA Staff was informed by Allen-Bradley representatives that the existing Wonderware InTouch SCADA screens can be preserved and migrated into the new RSView software to minimize the programming effort associated with switching software platforms. The validity of this information was not evaluated; however, it is likely that there is a considerable amount of programming effort associated with re-creating the logic associated with the existing SCADA screens, even if the screen graphics can be easily migrated from InTouch to RSView.

There are also upgrades to facilities within the SEWRF. These include upgrades to add additional monitoring, controls, and SCADA alarms to facilities that are only visible on SCADA for status purposes. Additional upgrades are warranted to improve the SCADA system's capabilities to monitor and alert staff to process-related issues that require operator attention. The improvements will also allow operators to better attend to the issues remotely from the Control Room, allowing them to continue to monitor the remainder of the plant processes as well. The areas requiring upgrades include the Recycled Water Facilities, the Effluent Pump Station, RAS pumps, the Dewatering Building conveyor and dewatering sludge feed pumps, the boilers, and the AWP Facility.

The cost associated with the SCADA upgrades are provided in Table 5.27. Costs related to the Control Room modifications are not considered as those modifications are underway by SEJPA. Costs associated with software upgrades are also not listed as the costs are dependent on SEJPA's final decision on choosing a platform.

Table 5.27 SCADA Upgrades Cost Estimate

Item	Cost Estimate
Control Room Modifications & SCADA Console Replacement	TBD
SCADA Computer & Network Hardware Upgrades	$40,000
SCADA Software Upgrade	TBD
Coast Pump Station	23,000
Reclaim System Improvements	75,000
Effluent Pump Station Modifications	29,000
RAS Pump Control Modifications	36,000
Screw Conveyor Modifications	36,000
San Elijo Hills Pump Station	53,000
Boiler System Modifications	44,000
AWP System Improvements	118,000
Sludge Feed Batch Programming	33,000
Subtotal	$786,000
Contingencies, Taxes	$195,000
Total Estimated Construction Cost	$981,000
Admin. Fees	$98,000
Total Estimated Project Cost	$1,079,000

It should be noted that many of the SCADA upgrades will be self-performed by SEJPA staff. For that reason, the project cost includes reduced soft costs for only contingency (20%), sales tax (4%), and administrative costs (10%).

5.16 SOLAR FACILITIES, PHASE II

SEJPA is currently investigating installation of solar facilities on roofs of existing building and on new carport facilities. The Phase I solar project will be completed in-house under the direction of SEJPA staff. For this project, the feasibility of implementing solar photovoltaic (PV) power generation technology at a larger scale and as an additional means to offset the electrical energy consumption was explored. A lifecycle cost analysis was used to evaluate the economic feasibility associated with the construction and operation of the solar PV system. Two PV system ownership scenarios were considered, as follows:

1. Own – the PV system is owned, operated, and maintained by SEJPA for the lifespan of the system.

2. Power Purchase Agreement (PPA) – SEJPA enters a PPA with a third party PV system supplier (PPA provider).

5.16.1 Background

A solar PPA is a financial arrangement between a PPA provider and a host customer. The PPA provider designs, constructs, owns, operates, and maintains the PV system for the duration of the agreement. The host customer agrees to provide the site on its property for the PPA provider to install and operate the system and agrees to purchase all energy produced by the system for the duration of the agreement. The PPA also includes a pre-negotiated energy rate structure that specifies the price per unit of energy (kWh) purchases, and in some cases an annual energy price escalator is built-in to the rate structure that increases the energy price on an annual basis for the duration of the agreement.

PPA's allow the host customer to avoid many of the traditional barriers to implementation of solar PV technology, such as;

- High up-front capital costs;
- System performance risk; and
- Complex design and permitting processes.

In addition, PPA's allow the host customer to lock in electricity rates for the term of the agreement, which acts as a hedge against increasing future commercial energy prices. From a financial perspective, PPA's have an advantage over direct ownership alternatives for municipal organizations that are tax-exempt. Due to their tax-exempt status, municipal organizations cannot benefit from the federal tax incentives associated with installation and operation of onsite solar PV technology. However, in a PPA, the PPA provider is typically a private organization subject to federal taxation and can realize the federal tax incentives for solar PV systems installed and operated on host customer property. The federal tax incentives realized by the PPA provider can be passed on to the host customer in the form of a more attractive energy rate structure, thus allowing the tax-exempt host customer to realize the solar PV federal tax incentives indirectly. Figure 5.1 shows the typical roles of PPA participants, provided by the US EPA.

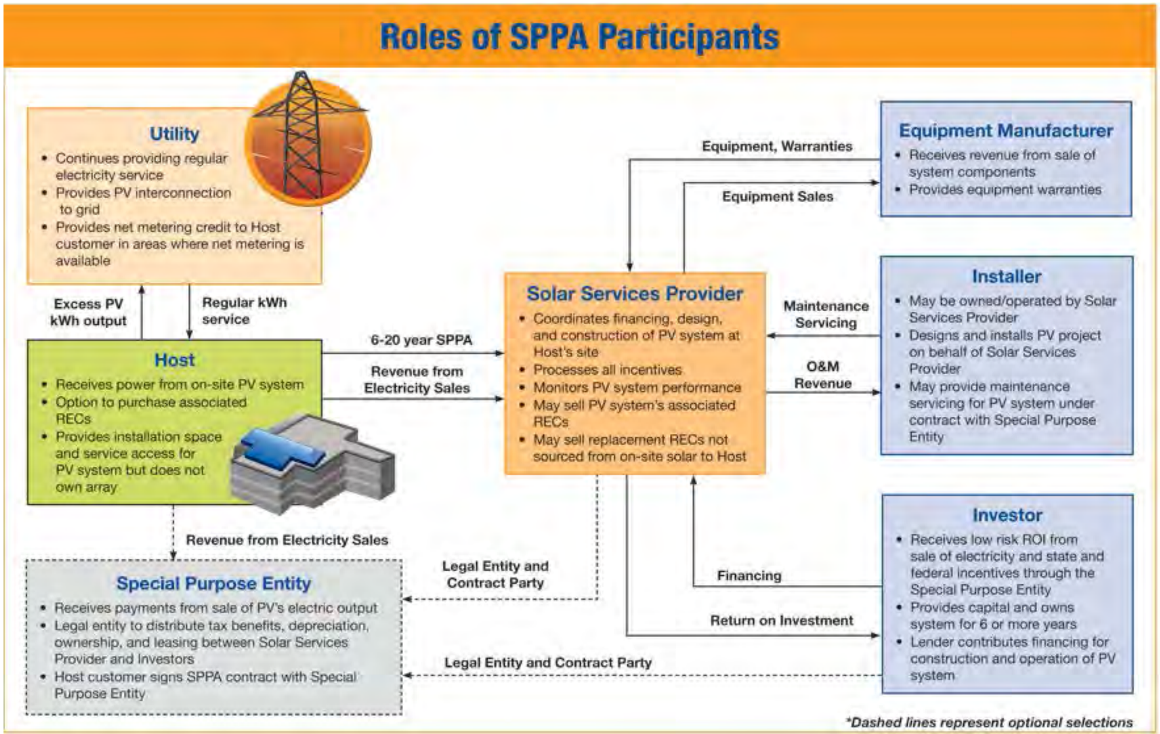

Figure 5.1 Roles of Various Participants of a Solar PPA (US EPA)

Under most PPA's, the typical period of the agreement is 20 years. At the end of the term, several options are available to the host customer:

1. Purchase the system at Fair Market Value.
2. Renew the contract in up to two 5-year increments.
3. PPA provider will remove the system at no cost to host customer.

5.16.2 Data Gathering

To begin the analysis, various solar PV system suppliers were contacted to obtain information on the current state of PPA agreements and costs of system ownership. The following three suppliers were selected for this feasibility study:

1. REC Solar
2. Solar City
3. SPG Solar

The suppliers were solicited to specify preliminary terms, design criteria, and energy production projections for both scenarios (Own/Operate and PPA). Information requested from suppliers is listed below.

1. System type (Fixed or 1-Axis Track)
2. System Size (kW DC)
3. Year 1 Energy Production (kWh)
4. System Degradation Rate (%)
5. Cost to Purchase System ($)
6. PPA Rate ($/kWh)
7. PPA Escalator (%)
8. PPA Terms and Conditions

Pertinent information provided by the PV system suppliers is presented with the analysis. From the data, several system sizes, and ownership vs. various PPA terms were generated. During the analysis, a total of five locations were determined to be suitable to install a solar PV system. Figure 5.2 presents the site plan with the five locations designated for solar power. The sizes or area of each of the locations is also presented in the figure.

5.16.3 Results and Discussion

The purpose of this study was to conduct a single feasibility study analyzing all options, based on the same assumptions and parameters. This allows selection of the most efficient and cost-effective solution. Enough data were compiled to present five different scenarios varying many system and agreement parameters. The PPA scenarios consisted of varying the system type and size (Installed on all 5 locations vs. installed at both field areas only), PPA rate, and annual PPA rate escalation. The ownership scenarios consisted of varying the system type and size. The following subsections present the approach to the analysis and corresponding results. Table 5.28 presents the five potential solar installation areas with the corresponding system size and electricity output potential. Upfront expenditure for each area is also estimated in the table.

Table 5.28 Preliminary Solar Sizing for Five Potential Installation Areas

Area	Description	Area (ft^2)	Size System (kW-DC)	Year 1 Production (kWh)	Upfront Expenditure ($)
1	Top of CCB	3,600	18	30,026.31	30,000
2	East facing roof	600	3	5,004.38	30,000
3	South facing roof	1,100	5.4	9,174.71	30,000
4	Field area 1	10,000	49.4	83,406.41	60,000
5	Field area 2	16,250	80.3	135,535.42	60,000
	Total	31,550	156	263,147.23	210,000

Assumptions

Several assumptions were made in order to conduct the lifecycle cost analysis. Assumptions were common to all five scenarios and are presented below:

1. All energy produced by the solar PV system is consumed on site.
2. For all PPA scenarios installing at areas 1 through 3 (Top of CCB and roofs), a $30,000 upfront capital expenditure per area has been included to account for equipment not provided by the PPA provider, such as conduit and wire between the solar PV system and the point of connection with the plant electrical system, and modifications required at the main plant switchgear. For all ownership scenarios installing at areas 1 through 3, the $30,000 upfront capital expenditure per area has been added to the capital cost of the solar PV system because both capital expenditures would be incurred in the same year.
3. For all PPA scenarios installing at areas 4 and 5 (Both field areas), a $60,000 upfront capital expenditure per area has been included to account for equipment not provided by the PPA provider, such as conduit and wire between the solar PV system and the point of connection with the plant electrical system, and modifications required at the main plant switchgear. For all ownership scenarios installing at areas 4 and 5, the $60,000 upfront capital expenditure per area has been added to the capital cost of the solar PV system because both capital expenditures would be incurred in the same year.
4. For all scenarios, the Year 1 energy rate is estimated to be $0.125/kWh, as determined from historical data.
5. Project duration is 20 years based on PPA terms.
6. Average annual PV system energy output degradation is 0.5 percent per year to account for decreased efficiency of the PV system over time.
7. San Diego Gas and Electric (SDGE) energy cost escalation rate is 3.0 percent per year.
8. Average inflation rate is 3.0 percent per year.
9. Project discount rate is 4.0 percent.

Net Present Value Analysis

Using the data provided from the three solar PV PPA providers in combination with the aforementioned assumptions, a net present value analysis was performed for 20 years on the five scenarios considered. Table 5.29 summarizes all findings in the net present value analysis.

From the analysis, various results are indicated, summarized below:

1. The scenario involving purchasing, operating, and owning the solar PV system (Scenario 5) has a negative net present value at 20 years of operation.
2. Scenarios involving the PPA agreement tend to be more economically attractive than ownership scenarios.

SOLAR ANALYSIS SITE PLAN

FIGURE 5.2

SAN ELIJO JOINT POWERS AUTHORITY
2015 FACILITY PLAN

carollo

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Table 5.29 Net Present Value Analysis Summary

Scenario	PPA or Own	System Location[2]	Size (kW DC)	Year 1 Energy Production (kWh)	Upfront Capital Expenditure[3]	PPA Rate ($/kWh)	PPA Annual Escalation Rate	SCE Energy Cost Escalation Rate[4]	Inflation Rate	Project Discount Rate	20-Year Net Present Value	Pay Back (yrs)
1	PPA	All 5 Areas	156	263,147	$210,000.00	0.09500	0.00%	3.00%	3.00%	4.00%	$16,203	18.8
2	PPA	All 5 Areas	156	263,147	$210,000.00	0.08500	2.00%	3.00%	3.00%	4.00%	$24,623	17.9
3	PPA	Area 4 and 5[5]	130	218,942	$120,000.00	0.09500	0.00%	3.00%	3.00%	4.00%	$68,204	13.7
4	PPA	Area 4 and 5[5]	130	218,942	$120,000.00	0.08500	2.00%	3.00%	3.00%	4.00%	$75,210	12.3
5	Own	All 5 Areas	156	263,147	$538,981.00[6]	N/A	N/A	3.00%	3.00%	4.00%	$(338,407)	>20

Notes:

1. All energy produced by PV system is used within the facility.
2. Area 1 – Top of CCB, Area 2 – East-facing roof, Area 3 – South-facing roof, Area 4 – Field area 1, Area 5 – Field Area 2
3. Upfront capital expenditure determined by assumptions listed in above section.
4. For all scenarios, the Year 1 energy rate is estimated to be $0.125/kWh.
5. Area 4 and 5 reflect installation of the solar PV system in both field areas. This represents the vast majority of area available for the solar system.
6. Represents $210,000 of upfront expenditure and the solar PV system cost of $328,981.

3. Scenarios installing a solar PV system under a PPA agreement at the larger field areas only (Scenario 3 and 4) have a significantly higher net present value and shorter pay back periods than scenarios where solar are installed at all 5 areas.

4. Scenarios using a PPA rate escalation (Scenarios 2 and 4) have slightly higher net present value and shorter pay back periods than scenarios that have a fixed PPA rate.

5. Scenarios 4 involves a PPA agreement and offers the greatest feasibility based on the net present value analysis. The 20-Year Net Present Value for this scenario is $75,210. The Pay Back time for this scenario is around 12 years.

5.16.4 Conclusions

Based on the results of the net present value analysis, the installation of a solar PV system at the site is feasible using a PPA agreement. Ownership scenarios exhibited highly negative results and should not be considered for implementation; this is mainly due to the comparatively low solar output that can be achieved by a system sized for the available area. Although all PPA alternatives presented positive net present values, scenarios installing a solar system on both field areas only (Scenarios 3 and 4) are recommended due to their significantly shorter pay back periods. These results are based on the majority of total available electricity being generated from the larger area encompassing the field areas. In fact, these areas (Area 4 and 5) represent nearly 84 percent of the electricity generated by the entire system installed at all five areas. Finally, the use of a fixed or variable PPA rate does not significantly influence the results, although the data presented yields a slight advantage to the variable rate.

5.17 SEISMIC IMPROVEMENTS

During the condition assessment, existing buildings were inspected to identify any potential construction methods that do not meet current seismic code requirements. Suspect areas were identified and additional investigation was done to review the record drawings and confirm the method of construction. Typical buildings of concern are those constructed of heavy block wall with wood roof framing. Older construction using these materials often did not provide adequate cross connection between the wood framing and block walls. Under seismic conditions, the connections are prone to failure, which can allow the walls to separate from the roof, potentially causing collapse of the wall and/or roof. Based on this review, the following buildings require seismic retrofit of the roof to wall connections:

- Cogeneration Building
- Operations Building
- Chlorination Building

The cost for performing the retrofit is provided in the Table 5.30.

Implementing this project will improve site and staff safety. The project can be combined with the Administration and Operations Buildings Improvements project discussed in Section 5.17 for economy of scale.

Table 5.30 Seismic Improvements Cost Estimate

Item	Cost Estimate
Seismic Upgrades	$140,000
General Conditions	$21,000
Subtotal	$161,000
Contingencies, Contractor OH&P, Taxes	$79,000
Total Estimated Construction Cost	$240,000
Engineering & Admin. Fees	$48,000
Total Estimated Project Cost	$280,000

5.18 SITE IMPROVEMENTS & SITE SECURITY

5.18.1 Site Improvements

The SEWRF site is fairly open north of the Administration and Operations Buildings. There is an existing stormwater sedimentation pond in the north-west corner of the property. The pond outlet is an open concrete channel that runs the length of the property along the western edge. The open storm drain channel is approximately 1,700 feet in length, with depth up to 10 feet and width up to 30 feet. The open channel takes up quite a bit of space that could otherwise be used for site access. There have also been discussions of building a community walking path through the plant that would provide access to the San Elijo Lagoon. The path of the open channel would provide a good location for this as it is along the outer edge of the plant and could then be fenced off from the path to maintain security. Converting the open channel to a buried box culvert would allow the space to be utilized for community purposes or otherwise provide additional site access to SEJPA staff.

The existing open channel transitions to a triple-barrel box culvert to pass underneath Manchester Avenue and the final outlet. Installing a similar culvert the length of the channel would require three box culvert sections, each with a width of 8 feet and a depth of 6 feet will provide the needed capacity. Transition structures would be needed at the outlet of the sedimentation basin and between the new and existing culverts.

Additional site improvements include replacement and repairs to the asphalt roads. Much of the asphalt is in poor condition and in need of replacement. There is approximately 166,000 square feet of asphalt area. It is estimated that as much as half is in need of replacement or repair. Following the major repair project, it is recommended that SEJPA implement a program to repair and reseal the asphalt every five years. This will improve the life and appearance of the roads and reduce the need for larger capital projects for larger replacement.

5.18.2 Site Security

Based on the review of the site security during the condition assessment, it is recommended that a phased approach be made to identify and address site security. The first phase would be to conduct a master plan to make a thorough assessment of the existing security. The study should include a needs assessment and threat risk assessment as well as a summary of best practices and site-specific recommendations for physical, electronic, and operational security improvements to address any issues identified. The study should make recommendations based on risk in order to maximize the value of the improvements. While there are no published guidelines for security at wastewater treatment plants, there are a number of "best practices" available from numerous sources, including the EPA, ASCE, and AWWA, among others. The study should utilize these sources to create a specialized plan for the SEWRF. It is recommended that a budget of $50,000 be made available to complete the study.

Security at the SEWRF consists of security fencing around the property with barbed wire, chain link fence, an automated entry gate, and limited surveillance. The perimeter fence has barbed wire but there are many locations where the fence height is less than 6 feet or nearby trees overhang the fence. Video surveillance is installed at the entry gate and an additional camera monitors the main entrance road from the operations building. The various site buildings are kept locked by the door hardware.

