2021 Asset Management Plan

OC SAN
ORANGE COUNTY SANITATION DISTRICT

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Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
AM	Asset Management
AS	Activated Sludge
AS1	Activated Sludge 1
AS2	Activated Sludge 2
BB	Blower Building
CCTV	Closed-Circuit Television
Cen Gen	Central Generation Facility
CIP	Capital Improvement Program
CP	Control Panel
CM	Corrective Maintenance
CTS	Co-thickened sludge
DAFT	Dissolved Air Flotation Thickener
DC	Distribution Center
DCJ	Distribution Center J
DIG	Digester
DIP	Ductile Iron Pipe
E&I	Electrical & Instrumentation
EBDB	East Basin Distribution Box
EJB	Effluent Junction Box
Elec.	Electrical
EPSA	Effluent Pump Station Annex
FE	Facilities Engineering
$FeCl_3$	Ferric Chloride
FY	Fiscal Year
GWRS	Groundwater Replenishment System
H_2S	Hydrogen Sulfide
HCl	Hydrochloric Acid
HDPE	High-Density Polyethylene Resin
HP	Horsepower
HPU	Hydraulic Power Unit
HVAC	Heating, Ventilation, and Air Conditioning

Acronym or Abbreviation	Meaning
HW	Headworks
I&C	Instrumentation and Controls
Inst.	Instrument
JB	Junction Box
kV	Kilovolt
kW	Kilowatt
LEL	Lower Explosive Limit
LOFLO	Low Flow
LOX	Liquid Oxygen
M&D	Metering & Diversion
MCC	Motor Control Center
MES	Major Equipment Status
MGD	Million Gallons Per Day
ML	Mixed Liquor
MP	Maintenance Project
MSP	Main Sewage Pump
MTBF	Mean Time Between Failure
N/A	Not Applicable
NaOH	Sodium Hydroxide
NASSCO	National Association of Sewer Service Companies
NFPA	National Fire Protection Association
No.	Number
NPDES	National Pollutant Discharge Elimination System
NSC	North Scrubber Complex
O&M	Operations and Maintenance
OC San	Orange County Sanitation District
OCWD	Orange County Water District
OEM	Original Equipment Manufacturer
OOBS	Ocean Outfall Booster Station
OPT	Optimization
OSHA	Occupational Safety and Health Administration
OXI	Oxidizer
P1	Plant No. 1

Acronym or Abbreviation	Meaning
P2	Plant No. 2
PB	Power Building
PSB	Primary Sedimentation Basin
PdM	Predictive Maintenance
PE	Primary Effluent
PEDB	Primary Effluent Distribution Box
PEJB	Primary Effluent Junction Box
PEPS	Primary Effluent Pump Station
PISB	Primary Influent Splitter Box
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PRN	Project Request Number
PS	Pump Station
psi	Pounds Per Square Inch
PVC	Polyvinyl Chloride
PWPS	Plant Water Pump Station
RAS	Return-Activated Sludge
RCM	Reliability-Centered Maintenance
RCP	Reinforced Concrete Pipe
RFID	Radio Frequency Identification
RSS	Return Secondary Sludge
RUL	Remaining Useful Life
RWQCB	Regional Water Quality Control Board
SARI	Santa Ana River Interceptor
SBF	Sludge Blending Facility
SC	Secondary Clarifier
SCADA	Supervisory Control and Data Acquisition
SCR	Selective Catalytic Reduction
SE	Secondary Effluent
SEJB	Secondary Effluent Junction Box
SR	Secondary Return
SSC	South Scrubber Complex
T&D	Thickening & Dewatering

Acronym or Abbreviation	Meaning
TF	Trickling Filter
TFPS	Trickling Filter Pump Station
TFSC	Trickling Filter Secondary Clarifier
TFSE	Trickling Filter Secondary Effluent
TL	Trunkline
TPAD	Temperature-phased Anaerobic Digester
TSS	TSS
UPS	Uninterruptible Power Supply
V	Voltage
VCP	Vitrified Clay Pipe
VDC	Volts Direct Current
VFD	Variable Frequency Drive
WAS	Waste-Activated Sludge
WSS	Waste Sidestream, Waste Secondary Sludge (pg. 67)
WSSPS	Waste Sidestream Pump Station

Executive Summary

Asset Management Plan Intent and Purpose

The Orange County Sanitation District (OC San) Asset Management Plan is a tactical document that captures OC San's organizational structure maintenance plans, and capital improvement plan implementation on an annual basis. This document will continue to change in content and structure to reflect our efforts for continual improvement and to meet the needs of stakeholders.

Safe and reliable infrastructure and process equipment are essential to providing industry-leading wastewater collection and management, while achieving our mission and vision statements. We manage asset reliability, mitigate risk, and ensure the quality of our delivered services according to the following stated intent for our Asset Management Program:

> ***"OC San will know the condition of assets we own and will have a plan to operate and maintain these assets to deliver the required level of service, at the lowest life cycle cost, with an acceptable level of risk."***
>
> ***~ James D. Herberg, OC San General Manager***

Overview of OC San's Infrastructure

OC San owns and operates wastewater collection system infrastructure, as well as two resource recovery and wastewater treatment facilities, located in Fountain Valley and Huntington Beach. Our collection system infrastructure includes 388 miles of regional trunk sewer pipelines and 15 pump stations located throughout the OC San service area (Figure ES-1-1). Wastewater is conveyed to Reclamation Plant No. 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach. These facilities treat an average daily wastewater flow of 189 million gallons per day (MGD), serving over 2.6 million people in central and northern Orange County, California.

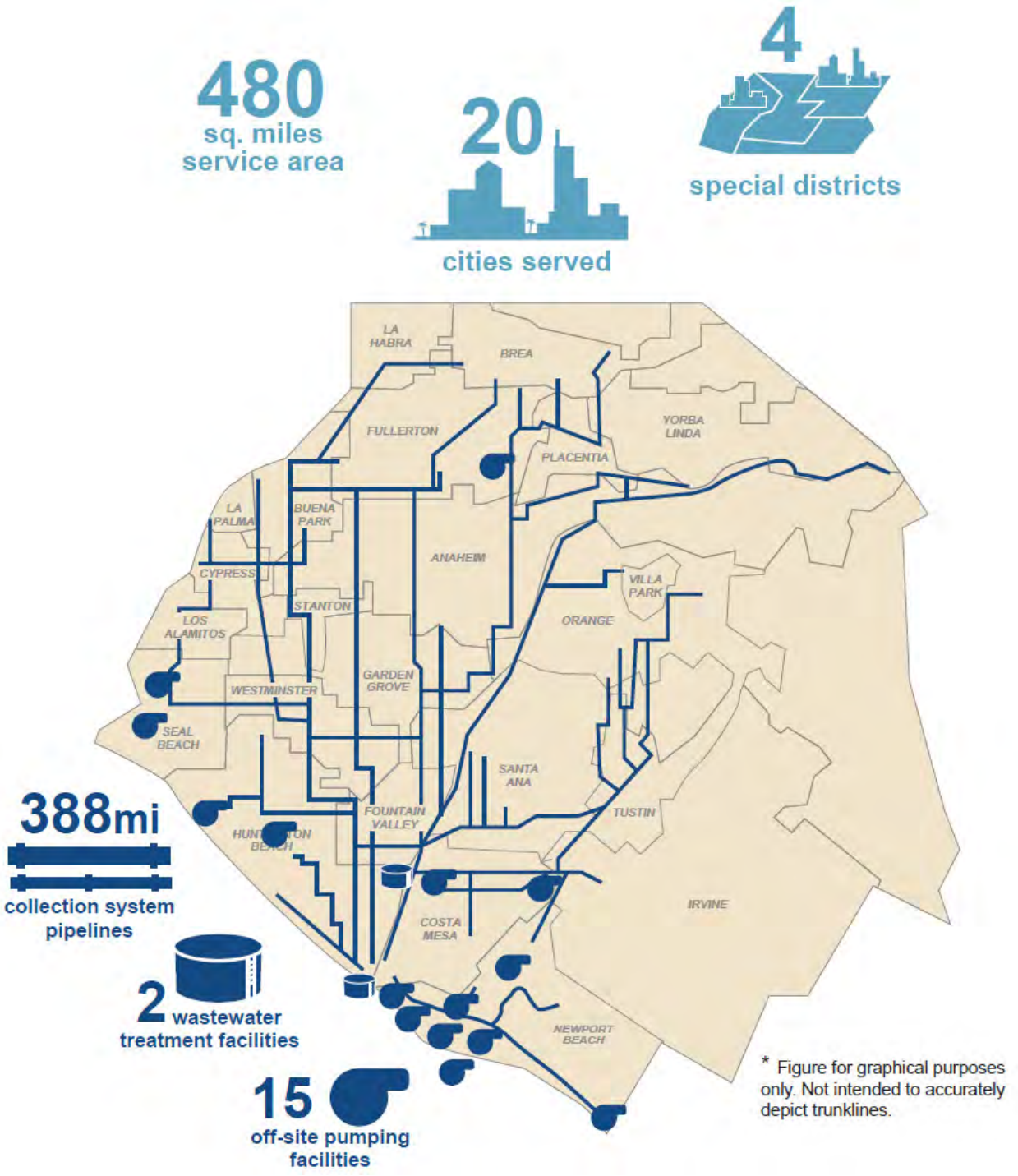


Figure ES-1-1. OC San's Service Area

Figure ES-1-2 shows the facility valuation by asset system for OC San's wastewater infrastructure. The valuation was prepared as part of the 2017 Facilities Master Plan.

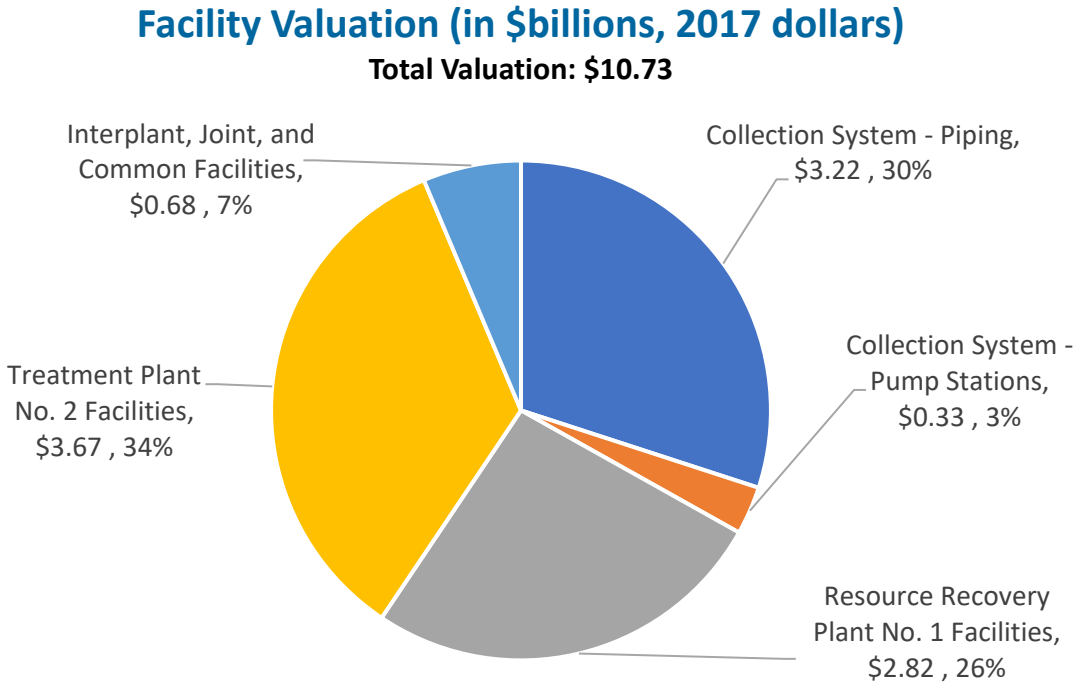


Figure ES-1-2. Facility Valuation by Location

State of OC San's Infrastructure

The following system-level summary tables and condition score maps provide a high-level overview of the Area Asset Management (AM) Summaries contained in Section 2**.** The system-level summaries are organized as follows:

- Plant No. 1 (Figure ES-1-3 and Table ES-1-1)
- Plant No. 2 (Figure ES-1-4 and Table ES-1-2)
- Collection System – Pump Stations and Newport Force Mains (Figure ES-1-5 and Table ES-1-3)
- Collection – Pipelines (Figure ES-1-6 and Table ES-1-4)

The system-level summaries generally include the following fields:

- **Area No.**
- **Area Name**
- **Average Remaining Useful Life (RUL) Score**: Estimated average RUL score for each discipline (civil, structural, mechanical, electrical, and instrumentation) or area based on an average of the RUL scores provided by Asset Engineers in the detailed Area AM Summaries.
- **Percentage of RUL Scores with 4s or 5s**: Percentage based on total number of RUL scores assigned to each area in the detailed Area AM Summaries. The percentage is an alternate metric for the overall condition of the area and equipment. A RUL score of 5 indicates less than 5 years of useful life remains for an asset or set of assets. A RUL score of 4 indicates 5 to 10 years of useful life remains for an asset or a set of assets.
- **Replacement Value ($ millions)**: Process area replacement value from the facility valuation.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 1 OVERVIEW