Based on our review of the site security it is recommended that the perimeter fence be replaced. All fencing should be at least 8 feet in height from the clear side. Chain link fencing should include three-strand barbed wire. Overhanging trees and bushes should be cut back or removed to discourage climbing over the fence. It is also recommended that barbed wire or another climbing deterrent be installed on the block wall next to the entry gate. The estimated project cost to replace the fencing is provided in Table 5.36. Due to the project simplicity, the cost estimate includes a reduced contingency at 15 percent, and reduced engineering, legal and administration fees at 15 percent.

Additional recommendations for site security improvements should consider using an enterprise access control system to monitor and alarm all building entry points, additional video surveillance around the perimeter, entry points, and critical asset areas, developing intrusion response plans, and operational policies and procedures to support security. The inclusion of these improvements and the extent of their scope should be studied in more detail under the Phase 1 Study for potential implementation.

The cost estimate for the recommended site improvements and security measures for the new culvert is shown in Table 5.31.

Table 5.31 Site Improvements Cost Estimate

Item	Cost Estimate
Site Work	$91,000
Box Culverts, Precast	$1,164,000
Fence Demolition	$19,000
Fencing	$222,000
Corner Posts	$2,000
Automated Gate	$16,000
Asphalt Replacement	$332,000
General Conditions	$188,000
Subtotal	$2,073,000
Contingencies, Contractor OH&P, Taxes	$1,026,000
Total Estimated Construction Cost	$3,099,000
Engineering & Admin. Fees	$620,000
Total Estimated Project Cost	$3,769,000

5.19 BUILDING IMPROVEMENTS

Based on the deficiencies in meeting building code requirements documented in Chapter 3, replacement or repurposing of the Administration and Operations Buildings is recommended. Three alternatives have been developed for a new Administration Building and replacement or repurposing of the Operations Building, including:

1. Alternative 1: Construct a new, relocated trailer-type Administration Building similar to the existing and reuse the existing Operations Building.
2. Alternative 2: Construct a new Administration Building and reuse the Operations Building. The Administration Building would be located near the plant entrance.
3. Alternative 3: Construct a new, combined Administration Building and Operations Building near the plant entrance. For the purposes of this study, the construction is considered to occur in a phased approach. This would allow SEJPA the opportunity to master plan the Administration Building for future expansion while not over-committing funds to construct the entire facility at once.

The alternatives have been developed based on the review of existing spaces, area use, and the recommended space needs based on SEJPA staff levels and needs. Note that an alternative has not been developed that considers demolition of the facilities and reconstruction in the same space. This construction would be very disruptive to continued operation of the SEWRF. Temporary facilities would be required on site or staff would have to be relocated off-site. Relocating off-site will reduce response time to alarms and other day-to-day operational and maintenance needs. It would also be necessary to relocate the control room and SCADA system. The costs for these temporary items will increase cost. Additionally, this approach would not address the recommendation to locate administrative staff closer to the plant entrance for improved site management and security. The recommended space needs, and a review of existing space, are provided in Table 5.32. Overall, the existing Administration Building, Operations Building, and Shop provide a combined space of approximately 9,400 square feet.

5.19.1 Alternative 1 – New Administration Trailer & Reuse the Operations Building

Figure 5.3 shows the proposed location for a new administration trailer. A typical trailer that would serve SEJPA's need is approximately 1,440 square feet and comes in a doublewide option. The trailer is considered a temporary structure and it would require additional permits for occupancy use. The maximum lease and permitting for a trailer is 60 months. The permit criteria may include seismic provisions by the trailer provider. A delivery, set up and installation cost will need to be considered. Inflation will have to be strongly considered if occupancy will continue for an evaluation period of 25 years.

This alternative also considers renovating or improving the existing tenant space of the existing Operations Building. The considerations include the possibility of asbestos removal, lead removal, and the evaluation of seismic integrity. These factors can greatly influence the cost of planning any type of renovation to the existing operations facility. The purpose of renovating this space is to correct all of the deficiencies that have been noted regarding building code and ADA compliance. In addition to building code compliance, the efficiency of circulations and adjacencies of programmed spaces will be greatly increased. Failure to make any improvements or remediation to the existing operations building will continue to expose the SEJPA to building code and ADA violations.

Table 5.32 Existing and Recommended Space Needs

		Existing Room Sizes			Proposed Room Sizes		
Room Type	Room Designation	Existing Room Size, sq ft	Existing Occupants	Room Deficient, CBC, ADA, Other	Room Description	Recommended Net Area, sq ft	Proposed Occupants
Operations/Administration							
Office	General Manager	189	1	ADA	Executive Size	250	1
Office	Director of Operations	218	1	ADA	Executive Size	250	1
Office	Mechanical Systems Supervisor				Standard size	150	1
Workstation	Mechanical Series	297	3	CBC	Standard Workstation	60	1
Workstation	Mechanical Series				Standard Workstation	60	1
Office	Chief Plant Operator	172	1	CBC	Mid-Level Size	200	1
Workstation	Operator Series	0	0	-	Standard Workstation	60	1
Workstation	Operator Series	0	0	-	Standard Workstation	60	1
Office	System Integration Supervisor	0	0	-	Standard size	150	1
Office	System Integration Series	0	0	-	Standard size	150	1
Workstation	System Integration Series	0	0	-	Standard Workstation	60	1

Table 5.32 Existing and Recommended Space Needs

Room Type	Room Designation	Existing Room Sizes: Existing Room Size, sq ft	Existing Room Sizes: Existing Occupants	Existing Room Sizes: Room Deficient, CBC, ADA, Other	Proposed Room Sizes: Room Description	Proposed Room Sizes: Recommended Net Area, sq ft	Proposed Room Sizes: Proposed Occupants
Office	Associate Engineer	106	1	ADA	Standard size	150	1
Workstation	Control Room	338	4	ADA	Control Console with (4) workstations	550	4
Office	Water Reclamation Specialist	203	2	ADA	Standard size	150	1
Office	Open Office				Mid-Level Size	200	1
Finance/Administration							
Office	Director of Finance	109	1	ADA	Executive Size	250	1
Office	H.R. Safety Administrator	109	1	ADA	Standard size	150	1
Office	Accounting Tech	126	1	ADA	Standard size	150	1
Workstation	Administrative Assistant/ Receptionist	110	1	ADA	Entry Lobby with workstation	250	1
	Subtotals	1977	17			3300	22

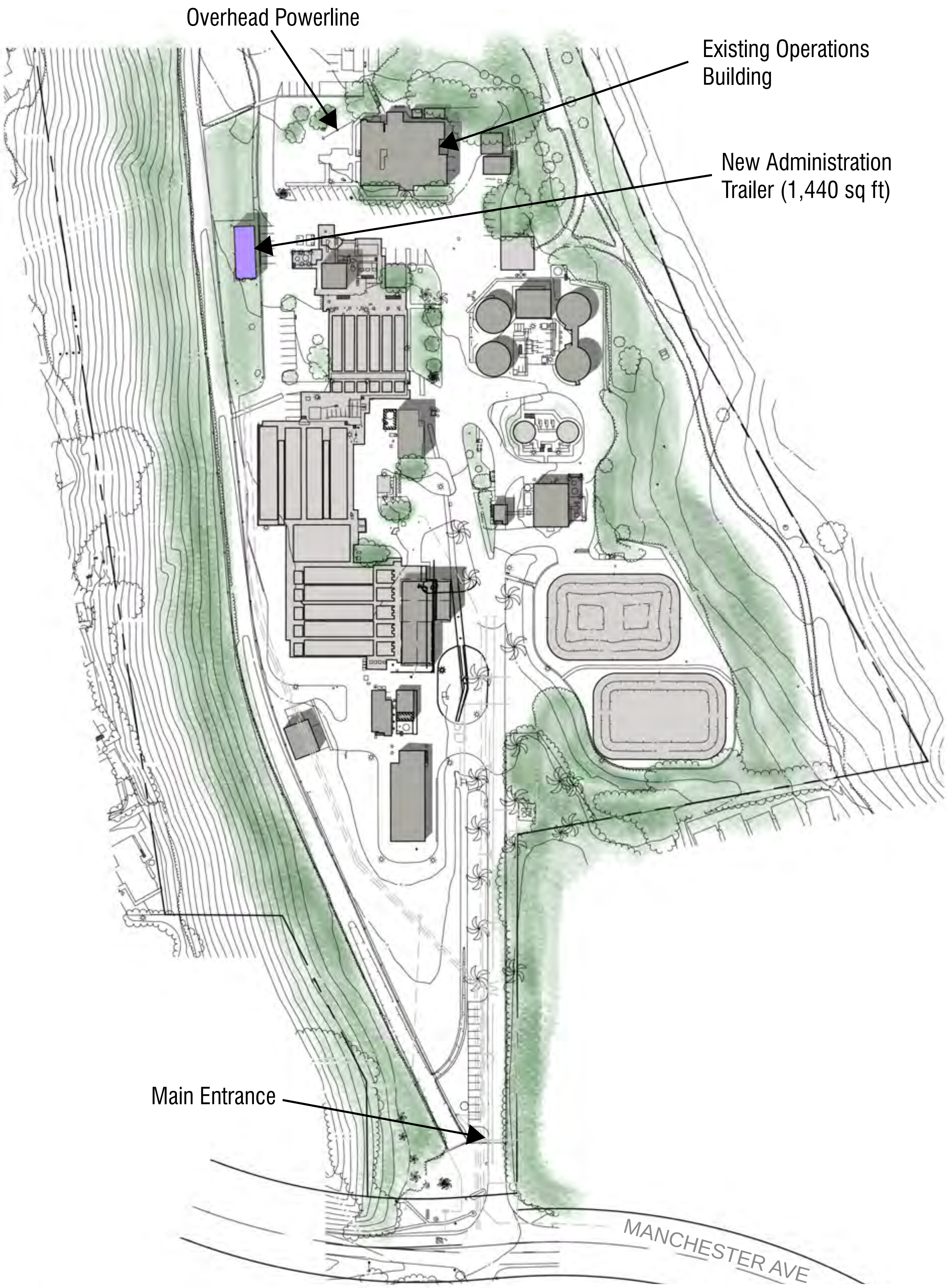
Table 5.32 Existing and Recommended Space Needs

		Existing Room Sizes			Proposed Room Sizes		
Room Type	Room Designation	Existing Room Size, sq ft	Existing Occupants	Room Deficient, CBC, ADA, Other	Room Description	Recommended Net Area, sq ft	Proposed Occupants
Laboratory							
Office	Senior Laboratory Analyst/ Lab Analyst Series	199	2	ADA	Room with (2) workstations	250	2
Room	Microbiology Lab	360	--	ADA	Existing Size	360	-
Room	Laboratory Storage	706	--	ADA	Existing Size	710	-
Room	Gas Storage	84	--	-	Existing Size	90	-
Room	Laboratory	884	--	ADA	Existing Size	890	-
	Subtotals	2233	2			2300	2
Support Spaces							
Room	Lunch Room	347	22	CBC/ ADA	Sized for Occupant Load	700	25
Room	Board/ Training Room	321	22	CBC/ ADA	Sized for Occupant Load	1100	35-40
Room	Break Room	0	-	-	Sized for Occupant Load	750	25-30
Room	Meeting Room	0	-	-	Sized for Occupant Load	350	8-10
Room	Men's Locker's	283	19 Lockers	ADA	Sized for Locker Load	400	-
Room	Women's Locker's	206	6 Lockers	ADA	Sized for Locker Load	100	-

Table 5.32 Existing and Recommended Space Needs

Room Type	Room Designation	Existing Room Sizes: Existing Room Size, sq ft	Existing Room Sizes: Existing Occupants	Existing Room Sizes: Room Deficient, CBC, ADA, Other	Proposed Room Sizes: Room Description	Proposed Room Sizes: Recommended Net Area, sq ft	Proposed Room Sizes: Proposed Occupants
Room	Men's Restroom	143	4	ADA	Sized for Plumbing Load	350	4
Room	Women's Restroom	0	1	ADA	Sized for Plumbing Load	200	2
Room	Unisex Restroom	48	1	ADA	Sized for Plumbing Load	80	1
Room	Janitor's Closet/ Supply	0	--	--	Water Heater/ Floor Sink and Storage	120	-
Room	Work/ Copy Room	0	--	--	Medium Room Size	250	-
Room	Library	0	--	--	Small Room Size	150	-
Room	Finance File Storage	600	--	ADA	Medium Room Size	250	-
Room	Server Room	119	--	ADA	Small Room Size	150	-
Room	Electrical Room	0	--	--	Small Room Size	150	-
Room	SCADA Room	16	--	CBC	Small Room Size	150	-
Room	Fire Riser	0	--	--	Standard Room Size	50	-
	Subtotals	**2083**	50			**5300**	-
	Net Square Footage					10,900	
	Gross Square Footage[1]					13,100	

Note
1. Gross square footage includes circulation area calculated as 20 percent of recommended room area.



ADMINISTRATION AND OPERATIONS BUILDING ALTERNATIVE 1

FIGURE 5.3

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5.19.2 Alternative 2 – New Administration Building & Reuse the Operations Building

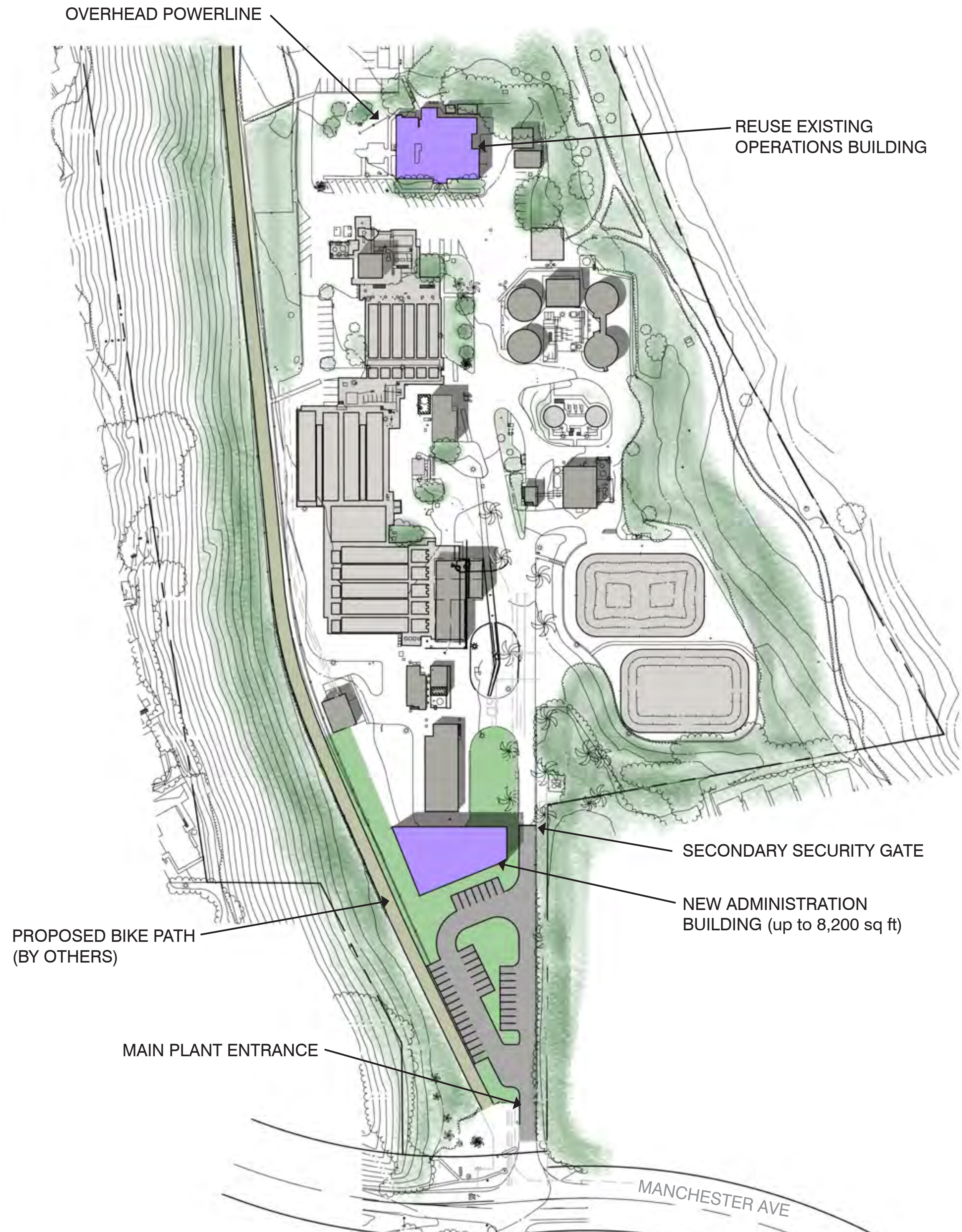
Figure 5.4 shows the proposed location for a new Administration Building with approximately 8,200 square feet. The facility is located near the main plant entrance to enhance security and provide better plant oversight. A secondary entrance gate is recommended to be installed east of the new building so that the main entrance gate can remain open during business hours. This will improve visitor entrance and allow larger groups (public or agency tours, for example) to congregate at the Administration Building prior to entering the site. The secondary gate would allow SEJPA to monitor and control who enters the plant.

The Administration Building is sized to accommodate all of the administration functions for both the operations and the financial divisions of this plant. The new administration building would not be large enough to house the laboratory or mechanical shop functions that currently exist in the Operations Building.

This alternative also considers renovating or improving the existing Operations Building as discussed in Alternative 1. The same considerations regarding cost and complying with building and ADA provisions still apply. The difference is that the laboratory will have to remain in this space and the cost for new equipment or modifications to the existing laboratory will influence the cost of improving the existing space. Renovating the Operations Building would also have to consider repurposing of existing space to serve different functions. Repurposing of the spaces may not align with staffing considerations and could result in a physical separation between administration and operations staff or within the operation staff.

5.19.3 Alternative 3 – New Administration Building & New Operations Building

Alternative 3 is considered to be phased approach to providing new space. Phase 1 involves the construction of a new Administration Building and Phase II would expand the new Administration Building to include a wing addition for the operations division. Site considerations will require covering the open stormwater channel to accommodate new parking as well as some grading work to accommodate the new structure, parking, and driving lanes. The 100-year flood plain elevation is at elevation of approximately 20 feet according to published FEMA flood maps. This elevation is just inside the main entrance gate. Only minor grading modifications are expected in order to stay above the flood plain.



ADMINISTRATION AND OPERATIONS BUILDING ALTERNATIVE 2

FIGURE 5.4

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5.19.3.1 Phase 1 - New Administration Building

Figure 5.5 shows the proposed location of the new Administration Building that is approximately 6,700 square feet. The location is also at the plant entrance for the same advantages described for Alternative 2. The Administration Building would be able to handle all of the administration functions and much of the common use spaces such as conference rooms and work rooms.

5.19.3.2 Phase 2 - New Operations Building

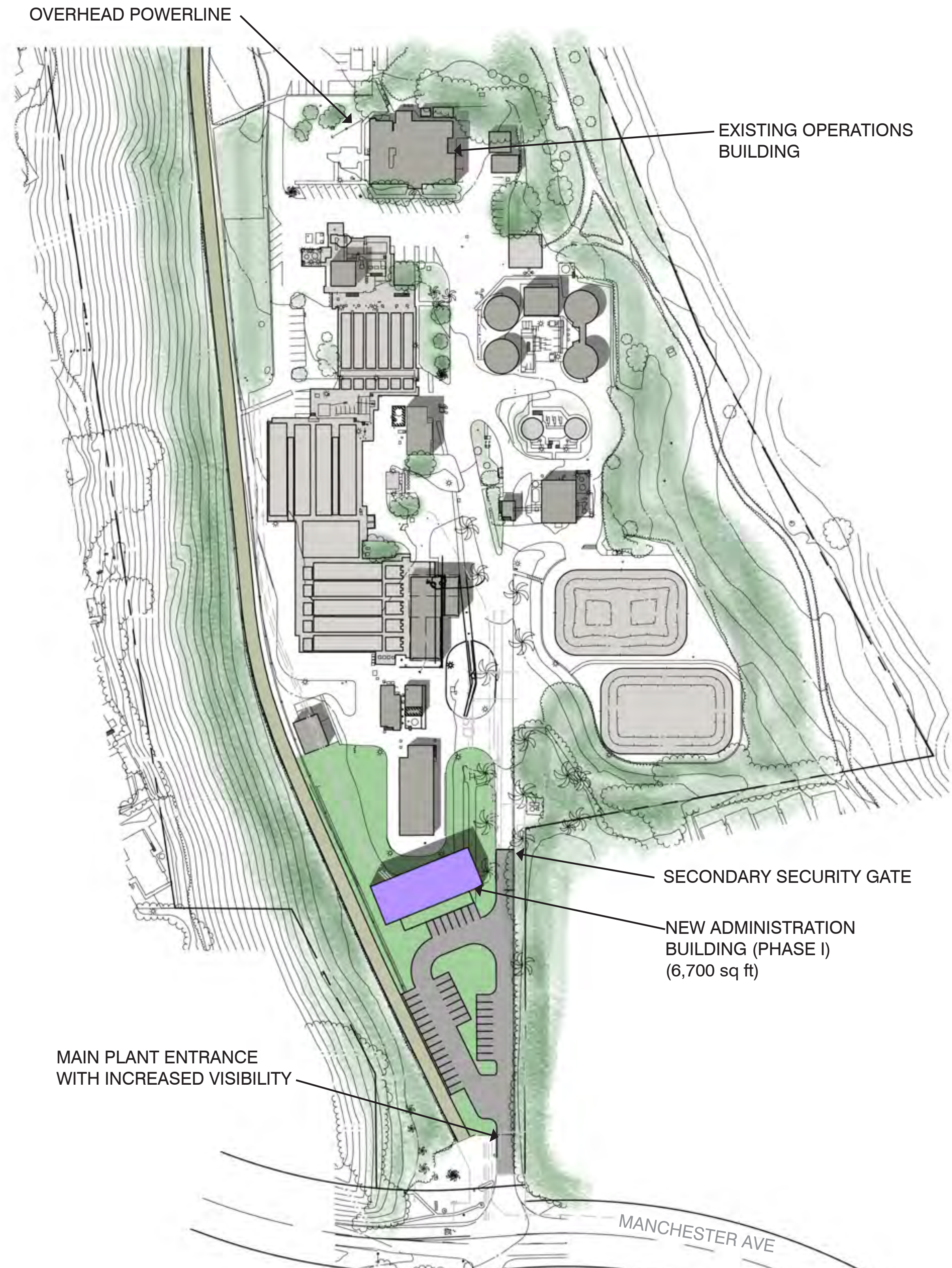
Figure 5.6 shows the expansion of the Administration Building with a new operations wing that is approximately 4,300 square feet. The total building square footage would increase to approximately 11,000 square feet. The efficiency and the use of the programmed spaces will also be greatly improved since all of the administration and operations spaces would be consolidated under the same building.

5.19.4 Alternative Analysis

The overall building use and space are summarized in Table 5.33. The table distinguishes between the new buildings and temporary trailer offices.

Table 5.33 Alternatives Building Space Comparison

			Alternative 3	
Description	Alternative 1	Alternative 2	Phase 1	Phase 2
Temporary Administration Trailer, sq ft	1,440	0	0	0
Existing Operations Facility, sq ft	7,413	7,413	7,413	0
Existing Shop, sq ft	630	630	630	630
New Administration Building, sq ft	0	8,200	6,700	6,700
New Operations Facility, sq ft	0	0	0	4,300
Subtotal	9,483	16,243	14,743	11,630



ADMINISTRATION AND OPERATIONS BUILDING ALTERNATIVE 3, PHASE 1

FIGURE 5.5

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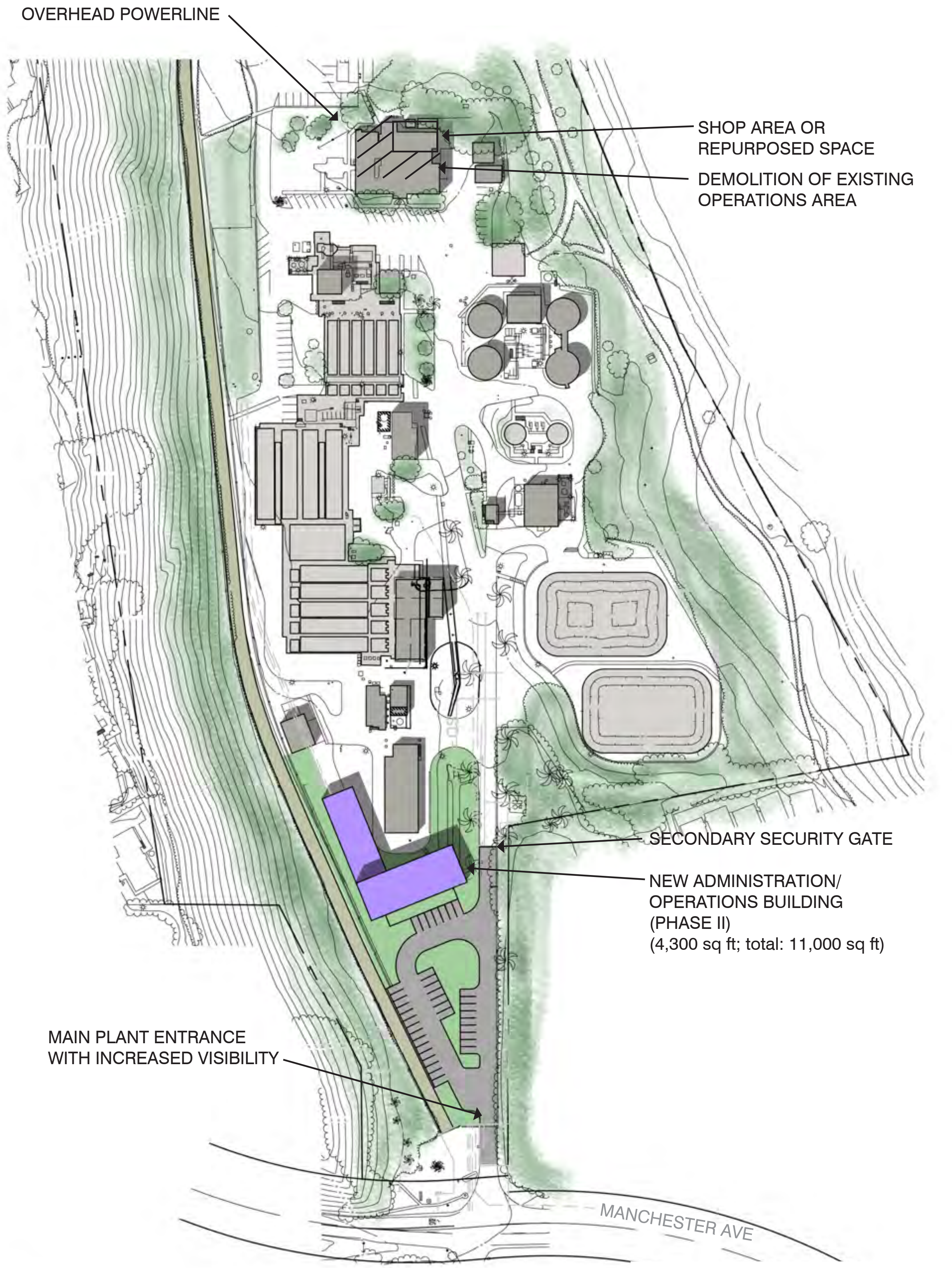

ADMINISTRATION AND OPERATIONS BUILDING ALTERNATIVE 3, PHASE 2

FIGURE 5.6

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Table 5.34 summarizes the total estimated project cost of each alternative. Site work is included to account for grading issues and relocation of below grade pipes and other utilities. The cost does not include utility electrical costs, or other unknown factors that may arise under a detailed planning study. Asbestos remediation has been estimated for the Operations Building but other environmental hazards such as lead have not been accounted for. A detailed survey is recommended to identify any other hazards.

Table 5.34 Administration & Operations Cost Analysis

			Alternative 3	
Description	Alternative 1	Alternative 2	Phase 1	Phase 2
New Building (1)	$0	$1,804,000	$1,474,000	$946,000
Site Improvements	$100,000	$500,000	$500,000	$0
Temporary Trailer(2)	$60,000	$0	$0	$0
Operations Building Improvements(3)	$223,000	$223,000	$223,000	$0
Asbestos Remediation(4)	$163,000	$163,000	$0	$163,000
Demolition(5)	$0	$0	$0	$89,000
General Conditions	$82,000	$403,000	$329,000	$180,000
Subtotal	$628,000	$3,093,000	$2,526,000	$1,378,000
Contingencies, Contractor OH&P, Sales Tax	$311,000	$1,531,000	$1,251,000	$682,000
Total Estimated Construction Cost	$939,000	$4,624,000	$3,777,000	$2,060,000
Engineering & Admin. Fees	$188,000	$925,000	$755,000	$412,000
Total Estimated Project Cost	$1,127,000	$5,549,000	$4,532,000	$2,472,000

Notes:
1. New building costs estimated at $220 per square foot.
2. Trailer cost assumes a 60-month permit period.
3. Renovation costs estimated at $30 per square foot.
4. Remediation costs estimated at $22 per square foot.
5. Demolition costs estimated at $12 per square foot

Alternative 3 has a combined cost of $7,004,000. The phased approach allows this cost to be spread over time. It also provides the greatest advantages in providing efficient use of building space and meeting all building code requirements. Alternative 1 is the lowest cost option. However, it does not address the code compliance issues in the Operations Building, and it is not a permanent solution. The use of another temporary facility will likely not appease the Coastal Commission in obtaining a new permit and this approach will put SEJPA in an awkward position of trying to pass a temporary facility off as a permanent structure. Alternative 1 is not recommended and should not be considered moving forward.

5.19.5 Recommendation

An Option and Evaluation Ranking Matrix has been created to provide a ranking system to evaluate each alternative and facilitate the recommendation process, as shown in Table 5.35. Each of the alternatives' objectives is given a weighting factor of importance in the matrix. The objectives are assigned a number from 1 to 4 with a ranking of 4 as the best possible rank. The rank is multiplied by the weighting factor to assign a score for each objective. The score of each objective is totaled to assign a final score for each alternative.

Table 5.35 Alternatives Evaluation Ranking Matrix

Objectives	Weighting Factor	Alternative 1		Alternative 2		Alternative 3	
		Rank	Score	Rank	Score	Rank	Score
Efficient Space For Function (e.g. grouping divisions and similar staff)	25%	1	0.25	2	0.5	4	1
Addresses Site Security	20%	1	0.2	3	0.6	3	0.6
Efficient Site Utilization	5%	2	0.1	3	0.15	4	0.2
Addresses Code/Health/Safety/Unknown Risks/ ADA	30%	1	0.3	2	0.6	4	1.2
Site Disruption/Constructability	5%	4	0.2	2	0.1	2	0.1
Building Costs/Site Work Costs	15%	4	0.6	3	0.45	2	0.3
Total Score	100%	1.65		2.4		3.4	

Note
1. Scores are from 1-4 with 4 being "BEST."

Although each alternative has its purpose for viability, we recommend that all non-compliant code and ADA issues should be addressed. From this standpoint, Alternative 1 is the least desirable. Alternatives 1 and 2 both utilize the Operations Building. A more detailed study is needed to identify other unknown conditions or hazardous materials and determine an appropriate cost to rehabilitate the facility. These options do not fully address, safety, code compliance, ADA, or provide an increase of efficiency and improved relationship for programmed spaces between divisions and staff. Additionally, the age of the Operations Building should also be considered. While a new larger Administration Building could have a life span of 30 to 40 years, the Operations Building is already that old in many areas of its phased construction. It is unlikely the building will last for another 30 to 40 years without increased maintenance costs or rehabilitation costs.

The outcome of the evaluation matrix shows Alternative 3 to have the best overall score of 3.4. The two main objectives that allow this to be the best option is efficient space planning and the most code, safety, and accessibility compliance of the new building. With the completion of Phase II, a single facility will be able to consolidate all of the administration spaces. This consolidation can be used to produce a higher quality facility and create a highly improved relationship between all of the spaces of all of the divisions among the staff.

5.20 LAND OUTFALL REPLACEMENT

The SEWRF outfall system, shown on Figure 5.7, is operated by SEJPA and owned jointly by SEJPA's member agencies and the City of Escondido. The system maintains a capacity of 25.5 mgd, with 20.15 mgd owned by Escondido and the remaining 5.35 mgd owned by SEJPA. The outfall system consists of 3,300 feet of 30-inch asbestos cement (AC) and polyvinylchloride (PVC) land outfall and 4,000-feet of 30-inch and 4,000 feet of 48-inch reinforced concrete ocean outfall. As shown on Figure 5.8, the land outfall consists of 2,500-feet of AC pipe installed in 1964 and 800-feet of PVC installed in 1999. Much of the AC portion of the land outfall is located within the San Elijo Lagoon, under tidal channels. The AC pipe is 50 years old and is likely nearing the end of its useful life. The initial construction of the land outfall most likely included standard open-trench construction methods. As such, the SEJPA is interested in assessing its condition.

5.20.1 AC Pipe Characteristics

AC pipe is made from a mixture of Portland cement (or cementitious materials) and asbestos fibers with or without silica. AC pipe installed in North America was typically manufactured to ASTM C500 specifications as either Type I or Type II pipe. The first asbestos cement pipe introduced and used in the United States occurred in 1931 and was Type I pipe that consisted of approximately 80% Portland cement and 20% asbestos fibers. Type II asbestos cement pipe was introduced in the United States in the mid 1930's. In Type II pipe, 40 percent of the Portland cement was replaced with silica and the pipe was pressure and heat cured in an autoclave. This pipe proved more resistant to acids and sulphates and is considered a chemically resistant pipe. Type II pipe became the predominant type of pipe used in North America from the 1940's forward.

External corrosion is generally caused by surrounding soils conducive to lime leaching. These soils typically have high concentration of sulfates, low ph, and a high or variable groundwater table in the vicinity of the pipe. High levels of soluble sodium are indicative of the presence of sodium sulfate, which can induce sulfate deterioration in concrete, resulting in a softening of the pipe wall. Soil moisture content also influences the external corrosion rate. Wetter soils are typically more conducive to exterior deterioration of asbestos cement pipe than dry or fast draining soils.

Interior corrosion, caused by soft or acidic water can be particularly damaging to asbestos cement pipe. Typically, the Langelier Index (LI) and Aggressive Index (AI) are used to assess the aggressiveness of water transported through the pipe: A LI less that 2 or AI less than 10 are indicative of highly aggressive water.

SAN ELIJO WATER RECLAMATION FACILITY
LAND & OCEAN OUTFALL

FIGURE 5.7

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SEWRF LAND OUTFALL

FIGURE 5.8

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5.20.2 Available Condition Assessment Techniques

Condition assessment and environmental testing are used to check the condition of AC pipe and the corrosiveness of the internal and external environment. For pipe wall condition assessments, both destructive and non-destructive methods exist that provide qualitative and quantitative information on the pipe. Environmental testing is a non-destructive method that only indicates the presence or absence of conditions that could lead to deterioration of the pipe. Methods available for use are listed below.

5.20.3 Non-destructive Testing

Visual/Chemical Inspection – Visual inspection of the exterior of the pipe is a qualitative method that provides information on the presence of corrosion, but does not quantify the extent of corrosion. These inspections can include scratch tests to assess degradation in the exterior wall, sounding of the pipe for discontinuities, measuring the depth of pitting in the wall, and pH testing of the pipe surface to determine if lime leaching has occurred.

Soil and Groundwater Testing - For AC pipe, the primary mechanisms of potential degradation are from attack by aggressive chemicals in the surrounding soil. These chemical attacks come in the form of sulfate deterioration, concrete carbonation, and acid attack. Testing will reveal potential problems related to leachable calcium, sodium, and sulfate ions in the soil and groundwater that cause chemical degradation of the pipe.

Conveyed Water Testing - The aggressiveness of the conveyed water can result in degradation of AC pipe. For example, soft water with very low carbonate and bicarbonate content could result in the leaching of free lime from the cement. Testing of the conveyed water in the pipe can indicate how aggressive the water is as measured by use of the LI and AI.

Sonic Leak Inspection - Sonic inspection entails sending a receiver through a pressurized pipeline and listening for acoustic events that may indicate leaks in the pipe. The level of the sound or frequency can help evaluate the size of the leak. The approximate location of the leak can also be determined by correlation methods and equipment. This method, however, does not provide condition information on pipe wall. It only evaluates the presence of leaks, which tend to manifest at joints and may not be indicative of overall pipe condition.