Figure ES-1-3. Plant No. 1 Process Area – Remaining Useful Life Score Map

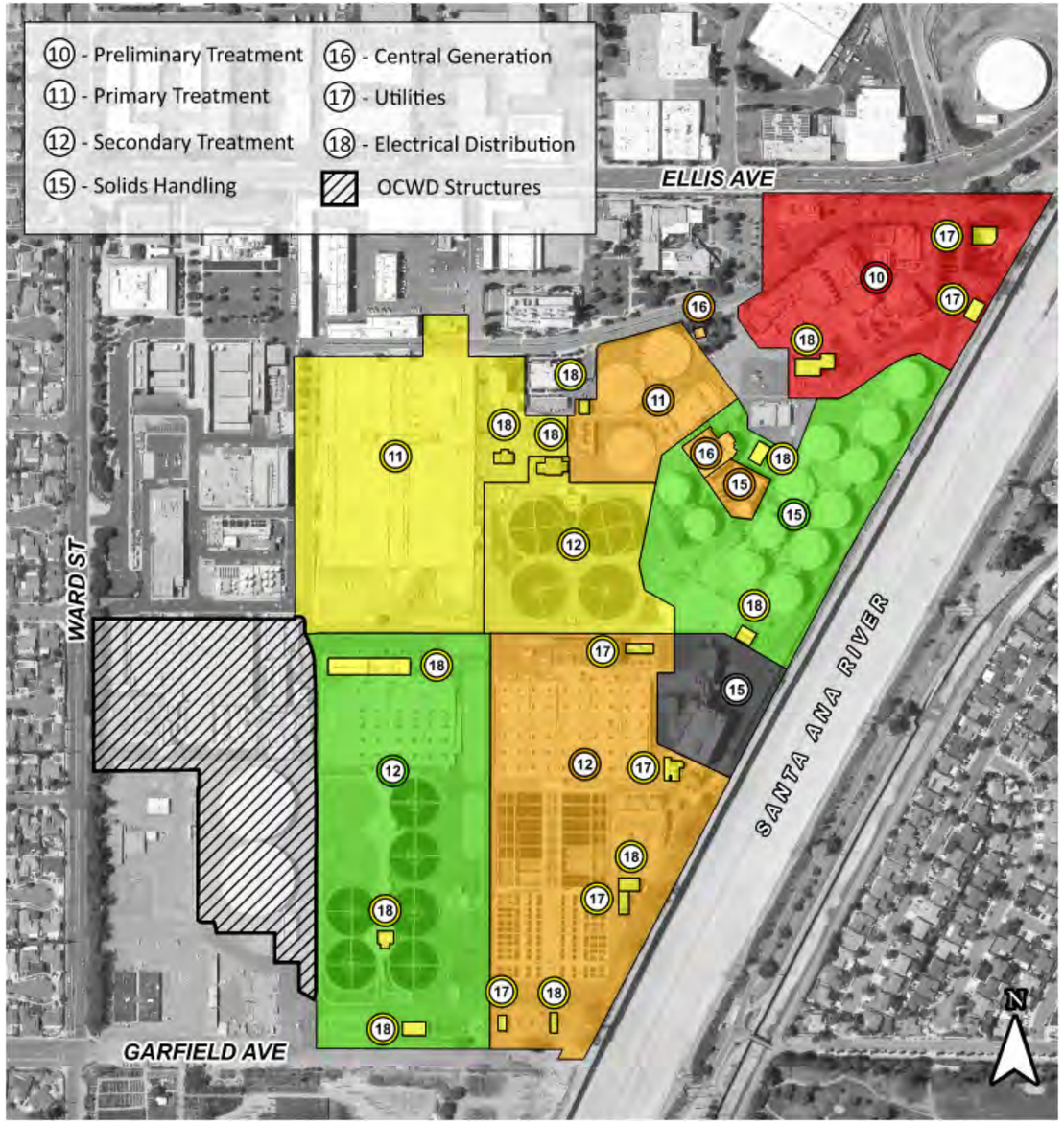


Table ES-1-1. Plant No. 1 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	2	3	5	5	5	5	67%	$386.9
11	Primary Treatment - Basins (1-5)	4	2	4	5	5	4	67%	$107.2
11	Primary Treatment - Basins (6-31)	4	2	3	3	3	3	20%	$390.3
12	Secondary Treatment - Activated Sludge 1	3	3	4	4	5	4	51%	$604.1
12	Secondary Treatment - Activated Sludge 2	1	1	2	3	2	2	13%	$373.4
12	Secondary Treatment - Trickling Filter	1	1	3	4	3	3	7%	$67.8
14	Interplant	2	2	2	2		2	17%	$752.6
15	Solids Handling - Digesters	2	1	2	2	2	2	3%	$254.7
15	Solids Handling - T&D Facilities	1	1	1	2	1	1	0%	$190.2
15	Solids Handling - Gas Handing	3	4	4	4	5	4	67%	$37.3
16	Central Generation[a]		3	3	4	4	4	46%	$170.5
17	Utilities	3	3	3	2	2	3	0%	$194.2
18	Electrical Distribution[a]				3		3	42%	$81.6
19	Miscellaneous Structures & Grounds	*TBD*					*TBD*	*TBD*	$249.0
	Plant No. 1 Total							**32%**	**$3,859.9**

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

OCWD = Orange County Water District; RUL = Remaining Useful Life; TBD = To Be Determined;

T&D = Thickening and Dewatering

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 2 OVERVIEW

Figure ES-1-4. Plant No. 2 Process Area – Remaining Useful Life Score Map

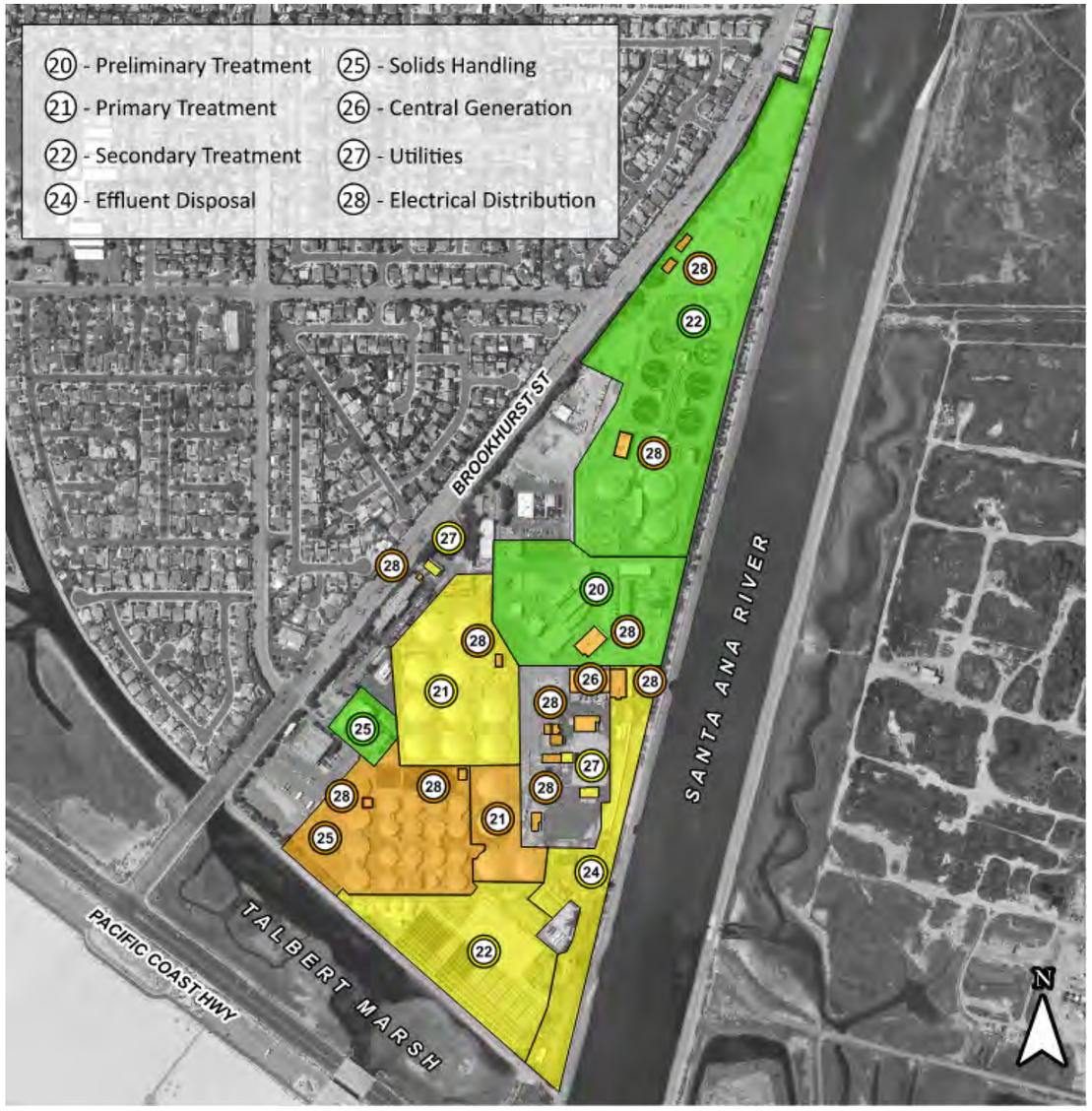


Table ES-1-2. Plant No. 2 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	2	2	2	2	2%	$357.6
21	Primary Treatment - A-Side	5	4	4	3	3	4	57%	$166.8
21	Primary Treatment - B- & C-Side	3	3	3	3	3	3	4%	$333.6
22	Secondary Treatment - Activated Sludge	3	3	3	4	3	3	20%	$612.6
22	Secondary Treatment - DAFT	4	1	3	3	3	3	9%	$57.7
22	Secondary Treatment - Trickling Filter	2	1	2	3	3	2	5%	$342.4
24	Effluent Disposal	2	2	3	3	4	3	21%	$900.2
25	Solids Handling - Digesters	3	4	4	4	4	4	72%	$355.5
25	Solids Handling - Facilities	2	1	2	2	2	2	5%	$184.6
25	Solids Handling - Gas Handling	3	3	4	4	4	4	33%	$37.3
26	Central Generation[a]		3	4	4	4	4	70%	$363.8
27	Utilities	3	3	3	3	2	3	0%	$108.3
28	Electrical Distribution[a]				4		4	65%	$80.1
29	Miscellaneous Buildings & Grounds	*TBD*					*TBD*	*TBD*	$146.2
	Plant No. 2 Total							**38%**	**$4,046.9**

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

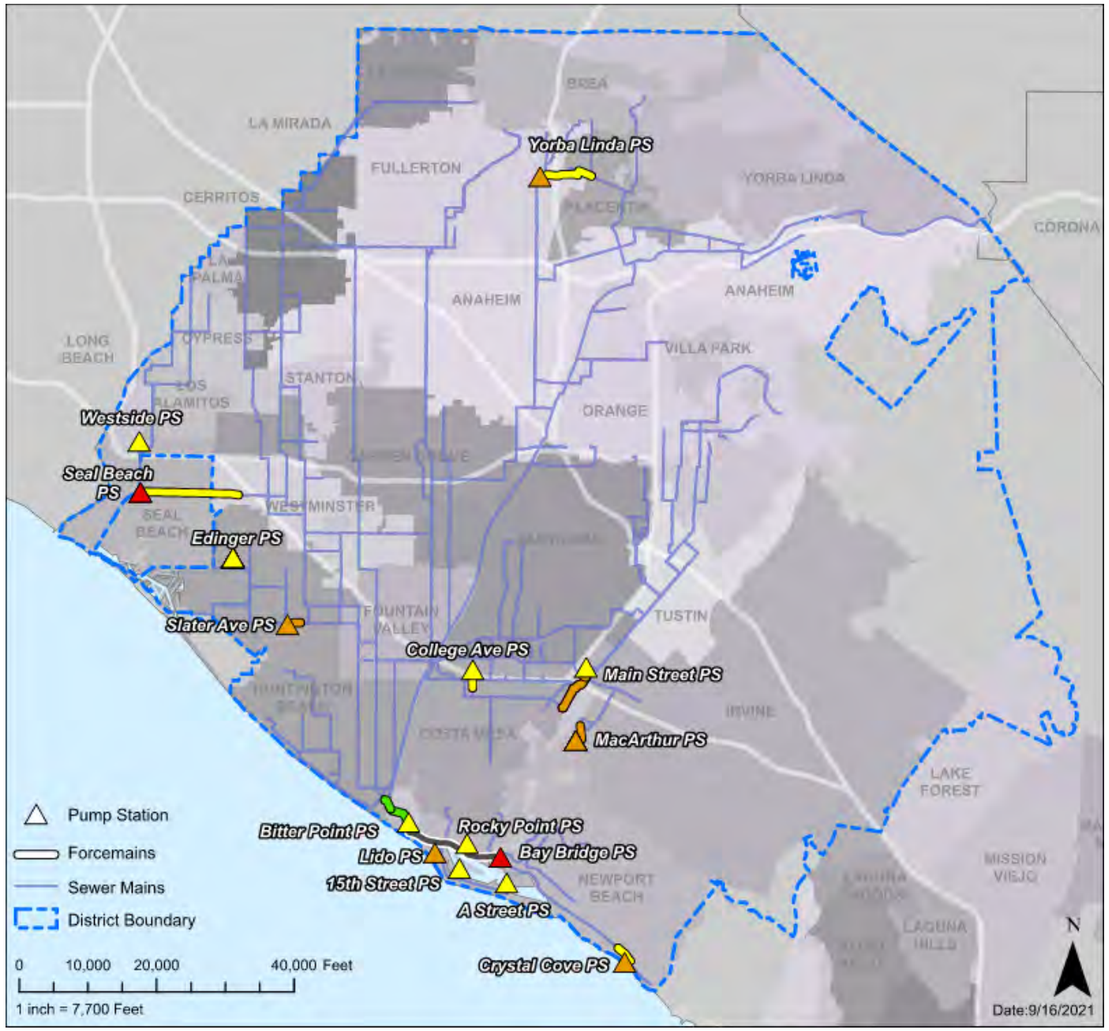
Acronym Key:

DAFT = Dissolved Air Flotation Thickener; RUL = Remaining Useful Life; TBD = To Be Determined

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW

Figure ES-1-5. Collection System Pump Station – Remaining Useful Life Score Map



Note: Not all pump station force mains are shown on this map. Only longer forcemains are shown.

Table ES-1-3. Pump Station and Force Main Remaining Useful Life and Replacement Value Summary

Service Area	Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
5	15th Street	3	4	3	3	2	3	25%	$14.8
5	A Street	3	4	4	3	2	3	25%	$12.9
5	Bay Bridge	4	4	5	4	5	5	85%	$37.5
5	Bitter Point	2	3	4	2	2	3	23%	$35.5
6	College	3	3	3	2	2	3	8%	$26.4
5	Crystal Cove	3	3	4	4	3	4	33%	$2.8
11	Edinger	4	3	3	3	3	3	27%	$14.2
5	Lido	1	4	4	4	4	4	50%	$22.2
7	MacArthur	4	4	4	4	2	4	64%	$18.0
7	Main Street	4	3	4	3	3	3	46%	$48.4
5	Rocky Point	1	4	4	2	2	3	23%	$17.6
11	Slater	4	4	4	3	3	4	31%	$38.8
3	Seal Beach	3	4	5	5	4	5	83%	$45.8
3	Westside	3	3	3	2	3	3	8%	$33.7
2	Yorba Linda	3	4	4	3	3	4	36%	Not Valued
5	Newport Force Mains [a]	1	-	-	-	-	1	0%	-
	Collection PS Total							**38%**	**$368.6**

RUL Legend:

RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:

PS = Pump Station; RUL = Remaining Useful Life

[a] White box with dash lines indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PIPELINES OVERVIEW

Figure ES-1-6. Collection System Pipelines – Remaining Useful Life Score Map

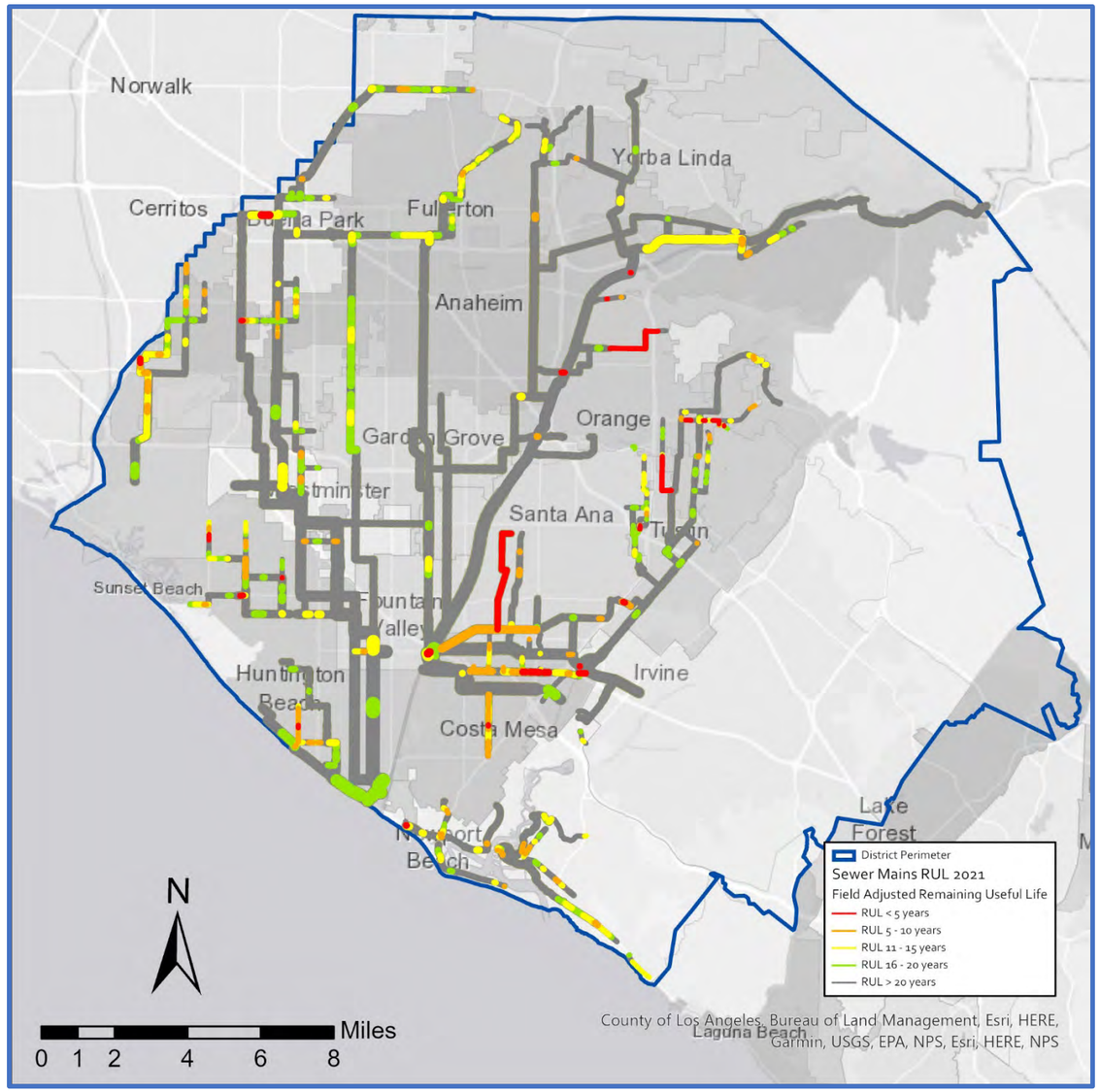


Table ES-1-4. Collection System Pipelines Remaining Useful Life and Replacement Value Summary