Acoustic Pipe Wall Stiffness Assessment - Acoustic signals can also be used to estimate remaining effective AC pipe wall thickness. An acoustic signal is transmitted through the pipe and measured to determine effective (non-deteriorated) wall thickness. Although this technology cannot be used to identify specific locations of severe degradation, it can be used to estimate the average remaining wall thickness over the length the acoustic signal is measured (typically a few hundred feet).

Broadband Electromagnetic (BEM) Thickness Testing - Broadband electromagnetic testing is electromagnetic or eddy current system that produces a thickness profile of a pipe. The BEM scan is not affected by background electromagnetic interference, and the test frequencies can be adjusted to the specific pipe material and site conditions. This technology has been used successfully for the assessment of ferrous metal pipe thickness and is currently being adapted for use with AC pipe. The BEM assessment requires a section of pipe be excavated to allow 360-degree access over the length of pipe to be tested. Since the use of this technology on AC pipe is in development, independent verification of the pipe characteristics by analyzing pipe samples is highly recommended to ensure the reliability of the results.

5.20.4 Destructive Testing

5.20.4.1 Mechanical Testing of Pipe

Pipe samples from failed pipe and coupons from in service pipe can be mechanically tested. Commonly used mechanical tests include Hydrostatic Pressure Test to measure the burst strength, the Flexural Test to determine if the pipe can withstand the loads stated in the specifications, the Crushing Test to determine if the pipe can withstand the crushing loads stated in the specifications and the Schmidt Hammer tests to measure the elastic properties or strength of the AC pipe, mainly surface hardness and penetration resistance. O-ring condition can be tested by applying a compression test (ASTM D 395) and a hardness test (ASTM D 1415) and Fourier transform infrared spectroscopy.

5.20.4.2 Testing of Pipe Coupons

Electron Microscopes - Scanning Electron Microscope (SEM) and Energy Dispersive Spectroscopy (EDS) are two examples of electron microscopes that use a focused beam of electrons to analyze chemicals, e.g., AC pipe samples to determine pipe degradation.

Phenolphthalein Dye Testing - Phenolphthalein dye testing can be used to identify how much of the pipe cross section has degraded. When phenolphthalein dye is injected or sprayed over the cross section of an asbestos cement coupon, the cross section will turn purple or pink where calcium is still available while the white area may indicate degradation of calcium.

Chemical Analysis Using Energy Dispersive Spectroscopy (EDS) - Energy Dispersive Spectroscopy (EDS) with an electron microscope can be used to determine the chemical composition of asbestos cement pipe sections. Because calcium leaching causes a loss of strength, the calcium content (or lack thereof) may be an indicator of deterioration.

Petrographic Analysis- Petrographic examination of the pipe may reveal sulfate induced deterioration and acid attack on the pipeline wall in addition to other signs of failure.

5.20.5 Techniques Evaluated for the San Elijo Land Outfall

In an effort to determine the condition of the land outfall, a number of techniques have been evaluated for applicability. These methods include the following:

- Acoustic Pipe Wall Stiffness Assessment
- Broadband Electromagnetic (BEM) Thickness Testing
- Visual/Chemical Testing
- EDS Testing of Pipe Coupons

Sonic leak detection was not evaluated as it does not provide information on the condition of pipe wall. Mechanical testing was not evaluated as it was not deemed feasible to extract full pipe sections of the land outfall for testing.

5.20.6 Acoustic Pipe Wall Stiffness Assessment

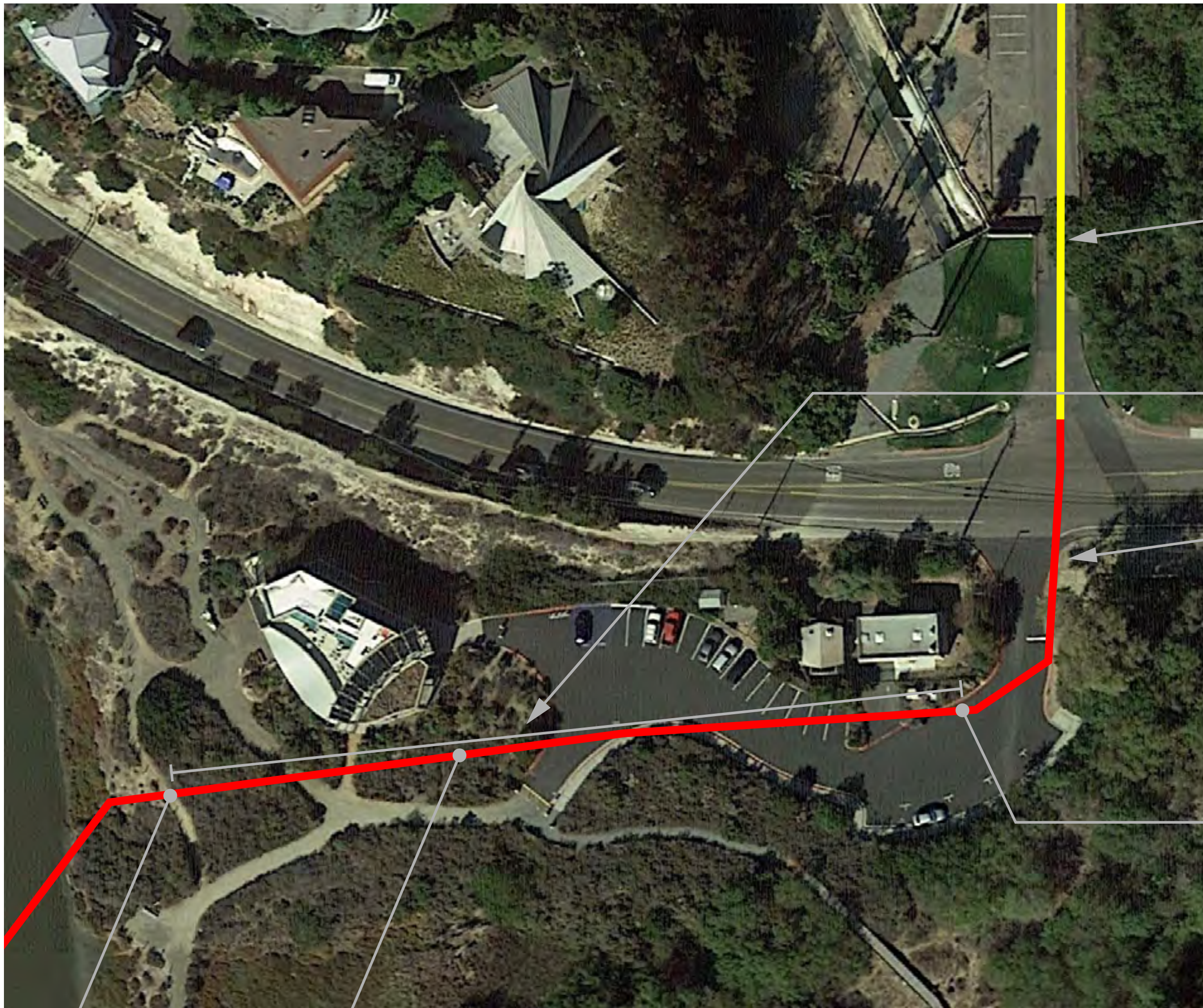
Acoustic pipe wall testing was evaluated using Echologics ePulse testing system. This system measures the average pipe wall thickness between acoustical sensors attached to the pipe. These sensors are attached via existing pipe access (flushing vault and air valve structure) and are also attached directly to the surface of the pipe with access being provided via vacuum potholing. A third access to the pipe (outside the limits to be tested) is required to induce the acoustical frequency onto the pipe. The recommended sensor spacing is limited to no more than 300-feet.

Due to sensor spacing limitations, it is not possible with this technology to assess the portion of the outfall located underwater. Therefore, the initial testing program includes testing two sections of pipe, the first located within the parking lot of the San Elijo Lagoon Conservancy staging area, and the second located west of the lagoon between the railroad tracks and Highway 101. The proposed testing locations are shown on Figure 5.9 and 5.10.

Estimated cost for the assessment is shown in Table 5.36.

Table 5.36 Estimated Cost for Assessment

Task	Estimated Cost ($)
Acoustical Pipe Wall Testing (two location approximately 800-feet of pipe total)	40,000
Potholing (up to 4 locations)	17,000
Data Analysis and Reporting	10,000
Subtotal	67,000
Contingency (15%)	10,000
Budget Level Fee Estimate	77,000



ACOUSTICAL PIPE WALL THICKNESS TESTING – LOCATION 1

FIGURE 5.9

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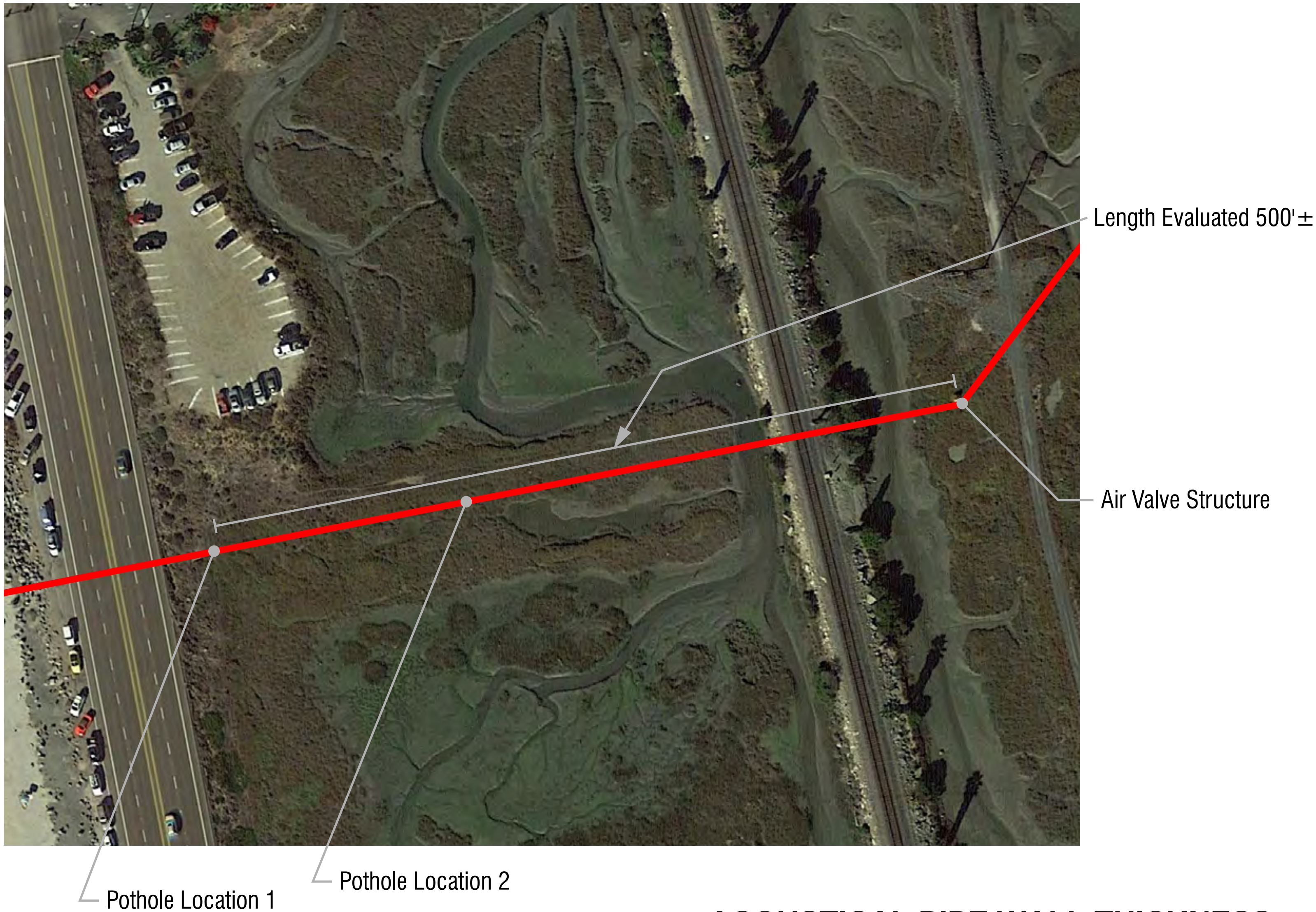

ACOUSTICAL PIPE WALL THICKNESS TESTING – LOCATION 2

FIGURE 5.10

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Future testing on the underwater section of pipe may be accomplished during reconstruction of the lagoon. Assuming access can be provided to the pipe by others, we anticipate a similar level of effort and cost to test this section of pipe.

While providing acoustic pipe wall thickness testing as outlined above is certainly possible, because of the difficult site conditions the reliability of the results would be questionable. Echologics has provided a number of qualifications with their proposal that identify these challenges as follows:

- Lack of adequate pressure in the outfall: For the testing to be effective, a minimum pressure of 20 psi is required in the outfall. Adequate pressure is a concern.
- Possibility of air pockets in the outfall: Based on a review of the drawings and minimal air release facilities along the alignment, air pockets in the outfall are likely present and would adversely affect the accuracy of the results.
- Unknown effluent properties: Given that the service fluid within the pipe is secondary effluent the bulk modulus of the effluent is unknown. Using an assumed bulk modulus will affect the accuracy of the results.
- Difficulty of Pipe Access: At two locations, access to the pipe will be by vacuum excavation (potholing). Due to the location of the potholing near the lagoon, the ability to control water and provide suitable access to a clean pipe is questionable.
- Small sample size: The testing program, if successful, will not provide any condition information of the underwater section of the outfall and the relatively small sample size of tested pipes may not give a representative result for the entire pipeline.

5.20.7 Broadband Electromagnetic (BEM) Thickness Testing

Broadband electromagnetic testing was suggested as an applicable technology by V&A Consultants in February of 2014. However, since that time V&A and Carollo Engineers have become aware that BEM is currently being adapted for use with AC pipe and does not have a track record that proves the results for AC pipe. Based on this, Carollo does not recommend condition assessment using BEM technology for this project.

5.20.8 Visual Inspection and Coupon Testing

Visual inspection and coupon testing is proposed to be conducted at two locations as shown on Figure 5.11. The pipe is proposed to be excavated at each location to allow man entry into the excavation for pipe inspection. Shoring and dewatering of the excavations will be required to support the testing activities. At each location where the pipe is exposed, the following tests are proposed to be conducted.

- Measure soil resistivity using the Wenner Four Electrode Method along the exposed pipe. The Wenner 4-pin method provides in situ resistivity data at various depths. Lower soil resistivity indicates a more corrosive soil environment.

SEWRF LAND OUTFALL TEST PIT LOCATIONS

FIGURE 5.11

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- Measure pH of the pipe surface using phenolphthalein test indicating solution. This test will indicate if lime leaching has occurred on the pipe surface. The loss of lime is associated with degradation of asbestos cement pipe.
- Observe the condition of the pipe surface. Perform scratch test with metal scraper. This test is useful for tentative identification and qualification of pipe conditions in field, but it cannot quantify degree of corrosion attack.
- Digital photographs of corrosion observations of the pipe surfaces. It is noted that the qualitative condition assessment observations are subjective and based upon the evaluator's expertise.
- Pipe condition assessment by sounding to listen for discontinuities and penetration measurements with a chipping hammer (find depth to sound material).
- Pit depth measurements will be performed in areas where pitting is observed. A depth gauge will be used for pit depth measurements.
- A soil sample will be obtained from each excavation. The soil samples collected will be tested for electrical resistivity, chlorides, sulfates, pH, and bi-carbonates.
- Pipe Coupon Analysis: The following tests will be performed on two hot tap coupons of AC pipe removed from the pipe; visual examination aided by low power stereomacroscopy, hardness and scratch testing, phenolphthalein indicator staining, chemical analysis of pipe cross section using scanning electron microscopy/x-ray energy dispersive spectrography (SEM/EDS) techniques, and an estimation of the remaining service life prior to failure due to cement mortar leaching.

The estimated cost for the visual inspection and coupon analysis is shown in Table 5.37 below.

Table 5.37 Estimated Cost for Visual Inspection and Coupon Analysis

Task	Estimated Cost ($)
Test pit excavation and shoring (two locations)	40,000
Dewatering (assumes one well point at each location)	15,000
Groundwater Handling/Permitting	10,000
Hot tapping for coupons at two locations	6,000
Visual Inspection/Data Analysis/Lab Testing	35,000
Data Analysis and Reporting	10,000
Subtotal	116,000
Contingency (15%)	18,000
Budget Level Fee Estimate	134,000

This testing will not provide any quantitative condition information of the overall outfall, but it will provide an indication of corrosion present at the locations tested.

5.20.9 CIP Planning for Land Outfall Replacement

The land outfall is 50 years old. It is located in what is likely considered a corrosive environment, and is approaching the end of AC pipe's advertised service life. Given that, planning for the ultimate replacement of the pipe is justifiable. A feasible concept has been identified for replacement that includes Horizontal Directional Drill (HDD) technology to install a new land outfall while the existing land outfall remains in service. This same technology was used by the City of Solana Beach to construct a new sewage force main through the lagoon from the pump station on Pole Road Trail to the SEWRF plant entrance on Manchester Avenue.

The concept is shown on Figure 5.12. Drilling is proposed to be staged in the southernmost part of the Las Olas Restaurant parking lot. The receiving area is proposed on the western corner of the SEWRF plant entrance and Manchester Avenue. The total length of the HDD is approximately 2,100-feet. Pipe laydown and stringing is proposed for the east side of the SEWRF entrance driveway. Once drilling is progressed from the Las Olas parking area to the SEWRF plant entrance, and the desired diameter of the hole is obtained through additional passes with the drill bit and reaming of the hole, the pipe is attached to the drilling rod and pulled into the hole in one continuous operation. It is anticipated that drilling operations would last six to eight weeks.

To install the pipe from the Las Olas Restaurant to the ocean outfall, the HDD rig would be reoriented to drill towards the ocean outfall on the west side of Highway 101. Pipe would then be pulled from the beach side of Highway 101 back to the HDD staging area. The length of this HDD is approximately 200-feet. An alternative to HDD is to install open cut pipe along the east side of Highway 101 to the existing land outfall alignment, then jack and bore under Highway 101. A junction structure would then need to be constructed to allow the final connection of the new land outfall pipe and existing ocean outfall. The structure would provide a location for future access and monitoring of the outfall system.

Table 5.38 below provides the estimated project cost to construct

It is recommended that SEJPA begin the planning for the replacement of the Land Outfall. This should include preliminary studies to identify the engineering and administrative requirements of the project, develop and analyze potential alternatives, and further refine the cost. Permitting may be fairly extensive.