Trunklines	No. of Pipes with RUL Scores of 4 or 5	Miles of Pipes with RUL Scores of 4 or 5	Percentage of RUL Scores with 4s or 5s (By Length)	Replacement Value ($ Millions, in 2021 Dollars) [a]
Baker-Main	74	5.62	14%	$303.6
Bushard	0	0.00	0%	$266.2
Coast	17	1.11	10%	$108.6
Euclid	1	0.10	0%	$297.4
Interplant	0	0.00	0%	$127.1
Knott	37	3.23	5%	$688.6
Miller-Holder	7	0.71	2%	$326.3
Newhope	4	0.25	1%	$230.3
Newport	17	0.82	4%	$238.3
SARI	40	2.11	4%	$568.6
Sunflower	12	0.72	2%	$330.4
Talbert	74	5.86	70%	$63.5
Total	**283**	**20.53**	**6%**	**$3,548.9**

RUL Legend:

RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

[a] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.

Budgetary Considerations

The Asset Management Plan focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations for robust planning purposes. OC San has been striving to identify more accurately medium- to long-term capital cash flow requirements.

Fiscal Year (FY) 2021-2022 Budget Update, the second year of the two-year budget adopted in June 2020, includes updates to the 20-year Capital Improvement Program (CIP) outlay. Figure ES-1-7 includes current and projected CIP projects.

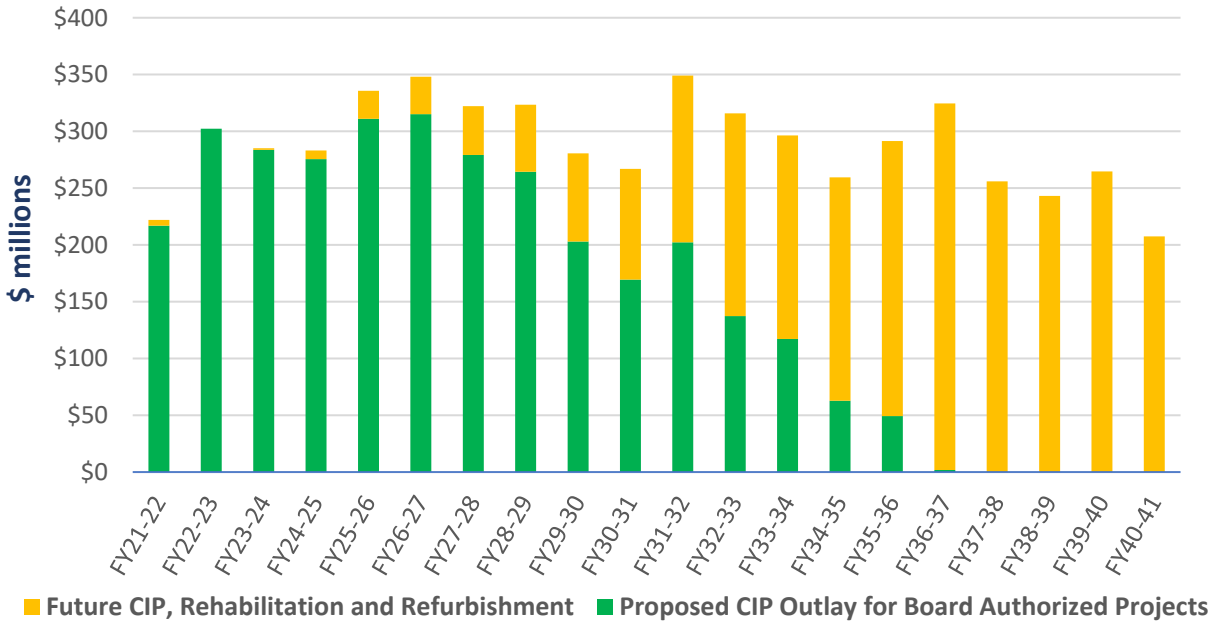


Figure ES-1-7. 20-Year CIP Outlay

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1 Introduction

The Orange County Sanitation District (OC San) Board of Directors developed mission and vision statements to clearly communicate OC San's purpose to our stakeholders and to articulate OC San's organizational objectives. OC San's vision supports our mission by expressing what we strive to achieve now and into the future.

Our Mission

To protect public health and the environment by providing effective wastewater collection, treatment, and recycling services.

Our Vision

OC San will be a leader in:

- *Providing reliable, responsive, and affordable services in line with customer needs and expectations.*
- *Protecting public health and the environment utilizing all practical and effective means for wastewater, energy, and solids resource recovery.*
- *Continually seeking efficiencies to ensure that the public's money is well spent.*
- *Communicating our mission and strategies with those we serve and all other stakeholders.*
- *Partnering with others to benefit our customers, this region, and our industry.*
- *Creating the best possible workforce in terms of safety, productivity, customer service, and training.*

Through improved and robust asset management practices, we are better able to coordinate and plan actions to ensure our collection system, treatment, and resource recovery infrastructure is safe and reliable, and meets the rigorous level of service embodied by our mission statement.

In November 2019, OC San's strategic planning process resulted in the creation of an asset management policy and asset management initiatives. Collectively, the policy and initiatives make up OC San's asset management strategy.

Asset Management Policy

OC San will assess and manage the collection system and treatment plant systems and assets to improve resilience and reliability while lowering lifecycle costs. This will be accomplished through adaptive operation, coordinated maintenance and condition assessment, and planned capital investment. Staff will balance maintenance, refurbishment, and replacement strategies to maximize useful life, system availability, and efficiency.

Asset Management Initiatives

- *Create an annual Asset Management Plan documenting the condition of the collection system and treatment plants, and upcoming maintenance or capital projects.*
- *Coordinate the efforts of operations, collections, mechanical maintenance, electrical maintenance, instrument maintenance, and engineering through process teams to assure the Sanitation District's resources are focused on the high priority work functions.*

- *Maintain a 20-year forecast of all CIP projects needed to maintain or upgrade the Sanitation District's $10.7 billion in assets on a prioritized risk basis to establish rate structures.*

The Asset Management Plan is a living document that describes constantly evolving operation strategies, maintenance and refurbishment plans and adaptations, and CIP implementation initially captured in the Facilities Master Plan and revised on an annual basis through the budgeting process. The information included in the Asset Management Plan encompasses the breadth of information needed to successfully align the capital and operational planning activities necessary to meet the Asset Management Program objectives. The key objectives that are built into the Asset Management Program include the following:

1) Take a proactive approach to repair, rehabilitation, and replacement.
2) Ensure assets are reliable and operating when needed.
3) Minimize unplanned outages and equipment downtime.
4) Manage risks associated with asset or service impairment through asset performance optimization.
5) Develop cost-effective management strategies for the long term.
6) Strive to implement world class asset management strategies through continual improvement in our asset management practices.

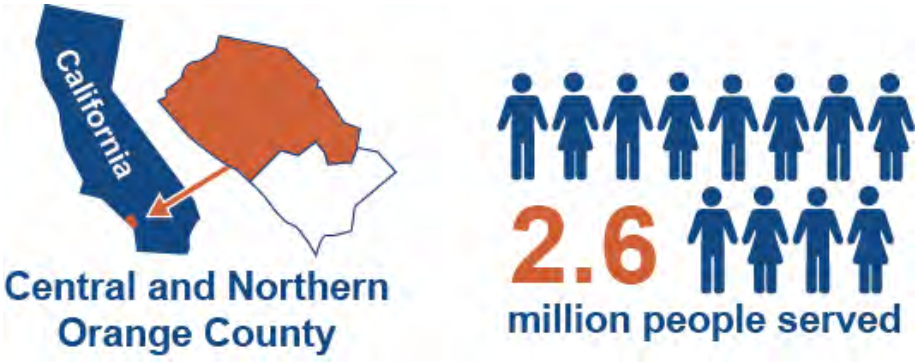
The Asset Management Plan is a key component of OC San's overall planning activities. It aligns with the OC San's Strategic Plan, and the Facilities Master Plan and projects identified therein, while identifying potential and new opportunities that may require funding in the budget development process. Table 1-1 describes the relationship of the Asset Management Plan to the other planning activities.

Table 1-1. Linkage between Asset Management Plan and Other Planning Activities

Planning Activity	Description	Planning Horizon	Update Cycle
Strategic Plan	Defines the strategic initiatives to be pursued by OC San and provides a basis for long-term financial, capital, and operating planning. The Asset Management Plan aligns with Strategic Plan goals and objectives.	5- to 10-year	Biennial
Facilities Master Plan	Identifies long-term capital improvement plans to address treatment and collection system infrastructure improvement needs. Projects identified in the Facilities Master Plan are incorporated into the Asset Management Plan and refined as appropriate.	20-year	Varies
Asset Management Plan	Documents the overall condition of treatment and collection system assets and plans to address key condition and performance issues to ensure assets meet OC San's levels of service.	1-year 5-year 10-year	Annual
Budget Document	Lays out the framework of OC San's activities and serves as a source of information for our Board of Directors, rate payers, and employees. It includes operational, capital, and debt service expenditures necessary to support our mission and to execute the Strategic Plan adopted by our Board of Directors. The Asset Management Plan identifies new operational, maintenance, and capital improvement activities for consideration during the budget development process.	2-year	Annual

1.1 Overview of OC San's Infrastructure

OC San is responsible for providing wastewater collection, treatment, and recycling services to over 2.6 million people in central and northern Orange County, California. OC San's two resource recovery and wastewater treatment facilities treat an average daily wastewater flow of 189 million gallons per day (MGD) from residential, commercial, and industrial sources.



In addition to our plant facilities, OC San owns and operates wastewater collection system infrastructure. Our collection system infrastructure includes 388 miles of regional trunk sewer pipelines and 15 pump stations located throughout OC San's service area (Figure 1-1). Wastewater is conveyed via the collection system to Reclamation Plant No. 1 in Fountain Valley, and Treatment Plant No. 2 in Huntington Beach, where resource recovery and wastewater treatment take place.

OC San's treatment plants currently operate under a regulatory permit from the Regional Water Quality Control Board (RWQCB). This authority is established through the National Pollutant Discharge Elimination System (NPDES) that permits the discharge of treated wastewater through an ocean outfall system to the Pacific Ocean. While some of this treated water is released five miles offshore through a deep-water ocean outfall system, most is recovered and delivered to the Orange County Water District (OCWD). OCWD further treats OC San's effluent, using the Groundwater Replenishment System, which improves the effluent water quality, to drinking water standards for groundwater recharge and irrigation purposes. The following sections briefly describe the key systems under OC San's management.

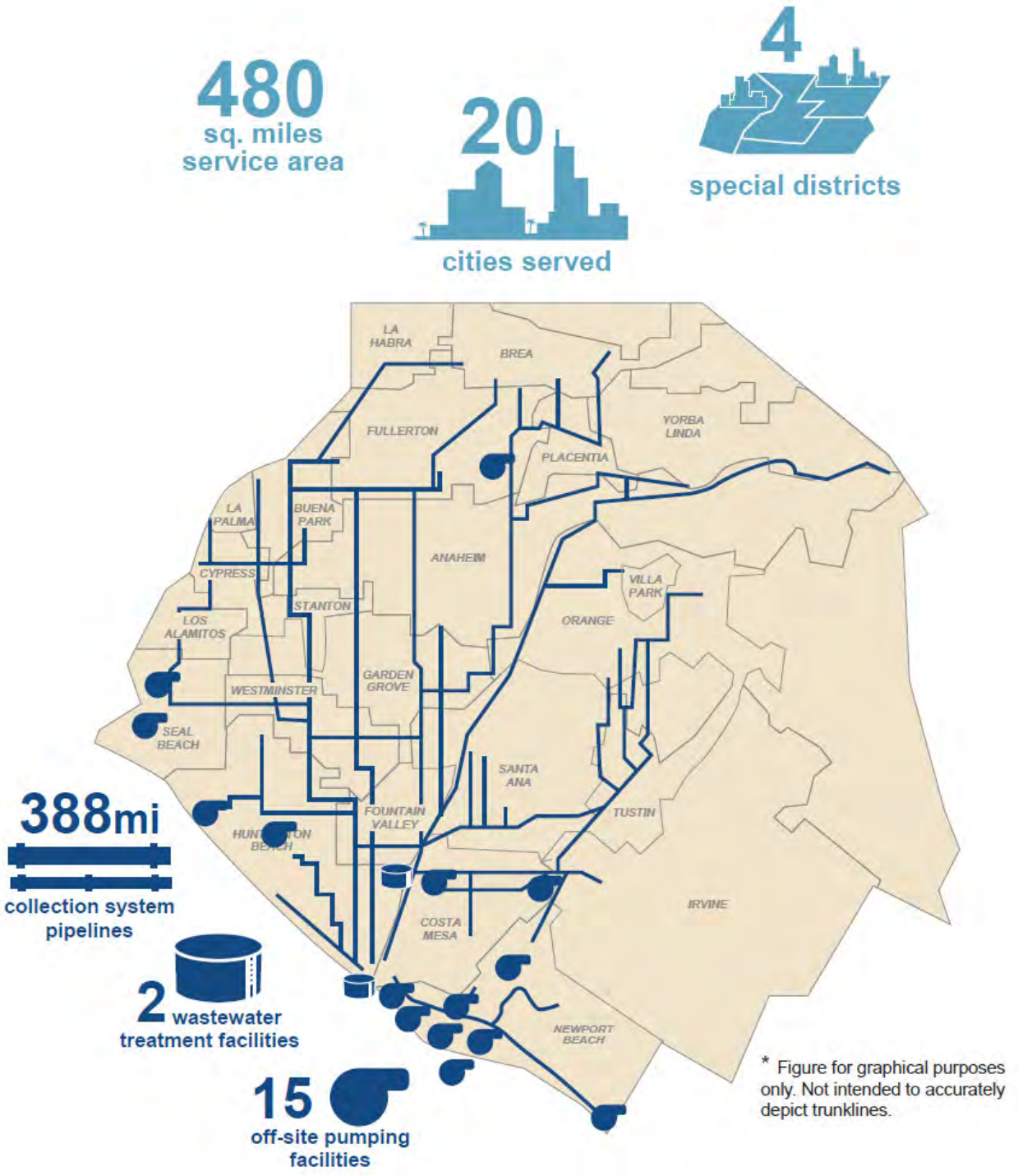
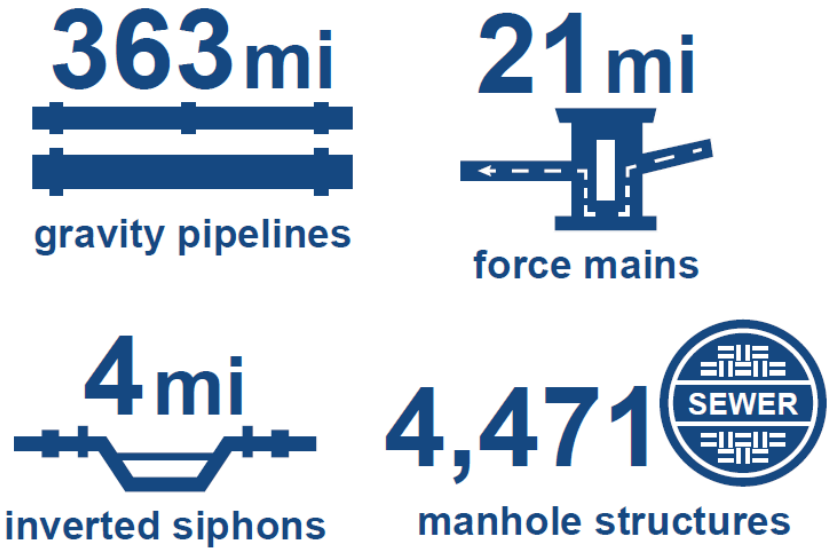


Figure 1-1. OC San's Service Area

1.1.1 Collection System

OC San's collection system serves as a regional conveyance system, collecting and conveying flows from 20 cities and 4 special districts. OC San's 388 miles of collection system pipelines and 15 pump stations are spread throughout northern Orange County and include 363 miles of gravity pipelines, 21 miles of force mains, 4 miles of inverted siphons and 4,471 manhole structures.



1.1.2 Reclamation and Treatment Plant System

OC San owns and operates two wastewater treatment plants that serve two primary functions—treatment and reclamation. Reclamation Plant No. 1 (Plant No. 1) is located in the city of Fountain Valley, approximately 4 miles inland of the Pacific Ocean and adjacent to the Santa Ana River. Influent wastewater entering Plant No. 1 passes through a flow metering and diversion structure, mechanical bar screens, grit chambers, and primary basins, before going to one of two air-activated sludge processes, or trickling filters, and secondary clarifiers. Up to 135 MGD of secondary effluent can be diverted to OCWD's facilities for tertiary treatment prior to reuse. The remaining flow goes to the Plant No. 2 ocean outfall system. For a map of the facilities and more detailed understanding of how Plant No. 1 processes work together, please refer to Appendices A and B, respectively.

Solids treatment at Plant No.1 includes co-thickening of primary and secondary sludge, followed by anaerobic digestion process and centrifuge dewatering of digested sludge to produce Class-B biosolids. Digester gas produced at Plant No. 1 is collected, cleaned, compressed, and transferred via a closed piping system, to the Central Power Generation Facility, as a renewable fuel for energy generation. In addition, Plant No. 1 includes facilities for odor control and chemical addition to support the aforementioned

Treatment Plant No. 2 (Plant No. 2) is located in the City of Huntington Beach, adjacent to the Santa Ana River and east of Pacific Coast Highway. Raw sewage flow entering Plant No. 2 passes through a flow metering structure, mechanical bar screens, and grit removal chambers. Flow then passes through primary basins before being split between the oxygen activated sludge secondary treatment facility or the trickling filters/solids contact basins, where it is finally discharged directly to the ocean via the outfall pumping system.

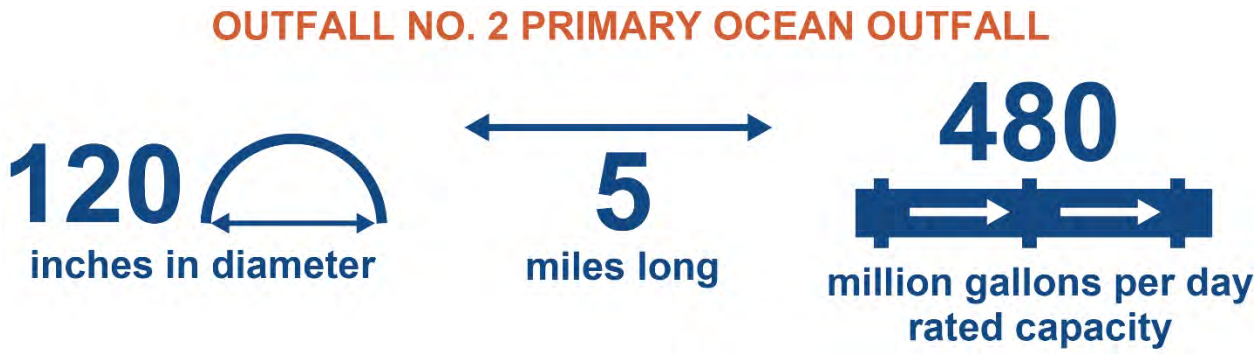
Solids treatment at Plant No. 2 includes dissolved air flotation thickening of waste-activated sludge (WAS) and secondary sludge, anaerobic sludge digestion of primary and thickened secondary sludge, and centrifuge dewatering of digested sludge to produce Class-B biosolids. Plant No. 2 also has facilities for odor control and chemical addition. Digester gas produced at Plant No. 2 is collected, compressed, cleaned, and distributed to a Central Power Generation System as a renewable fuel for energy generation. Compressed digester gas can be shared between the plants through the interplant gas line.

Currently, Plant No.2 secondary effluent is discharged to the ocean through the outfall system. After the construction of OCWD's Groundwater Replenishment System (GWRS) final expansion and associated projects in 2023, Plant No. 2 reclaimable secondary effluent together with Plant No. 1 secondary effluent (a total of up to 175 MGD) will be diverted to OCWD for tertiary treatment and reuse. For a map of the facilities and more detailed understanding of how Plant No. 2 processes work together, before and after the final expansion of GWRS, please refer to Appendices C, D, and E, respectively.

1.1.3 Outfall System

The ocean outfall system includes three discharge structures: Outfall No. 1, Outfall No. 2, and the Santa Ana River Emergency Overflow Weirs.

Outfall No. 2 serves as the primary ocean outfall, discharging treated wastewater approximately 5 miles offshore at a depth of approximately 200 feet. It began service in 1971 and is currently undergoing planned assessment and rehabilitation activities to ensure its reliability for many years to come.



Outfall No. 1 serves as an emergency outfall. It was originally constructed in 1954 and was later modified in 1965. It is located over a mile offshore at a depth of approximately 65 feet and serves as a primary backup to Outfall No. 2. OC San's NPDES permit specifies that this outfall can only be used in the case of an emergency or during planned maintenance activities.

The outfall system has two Santa Ana River Emergency Overflow Weirs at Plant No. 2, which discharge directly to the Santa Ana River. These weirs are for extreme emergency use only and serve as a secondary backup to the primary outfall facilities, ensuring the safety and welfare of the community at large.

1.2 Facility Valuation

As part of the 2017 Facilities Master Plan, OC San commissioned an engineering study to determine the 2017 valuation of all OC San capital facilities, including Plant No. 1, Plant No. 2, interplant and joint treatment facilities, and the collection system, including sewer pipelines and lift stations.

Figure 1-2 shows the valuation information, presented in five general sub-process areas:

- Collections Systems Piping
- Collection Systems Pump Stations
- Reclamation Plant No. 1 Facilities
- Treatment Plant No. 2 Facilities
- Interplant, Joint, and Common Facilities

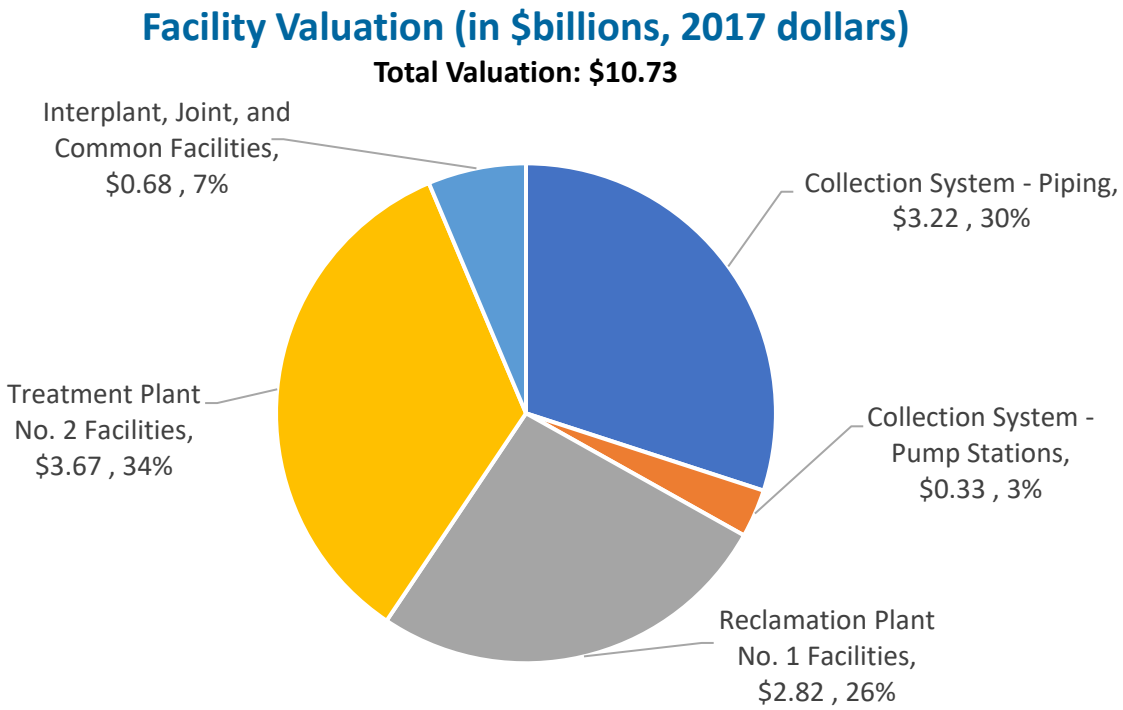


Figure 1-2. Facility Valuation by Area

1.3 Asset Management Organization

Asset management is an essential part of OC San, and our overall mission to deliver safe, economical, and reliable wastewater treatment services. Every part of our organization is involved in some aspect of asset management and ensuring that assets are designed, constructed, operated, and maintained to reliably deliver the required level of service to our customers. Through a very collaborative effort, each group plays an important role in ensuring that the individual asset management initiatives are properly executed (Figure 1-3).

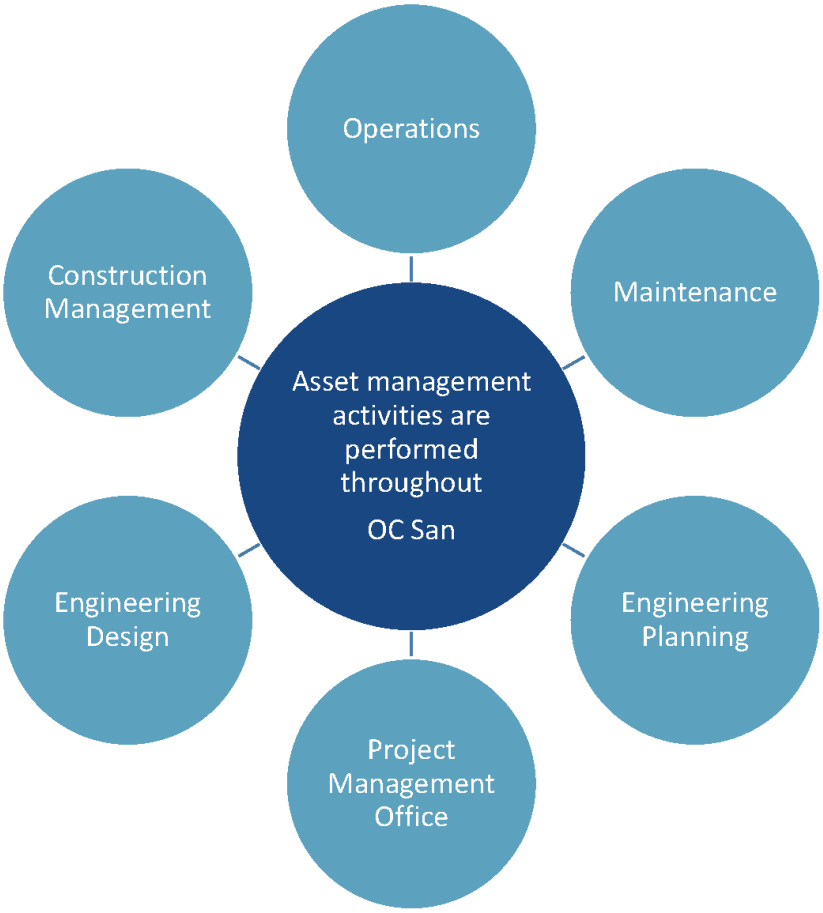


Figure 1-3. Roles in Asset Management

- **Operations** operates and monitors assets and infrastructure that convey, treat, process, and recover resources.
- **Maintenance** performs proactive, corrective, and restorative activities in a planned setting to maintain asset reliability and capacity.
- **Engineering Planning** provides engineering support for short- and long-term management of assets, while working towards asset management objectives.
- **Project Management** manages design and construction of new facilities and the rehabilitation of older facilities. The Small Projects Delivery team within the Project Management Office is responsible for the design and construction management of facilities and maintenance projects.

- **Engineering Design** ensures projects and assets are designed in accordance with engineering standards and codes and meet stakeholder needs.
- **Construction Management** ensures assets are constructed in accordance with contract requirements.

To fulfill our commitment to our ratepayers for providing safe and reliable services, OC San's Asset Management Program is structured to align the Engineering, Operations, and Maintenance (O&M) departments. OC San's Asset Management Group, within the Engineering Planning Division, consists of nine Asset Engineers responsible for understanding the key issues or concerns related to the condition of OC San's assets and for developing and coordinating plans or strategies to ensure that the assets operate reliably and are functioning properly. The Asset Engineers, assigned to their respective process or collection system area(s), work closely with the O&M Area Team members to maintain familiarity with all aspects that may impact the operational, condition, process, and maintenance-related issues within their assigned areas. Collectively, the Area Teams work together to reach the goal of providing the required level of service to our customers, at the lowest lifecycle cost with an acceptable level of risk. This strategy involves a significant investment in internal coordination but ensures that we are properly assessing risks, solving problems and process deficiencies in a timely manner, and providing optimal water treatment services.

The mission of the Maintenance Division is to protect public health and the environment by providing reliable power distribution, electrical and instrument maintenance, civil facilities and grounds maintenance, and mechanical maintenance to the treatment plant and associated pump stations in outer lying service areas. The Maintenance Division provides required predictive, preventive, and corrective maintenance and planning activities to include project support in design and construction phases, collectively referred to as reliability-centered maintenance (RCM). The goals of RCM involve implementing well-coordinated maintenance strategies to ensure OC San's assets will operate at the required level of service.