SEWRF LAND OUTFALL REPLACEMENT CONCEPT

FIGURE 5.12

SAN ELIJO JOINT POWERS AUTHORITY
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Table 5.38 Land Outfall Replacement Cost

Task	Estimated Cost ($)
2,300 LF 30-inch HDD (at $1,500/ft)	$3,450,000
Junction Structure	$26,000
Pipe Connections	$16,000
Subtotal	$3,492,000
Contingencies, Contractor OH&P, Sales Tax	$1,729,000
Total Estimated Construction Cost	$5,221,000
Engineering & Admin. Fees	$1,044,000
Total Estimated Project Cost	$6,265,000

6.1 INTRODUCTION

This section provides an approach to ranking the CIP projects recommended in Chapter 5. Project ranking is explained and project justification is provided for the top ten projects. Certain projects have been combined due to scope similarity or for purposes of economy of scale. These include the following:

- Return Flow Upgrades project is combined with the Aeration Upgrades project.
- Seismic Upgrades project is combined with the Administration & Operations Buildings Improvements.
- DAF Upgrades project is combined with the Dewatering Upgrades project.

6.2 CIP PROJECT RANKING

The CIP projects identified in Chapter 5 are summarized in Table 6.1. The table identifies the major project components and drivers along with the estimated project cost. Project numbers are assigned arbitrarily for tracking purposes.

In order to compare and evaluate projects for scheduling and budgeting needs, a ranking system has been developed using a "triple-bottom line" approach. Similar to criticality ratings, this approach compares the community, environmental, and economic aspects between each CIP project to achieve the goals of SEJPA and this project. Each category has an individual goal:

- Financial: Implement cost effective projects and solutions. Maximize economic benefits for customers through cost-effective operations.
- Environmental: Meet or exceed permit limits and minimize reportable offenses. Improve habitat and minimize impacts to the local and global environment.
- Social: Maintain a high standard of worker safety and protection and maximize community benefits through improved aesthetics and recreational uses.

The overall result of meeting these goals will be to implement projects that rank highest is all categories on a weighted scale. SEJPA and Carollo have weighted each category to align with SEJPA's goals of staff safety and consistent and reliable wastewater treatment: as shown in Table 6.2.

Table 6.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
1	Land Outfall Replacement	• Replace the Land Outfall beneath the San Elijo Lagoon.	• Risk • Safety • Condition	$6.27
2	Buildings & Seismic Improvements	Architectural/Structural • New Administration Building, located near to plant entrance • New and/or Rehabilitated Operations Space • Provide seismic retrofit of roof-to-wall connections for the following: o Operations Building o Cogeneration Building o Chlorine Building	• Code Compliance • Risk • Safety • Condition	$7.00
3	Preliminary Treatment Upgrades	Mechanical • Install three mechanical bar screens. • Install duty/standby compactors • Install new screenings conveyor • Replace inlet gate and scum gate in Primary Sedimentation Basin No. 3 Structural • Repair and reline screenings channels • Add freeboard to channels • Repair and reline grit influent, grit bypass, and grit effluent channels • Replace channel covers • Replace grit chamber covers • Repair corrosion in Primary Sedimentation Basin No. 3 • Install fall arrest system	• Condition • Risk • Reduced Labor • Process Improvement • Safety	$2.37

Table 6.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
4	Electrical	Electrical • Replace Switchboard MS-2 in Cogeneration Bldg • Replace Odor Control Panel in Headworks • Complete and update Arc Flash Study and install AF labels on all panels	• Condition • Safety • Risk	$0.71
5	Dewatering Upgrades	Mechanical • Replace Belt Filter Presses • Replace feed pumps Structural • Evaluate and retrofit and repair hopper • Repair mezzanine and roof decking Electrical • Replace electrical equipment and controls	• Condition • Safety • Reduced Labor • Process Improvements	$1.79
6	Digester Improvements	Mechanical • Replace Sludge Circulation Pumps Nos. 2 , 3, and 5 • Replace heat exchangers • Consider heat exchanger replacement Structural • Replace Digester No 2 floating cover • Concrete repair and lining in Digester No. 2 • Repair seals around cover in Digester No. 3 • Repair joint between cover and walls in Digester No. 4 • Perform more detailed inspection and repair of cracks on Digesters 2, 3, and 4.	• Condition • Redundancy • Reduced Labor • Process Improvements	$1.66

Table 6.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
7	Aeration & Return Flow Upgrades	<u>Mechanical</u> • Install mixing in anoxic zones. • Install high efficiency blowers • Replace drain pump, provide shelf spare • Diffusers • Permanent Baffles • Install Return Flow Pump No. 4 • Replace discharge piping, all pumps. • Replace pump rails, all pumps. • Install fall arrest system	• Process Improvement • Energy Efficiency • Redundancy • Condition • Safety	$0.88
8	DAF Upgrades	<u>Mechanical</u> • Replace Pumps (3 total) • Replace DAF No. 2 Drive • Install Pressurization Pump No. 2 on DAF No. 2 • Implement co-thickening <u>Structural</u> • Coat mechanisms	• Condition • Reduced Labor • Process Improvement • Energy Efficiency	$0.44
9	SCADA	<u>Electrical</u> • Transition to single platform • Update SCADA software • Install SCADA system hardware (servers, historians, network attached storage, etc.) • Add missing equipment signals, alarms, etc. • Update Control Room workstation	• Condition • Risk • Operations Improvements	$1.08

Table 6.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
10	Secondary Upgrades	Mechanical • Replace scum troughs and reinstall at correct elevation. • Remove RAS Pump Nos. 1 and 2 • Install VFD on scum pump • Add mixing to RAS/WAS wet well • Install fall arrest system Structural • Repair and reline concrete in effluent boxes, RAS channel and effluent channel • Replace weir troughs and inlet baffles	• Condition • Process Improvement • Reduced Labor • Safety	$1.21
11	Site Improvements & Security	Civil • Replace open storm channels with storm pipes, or culverts to improve site access and use. • Replace site asphalt Structural • Improve fencing for proper height and climbing deterrents • Install climbing deterrent on block wall at gate • Improve video surveillance at critical areas • Consider intrusion alarms at major assets	• Site Improvements • Public Access • Community • Safety • Risk	$3.77
12	Tertiary Upgrades	Mechanical • Replace Reclamation Pumps Nos. 1-3 • Install Reclamation Pump No. 4 • Automate Valves • Install additional RO Membranes Structural • Install baffles in CCB	• Process Improvement • Additional disinfection capacity	$0.77

Table 6.1 CIP Projects Summary

Project No.	Process Area	Project Components	Driver	Cost ($ million)
13	Reuse Storage	Mechanical • Install Reuse Pump Station Structural • Modify FEB's for storage of reuse water	• Increase on-site storage • Operations Improvements	$3.88
14	Solar Upgrades, Phase II	Electrical • Install solar field	• Energy Efficiency	$0.20
15	Odor Control Improvements	Mechanical • Replace Scrubber No. 1 Recirculation Pumps Nos. 1 and 2 Structural • Replace Hypochlorite Storage Tank No. 2 • Replace Caustic Storage Tank No. 2 • Replace Caustic Storage Tank No. 1 Electrical • Add SCADA alarms for Recirculation Pumps	• Condition • Process Improvement	$0.21
16	Class A Biosolids	Mechanical • Produce Class A Biosolids using solar drying, heat drying, or three-phase digestion	• Process Improvements	$2.00
17	Cogeneration	Mechanical • Install cogeneration system	• Process Improvement • Energy Efficiency	$2.66
			10-YEAR TOTAL CIP PROJECT COST:	$36.90

Table 6.2 Prioritized CIP Projects

Category	Weight
Financial	30%
Environmental	35%
Social	35%
Total	100%

The "triple bottom line" approach was reviewed and discussed with SEJPA with significant feedback on project importance for each category. The results of the assessment are provided in Table 6.3. The detailed comparison sheets are contained in Appendix B.

Table 6.3 Prioritized Project List

Weight	35%	35%	30%		
Potential Project/ Process Area	Social	Environmental	Financial	Total	Project Cost ($M)
Land Outfall Replacement	4.55	4.9	4.2	13.65	$6.27
Buildings & Seismic Upgrades	4.9	4.55	3.9	13.35	$7.00
Preliminary Treatment Upgrades	4.2	4.2	3.6	12	$2.37
Electrical Upgrades	3.5	3.15	2.7	9.35	$0.71
Dewatering Upgrades	2.45	3.15	3.3	8.9	$1.79
Digester Improvements	3.5	2.1	1.8	7.4	$1.66
Aeration Upgrades & Return Flow Upgrades	2.45	2.1	2.4	6.95	$0.88
DAF Upgrades & Co-Thickening	2.45	1.75	2.4	6.6	$0.44
SCADA	2.45	1.75	2.1	6.3	$1.08
Secondary Upgrades	1.75	2.8	0.9	5.45	$1.21
Site Improvements & Security	2.8	1.4	1.2	5.4	$3.77
Tertiary Upgrades	2.1	1.75	1.5	5.35	$0.77
Reuse Storage	1.75	1.75	1.2	4.7	$3.88
Solar Phase II	1.4	1.4	1.8	4.6	$0.20
Odor Control Improvements	0.7	1.4	0.6	2.7	$0.21
Class A Biosolids	0.35	1.05	0	1.4	$2.00
Cogeneration	0	0	0.6	0.6	$2.66
				TOTAL CIP PROJECT COST	$36.90

The results of the "triple bottom line" provide a suggested implementation schedule based on perceived project importance. This should be balanced with consideration of available funds and project coordination.

6.3 IMPLEMENTATION SCHEDULE

A preliminary schedule has been provided to assist SEJPA in allocating funds for the CIP projects over the course of a ten-year period. The schedule is shown in Figure 6.1. The schedule estimates the project duration and provides an illustration of the work effort per year. The schedule should be revised at least annually and adjustments should be made according to budget, project progress, and any changes to progress priority.

6.4 BUSINESS CASE EVALUATION

Business case evaluations are provided on the following pages for the top ten critical CIP projects identified above.

6.4.1 Land Outfall Replacement

6.4.1.1 Background

SEJPA operates and maintains the Land Outfall pipe as part of the overall outfall system. The system is jointly owned by SEJPA's member agencies and the City of Escondido. The system maintains a capacity of 25.5 mgd, with 20.15 mgd owned by Escondido and the remaining 5.35 mgd owned by SEJPA. The outfall system consists of 3,300 feet of 30-inch asbestos cement (AC) and polyvinylchloride (PVC) land outfall and 4,000-feet of 30-inch and 4,000 feet of 48-inch reinforced concrete ocean outfall. The land outfall consists of 2,500-feet of AC pipe installed in 1964 and 800-feet of PVC installed in 1999.

Much of the AC portion of the land outfall is located within the San Elijo Lagoon, under tidal channels. The AC pipe is 50 years old and is likely nearing the end of its useful life. Over time, AC pipe undergoes gradual degradation in the form of internal calcium leaching due to conveyed water and/or external leaching due to groundwater and the soil conditions. This leaching leads to reduction in effective cross-section, which results in pipe softening and loss of mechanical strength.

The pipe's location below the lagoon makes it difficult to assess the condition without significant and costly effort within an environmentally sensitive area. This project explored various destructive and non-destructive methods to locate and test the pipe. Multiple pipe testing vendors were contacted to discuss condition assessment methods and validity for AC piping, including site visits to the lagoon area to identify potential test areas. The overall result of this effort found that there are limited test methods available and the tests that are possible will produce less than conclusive results or results that are specific only to the tested area of pipe. This could lead to over-estimates of the pipe's condition and remaining useful life. Replacement of the pipe has been recommended.

Project	Capital Cost	Fiscal Year 15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Land Outfall Replacement	$6.27	$2.51	$2.51	$1.25							
Buildings & Seismic Upgrades	$7.00	$2.80	$2.80	$1.40							
Preliminary Treatment Upgrades	$2.37	$1.19	$1.19								
Electrical Upgrades	$0.71	$0.36	$0.36								
Dewatering Upgrades	$1.79		$0.72	$1.07							
Digester Improvements	$1.66			$0.83	$0.83						
Aeration Upgrades & Return Flow Upgrades	$0.88			$0.22	$0.44	$0.22					
DAF Upgrades & Co-Thickening	$0.44				$0.22	$0.22					
SCADA	$1.08				$0.54	$0.54					
Secondary Upgrades	$1.21				$0.30	$0.61	$0.30				
Site Improvements & Security	$3.77	$0.05				$1.86	$1.86				
Tertiary Upgrades	$0.77					$0.19	$0.38	$0.19			
Reuse Stroage	$3.88						$0.97	$1.94	$0.97		
Solar Phase II	$0.20							$0.12	$0.08		
Odor Control Improvements	$0.21							$0.05	$0.10	$0.05	
Class A Biosolids	$2.00								$1.00	$1.00	
Cogeneration	$2.66									$1.33	$1.33
TOTAL CIP COST	**$36.9**	$6.90	$7.57	$4.78	$2.34	$3.64	$3.52	$2.30	$2.15	$2.38	$1.33

CIP PROJECT IMPLEMENTATION SCHEDULE

FIGURE 6.1

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6.4.1.2 Project Need and Drivers

This project is driven by the fact that the Land Outfall is the sole source for discharging secondary effluent produced by SEJPA and the City of Escondido to the ocean. There are permit, safety, and environmental drivers that must be addressed as well as a social driver. The existing pipe is constructed in a wet, brackish environment that may eventually result in collapse and failure of the pipe wall. A spill resulting from a pipe break would be grounds for a permit violation and would have significant penalties, beginning around one dollar per gallon of spilled effluent. Furthermore, a spill in the environmentally protected lagoon could leave SEJPA open to actions by outside groups. Replacement of the pipe will ensure that SEJPA can continue to operate the SEWRF while continuing to be a good steward of the environment.

6.4.1.3 Recommendations

The recommended project will install a new pipe beneath the lagoon while the existing line remains in service during construction. Brief shutdowns will only be needed during the final connections. Horizontal Directional Drilling (HDD) is recommended as a less invasive construction technology. This technology was recently used by the City of Solana Beach to install a new pipe from their pump station to the SEWRF, The concept is shown on Figure 6.2. The HDD pipe would be installed from the SEWRF to the parking lot adjacent to Las Olas Restaurant and on the east side of Highway 101. Directional drilling would then also be used to extend the pipe below Highway 101. Open cut installation of the last pipe pieces and a new junction structure would be utilized to complete construction on the beach area and connect to the Ocean Outfall.

6.4.1.4 Alternatives

There is potential that the lagoon area will be accessible in the near future due to planned construction. The planned construction will include widening Interstate 5, installing a second railroad track through the lagoon, and re-engineering and relocating of the lagoon waterway, among other improvements. The project will include heavy machinery and is planned to take up to three years for construction. If the land outfall is constructed during this time, open trench construction may provide a cost savings compared to directional drilling.

6.4.1.5 Justification

The Land Outfall pipe is a critical asset to the SEJPA. The risk of pipe failure, especially in the lagoon area, would include economic and social repercussions. Fines imposed by the Regional Water Quality Control Board could be $1 per gallon or more. The lagoon is an environmentally protected marine reserve. Any spill in the area could result in additional fines or potential lawsuits from environmental groups or the federal government. Additional test to assess the pipe condition are likely to be inconclusive. A proactive approach to ensure the longevity of the asset and protect the environment is recommended.

6.4.1.6 Project Cost

The project cost is estimated at $6.4 million.

SEWRF LAND OUTFALL REPLACEMENT CONCEPT

FIGURE 6.2

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6.4.2 Buildings Upgrades

6.4.2.1 Background

The SEJPA utilizes a single story building (7,413 sf) and a temporary trailer (1,440 sf) to provide needed workspace for the 21 employees and two interns that work at the San Elijo Water Reclamation Facility. This workspace includes offices, public meeting space, reception area, operation control room, laboratory, maintenance garage, library, IT control room, production and copier room, kitchen and break room, restrooms, and locker rooms. The trailer serves as the Administration Building and houses six full-time employees. This building functions as the interface point with the public and is intended to provide site access control. All visitors are required to sign-in at this location upon entrance to the facility.

The Operations Building, which is located adjacent to the Administration Building, houses 16 employees that range from engineers and laboratory staff to process operators and mechanics. The Operations Building was originally constructed in 1965 and has been added onto at least four times since then. This building includes the operation control room, public meeting/conference room, offices, library, laboratory, maintenance garage, kitchen and break room, and restrooms and locker rooms. As this building was constructed through a series of expansions over a period of roughly 49 years, the net result is redundant load-bearing walls within the building that limits remodeling options and provides an awkward floor plan.

The facility inspection conducted by Carollo identified a variety of code compliance concerns related to the California Building Code (CBC), the Americans with Disabilities Act (ADA), and the California Energy Commission. These items will be discussed in greater detail in the Project Needs & Drivers section. In addition, based on a review of staffing levels and work areas, it appears that additional building space is required for both code compliance and efficient work flow. As the noted building deficiencies include both safety and code compliance, it is strongly recommended that prompt action be taken to resolve deficiencies or begin planning for the discontinued use of these buildings.

6.4.2.2 *Project Need & Drivers*

The need and drivers for this project are to address safety, security, operational, and code deficiencies associated with the Administrative and Operations Buildings. Creating a safe and secure work place that provides both open and, as necessary, restricted public access is paramount to managing risk and liability. Furthermore, modernizing the SEJPA's building assets will likely improve work efficiency, employee morale, and create new opportunities to connect with the public.

Deficiencies associated with the Administrative Building (i.e., modular trailer) included the following:

- Installed as a temporary facility 15 years ago (permitting)
- Unsound foundation/improper trailer anchorage to foundation (safety)
- Located below high voltage power electrical lines (safety)
- Location provides inadequate site security to restricted areas (safety and security)
- Lacks proper entrance access as it lacks a wheel-chair ramp (safety and ADA compliance)
- Lacks necessary plumbing fixtures and adequate work space (CBC)
- Lacks fire suppression system and fire resistance rating (CBC and safety)
- Lacks compliance with energy efficiency standards (CEC)
- Lacks proper turning radius within the trailer for ADA compliance (ADA)

Deficiencies associated with the Operations Building included the following:

- Lacks proper wheel-chair ramp (safety and ADA)
- Building entrance approach exceeds ADA requirements; potential slip hazard (safety and ADA)
- The wall-to-roof connections do not meet current seismic code (safety and CBC)
- Lacks adequate work space and occupancy space requirements (CBC)
- Lacks compliance with energy efficiency standards (CEC)
- Lacks proper turning radius, restroom design, locker room design within the building for ADA compliance (ADA)
- Lacks proper egress design (CBC and safety)
- Some deficiencies with fire suppression system

6.4.2.3 *Recommendations*

The final proposed project will likely be reached through a detailed decision making process that includes both agency and community input. The intent of this report is to establish a reasonable recommendation based on the information known at this time. It is understood that these recommendations will most likely evolve as the project advances from concept to construction.