1.3.1 Predictive Maintenance

OC San takes a proactive RCM approach emphasizing Predictive Maintenance (PdM). The Maintenance Reliability Group implements the PdM Program, which collects data through condition monitoring, enabling the real-time performance of assets. Methods of data collection are Insulation Resistance testing, Infrared Thermography, Structure Borne Ultrasound, Electrical Signal Analysis, Vibration Analysis, and Oil Analysis. The premise of PdM is a proactive approach to minimize unexpected breakdowns, reduce repair cost, extend the Mean Time Between Failure (MTBF), monitor the actual equipment health through quantifiable means, and perform advanced analysis and failure detection. In addition, when sudden changes or variations in the process manifest, they are often found during the regular Maintenance Reliability rounds as part of their everyday work. The ability to monitor equipment lends itself to helping Maintenance to optimize intervals between corrective repairs, minimizing the number and cost of unscheduled repairs created by machine-train failures, and improving the overall equipment reliability.

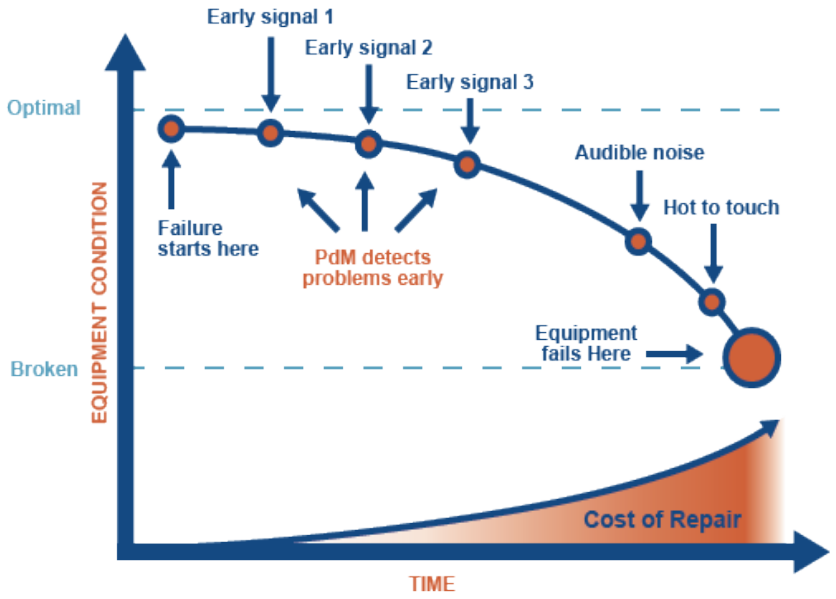


Figure 1-4. PdM Summary

The Maintenance Specialists and Reliability Technicians in this group use various techniques such as:

- Vibration analysis to measure imbalance in rotating equipment.
- Thermography to measure excessive temperature rise.
- Oil and wear debris analysis to predict lubricant and equipment degradation.
- Ultrasound inspection of electrical power distribution equipment for detecting corona and other destructive conditions that pose a potential for arc flash incidents.
- Motor circuit analysis of de-energized motors, large or small, for diagnosing condition of the motor and its associated power circuits for determining motor stator health, broken rotor bars, deteriorating motor connections, and any impending failure trends.
- Motion Amplification amplifies a regular video frame of operating equipment, turning each camera pixel into a pseudo-accelerometer, which allows for an advanced analysis of machine faults. In addition, it augments other reliability analysis tools for troubleshooting purposes.

OC San has a two-decade history of PdM as summarized in Table 1-2.

Table 1-2. High-Level Summary of OC San's Predictive Maintenance Program

Year	Activity
2002	Baseline vibration monitoring with consultant assistance
2006	Comprehensive vibration analysis program implementation at both treatment plants and 15 pump stations
2012	Comprehensive predictive maintenance program implementation and establishment of Reliability Maintenance Team that includes engineers and four Reliability Maintenance Technicians
2014	Predictive maintenance program assessment conducted by Allied Reliability Inc.
2018	Machinery lubrication program assessment conducted by Noria Corporation Inc.; added ultrasound and thermography to test electrical equipment
2019	Motion Amplification equipment by RDI Technology added to the Predictive Maintenance Program
2020	Motor circuit analysis for large and small motors

1.3.1.1 Mechanical Discipline

The mechanical discipline has the most mature PdM Program and involves variance trending of the PdM test results, which include:

- Vibration analysis
- Oil analysis
- Airborne Ultrasound
- Infrared thermograph
- IRIS motion camera (measures deflection and displacement)

In addition to PdM activities for mechanical equipment, OC San also uses laser alignment techniques to enhance alignment rotating machinery accuracy to increase operating life span.

1.3.1.2 Electrical Discipline

The electrical PdM Program continues to evolve and currently includes the following tests:

- Oil analysis for transformers
- Ultrasound to detect arcing
- Infrared thermography to detect hot spots
- Electrical power distribution equipment preventive maintenance
- Circuit breakers and protective relays preventive maintenance and testing
- Motor circuit analysis for large and small motors
- Medium voltage feeder cable testing to determine the health of cables and insulation

1.3.2 Preventive and Corrective Maintenance

Beyond the advanced PdM strategies, OC San also performs time and cycle-based preventive maintenance (PM) and corrective maintenance (CM) activities. It is these activities that, if well implemented, greatly extend the life of the assets. Recognizing the importance of these efforts, OC San has dedicated two groups of skilled individuals to reinforce and sustain these activities.

- OC San has created a PM Optimization Group that is tasked with conducting an in-depth assessment to optimize preventive maintenance strategies for new and existing assets and to establish maintenance approaches and strategies for assets installed by capital improvement projects prior to beneficial occupancy. The PM Optimization Program tracks, maintains, and manages assets throughout their lifecycles from design, construction, commissioning, beneficial occupancy, operations, and maintenance, to the eventual decommissioning or replacement of assets. This ensures that asset lifecycle is maximized with the lowest risk to process failure by achieving the intended reliability, at the lowest possible cost, and maximizing equipment availability.
- The Maintenance Planning Group drives reliability and effectiveness in the craft-based maintenance work groups they support by ensuring that work groups have sufficient ready-to-execute work with appropriate resources such as tools, materials, labor, and job plans. Maintenance Specialists in this group are responsible for managing blanket maintenance service contracts, planning and scheduling maintenance activities, optimizing preventive maintenance activities within Maximo (which includes fine tuning job plans based on input received from field staff, leads, and maintenance Supervisors and Engineers), and coordinating complex maintenance activities involving shutdowns and outages.

OC San's preventive and CM program is staffed to address the long-term reliable performance of civil, mechanical, electrical, and instrumentation assets. PM and CM activities specific to these disciplines are an integral part of OC San's maintenance program. The following lists provide examples of tasks performed; however, they are not meant to be inclusive of all maintenance responsibilities. Often, OC San staff get the job done by improvising in the field setting to meet the challenge.

1.3.2.1 Civil Discipline

PM and CM activities include:

1) Cleaning of civil facilities.
2) Chemical conditioning of the sewage to reduce corrosion and control odors.
3) Minor repairs.
4) Application and repair of coatings.
5) Maintenance and testing of cathodic protection systems.

1.3.2.2 Mechanical, Electrical, and Instrumentation Disciplines

PM and CM activities include:

1) Valve and gate exercising program comprising more than 264 PM tasks for over 1,650 valves and gates in both plants and collection system.
2) Equipment rotation program to ensure equipment wear is predictable.
3) Adjustments and mechanical alignments.
4) Equipment rebuilding and regular testing.
5) Changing of lubricants and filters.
6) Electrical equipment cleaning and tightening.
7) Sensors and meters calibration.

2 State of OC San's Infrastructure

The Area Asset Management (AM) Summaries are intended to summarize the condition of major assets, identify key issues for further investigation, and summarize maintenance and CIP projects planned over the next 10 to 15 years. The approach for developing the AM Summaries is to assemble a list of major assets, document key issues, define the average remaining useful lives of these assets, and identify OC San's plan to address performance and reliability issues of these assets over the 1-, 5-, and 10-year planning horizons. Each month, Asset Engineers present one or more of the AM Summaries to the AM Council; over the course of a year all the process areas, pump stations and collection system are presented. The Area AM Summaries are updated as needed and incorporated into the Asset Management Plan, which is published annually.

2.1 Asset Management System Summaries

The following system-level summaries provide a high-level overview of the Area AM Summaries contained in Section 2.2. The remaining useful life (RUL) scores are an average of the RUL scores for that discipline within that process area. Detailed condition scores are presented in the Area AM Summaries. The system-level summaries are organized by:

- Plant No. 1
- Plant No. 2
- Collection System – Pump Stations
- Collection System – Pipelines

The system-level summaries include an area map showing the general layout of the process areas or collection system, and a table with the following fields:

- **Area No.**
- **Area Name**
- **Average RUL Score**: Estimated average RUL score for each discipline (civil, structural, mechanical, electrical, and instrumentation) or area based on an average of the RUL scores provided by Asset Engineers in the detailed Area AM Summaries.
- **Percentage of RUL Scores with 4s or 5s**: Percentage based on total number of RUL scores assigned to each area by Asset Engineers in the detailed Area AM Summaries. The percentage is an alternate metric for the overall condition of the area. A RUL score of 5 indicates less than 5 years of useful life remains for an asset or set of assets. A RUL score of 4 indicates 5 to 10 years of useful life remains for an asset or a set of assets.
- **Replacement Value ($million)**: Process area replacement value from the 2017 facility valuation.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 1 OVERVIEW

Figure 2-1. Plant No. 1 Process Area – Remaining Useful Life Score Map

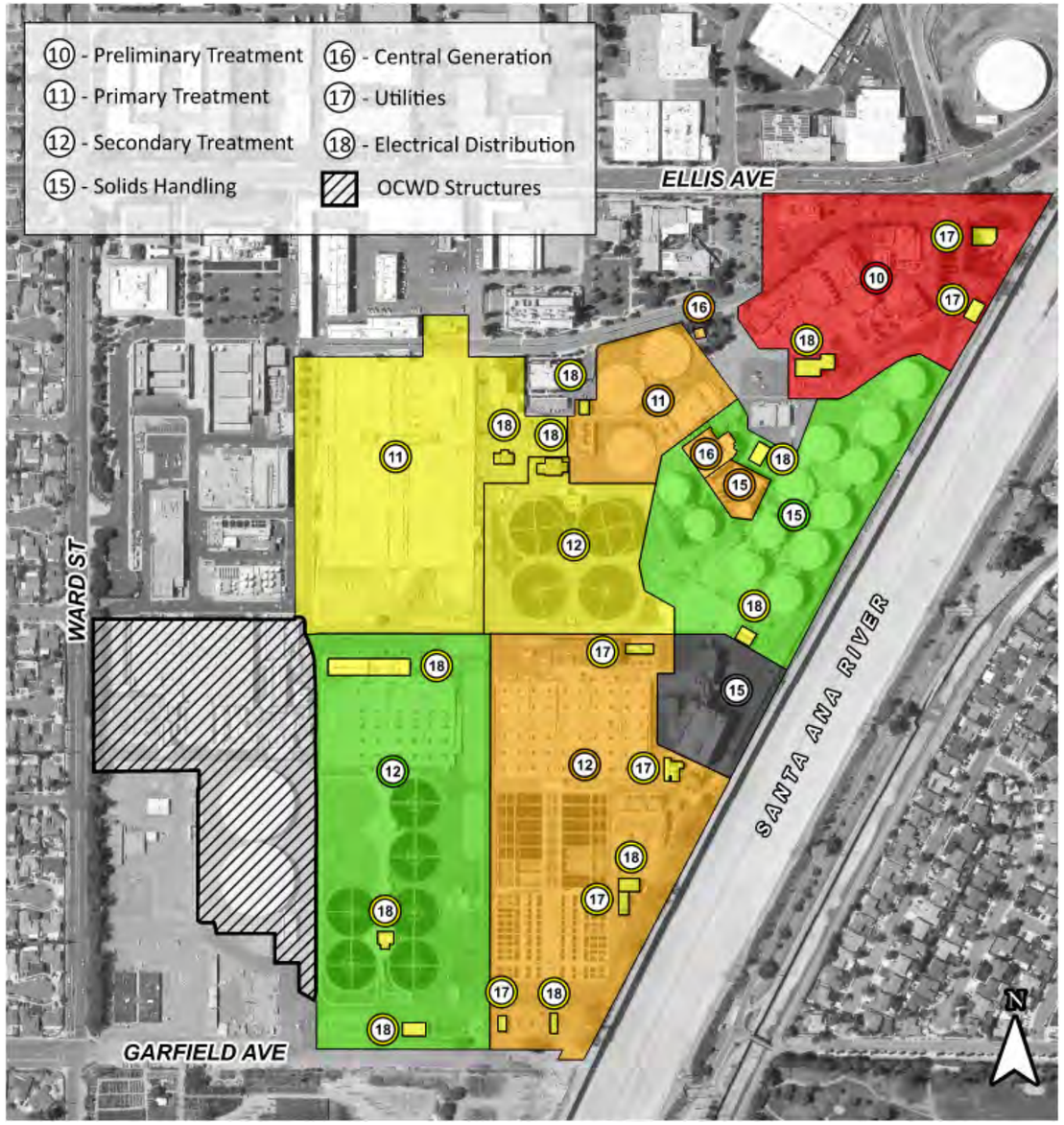


Table 2-1. Plant No. 1 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	2	3	5	5	5	5	67%	$386.9
11	Primary Treatment - Basins (1-5)	4	2	4	5	5	4	67%	$107.2
11	Primary Treatment - Basins (6-31)	4	2	3	3	3	3	20%	$390.3
12	Secondary Treatment - Activated Sludge 1	3	3	4	4	5	4	51%	$604.1
12	Secondary Treatment - Activated Sludge 2	1	1	2	3	2	2	13%	$373.4
12	Secondary Treatment - Trickling Filter	1	1	3	4	3	3	7%	$67.8
14	Interplant	2	2	2	2		2	17%	$752.6
15	Solids Handling - Digesters	2	1	2	2	2	2	3%	$254.7
15	Solids Handling - T&D Facilities	1	1	1	2	1	1	0%	$190.2
15	Solids Handling - Gas Handing	3	4	4	4	5	4	67%	$37.3
16	Central Generation[a]		3	3	4	4	4	46%	$170.5
17	Utilities	3	3	3	2	2	3	0%	$194.2
18	Electrical Distribution[a]				3		3	42%	$81.6
19	Miscellaneous Structures & Grounds	*TBD*					*TBD*	*TBD*	$249.0
	Plant No. 1 Total							**32%**	**$3,859.9**

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

OCWD = Orange County Water District; RUL = Remaining Useful Life; TBD = To Be Determined;

T&D = Thickening and Dewatering

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 2 OVERVIEW

Figure 2-2. Plant No. 2 Process Area – Remaining Useful Life Score Map

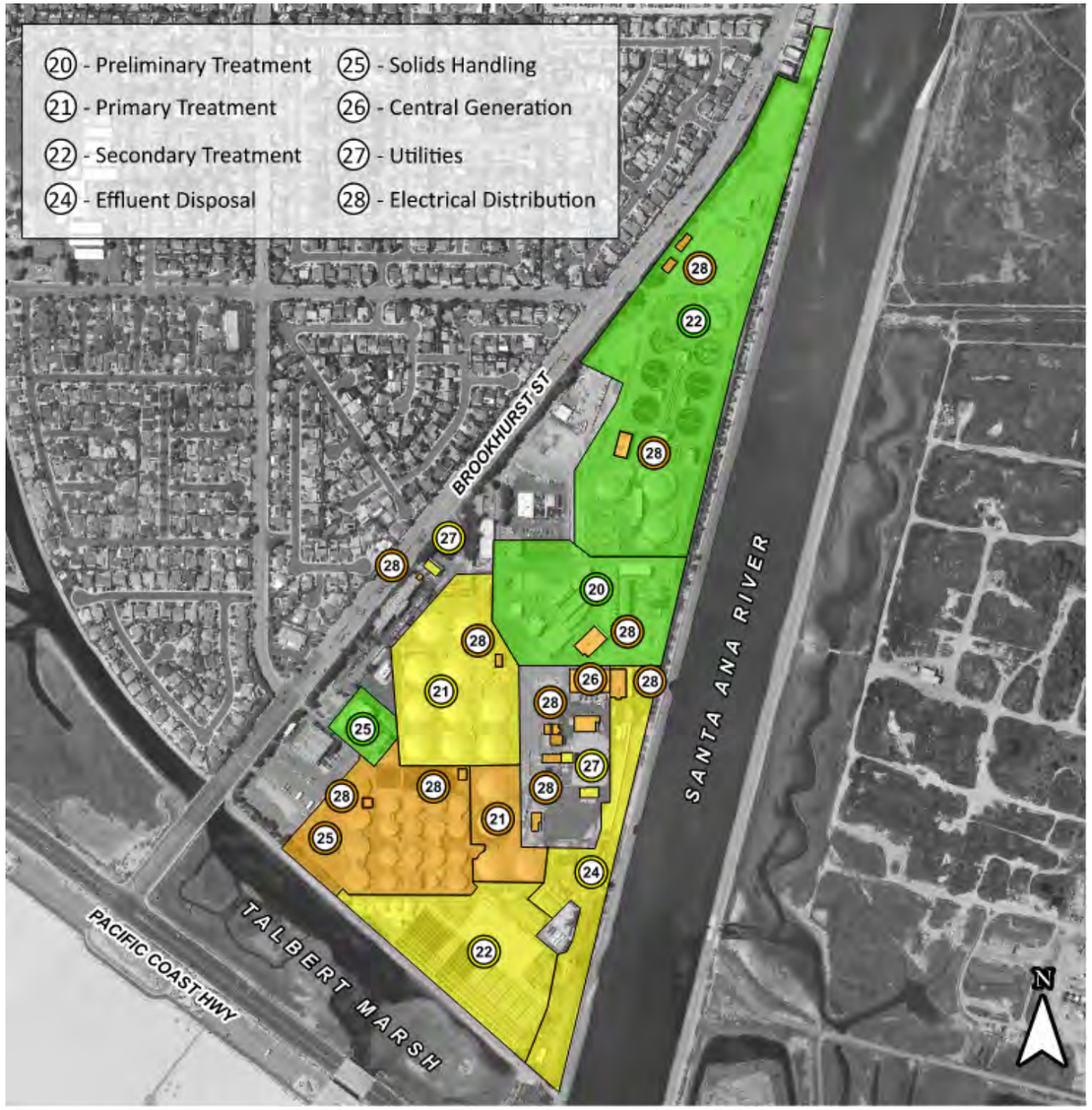


Table 2-2. Plant No. 2 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	2	2	2	2	2%	$357.6
21	Primary Treatment - A-Side	5	4	4	3	3	4	57%	$166.8
21	Primary Treatment – B- & C-Side	3	3	3	3	3	3	4%	$333.6
22	Secondary Treatment - Activated Sludge	3	3	3	4	3	3	20%	$612.6
22	Secondary Treatment - DAFT	4	1	3	3	3	3	9%	$57.7
22	Secondary Treatment - Trickling Filter	2	1	2	3	3	2	5%	$342.4
24	Effluent Disposal	2	2	3	3	4	3	21%	$900.2
25	Solids Handling - Digesters	3	4	4	4	4	4	72%	$355.5
25	Solids Handling - Facilities	2	1	2	2	2	2	5%	$184.6
25	Solids Handling - Gas Handling	3	3	4	4	4	4	33%	$37.3
26	Central Generation[a]		3	4	4	4	4	70%	$363.8
27	Utilities	3	3	3	3	2	3	0%	$108.3
28	Electrical Distribution[a]				4		4	65%	$80.1
29	Miscellaneous Buildings & Grounds	*TBD*					*TBD*	*TBD*	$146.2
	Plant No. 2 Total							**38%**	**$4,046.9**

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

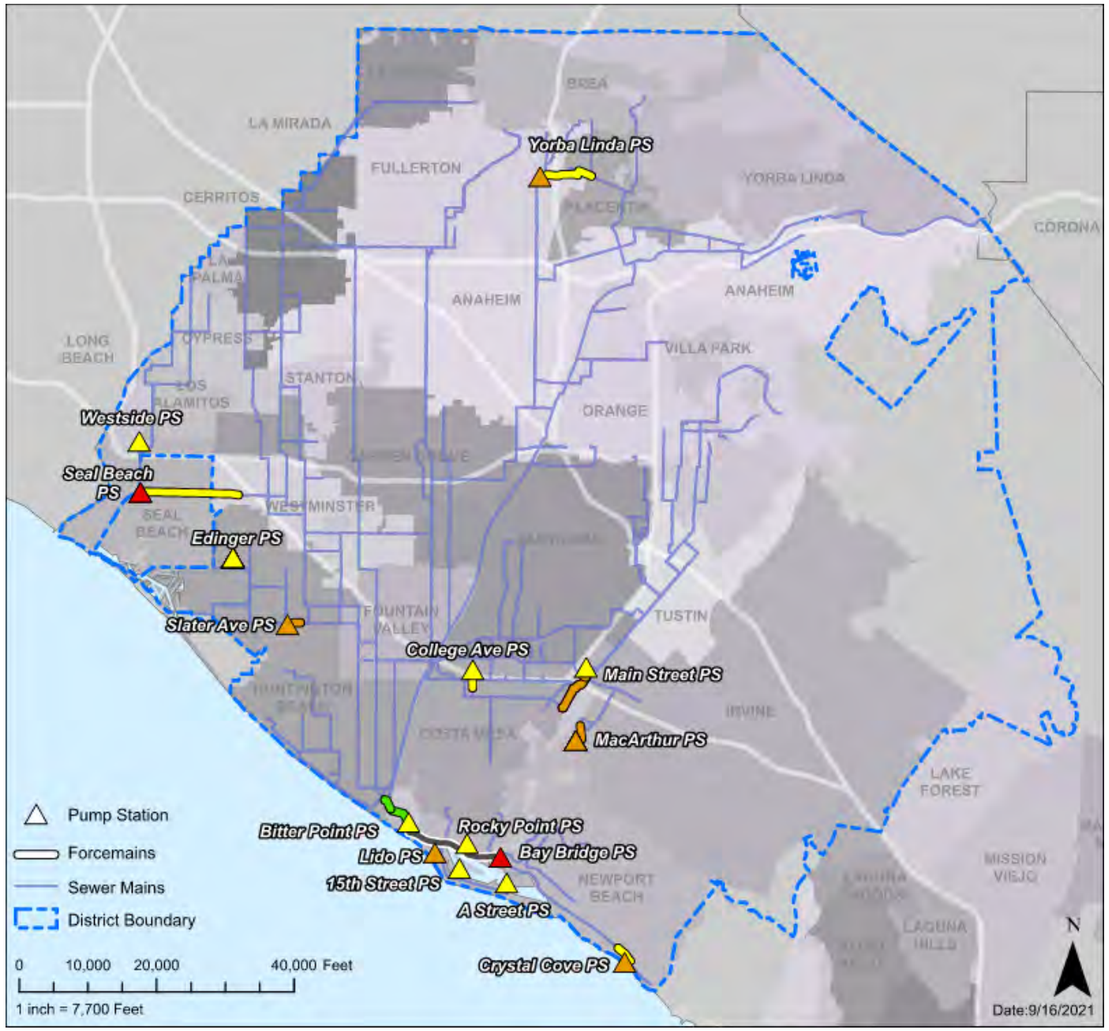
Acronym Key:

DAFT = Dissolved Air Flotation Thickener; RUL = Remaining Useful Life; TBD = To Be Determined

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW

Figure 2-3. Collection System Pump Station – Remaining Useful Life Score Map



Note: Not all pump station force mains are shown on this map. Only longer force mains are shown.

Table 2-3. Pump Station and Force Main Remaining Useful Life and Replacement Value Summary

Service Area	Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ Millions, in 2021 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
5	15th Street	3	4	3	3	2	3	25%	$14.8
5	A Street	3	4	4	3	2	3	25%	$12.9
5	Bay Bridge	4	4	5	4	5	5	85%	$37.5
5	Bitter Point	2	3	4	2	2	3	23%	$35.5
6	College	3	3	3	2	2	3	8%	$26.4
5	Crystal Cove	3	3	4	4	3	4	33%	$2.8
11	Edinger	4	3	3	3	3	3	27%	$14.2
5	Lido	1	4	4	4	4	4	50%	$22.2
7	MacArthur	4	4	4	4	2	4	64%	$18.0
7	Main Street	4	3	4	3	3	3	46%	$48.4
5	Rocky Point	1	4	4	2	2	3	23%	$17.6
11	Slater	4	4	4	3	3	4	31%	$38.8
3	Seal Beach	3	4	5	5	4	5	83%	$45.8
3	Westside	3	3	3	2	3	3	8%	$33.7
2	Yorba Linda	3	4	4	3	3	4	36%	Not Valued
5	Newport Force Mains [a]	1	-	-	-	-	1	0%	-
	Collection PS Total							**38%**	**$368.6**

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

PS = Pump Station; RUL = Remaining Useful Life

[a] White box with dash lines indicates there are no assets assigned to this discipline within this process area.

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ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PIPELINES OVERVIEW

Figure 2-4. Collection System Pipelines – Remaining Useful Life Score Map

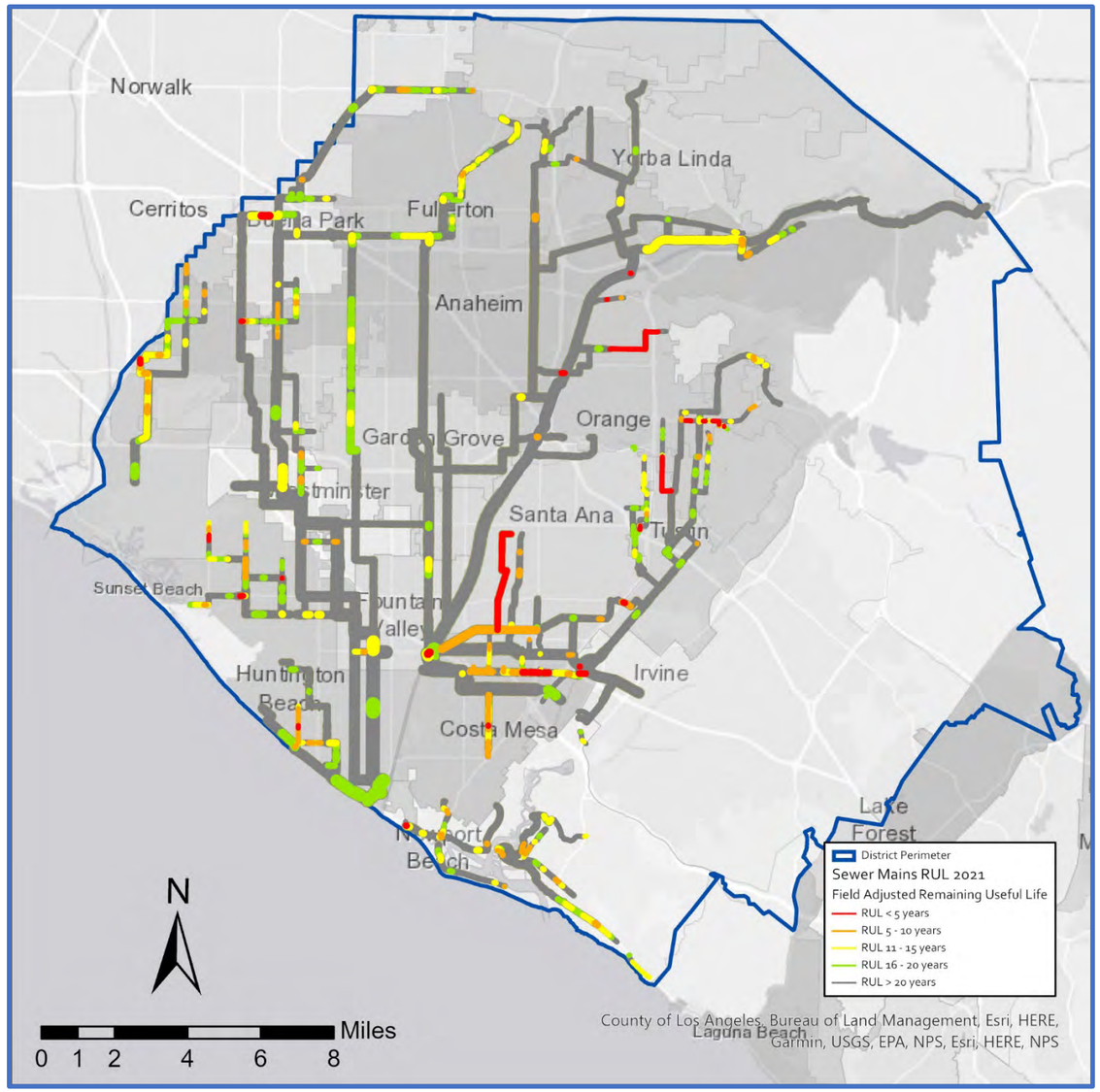

Table 2-4. Collection System Remaining Useful Life and Replacement Value Summary

Trunklines	No. of Pipes with RUL Scores of 4 or 5	Miles of Pipes with RUL Scores of 4 or 5	Percentage of RUL Scores with 4s or 5s (By Length)	Replacement Value ($ Millions, in 2021 Dollars) [a]
Baker-Main	74	5.62	14%	$303.6
Bushard	0	0.00	0%	$266.2
Coast	17	1.11	10%	$108.6
Euclid	1	0.10	0%	$297.4
Interplant	0	0.00	0%	$127.1
Knott	37	3.23	5%	$688.6
Miller-Holder	7	0.71	2%	$326.3
Newhope	4	0.25	1%	$230.3
Newport	17	0.82	4%	$238.3
SARI	40	2.11	4%	$568.6
Sunflower	12	0.72	2%	$330.4
Talbert	74	5.86	70%	$63.5
Total	**283**	**20.53**	**6%**	**$3,548.9**

RUL Legend:

RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

[a] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.

2.2 Area Asset Management Summaries

The following AM Summaries document the current state of process areas in both plants and the collection system. The remainder of this section contains the AM Summaries organized as follows:

Plant No. 1 Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – Activated Sludge
- Secondary Treatment – Trickling Filters
- Interplant
- Solids Handling – Digesters
- Solids Handling – Facilities
- Central (Power) Generation
- Utilities
- Electrical Distribution

Plant No. 2 Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – Activated Sludge
- Secondary Treatment – Trickling Filters/Solids Contact
- Effluent Disposal
- Solids Handling – Digesters
- Solids Handling – Facilities
- Central (Power) Generation
- Utilities
- Electrical Distribution

Collection System Asset Management Summaries

- Pump Stations
- Pipelines

The AM Summaries are built around a common structure. This structure provides a framework for continued use and development of the summaries. Key structure elements for AM Summaries are shown on Figure 2-5 below.