Based on available information, it is recommended that this project be developed in phases. Phase 1, shown on Figure 6.3, will construct a 6,700 square foot Administration Building and accompanying parking area near the existing plant entrance. This location provides necessary public access to the Administration Building while restricting access to the facility portion of the property. This proposed site improves security and oversight of visitor access to the SEWRF, as well as improves traffic flow within the facility. The new building will provide space for a new public meeting and conference room, new office space, required restrooms and break area, and new engineering plan room. It is planned that the Administrative Building will provide adequate work space for approximately 11 full-time staff. Phase 1 will also include renovating the existing Operations Building to correct the code deficiencies and modernize the control room, laboratory, and offices. The renovated Operations Building will support approximately 10-12 full-time staff. The renovated building would then be utilized until the end of its useful life, or until such time that SEJPA is ready to enact Phase II. Phase II provides the allowance to expand the Administration Building another 4,300 square feet to provide a wing for the Operation and Laboratory staff or to build a new separate Operations Building.

6.4.2.4 Alternatives

Alternatives evaluated but not recommended include 1) construct new Administration Building installed as a temporary doublewide trailer relocated away from the power lines and renovation of the Operation Building and 2) construct new Administration & Operations Building constructed for all purposes except for the laboratory and mechanic's shop, which would remain in the renovated Operations Building.

Alternative No. 1 was not selected as it does not provide a permanent facility that will meet the project needs and drivers, including the need to provide better security and site access by locating the new facility near the plant entrance.

Alternative No. 2 was not selected as it does not consider reuse of the Operations Building to the extent of the selected alternative. Alternative No. 2 has a higher cost compared to the first phase of the selected alternative while providing space that can be provided by renovating the Operations Building. The selected alternative provides SEJPA with more flexibility in utilizing existing space and determining when additional space is needed or when the Operations Building can no longer serve any useful function.

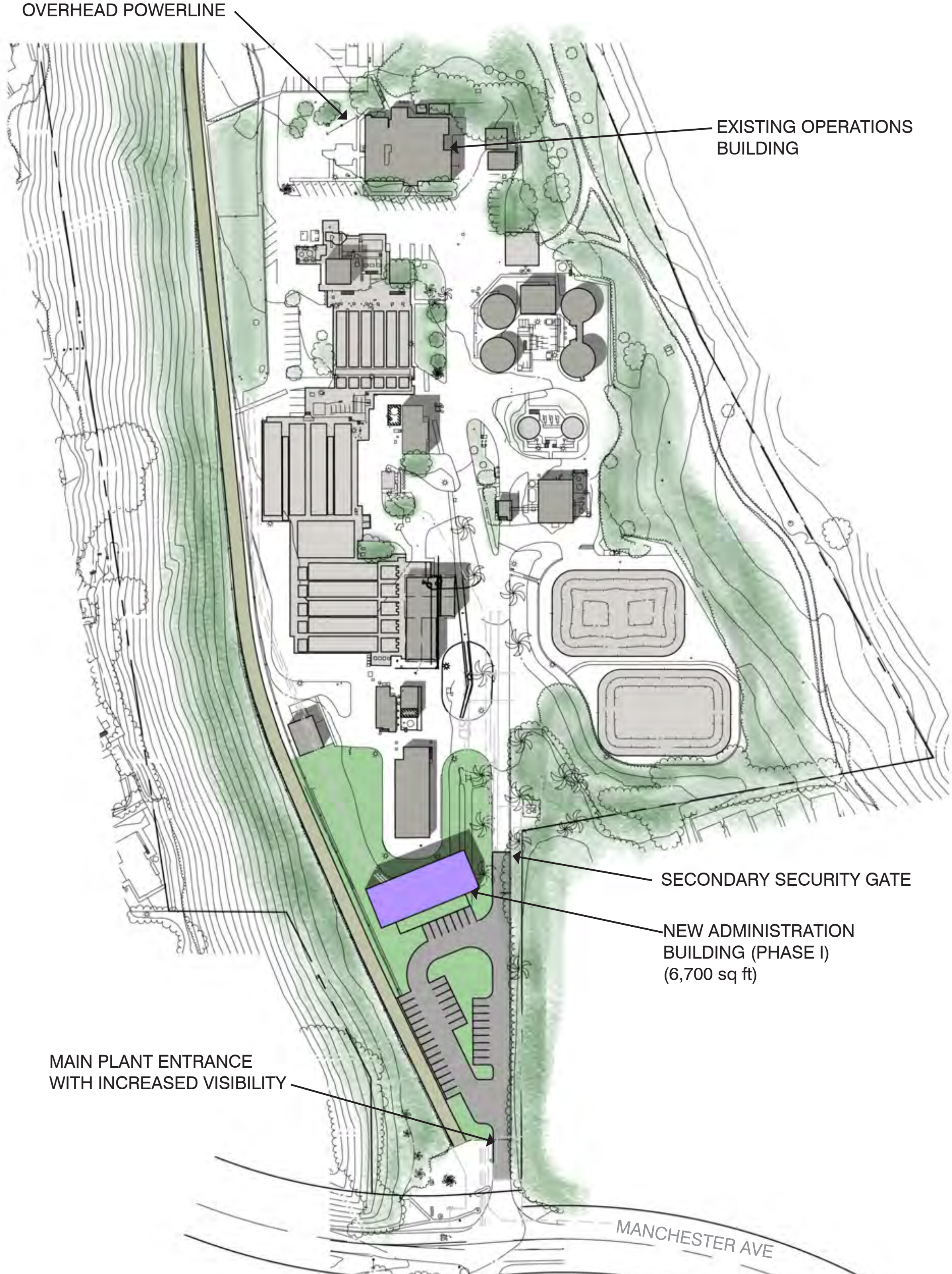
6.4.2.5 Justification

This project provides the most benefit in meeting code compliance for safe working conditions, efficient use of space and economics. Phasing the building expansion allows SEJPA to allocate funds over a longer planning period. There is also risk and liability associated with continuing to operate in the known deficiencies associated with ADA and CBC compliance.

In a seismic event, there is not adequate bracing to prevent the walls from potentially falling over which would then lead to roof collapse. This poses a safety threat to SEJPA staff.

6.4.2.6 Project Cost

The Phase I project cost estimate is $4.53 million. The Phase II project cost estimate is $2.47 million. The overall project cost is therefore $7 million.



ADMINISTRATION AND OPERATIONS BUILDING ALTERNATIVE 3, PHASE 1

FIGURE 6.3

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6.4.3 Preliminary Treatment Upgrades

6.4.3.1 Background

The headworks at the SEWRF consists of three barscreens (two automatic and one manual), a single screenings compactor, two grit washer/cyclones, two grit hoppers, three grit pumps, two grit blowers, and a single grit chamber. The facility was originally constructed in 1990 and has had no major upgrades. The condition assessment found mechanical and structural deficiencies throughout the facility. This includes the deteriorated condition of the bar screens, the concrete channels, the channel covers, and the grit chamber aluminum cover. Significant corrosion is evident on the equipment and the concrete surfaces. Operational issues were also noted. The bar screens and compactor require excessive labor to maintain operation. The compactor, located underneath both mechanical screens, has a tendency to clog due to rag build-up at the end of the compaction auger. Manual raking of the manual bar screen is required if both mechanical screens are out of service. Additionally, the mechanical bar screens and the compactor are installed in a very tight configuration. There is limited space to access the equipment for maintenance.

6.4.3.2 Project Need and Drivers

The need and drivers for the project include process improvements to maintain operations, restoring the facility to a new, or like-new, condition, increasing redundancy, addressing safety, and risk issues, and reducing labor associated with maintenance. Upgrading the facility is likely to improve grit and screening's removal. This is critical in protecting down-stream equipment, such as pumps and valves that experience wear due to grit. The primary sedimentation basins lack a safe entry and retrieval system. Temporary fall arrest systems are employed when staff must enter the basins for maintenance or cleaning. Installing a permanent fall arrest system will reduce risk to employees and improve plant safety.

6.4.3.3 Recommendations

The recommended project consists of the following:

- Install three mechanical bar screens in new concrete channels located adjacent to the existing screens,
- Install one duty and one spare screenings compactor. The spare compactor can be installed or may be a shelf-spare,
- Install screenings conveyor to move screenings from the mechanical screens to the screenings compactor,

- Replace the odor scrubber control panel in the grit building.
- Install a new cover on the grit chamber.
- Provide concrete repairs to the existing channels and install new tread plate covers.
- Replace the inlet and scum gates to Primary Sedimentation Basin No. 3.
- Install fall arrest system at Primary Sedimentation Basins.

6.4.3.4 Alternatives

No alternatives were evaluated for the purposes of this report. The preliminary design phase should consider alternatives available for mechanical bar screens, screenings compactors, and the grit chamber cover material. The desire to install the screens in new channels or modification of the existing channels can be considered. Modifications to the existing channels should consider improving access to the installed equipment as well as costs for a temporary screenings facility during construction.

6.4.3.5 Justification

Failure of these assets can lead to damaged equipment if rocks, grit, or large rags get clogged in pumps or other equipment. Failure can also lead to spills associated with a blinded screen or leaking channel. Rehabilitation and upgrade of the preliminary treatment areas will improve plant performance and reduce labor associated with the removal of rags and grit from the process stream. Digester performance will improve as less inorganics will be present, resulting in more effective mixing, and gas production. A new compactor will provide a better quality screenings for disposal, with reduced weight and associated disposal fees. The flexibility of constructing the new facility adjacent to the existing will provide additional screening capacity for peak wet weather storm events. Failure to implement the upgrades will result in continued asset deterioration and rising maintenance costs.

6.4.3.6 Project Cost

The estimated project cost is $2.34 million.

6.4.4 Electrical Upgrades

6.4.4.1 Background

The SEWRF's electrical power system, including motor control centers, switchgears, and panels, was mostly original until recently. Beginning in 2012, SEJPA has begun to update and replace the aging electrical gear throughout the plant. A new electrical building was constructed next to the Primary Sedimentation Basins to house new motor control centers. In 2014, a new standby power generator was installed to replace the two older units. There is remaining gear that is outdated, labor intensive to maintain, and with parts difficult to find.

Additionally, much of the gear is missing or has incorrect labeling to identify protective gear required for working around the equipment.

6.4.4.2 Need and Project Drivers

The need and drivers for this project are risk and safety associated with staff working in and around medium and high voltage electrical equipment. Replacing the remaining aged equipment will improve worker safety and will ensure the SEWRF has a safe and reliable electrical power system. Some of the equipment will be replaced under separate CIP projects, such as electrical gear associated with the Dewatering Building. Other gear, specifically, the Switchboard MS-2, do not package into another CIP project and should be replaced. The switchboard is a power feed to other equipment and contains an outdated automatic transfer switch that does not operate properly when power is restored following an outage. There is risk of injury working in the switchboard.

6.4.4.3 Recommendations

The following upgrades are recommended to complete the plant electrical system upgrade:

- Provide proper arc flash labeling on all electrical gear.
- Replace the outdated Switchboard MS-2 in the Chlorination/Generator Building.

6.4.4.4 Alternatives

There are no alternatives identified for the project.

6.4.4.5 Justification

This project will provide a safe working environment for staff working in and around the gear and reduce risk of injury. Replacing the automatic transfer switch will ensure the plant's standby power system operates properly to provide power during an outage and restores utility power correctly and without issue. Most of the SEWRF's electrical gear has been recently replaced. Replacing the MS-2 switchboard will complete the electrical upgrades at the SEWRF.

6.4.4.6 Project Cost

The estimated project cost is $712,000.

6.4.5 Dewatering Upgrades

6.4.5.1 Background

The Sludge Dewatering Facility includes three belt filter press feed pumps located near the digesters and the Dewatering Building. The building contains a dewatered solids conveyor on the first floor, two belt filter presses installed on a raised mezzanine, and two adjacent sludge cake hoppers in a tower just outside of the second floor. The building roof deck and the mezzanine framing are in poor condition, showing moderate to severe corrosion. The belt filter press drive motors and belts fail regularly due to corrosion issues. Electrical gear in the building has severe corrosion. The three belt filter press feed pumps are in poor condition as well, and in need of replacement. Spare parts are difficult to find. The sludge cake hoppers have small through-wall corrosion and minor corrosion on framing, valves, and anchor bolts. The belt filter presses are aged and the moist environment created from the high washwater use is a major factor in the corrosion.

6.4.5.2 Project Need & Drivers

The project need and drivers include addressing the facility's poor condition, improving process performance, improving worker safety, and reducing labor needs related to maintenance and operations of the facility. The equipment is reaching the end of its useful life and replacement is needed in order to continue operations. The building environment is moist and odorous, resulting in elevated corrosion to metal surfaces. There is limited SCADA monitoring and control of the facility.

6.4.5.3 Recommendations

The recommended project includes the following:

- New dewatering equipment. Screw presses or belt filter presses should be considered in a detailed preliminary design that includes sending sludge samples to manufacturers for recommendations on polymer use and equipment sizing and/or pilot testing. This report found screw presses to be slightly more advantageous on a net present worth analysis.
- New feed pumps.
- Remove or replace the mezzanine. The choice would be dependent on the selected dewatering technology.
- Structural rehab of interior metal surfaces and the dewatered solids storage hopper.
- Replacement of the control panel and electrical upgrades

- SCADA upgrades to add missing equipment signals and controls to the SCADA network.
- Modifications to the odor control piping and the dewatered sludge conveyor.

6.4.5.4 Alternatives

As noted above, screw presses and belt filter presses (BFP) should be evaluated in more detail. SEJPA staff is familiar with BFP operation. Screw presses are a fairly simple machine that require little operator oversight and can run unattended for long periods of time. This could results in a lower labor costs. The screw press is also enclosed for reducing odor concerns and uses significantly less wash water.

6.4.5.5 Justification

Without rehabilitation, the installed assets will continue to corrode and maintenance needs will increase. Eventually, the mezzanine will not be structurally sound and will pose a safety risk. Without replacement, the BFP efficiency will drop, resulting in solids with a higher water content and overall weight. This will increase disposal costs. Upgrades to the process equipment are likely to improve the dewatering process, resulting in a dryer cake and reduced hauling costs. Improving the building atmosphere by removing excess moisture and odors will enhance working conditions and prolong equipment operating life. Updating the SCADA monitoring and control of the process will result in work efficiencies and reduce operational costs.

6.4.5.6 Project Cost

The estimated project cost is $1.79 million.

6.4.6 Digester Improvements

6.4.6.1 Background

Solids stabilization at the SEWRF is achieved in four anaerobic digesters. Digester Nos. 1 and 2 were constructed in 1965. Digester No. 1 is no longer in service. Digester No. 2 has a floating cover. Digester Nos. 3 and 4 were constructed in 1990 and have fixed concrete domes. These two digesters are operated at constant level with overflow sent to Digester No. 2, which is used to feed digested sludge to the Dewatering Facility. Support facilities include gas mixing systems, two boilers, four heat exchangers, sludge circulation pumps, and waste gas burners. Digestion is an important facility at the SEWRF, providing pathogen removal from solids prior to dewatering and off-site disposal.

The condition assessment found multiple issues related to the condition of structures and equipment installed in the process area. This included:

- Significant corrosion to Digester No. 1
- Digester No. 2 exhibits lining failure and the metal cover has corrosion issues and is misaligned.
- Heat exchangers are no longer providing proper heat dispersion between the heated water and digester sludge.
- Sludge Circulation Pumps Nos. 2, 3, and 5 require replacement due to age and lack of spare parts.
- Repair joints and seals between dome and walls of Digester Nos. 3 and 4.

6.4.6.2 Project Need & Drivers

The recommended project is driven by a need to improve the facility condition and reduce labor. Facility upgrades will reduce labor associated with maintenance and operations and will increase redundancy. Maintaining the structural integrity of the digester structures is paramount to the process and to containing the digester gas, which is flammable.

6.4.6.3 Recommendations

The recommended project will provide the needed structural repairs to the digesters and install a new, fixed aluminum cover on Digester No. 2. New heat exchangers and sludge circulation pumps are recommended. The new pumps should be chopper-style pumps to reduce ragging and clogging of the digester piping.

6.4.6.4 Alternatives

No alternatives were identified.

6.4.6.5 Justification

The project is required to ensure proper treatment of solids removed from the wastewater throughout the SEWRF liquid treatment facilities. Failure to implement the recommended upgrades could lead to inadequate heating and treatment of the feed sludge. Inadequate treatment will result in extended digestion times, which will then limit the facility capacity and potential violations.

6.4.6.6 Project Cost

The estimated project cost is $1.66 million.

6.4.7 Aeration & Return Flow Upgrades

6.4.7.1 Background

The aeration basins are responsible for biological treatment and oxidation of the primary effluent. This process is crucial in meeting permit limits. There are currently four aeration basins. Two basins are outfitted with diffusers, air piping, and baffles. The baffles allow the first zone(s) to be fed little to no air to promote growth of preferred microbial organisms which break down the organics contained in the wastewater. A third basin is fitted with air piping and diffuser but no baffles. This basin is for emergency use. The fourth basin does not have any installed mechanical components. It is for future use, should the plant influent increase significantly. Much like the other basins, staff must enter the basins for cleaning. Staff also enters the basins to check and repair the baffles, gates, piping, and the diffusers. There is no permanent entry or fall arrest system to assist staff.

Air is fed to the aeration basins through multi-stage centrifugal blowers, located in the Blower Building. There is one 100 horsepower (HP) blower which was installed in 2008. Two 125 HP blowers are also installed and date back to 1990. These blowers have been rebuilt multiple times. Two other blowers are installed but have been taken out of service and are used for spare parts for the operating blowers. The condition assessment notes multiple improvements that can be made to the aeration process and the blowers to improve plant performance and increase efficiency.

The Return Flow Pump Station is the return point for drainage flows associated with processes throughout the SEWRF. This includes centrate from the Dewatering Building, drainage from the various process areas, and washwater from the AWP. The collected return water is pumped back to the head of the SEWRF for treatment. There are three submersible pumps installed with space for a fourth pump. The condition assessment noted capacity concerns and the need to install the fourth pump.