Figure 2-5. Area Asset Management Summary Structure

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Plant No. 1 Asset Management Summaries

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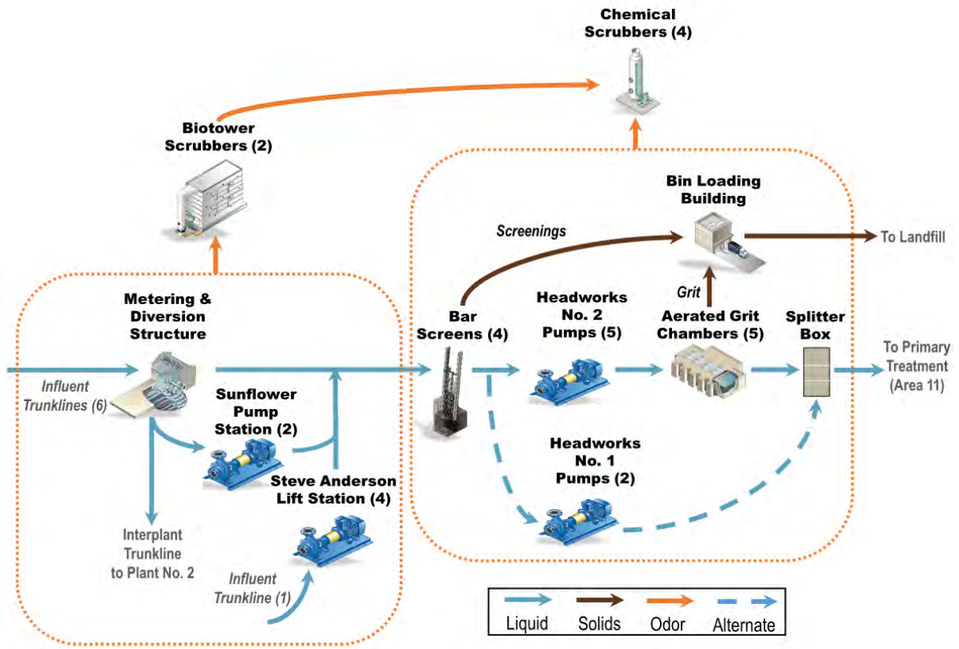
ASSET MANAGEMENT SYSTEM SUMMARY – AREA 10 – PLANT NO. 1 PRELIMINARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Metering & Diversion	Sunflower Pump Station	Steve Andersen Lift Station	Barscreens	Main Sewage Pumps	Grit Chamber	Splitter Box	Bin Loading	Odor Control
Civil									
Effluent Piping	-	-	-	-	-	-	2	-	-
Structural									
General	2	3	1	2	2	2	3	3	3
Mechanical									
Piping	5	-	1	-	2	-	-	-	-
Gates/Valves	5	5	2	5	5	5	5	-	5
Gearboxes	-	5	-	1	-	-	-	4	-
Screens	-	-	-	4	-	-	-	-	-
Pumps	-	4	2	-	4	-	-	-	5
Conveyors	-	-	-	4	-	-	-	4	-
Fans/Blowers	4	4	2	5	5	5	-	5	5
Electrical									
Operators	5	-	-	-	-	-	5	-	-
Motors	-	4	1	2	5	-	-	5	-
Variable Frequency Drives	-	-	3	-	4	-	-	-	4
Motor Control Centers	5	5	2	5	5	5	-	5	5
Instrumentation									
General	4	5	3	4	4	-	5	-	5

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Major Assets

Major Assets	Quantities
Metering & Diversion	
Flowmeters	7
Gates	26
Sunflower Pump Station	
Screw Pumps	2
Motors	2
Gearboxes	2
Lube Oil Systems	2
Gates	5

Major Assets	Quantities
Steve Anderson Lift Station	
Pump/Motor/VFD	4
Flowmeter	1
Barscreens	
5/8" Barscreens	2
1" Barscreens	2
Gates	22

Major Assets	Quantities
Main Sewage Pumps	
Pump/Motor/VFD	5
Headworks #1 Pumps	2
Gates	15
Splitter Box	
Gates	5
Weir Gates	15
Flowmeters	3

Major Assets	Quantities
Grit Chambers	
Grit Chambers	5
Gates	19
Stop Plates	10
Flap Gates	5
Blowers	3
Bin Loading	
Paddle Conveyors	2
Belt Conveyor	1

Major Assets	Quantities
Odor Control	
Bioscrubbers	2
Chemical Scrubbers	4

Acronym Key:

RUL = Remaining Useful Life;

VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 10 – PLANT NO. 1 PRELIMINARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **P1-105 Construction –** This project will rehabilitate most assets throughout the preliminary treatment area; however, the construction completion date is February 2028. Some assets have very little remaining life or have failed already and will need interim solutions before they are addressed by the project, such as exhaust fans and ducts in Rag/Grit Room.	• Continue to actively monitor the condition of aging assets scheduled for repairs/replacement under P1-105 and develop temporary/minimal solutions as applicable until a permanent solution is provided by P1-105.
• **Fugitive Odors –** Presence of fugitive odors at the headworks area was noted. Upon further investigation four major sources of contribution were identified which included splitter boxes, bin loading structure, headworks scrubbers and metering and diversion building.	• Corrective actions were taken at all the identified locations to eliminate or minimize presence of fugitive odors until P1-105 replaces the foul air system in this area.
• **Headworks Vulnerability Assessment** – Evaluate bar screens and other equipment to identify vulnerabilities and weak points within the Headworks process based on a high debris/ragging event.	• Review design criteria and operating philosophies for P1-105 and identify assets that lack redundancy and may fail during a high debris/ragging event. Provide recommendations to improve headworks process resiliency.
• **Headworks 1 Capacity –** Existing pumps at Headworks 1 were deemed unreliable to provide sufficient pumping capacity during wet weather. P1-105 bypass will be installed in 21-22 wet weather season.	• A temporary pumping system will be installed by P1-105 during wet weather season of 21-22 to provide sufficient pumping capacity.

Current and Future Projects

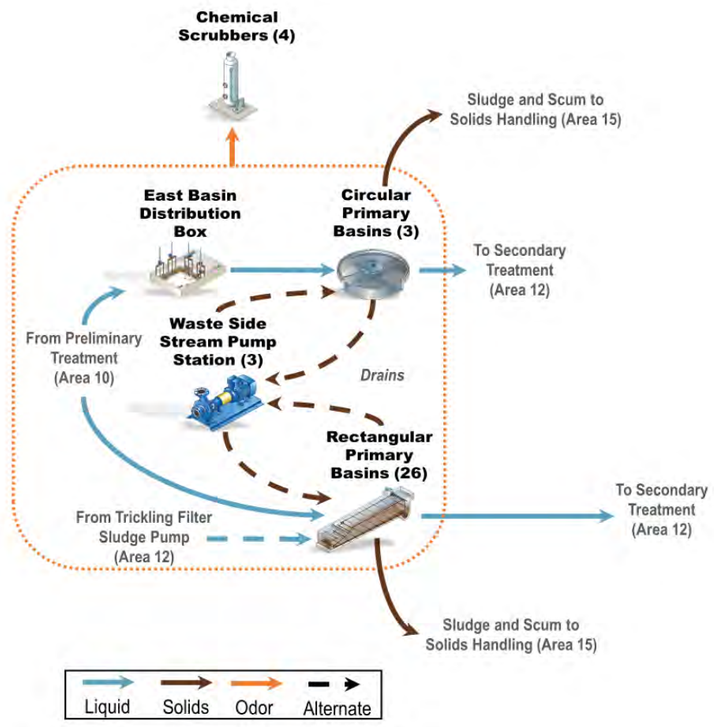
Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
P1-105	Headworks Rehabilitation at Plant No. 1	Headworks	• Rehabilitate structures of impacted facilities. • Replace mechanical/electrical/instrumentation as needed throughout impacted facilities. • Improve grit handling.															
FE19-04	Sunflower Pump Replacement at Plant No. 1	Sunflower Pump Station	• Rehabilitate Sunflower Pump Station.															
FE20-01	Wastehauler Station Safety and Security Improvements	Wastehauler Station	• Install automatic samplers, RFID entrance system, and temporary office trailer.															
FE18-11	Headworks Explosive Gas Monitoring Systems at Plant No. 1 and No. 2	Metering & Diversion, Odor Control	• Install Lower Explosive Limit monitoring system to detect explosive gas.															
X-102	Wastehauler Facility Improvements	Wastehauler Station	• Demolish abandoned wastehauler pump station and provide permanent building for staff.															
X-044	Steve Anderson Lift Station Rehabilitation	Steve Anderson Lift Station	• Rehabilitate or replace mechanical, electrical, and instrumentation.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvements Program; FY = Fiscal Year; RFID = Radio-Frequency Identification

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 11 – PLANT NO. 1 PRIMARY TREATMENT

Process Schematic



Note: Primary Basins No. 1 and 2 are not shown. The facilities are available for emergency capacity during high flows and are scheduled to be demolished within the next ten years.

Major Assets Remaining Useful Life

Asset Type	EBDB	PEDB -1	PEJB	PSB 1-2	PSB 3-5	PSB 6-15	PSB 16-31	WSSPS	PISB	Centerfeed Channels	Phys Chem	Odor Control
Civil												
Effluent Piping	4	5	4	5	4	5	5	3	-	-	-	-
Structural												
Structures	1	3	1	3	3	2	2	3	4	2	3	2
Cover	-	-	-	2	3	2	2	-	2	2	-	-
Mechanical												
Piping	-	-	-	-	-	-	-	3	-	-	3	-
Gates/Valves	2	4	3	5	5	3	3	3	3	3	3	2
Sludge/Scum Collection System	-	-	-	5	5	3	3	-	-	-	-	-
Sludge Pumping System	-	-	-	5	4	3	4	-	-	-	-	-
Scum Pumping System	-	-	-	5	4	4	4	-	-	-	-	-
Electrical												
General	-	-	-	5	4	2	2	5	2	-	3	3
Instrumentation												
General	-	-	-	5	4	3	3	3	3	-	3	5

RUL Legend:
RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Major Assets

Major Assets	Quantities
Rectangular Primary Basins	
Basins	26
Thickened Sludge Pumps	9
Dilute Sludge Pumps	4
Dilute Sludge Sumps	2
Scum Pumps	12
Scum Pits	6

Major Assets	Quantities
Circular Primary Basins	
Basins	3
Sludge Pumps	4
Scum Pumps	3
Chemicals	
Polymer Tanks	4
$FeCl_3$ Tanks	1

Major Assets	Quantities
Waste Sidestream Pump Station 1	
Pumps	3
Primary Odor Scrubber Complex	
Chemical Scrubbers	4
HCl Tanks	1
HCl Pumps	2
NaOH Tanks	1

Major Assets	Quantities
NaOH Pumps	5
Bleach Tanks	1
Bleach Pumps	8

Acronym Key:
EBDB = East Basin Distribution Box;
$FeCl_3$ = Ferric chloride; HCl = Hydrochloric acid; NaOH = Sodium hydroxide;
PEDB-1 = Primary Effluent Distribution Box 1; PEJB = Primary Effluent Junction Box;
PSB = Primary Sedimentation Basin;
PISB = Primary Influent Splitter Box;
RUL = Remaining Useful Life;
WSSPS = Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 11 – PLANT NO. 1 PRIMARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Rectangular Primary Basin –** The rectangular primary basins experience relatively frequent issues with mechanical parts and sludge pumping system that require maintenance. These issues require ongoing attention from maintenance and can affect Plant No. 1 treatment capacity.	• Several projects are planned to address rectangular primary basin issues and reliability including P1-133 and X-017. However, these projects cannot make the rectangular basins maintenance free. OC San should expect to dedicate a significant amount of maintenance and operations labor hours to these basins, especially during times when capacity is reduced by projects.
• **Construction Sequencing –** There are many upcoming projects that will perform work on the Plant No. 1 primary treatment system. These projects are largely interdependent on one another and will temporarily impact the primary capacity at Plant No. 1.	• Continue to holistically assess the capacity/treatment consequences of the upcoming projects, especially if schedules change during design and construction.
• **Circular Primary Basin –** Influent pipes to circular basins 3 and 4 were identified with cracks and leaking joints. To maintain desired peak flow capacity of 320 MGD, the circular basins are required to be in service.	• Develop repair options and implement an interim solution until P1-126 replaces the circular sedimentation basins.
• **Scum Management –** The scum collection system in rectangular primary basins have been experiencing operational issues such as trapped scum in various locations, overflow and failure of scum tipping troughs, and clogs in the scum pits and scum pumps.	• Two studies are planned to evaluate options to improve scum collection in rectangular primary basins, RE19-01 and PRN-00563. RE19-01 is focused on the use of new equipment in the scum pits such submersible chopper pump to address clogging issues. PRN-00563 will perform a comprehensive evaluation of the scum collection system and provides recommendations.
• **Primary Effluent Piping Manhole –** The Primary effluent piping from rectangular basins is equipped with two pressure manholes for access to the piping. The pressure manhole located on the eastside piping has experienced sever corrosion and must be replaced.	• Eastside pressure manhole cover and pressure plate must be replaced to prevent manhole cover failure. The westside pressure manhole requires additional cover to avoid collection of surface runoff water on top of pressure plate and to prevent further corrosion.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
PRN-00563	P1-33/37 Scum Study	Primary Basins 6-31	• Perform a study to determine the best solution to the various scums system issues, such as issues for the scum pumping system.															
RE19-01	Primary Scum Equipment Evaluation at Plant No. 1	Primary Basins 6-31	• Perform a test by utilizing a submersible conditioning pump in the scum pit and evaluate the improvements on scum pumping.															
PRN-00567	Plant No. 1 Primary Basin Rebar Protection Blanket Contract	Primary Basins 6-15	• Repair and protect exposed rebar.															
P1-133	Primary Sedimentation Basins No. 6-31 Reliability Improvements at Plant No. 1	Primary Basins 6-31	• Upgrade the sludge pumping system. Structural repair of launders in PISB. Repair of foul air system. • Provide adequate lighting and ventilation alarm improvements to meet current codes.															
P1-126	Primary Clarifiers Replacements and Improvements at Plant No. 1	Primary Basins 3, 4, and 5	• Replace Primary Basins 3, 4, and 5 and primary scrubber system. Rehabilitate associated conveyance pipes and structures. Demolish Primary Basins 1-2.															
X-017	Plant No. 1 Primary Clarifiers 6-31 Rehabilitation	Primary Basins 6-31	• Major rehabilitation of Primary Basins 6-31.															
X-006	Waste Sidestream Pump Station Upgrade	Waste Sidestream Pump Station	• Pump station rehabilitation and capacity increase.															

Types of Project Legend:

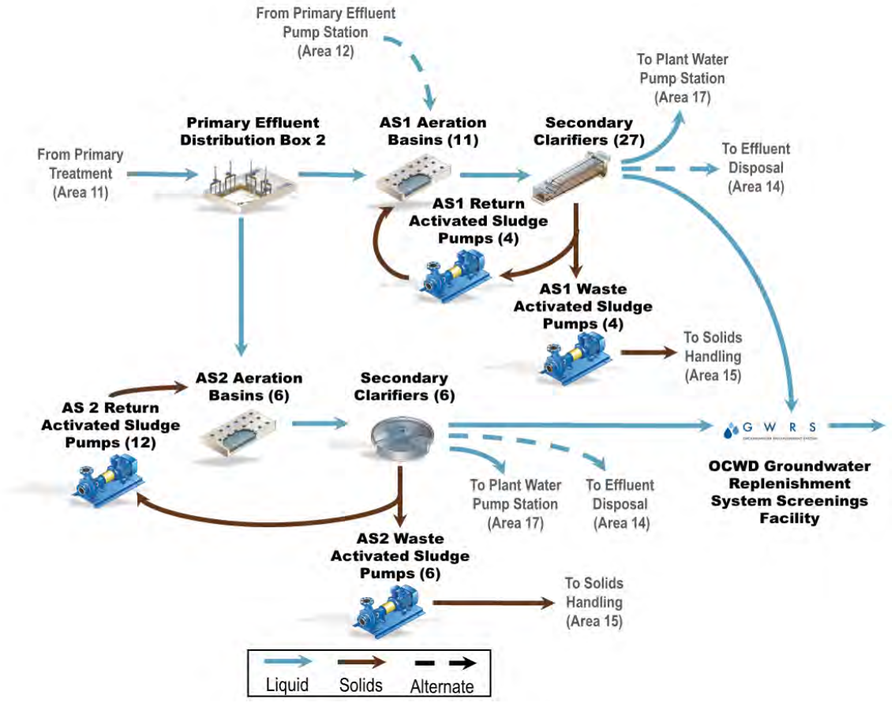
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvements Program; FY = Fiscal Year; GWRS = Groundwater Replenishment System; MGD = Million Gallons per Day; OC San = Orange County Sanitation District; OCWD = Orange County Water District; PISB = Primary Influent Splitter Box

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – ACTIVATED SLUDGE

Process Schematic



Key Issues

Key Issues	Actions and Recommendations
• **Activated Sludge Plant No. 1 – AS1 is an aging facility**	• Condition assessments show corrosion on the wall between reactors and steel rebar support chairs missing. Baffle wall supports and vertical airpipes were damaged on some of the basins. • RAS piping has severe corrosion and will be replaced by FE20-03. • Instrumentation is monitoring and replacing the equipment as needed.
• **Activated Sludge Basins Diffusers**	• Diffusers for activated sludge plants will be replaced in-house by Maintenance.
• **AS1 Blower Controls**	• Blower control system is obsolete and requires an upgrade to operate efficiently.
• **Primary Effluent Pump Station**	• One VFD's has failed and is being replaced. • PEPS will be demolished by a future project (P1-126).
• **AS1 Waste-activated Sludge Pumps**	• Pumps have reached their useful life and two pumps do not meet pumping capacity required.
• **Plant Water Pump Station**	• PWPS only receives water from AS1. Need additional source from AS2 for reliability.