6.4.7.2 Project Need & Drivers

The project need and drivers include process improvement, energy efficiency, improving process capacity and increasing redundancy. The condition assessment noted the following concerns:

- The anoxic zones upstream of the baffles do not have adequate mixing. This can lead to aerated activated sludge mixing with non-aerated sludge and reduced process performance and efficiency. The mixing also allows scum to migrate upstream in the basin, making it difficult to remove.
- The existing blowers are aged and difficult to maintain. Spare parts are difficult to find so the spare blowers are being parted to keep the operating blowers in service.

- The pump discharge pipe and rails in the Return Flow Pump Station are corroded and should be replaced.
- The fourth Return Flow Pump should be installed for redundancy with the added flows from the AWP.
- Stop logs in the primary effluent channel require replacement.
- Install an entry and fall arrest system around the basins.

6.4.7.3 Recommendations

Based on the condition assessment, it is recommended to install mixers in the aeration basin anoxic zones, replace the pump discharge rails and pipes in the Return Flow Pump Station, and install the fourth Return Flow Pump, install new stop logs in the primary effluent channel and replace the aged blowers.

6.4.7.4 Alternatives

A blower analysis was performed to evaluate installing two 75 HP high-efficiency turbo blowers to replace the existing 125 HP blowers. The analysis results show an annual power savings greater than $10,000 per year.

6.4.7.5 Justification

The project upgrades will decrease energy costs at the plant while maintaining process performance at a high level. Failure to implement the project will lead to increased maintenance costs associated with keeping the blowers running and removing scum from the anoxic zones. Capacity will continue to be a concern at the Return Flow Pump Station. The redundant pump will prevent potential overflows that would flow to the storm channels. Installing the fall arrest system will prevent injuries and provide a safe working environment.

6.4.7.6 Project Cost

The estimated project cost is $882,000.

6.4.8 DAF & Co-Thickening Upgrades

6.4.8.1 Background

The dissolved air flotation (DAF) system thickens WAS prior to digestion. The SEWRF uses two DAF tanks, each equipped with a rotating mechanism and a recirculation/pressurization system. A polymer feed pump is installed in the Sludge Dewatering Building. The mechanism for DAF No. 1 and DAF No. 2 are both recommended for recoating. The DAF No. 2 drive is still original, and in need of leak repair on the top of the shaft. All three of the thickened sludge pumps are reaching the end of their useful lives. The pumps are aged, the belt drives are beginning to fail, and spare parts are difficult to stock.

This project also evaluated the possibility of co-thickening primary and secondary solids in the DAF tanks. Currently, primary solids are stored briefly in the primary sedimentation basin hoppers before being pumped to the digesters. The solids are kept thin with a solids content of 1 to 2 percent solids compared to the industry standard of 4 to 6 percent. This is done to prevent the sludge blanket from going septic and off-gassing. The result is that the sludge feed to the digesters is highly variable and is considerably higher than if the sludge were thickened in the hoppers. The added flow reduces digester capacity and also affects the dewatering system capacity.

6.4.8.2 Project Need & Drivers

The recommended project will replace aged equipment and protect currently installed equipment. This will reduce maintenance costs. Improved process performance, by means of co-thickening, will lead to an increase in available digester capacity. This is important as SEJPA is adding additional flow from the City of Del Mar in the near future.

6.4.8.3 Recommendations

The recommended project will replace the thickened sludge pumps, install a new drive on the DAF No. 2 mechanism, and recoat both DAF sludge collector mechanisms. Modifications to allow for co-thickening include installation of new piping and valves to route the primary sludge piping from the digester area to the DAF's. A new sludge mixer should be installed in the splitter box to achieve proper mixing of the two sludges. Pilot testing is recommended to ensure performance is acceptable and achievable.

6.4.8.4 Alternatives

No alternatives have been identified.

6.4.8.5 Justification

This project will improve process performance and improve available capacity in the digester and the Dewatering Facility. This will allow for additional flows to the SEWRF, which can lead to an increase in recycled water production. Failure to replace the aged pumps and properly coat the mechanisms can lead to a process failure that would result in a potential spill.

6.4.8.6 Project Cost

The estimated project cost is $439,000.

6.4.9 SCADA Upgrades

6.4.9.1 Background

The existing SEWRF SCADA System is comprised of a network of distributed programmable logic controllers (PLC's) located at various unit process around the plant. The PLC's are connected to the plant SCADA system by fiber optic connection or wireless radio link. Most of the SCADA system hardware, including distributed PLC's, control panel devices, fiber optic cables, and wireless radios, are in good working condition and serving their intended functions. SEJPA staff has begun the process of replacing the outdated SCADA computers and the main PLC in the Operations Building Control Room. SEJPA is also reviewing options to consolidate the SCADA software to a single platform. Currently, one platform is used at the AWP facility, while another platform is used for the remainder of the SEWRF processes. Some of these processes are lacking controls and monitoring at the SCADA level. In addition, many of the offsite facilities that SEJPA is responsible for are not monitored on the SCADA system.

6.4.9.2 Project Need & Drivers

This project is driven by a need to maintain proper monitoring and control of all facilities that are associated with the SEWRF or SEJPA operations. Proper SCADA monitoring allows operators to view the facility operations from the control room and address potential issues before they become an emergency or a permit offense. This also allows SEJPA to maintain a big picture view of all facilities at once, rather than having to physically visit each location to ensure proper operation.

6.4.9.3 Recommendations

Much of the project recommendations can be performed by SEJPA staff, if desired. It is recommended that staff complete the upgrades to the Control Room SCADA computers and PLC. SEJPA should also finalize a decision and move to a single SCADA software platform. Facility and SEWRF process monitoring and control upgrades should be made at the following locations:

- Reclaim System Improvements
- Effluent Pump Station Modifications
- RAS Pump Control Modifications
- Screw Conveyor Modifications
- San Elijo Hills Pump Station
- Boiler System Modifications
- AWP System Improvements
- Sludge Feed Batch Programming

6.4.9.4 Alternatives

No alternatives have been identified for this project.

6.4.9.5 Justification

Continued improvements to the SCADA network will improve worker efficiency. Additional monitoring capabilities will allow operators to recognize and respond to potential emergencies before they occur, thus reducing SEJPA's risk to permit infractions.

6.4.9.6 Project Cost

The estimated project cost is $1.1 million.

6.4.10 Secondary Upgrades

6.4.10.1 Background

The secondary clarifiers provide final clarification of treated wastewater prior to tertiary treatment or ocean disposal. The five clarifiers were constructed in 1990, and each is outfitted with an inlet gate, inlet baffle, effluent weir trough and sludge collection and scum collection mechanisms. The clarifiers currently exhibit corrosion and operational issues that require attention. The scum troughs were originally installed too high above the water line. Tipping the troughs to actually capture floating scum is labor intensive. The installed inlet baffles and weir troughs all show extensive corrosion. Additionally, the RAS channel at the end of the basins has significant concrete corrosion. Similar to the other basins at the SEWRF, there is no fall arrest system installed to aid staff in safely entering the basins.

6.4.10.2 Project Need and Drivers

The recommended project is driven by a need to improve the process performance and reduce labor needs. The condition of multiple pieces of equipment should be addressed in order to ensure proper operation of the facility continues.

6.4.10.3 Recommendations

This project should provide structural repairs to the RAS channel, replacement of the weir troughs and inlet baffles, and installation of new automated scum collectors at the proper elevation. Consideration should be given to replacement of the sludge collectors, if needed. Installation of a fall arrest system around the basins is also recommended.

6.4.10.4 Alternatives

Raising the effluent weir elevation may provide a more cost effective solution rather than reinstalling the scum collectors at a new elevation, which will require significant concrete cutting and chipping. The plant hydraulics should be reviewed in connection with possibly raising the weirs.

6.4.10.5 Justification

Failure of the inlet baffles or weir troughs can lead to short-circuiting of solids through the basin and inefficient solids capture. Allowing excess solids to pass through the process can lead to upsets and additional maintenance needs at the Recycled Water Facilities and the AWP. Excessive solid pass-through could lead to a permit violation. Concrete repairs to the RAS channel will prolong the structures life while installing weir troughs at the project elevation will reduce plant maintenance needs.

6.4.10.6 Project Cost

The estimated project cost is $1.1 million.

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The site master plan, shown on Figure 7.1, identifies current and future land use around the San Elijo Water Campus. Existing facilities and process areas are identified along with the CIP projects recommended in this report. Currently undeveloped areas are also identified for future planning purposes. This includes, for example, the use of the back north lot for a potential brackish water or water reuse facility. New development of the site should be referenced to this master plan so that considerations can be made to the current, or planned, land use designation.

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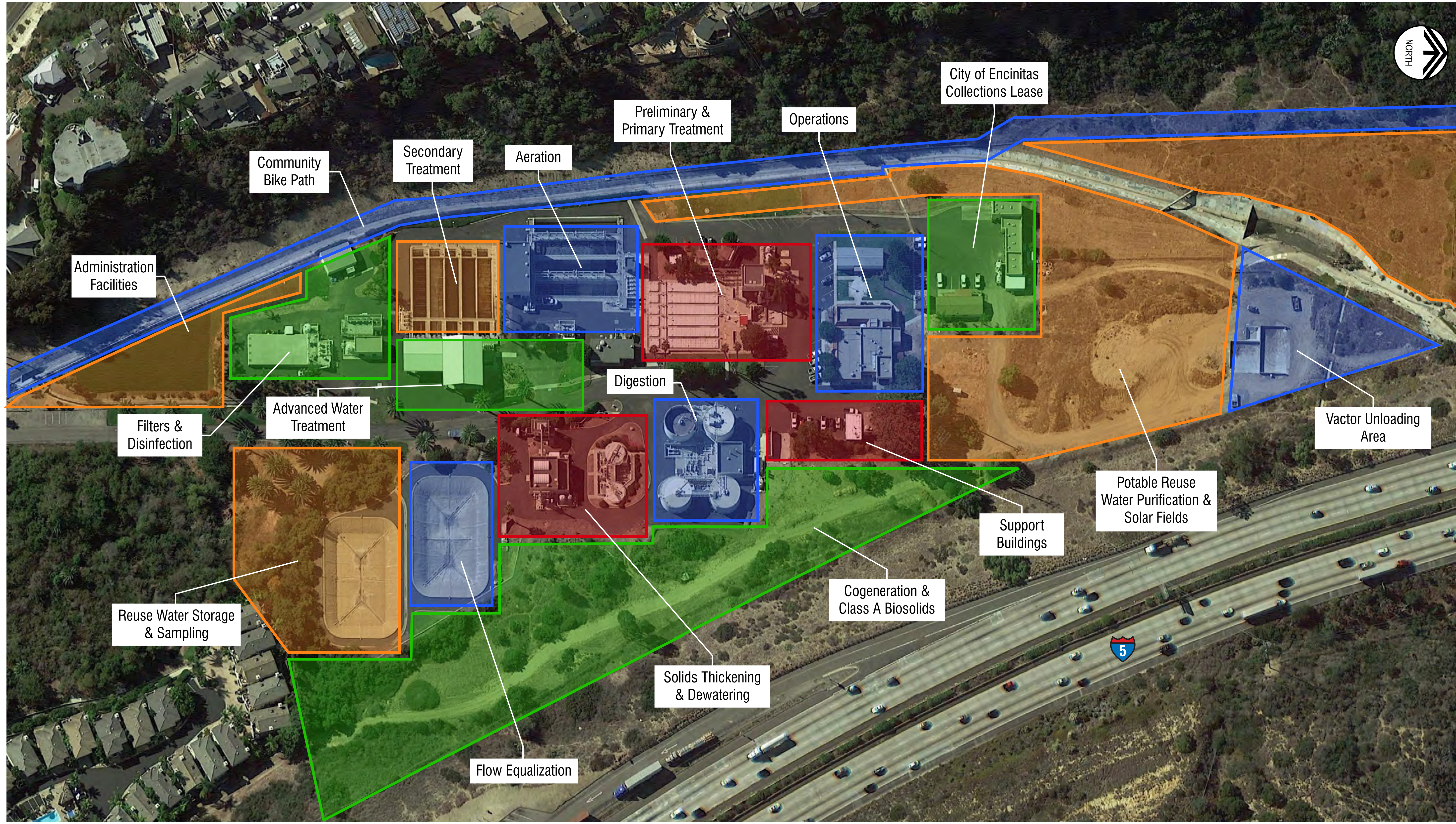

SAN ELIJO WATER CAMPUS SITE MASTER PLAN

FIGURE 7.1

SAN ELIJO JOINT POWERS AUTHORITY
2015 FACILITY PLAN

carollo

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 1/1/2015

PROJECT DESCRIPTION:
Summary Sheet

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	TOTAL COST
1	Preliminary Upgrades	$2,372,000
2	Return Flow Upgrades	$127,000
3	Aeration Upgrades	$755,000
4	Secondary Upgrades	$1,214,000
5	DAF Upgrades	$439,000
6	Digester Upgrades	$1,664,000
7	Dewatering Upgrades - Screw Press	$1,790,000
8	Odor Upgrades	$205,000
9	Seismic Upgrades	Included in Admin Bldg Cost
10	Site Improvements & Security	$3,769,000
11	Electrical Upgrades	$712,000
12	SCADA Upgrades	$1,079,000
13	Land Outfall	$6,265,000
14	Solar	$200,000
15	Cogeneration	$2,664,000
16	Admin Building	$7,004,000
17	Class A	$2,000,000
18	Tertiary Upgrades	$768,000
19	Reuse Storage	$3,878,000
	TOTAL PROBABLE COST (2014 DOLLARS)	**$ 36,905,000**

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Carollo Engineers have no control over variances in the cost of labor, materials, equipment; nor services provided by others, contractor's means and methods of executing the work or of determining prices, competitive bidding or market conditions, practices or bidding strategies. Carollo Engineers cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented as shown.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan

DATE: 5/1/2014

PROJECT DESCRIPTION:
Admin Bldg - Alt 3

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	PHASE 1 SCHEDULE OF VALUES QNTY	UNIT	UNIT PRICE	TOTAL COST	PHASE 2 SCHEDULE OF VALUES QNTY	UNIT	UNIT PRICE	TOTAL COST
1	New Building	6,700	SF	$220	$1,474,000	4,300	SF	$220	$946,000
2	Site Improvements	1	LS	$500,000	$500,000	0	LS	$500,000	$0
3	Temporary Trailer	0	MO	$1,000	$0	0	MO	$1,000	$0
4	Operations Building Improvements	7413	SF	$30	$222,390	0	SF	$30	$0
5	Asbestos Remediation	0	SF	$22	$0	7,413	SF	$22	$163,086
6	Demolition	0	SF	$12	$0	7,413	SF	$12	$88,956
7	Contractor General Conditions			15.0%	$329,459			15.0%	$179,706
	Total Direct Costs				$2,525,849				$1,377,748
				SUBTOTAL	$ 2,526,000				$ 1,378,000
				Contingency: 25%	$ 632,000				$ 345,000
				Contractor Overhead and Profit 15%	$ 474,000				$ 258,000
				State Sales Tax: 4%	$ 145,000				$ 79,000
					-				-
				Engineering, Legal and Administrative: 20%	$ 755,000				$ 412,000
				TOTAL PROBABLE COST (2014 DOLLARS)	**$ 4,532,000**				**$ 2,472,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Preliminary Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	LA	$10,000	$10,000
2	Bypass Pumping	15	DAY	$7,700	$115,500
3	Concrete	70	CY	$900	$63,000
4	Cocnrete Formwork	240	LF	$11	$2,736
5	Concrete Channel Repair Prep Work	1,872	SF	$16	$29,203
6	Concrete Channel Repair	1,872	SF	$26	$48,672
7	Aluminum Tread Plate	1,025	LB	$59	$59,963
8	Concrete Coating	1,872	SF	$21	$38,975
9	Mechanical Bar Screen	3	EA	$138,000	$414,000
10	Washer Compactor	2	EA	$79,000	$158,000
11	Fall Arrest System	1	EA	$17,957	$17,957
12	Sluice Gate, Stainless Steel	4	EA	$4,078	$16,312
13	Grit Chamber Cover	300	SF	$83	$24,984
14	Conveyor	1	EA	$67,000	$67,000
15	Electrical Upgrades	1	8.00%	$51,120	$51,120
16	Instrumentation	1	5.00%	$31,950	$31,950
17	Contractor General Conditions			15.0%	$172,406
	Total Direct Costs				$1,321,778

SUBTOTAL	$	1,322,000
Contingency: 25%	$	331,000
Contractor Overhead and Profit15%	$	248,000
State Sales Tax: 4%	$	76,000
		-
Engineering, Legal and Administrative: 20%	$	395,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**2,372,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Return Flow Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	EA	$5,000	$5,000
2	Sump Pump, Submersible, 25 HP	1	EA	$23,182	$23,182
3	Pipe & Rails	80	LF	$194	$15,494
4	90 Elbow	8	EA	$1,119	$8,952
5					
6					
7					
8					
9					
10	Electrical Upgrades	1	25.00%	$5,796	$5,796
11	Instrumentation	1	15.00%	$3,477	$3,477
12	Contractor General Conditions			15.0%	$9,285
	Total Direct Costs				$71,186

SUBTOTAL	$	71,000
Contingency: 25%	$	18,000
Contractor Overhead and Profit15%	$	13,000
State Sales Tax: 4%	$	4,000
		-
Engineering, Legal and Administrative: 20%	$	21,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**127,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Aeration Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	2	EA	$5,000	$10,000
2	Blower	2	EA	$90,000	$180,000
3	Mixer	4	EA	$25,000	$100,000
4	Pipe Modifications	1	EA	$10,000	$10,000
5	Drain Pumps	2	EA	$3,500	$7,000
6	Fall Arrest System	1	EA	$24,000	$24,000
7	Stop Log Replacement	2	EA	$7,500	$15,000
8					
9					
10	Electrical Upgrades	1	5.00%	$10,000	$10,000
11	Instrumentation	1	5.00%	$10,000	$10,000
12	Contractor General Conditions			15.0%	$54,900
	Total Direct Costs				$420,900

SUBTOTAL	$	421,000
Contingency: 25%	$	105,000
Contractor Overhead and Profit15%	$	79,000
State Sales Tax: 4%	$	24,000
		-
Engineering, Legal and Administrative: 20%	$	126,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**755,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Secondary Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	EA	$30,000	$30,000
2	Concrete Repairs	4,560	SF	$50	$228,000
3	Inlet Baffles	12	EA	$8,250	$99,000
4	Weir Troughs	12	EA	$10,000	$120,000
5	Scum Troughs	5	EA	$12,500	$62,500
6	Scum Pump VFD	1	EA	$5,000	$5,000
7	Fall Arrest System	1	EA	$19,600	$19,600
8					
9					
10	Electrical Upgrades	1	25.00%	$15,625	$15,625
11	Instrumentation	1	15.00%	$9,375	$9,375
12	Contractor General Conditions			15.0%	$88,365
	Total Direct Costs				$677,465

SUBTOTAL	$	677,000
Contingency: 25%	$	169,000
Contractor Overhead and Profit15%	$	127,000
State Sales Tax: 4%	$	39,000
		-
Engineering, Legal and Administrative: 20%	$	202,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**1,214,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
DAF Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	EA	$15,000	$15,000
2	Coat Mechanisms	2	EA	$15,000	$30,000
3	DAF No. 2 Drive	1	EA	$12,000	$12,000
4	Pressurization Pump No. 2	1	EA	$12,500	$12,500
5	Thickened Sludge Pumps	3	EA	$16,500	$49,500
6	Primary Sludge Piping	200	FT	$250	$50,000
7	Primary & WAS Sludge Mixer	1	EA	$20,000	$20,000
8					
9					
10	Electrical Upgrades	1	25.00%	$17,375	$17,375
11	Instrumentation	1	10.00%	$6,950	$6,950
12	Contractor General Conditions			15.0%	$31,999
	Total Direct Costs				$245,324

SUBTOTAL	$	245,000
Contingency: 25%	$	61,000
Contractor Overhead and Profit15%	$	46,000
State Sales Tax: 4%	$	14,000
		-
Engineering, Legal and Administrative: 20%	$	73,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**439,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Digester Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	EA	$45,000	$45,000
2	Digester No. 2 Cover	1	EA	$350,000	$350,000
3	Digester No. 2 Concrete Repairs & Lining	1	EA	$140,000	$140,000
6	Additional Digester Crack and Sealant Repairs	1	EA	$65,000	$65,000
7	Heat Exchanger	3	EA	$45,000	$135,000
8	Sludge Circulation Pumps	3	EA	$15,000	$45,000
9					
10	Electrical Upgrades	1	10.00%	$18,000	$18,000
11	Instrumentation	1	5.00%	$9,000	$9,000
12	Contractor General Conditions			15.0%	$121,050
	Total Direct Costs				$928,050

SUBTOTAL	$	928,000
Contingency: 25%	$	232,000
Contractor Overhead and Profit15%	$	174,000
State Sales Tax: 4%	$	53,000
		-
Engineering, Legal and Administrative: 20%	$	277,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**1,664,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Dewatering Upgrades - Screw Press

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES: QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolish Mezzanine	1	EA	$35,000	$35,000
2	Demolish Dewatering Pumps	3	EA	$5,000	$15,000
3	Structural Repairs	1	LS	$45,000	$45,000
4	Screw Press	2	EA	$265,000	$530,000
5	New Dewatering Pumps	3	EA	$9,000	$27,000
6	Conveyor Modifications	1	EA	$65,000	$65,000
7	Odor Control Modifications	2	EA	$7,000	$14,000
8	Piping & Valves	1	EA	$25,000	$25,000
9	Electrical	1	10.00%		$62,200
10	Instrumentation	1	8.00%		$49,760
11					
12	Contractor General Conditions			15.0%	$130,194
	Total Direct Costs				$998,154

SUBTOTAL	$	998,000
Contingency: 25%	$	250,000
Contractor Overhead and Profit15%	$	187,000
State Sales Tax: 4%	$	57,000
		-
Engineering, Legal and Administrative: 20%	$	298,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**1,790,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Dewatering Upgrades - Belt Filter Press

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolish Dewatering Pumps	3	EA	$5,000	$15,000
2	Demolish Mezzanine	1	EA	$35,000	$35,000
3	Structural Upgrades to meet Code	1	LS	$45,000	$45,000
4	Install new FRP Mezzanine	1	EA	$100,000	$100,000
5	2- Meter coated steel BFP as complete and operational unit	2	EA	$290,000	$580,000
6	New Dewatering Pumps	3	EA	$9,000	$27,000
7	Odor control Modifications	2	EA	$27,000	$54,000
8	Pipe & Valve Modifications	1	EA	$7,000	$7,000
9	Electrical Upgrades	1	8.00%		$48,560
10	Instrumentation	1	6.00%		$36,420
11					
12	Contractor General Conditions			15.0%	$142,197
	Total Direct Costs				$1,090,177

SUBTOTAL	$	1,090,000
Contingency: 25%	$	273,000
Contractor Overhead and Profit15%	$	204,000
State Sales Tax: 4%	$	63,000
		-
Engineering, Legal and Administrative: 20%	$	326,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**1,956,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Odor Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Tank Demolition	1	EA	$25,000	$25,000
2	Recirc Pumps	2	EA	$7,500	$15,000
3	Caustic Tank	1	EA	$31,250	$31,250
9					
10	Electrical Upgrades	1	40.00%	$6,000	$6,000
11	Instrumentation	1	EA	$10,000	$10,000
12	Contractor General Conditions			15.0%	$13,088
	Total Direct Costs				$100,338

SUBTOTAL	$	100,000
Contingency: 25%	$	25,000
Contractor Overhead and Profit15%	$	19,000
State Sales Tax: 4%	$	6,000
	$	25,000
Engineering, Legal and Administrative: 20%	$	30,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**205,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan | **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Seismic Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Seismic Upgrades	7000	SF	$20	$140,000
11					$0
12	Contractor General Conditions			15.0%	$21,000
	Total Direct Costs				$161,000

SUBTOTAL	$	161,000
Contingency: 25%	$	40,000
Contractor Overhead and Profit 15%	$	30,000
State Sales Tax: 4%	$	9,000
		-
Engineering, Legal and Administrative: 20%	$	48,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**288,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Site Improvements & Security

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Grading	18,133	CY	$5	$90,667
2	Box Culvert	3755	FT	$310	$1,164,050
3	Demolition	4,400	FT	$4	$18,568
4	New Fence	4400	FT	$51	$222,200
5	Corner Posts	16	EA	$125	$2,000
6	Gate, automated	1	EA	$16,000	$16,000
7	Asphalt	83,000	SQFT	$4	$332,000
8	Contractor General Conditions			15.0%	$227,023
	Total Direct Costs				$2,072,507

SUBTOTAL	$	2,073,000
Contingency: 25%	$	518,000
Contractor Overhead and Profit15%	$	389,000
State Sales Tax: 4%	$	119,000
	$	50,000
Engineering, Legal and Administrative: 20%	$	620,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**3,769,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Electrical Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1			EA		$0
2	Demolition	1	EA	$15,000	$15,000
3	Arch Flash	0	EA		$0
4	MS2	1	EA	$300,000	$300,000
5	Odor Control Panel	1	EA	$30,000	$30,000
6	Contractor General Conditions			15.0%	$51,750
	Total Direct Costs				$396,750

SUBTOTAL	$	397,000
Contingency: 25%	$	99,000
Contractor Overhead and Profit15%	$	74,000
State Sales Tax: 4%	$	23,000
		-
Engineering, Legal and Administrative: 20%	$	119,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**712,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
SCADA Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES				
		I/O Count	QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Reclaim System Improvements	80	1	EA	$ 30,000.00	$110,000
2	Effluent Pump Station Modifications	25	1	EA	$ 30,000.00	$55,000
3	RAS Pump Control Modifications	35	1	EA	$ 30,000.00	$65,000
4	Screw Conveyor Modifications	35	1	EA	$ 30,000.00	$65,000
5	San Elijo Hills Pump Station	31	1	EA	$ 55,000.00	$86,000
6	Boiler System Modifications	45	1	EA	$ 34,000.00	$79,000
7	AWT System Improvements	131	1	EA	$ 35,000.00	$166,000
8	Sludge Feed Batch Programming	30	1	EA	$ 30,000.00	$60,000
9	Computer & Network Hardware Upgrades	0	1	EA	$ 100,000	$100,000
	Total Direct Costs					$786,000

	SUBTOTAL	$ 786,000
Unit Cost of I/O $ 1,000	Contingency: 20%	$ 157,000
	Contractor Overhead and Profit%	$ -
	State Sales Tax: 4%	$ 38,000
		-
	Engineering, Legal and Administrative: 10%	$ 98,000
	TOTAL PROBABLE COST (2014 DOLLARS)	**$ 1,079,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Land Outfall

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	30-inch HDD	2,300	LF	$1,500	$3,450,000
2	Junction Structure	1	EA	$26,000	$26,000
3	Pipe Connections	2	EA	$8,000	$16,000
4	Contractor General Conditions			0.0%	$0
	Total Direct Costs				$3,492,000

SUBTOTAL	$	3,492,000
Contingency: 25%	$	873,000
Contractor Overhead and Profit15%	$	655,000
State Sales Tax: 4%	$	201,000
		-
Engineering, Legal and Administrative: 20%	$	1,044,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**6,265,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Tertiary Upgrades

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Reclaimed Pumps	4	EA	$30,000	$120,000
2	Pipe Modificaitons	1	LS	$15,000	$15,000
3	Motorized Valve Operators	4	EA	$3,000	$12,000
4	RO Membranes	1	LS	$100,000	$100,000
5	CCB Baffles	1	LS	$75,000	$75,000
6	Electrical		25.00%		$18,750
7	Instrumentation		10.00%		$7,500
	Contractor General Conditions			15.0%	$52,238
	Total Direct Costs				$400,488

SUBTOTAL	$	400,000
Contingency: 25%	$	100,000
Contractor Overhead and Profit15%	$	75,000
State Sales Tax: 4%	$	23,000
CFD Modeling Study	$	50,000
Engineering, Legal and Administrative: 20%	$	120,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**768,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

ENGINEER'S OPINION OF PROBABLE COST

PROJECT San Elijo 2015 Facility Plan | **DATE:** 5/1/2014

PROJECT DESCRIPTION:
Reuse Storage

CLIENT: San Elijo Joint Powers Authority

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES QNTY	UNIT	UNIT PRICE	TOTAL COST
1	Demolition	1	LS	$25,000	$25,000
2	FEB Covers	2	EA	$200,000	$400,000
3	Wall Modifications	2	EA	$350,000	$700,000
4	Basin Conversion to RW	1	LS	$100,000	$100,000
5	Pump Station Structure	1	LS	$250,000	$250,000
6	Pumps	1	LS	$150,000	$150,000
7	Piping & Mechanical	1	LS	$150,000	$150,000
8	Electrical		25.00%		$75,000
9	Instrumentation		10.00%		$30,000
	Contractor General Conditions			15.0%	$282,000
	Total Direct Costs				$2,162,000

SUBTOTAL	$	2,162,000
Contingency: 25%	$	541,000
Contractor Overhead and Profit15%	$	405,000
State Sales Tax: 4%	$	124,000
Engineering, Legal and Administrative: 20%	$	646,000
TOTAL PROBABLE COST (2014 DOLLARS)	**$**	**3,878,000**

Notes: Contingency is applied to Subtotal
Prevailing Wages is applied to Subtotal + Contingency
Sales Tax, as applicable, is applied to Subtotal + Contingency + Prevailing Wages
Engineering, Legal and Administrative is an estimate based on Subtotal + Contingency

SOCIAL

Potential Project/ Process Area	Preliminary Treatment Upgrades	Aeration Upgrades & Return Flow	Secondary Upgrades	DAF Upgrades & Cothickening	Digester Improvements	Cogeneration	Dewatering Upgrades	Odor Control Improvements	Land Outfall Replacement	Administration & Operations Buildings & Seismic Upgrades	Solar	Class A Biosolids	Site Improvements & Security	Electrical	SCADA	Tertiary Upgrades	Reuse Storage
Preliminary Treatment Upgrades	X	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
Aeration Upgrades & Return Flow Upgrades	0	X	1	1	0	1	0	1	0	0	1	1	0	0	1	0	0
Secondary Upgrades	0	0	X	0	0	1	0	1	0	0	1	1	0	0	1	1	1
DAF Upgrades & Cothickening	0	0	1	X	1	1	0	1	0	0	1	1	1	0	0	1	1
Digester Improvements	1	1	1	1	X	1	1	1	0	0	1	1	1	0	0	1	1
Cogeneration	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0
Dewatering Upgrades	0	1	1	1	0	1	X	1	0	0	0	1	0	0	1	1	1
Odor Control Improvements	0	0	0	0	0	1	0	X	0	0	0	1	0	0	0	0	0
Land Outfall Replacement	1	1	1	1	1	1	1	1	X	0	1	1	1	1	1	1	1
Administration & Operations Buildings & Seismic Upgrades	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1
Solar	0	0	0	0	0	1	1	1	0	0	X	1	0	0	0	0	0
Class A Biosolids	0	0	0	0	0	1	0	0	0	0	0	X	0	0	0	0	0
Site Improvements & Security	0	1	1	0	0	1	1	1	0	0	1	1	X	1	0	1	1
Electrical	0	1	1	1	1	1	1	1	0	0	1	1	0	X	1	1	1
SCADA	0	0	0	1	1	1	0	1	0	0	1	1	1	0	X	1	1
Tertiary Upgrades	0	1	0	0	0	1	0	1	0	0	1	1	0	0	0	X	1
Reuse Storage	0	1	0	0	0	1	0	1	0	0	1	1	0	0	0	0	X

Note: 1. Projects are scored by starting with the project listed in the vertical column. It is then compared to each project listed along the horizontal top axis. If the project is deemed more critical than the project listed along the top, it is given a score of 1. If the project listed along the top is considered more critical for the given ranking category, then the project is given a score of 0. The project score is then the sum of 1's and 0's running horizontally across the page. The sum is then multiplied by the category weight to determine the project's score in that category

ENVIRONMENTAL

Potential Project/ Process Area	Preliminary Treatment Upgrades	Aeration Upgrades & Return Flow Upgrades	Secondary Upgrades	DAF Upgrades & Cothickening	Digester Improvements	Cogeneration	Dewatering Upgrades	Odor Control Improvements	Land Outfall Replacement	Administration & Operations Buildings & Seismic Upgrades	Solar	Class A Biosolids	Site Improvements & Security	Electrical	SCADA	Tertiary Upgrades	Reuse Storage
Preliminary Treatment Upgrades	X	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
Aeration Upgrades & Return Flow Upgrades	0	X	0	1	1	1	0	0	0	0	1	1	1	0	0	1	1
Secondary Upgrades	0	1	X	0	1	1	0	1	0	0	1	1	1	0	1	1	1
DAF Upgrades & Cothickening	0	0	1	X	0	1	0	0	0	0	1	1	1	0	0	1	1
Digester Improvements	0	0	0	1	X	1	0	0	0	0	1	1	1	0	1	1	1
Cogeneration	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0
Dewatering Upgrades	0	1	1	1	1	1	X	0	0	0	1	1	1	0	1	1	1
Odor Control Improvements	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0	0	1
Land Outfall Replacement	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1
Administration & Operations Buildings & Seismic Upgrades	1	1	1	1	1	1	1	1	0	X	1	1	1	1	1	1	1
Solar	0	0	0	0	0	1	0	0	0	0	X	1	0	1	1	0	0
Class A Biosolids	0	0	0	0	1	1	0	0	0	0	0	X	1	0	0	0	0
Site Improvements & Security	0	0	0	0	1	1	0	0	0	0	1	1	X	0	0	0	0
Electrical	0	1	1	1	0	1	1	1	0	0	0	1	1	X	1	1	0
SCADA	0	1	0	1	0	1	0	0	0	0	0	1	1	0	X	1	0
Tertiary Upgrades	0	0	0	0	0	1	0	1	0	0	1	1	1	0	0	X	1
Reuse Storage	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0	X

Note: 1. Projects are scored by starting with the project listed in the vertical column. It is then compared to each project listed along the horizontal top axis. If the project is deemed more critical than the project listed along the top, it is given a score of 1. If the project listed along the top is considered more critical for the given ranking category, then the project is given a score of 0. The project score is then the sum of 1's and 0's running horizontally across the page. The sum is then multiplied by the category weight to determine the project's score in that category

FINANCIAL

Potential Project/ Process Area	Preliminary Treatment Upgrades	Aeration Upgrades & Return Flow Upgrades	Secondary Upgrades	DAF Upgrades & Cothickening	Digester Improvements	Cogeneration	Dewatering Upgrades	Odor Control Improvements	Land Outfall Replacement	Administration & Operations Buildings & Seismic Upgrades	Solar	Class A Biosolids	Site Improvements & Security	Electrical	SCADA	Tertiary Upgrades	Reuse Storage
Preliminary Treatment Upgrades	X	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
Aeration Upgrades & Return Flow Upgrades	0	X	1	1	1	1	0	1	0	0	1	1	0	1	0	1	1
Secondary Upgrades	0	0	X	0	0	1	0	1	0	0	0	1	0	0	0	1	1
DAF Upgrades & Cothickening	0	0	1	X	1	1	0	1	0	0	1	1	1	0	1	1	1
Digester Improvements	0	0	1	0	X	1	0	1	0	0	0	1	1	0	1	1	1
Cogeneration	0	0	0	0	0	X	0	0	0	0	0	1	1	0	0	0	0
Dewatering Upgrades	0	1	1	1	1	1	X	1	0	0	1	1	1	1	1	1	1
Odor Control Improvements	0	0	0	0	0	1	0	X	0	0	0	1	0	0	0	0	0
Land Outfall Replacement	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1
Administration & Operations Buildings & Seismic Upgrades	1	1	1	1	1	1	1	1	0	X	1	1	1	1	1	1	1
Solar	0	0	1	0	1	1	0	1	0	0	X	1	1	0	0	0	1
Class A Biosolids	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0
Site Improvements & Security	0	1	1	0	0	0	0	1	0	0	0	1	X	0	0	0	0
Electrical	0	0	1	1	1	1	0	1	0	0	1	1	1	X	1	1	1
SCADA	0	1	1	0	0	1	0	1	0	0	1	1	1	0	X	1	1
Tertiary Upgrades	0	0	0	0	0	1	0	1	0	0	1	1	1	0	0	X	1
Reuse Storage	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	0	X
Note:	1. Projects are scored by starting with the project listed in the vertical column. It is then compared to each project listed along the horizontal top axis. If the project is deemed more critical than the project listed along the top, it is given a score of 1. If the project listed along the top is considered more critical for the given ranking category, then the project is given a score of 0. The project score is then the sum of 1's and 0's running horizontally across the page. The sum is then multiplied by the category weight to determine the project's score in that category																