Major Assets Remaining Useful Life

Asset Type	PEPS	Blower Building 1	AS1 Aeration Basins	AS1 Clarifiers	AS1 RAS PS	AS1 WAS	AS2 PEPS 2	AS2 Blowers	AS2 Aeration Basins	AS2 Clarifiers	AS2 RAS/WAS PS	WSSPS 2	PEPS 2	PEDB2	AS1 & AS2 Junction Boxes	DAFTs	DAFTs Polymer System
Civil																	
Effluent Piping	-	3	3	3	5	-	-	-	-	-	-	-	1	1	1	4	-
Structural																	
Buildings	2	2	-	-	2	-	-	1	-	-	-	-	-	-	-	4	-
Structures	3	-	2	3	-	-	1	-	1	1	-	1	1	1	1	4	-
Mechanical																	
Piping	3	2	3	3	5	3	2	2	2	2	2	2	-	-	-	4	4
Pumps	3	-	-	-	3	3	-	-	-	-	3	3	-	-	-	5	5
Diffusers	-	-	4	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Mixers	-	-	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Clarifier/DAFT Moving Mechanism	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	4	-
Blowers	-	3	-	-	-	-		2	-	-	-	-	-	-	-	-	-
Drain Gates & Inlet Gates	-	-	3	3	-	-	-	-	2	2	-	-	1	2	-	-	-
HVAC & Ventilation		3	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Chemical/polymer Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Electrical																	
Variable Frequency Drives	3	-	2	2	2	2	-	-	4	4	4	4	-	-	-	2	2
Motor Control Centers	4	-	4	4	4	4	-	-	2	2	2	2	-	-	-	3	3
Instrumentation-																	
PLC's, Flow Meters	5	5	5	5	5	5	-	2	2	2	2	2	-	-	-	5	5

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:
AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; DAFT = Dissolved Air Flotation Thickener;
HVAC = Heating, Ventilation, and Air Conditioning; OCWD = Orange County Water District;
PEDB1 = Primary Effluent Distribution Box 1; PEDB2 = Primary Effluent Distribution Box 2;
PEPS = Primary Effluent Pump Station; PEPS 2 = Primary Effluent Pump Station 2; PLC = Programmable Logic Controller;
PS = Pump Station; RAS = Return Activated Sludge; RUL = Remaining Useful Life; WAS = Waste-activated Sludge;
WSSPS2 = Waste Sidestream Pump Station 2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – ACTIVATED SLUDGE

Major Assets

Major Assets	Quantities
Primary Effluent Pump Station	
Building	1
Wetwell	1
Pumps	2
Discharge Valves	3
AS1 Aeration Basins	
Aeration Basins	10
Inlet Gates	10
AS1 Blower Building 1	
Blower Building	1
Blowers	5

Major Assets	Quantities
AS1 Secondary Clarifiers	
Secondary Clarifiers	26
Inlet Gates	78
Sludge Collectors	52
AS1 RAS PS/WAS PS	
RAS PS Building	1
RAS Pumps	5
WAS Pumps	4
Primary Effluent Pump Station 2	
Structure	1
Gate	1

Major Assets	Quantities
AS2 Aeration Basins	
Aeration Basins	6
Inlet Gates	6
AS2 Blower Building 2	
Blower Building	1
Blowers	4
AS2 Secondary Clarifiers	
Secondary Clarifiers	6
Sludge Collectors	6
AS2 RAS PS/WAS PS	
RAS Pumps	12
WAS Pumps	6
Surface Wasting Pumps	6
Scum Pumps	6

Major Assets	Quantities
Waste Side Stream Pump Station 2	
Pumps	2
Structure	1
Primary Effluent Distribution Box 1	
Structure	1
Gates	1
Primary Effluent Distribution Box 2	
Structure	1
Gates	11
AS1 and AS2 Junction Boxes	
Junction Box Structures	8

Major Assets	Quantities
Dissolved Air Flotation Thickeners	
Concrete Tanks	6
Mechanical Sweep	6
Recycle Pumps	12
Retention Tank	6
TWAS Pumps	12
DAFTs Polymer System	
Storage Tank	2
Mix Tank	2
Polymer Transfer Pumps	2
Feed Pumps	6

Current and Future Projects

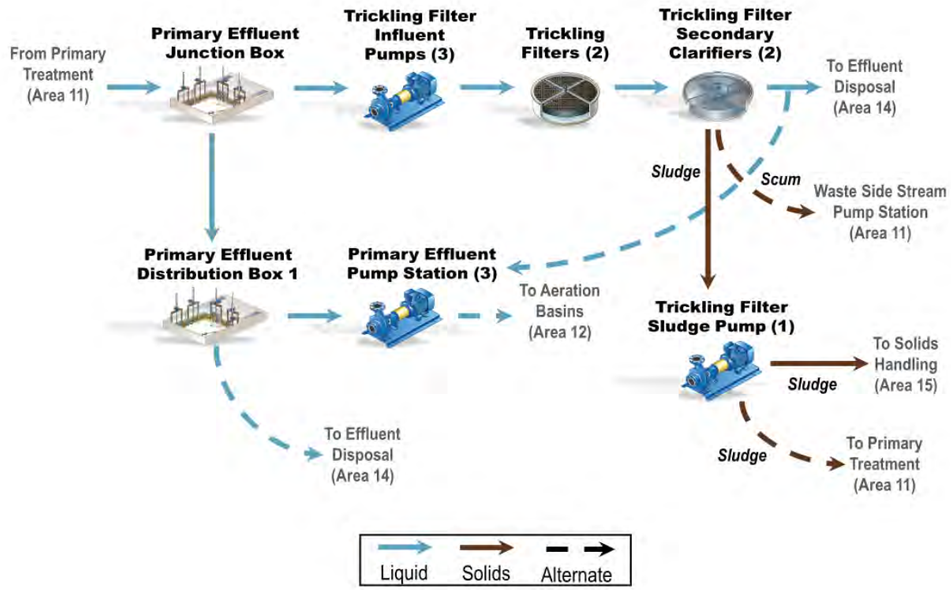
Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
PRN-00698	Plant No. 1 Activated Sludge WAS Pump Replacement	AS1 WAS Pumps	• Project P1-140 will replace 4 WAS pumps and VFDs.															
FE20-03	Return-Activated Sludge Discharge Piping Replacement at Activated Sludge Plant No. 1	AS1 RAS Pipe Discharge	• Replace the RAS discharge pipe located in Basins 3 and 8.															
X-043	DAFT Demolition at Plant No. 1	DAFTS	• Demolish DAFTs since the new thickening centrifuges are in service and DAFT is no longer needed.															
P1-140	Activated Sludge -1 and Secondary Clarifier Rehabilitation	AS1 Aeration Basin, clarifiers and blowers	• Major rehabilitation of all mechanical, electrical, and instrumentation assets including the blower system.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; CIP = Capital Improvement Program; FY = Fiscal Year;
DAFT = Dissolved Air Flotation Thickeners; PEPS = Primary Effluent Pump Station; PS = Pump Station;
RAS = Return-activated Sludge; WAS = Waste-activated Sludge; TWAS = Thickened Waste-activated Sludge

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – TRICKLING FILTERS

Process Schematic



Major Assets

Major Assets	Quantities
Trickling Filter Pump Station	
Structure	1
Trickling Filter Pumps	3
Trickling Filters	
Trickling Filter Basins	2
Rotary Distributor	2
Recirculation Fans	8
Secondary Clarifiers	
Circular Clarifiers	2
Sludge Collector	2
Sludge Pump	1
Junction Boxes	
Structure	6

Major Assets Remaining Useful Life

Asset Type	Trickling Filter Pump Station	Trickling Filters	Secondary Clarifiers	Junction Boxes
Civil				
Effluent Piping	1	1	1	1
Structural				
Buildings	-	1	1	-
Structures	1	1	1	1
Mechanical				
Piping	2	2	2	2
Pumps	3	-	3	-
Distributor Drive	-	3	-	-
Ventilation Fans	-	3	-	-
Trickling Filter Media	-	4	-	-
Clarifier Moving Mechanism	-	-	3	-
Valves, Gates	-	-	-	2
Electrical				
Motor Control Centers	3	3	3	-
Variable Frequency Drives	5	3	5	-
Instrumentation				
PLCs & Flow Meters	3	3	3	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

PLC = Programmable Logic Controller;

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – TRICKLING FILTERS

Key Issues

Key Issues	Actions and Recommendations
• **Trickling Filter Sludge Pumps** – Currently, only one sludge pump is in service.	• Project FE19-03 will replace the trickling filter's sludge pump with two sludge pumps and VFD's and remove the scum pumps.
• **Trickling Filter Influent Pumps** – VFDs are obsolete and need to be replaced. Replacement parts are not available.	• Clearinghouse approved the replacement of the VFDs (PRN-00492) and the addition of a second source of power from SWGR-TFB bus to VFD #1. Project FR1-0011 is in design for these improvements.
• **Electrical** – Low voltage cable failures.	• Several damaged cables were replaced by Maintenance in the past, and Clearinghouse approved a project to assess the remaining low voltage cables and replace the damaged cables (PRN-00409). FE19-03 will add new cables for the sludge pumps. Project FR1-0008 will replace the remaining cables.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE19-03	FE19-03 Trickling Filter Sludge and Scum Pumps Replacement at Plant No. 1	Sludge pumping	• Replace the sludge pump with two new pumps and remove three scum pumps.															
PRN-00414	Snail Control at Plant No. 1 Trickling Filters	Trickling Filters	• Project P1-126 will install permanent caustic dosing pumps and pipes to dose caustic to the Trickling Filters. Currently, Operations is using caustic totes.															
FR1-0011	Plant No. 1 Trickling Filter Pumps VFD replacement (three pumps)	Trickling Filters Pump Station	• Replace the obsolete VFDs on the Trickling Filter influent pumps.															
FR1-0008	Low Voltage Cable Replacement	Low voltage cables from Power Building 8 to the Trickling Filters	• Assess and replace the failed cables.															
X-015	Trickling Filters Facilities Rehabilitation at Plant No. 1	Major rehabilitation project	• Replace the Trickling Filter Feed Pumps, distribution arms and media, and secondary clarifier mechanisms.															

Types of Project Legend:

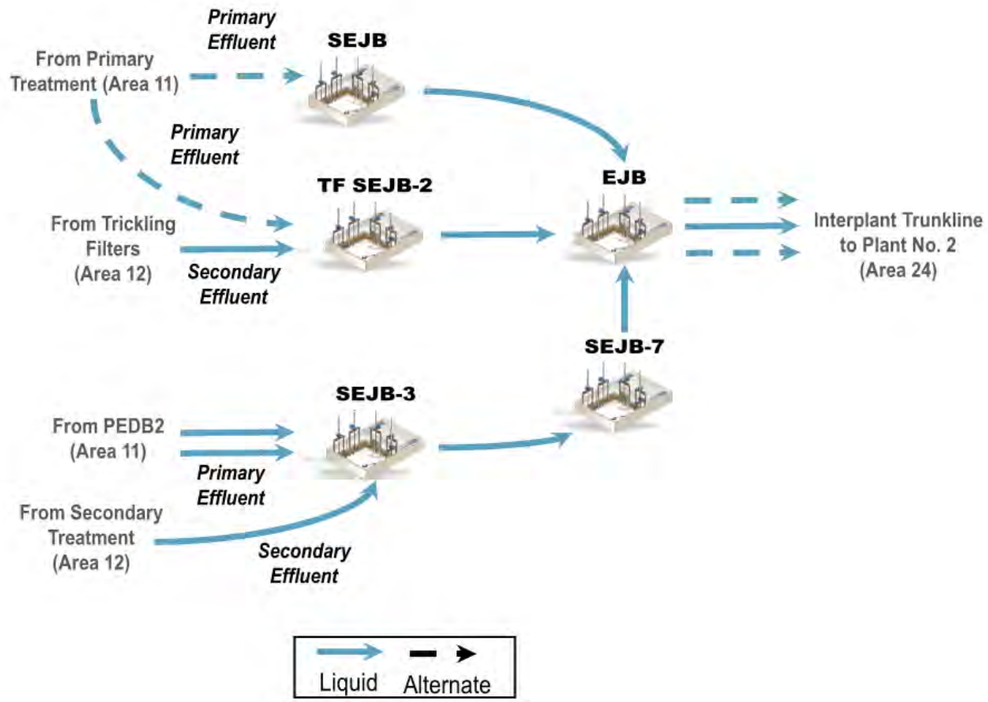
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvements Program; FY = Fiscal Year; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 - PLANT NO. 1 INTERPLANT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Plant No. 1 Facility										Santa Ana Corridor				Brookhurst Corridor	Ellis/Bushard Corridor
	EJB	TFSEJB-2	SEJB	SEJB3	SEJB7	PEJB1	SEJB2	66" PE/SE	84" PE/SE	108" PE/SE	66" PE/SE	84" PE/SE	120" PE/SE	16" Gas		
Civil																
Pipeline	-	-	-	-	-	-	-	4	3	3	4	2	1	-	1	-
Gas	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Structural																
Structure	1	1	3	2	1	4	1	-	-	-	-	-	-	-	-	-
Mechanical																
Sluice Gates	2	-	-	3	1	5	-	-	-	-	-	-	-	-	-	-
Butterfly Valves	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																
Fiber Optic	-		-	-	-	-	-	-	-	-	-	-	1	-	-	2

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

EJB = Effluent Junction Box; PE = Primary Effluent; PEDB2 = Primary Effluent Distribution Box 2; PEJB1 = Primary Effluent Junction Box 1; RUL = Remaining Useful Life; SE = Secondary Effluent; SEJB = Secondary Effluent Junction Box; SEJB2 = Secondary Effluent Junction Box 2; SEJB3 = Secondary Effluent Junction Box 3; SEJB7 = Secondary Effluent Junction Box 7; TFSEJB-2 = Trickling Filter Secondary Effluent Junction Box 2

Major Assets

Major Assets	Quantities
Plant No. 1 Facility	
Junction Boxes	6
Gates	17
Butterfly Valves	7
Large Diameter Piping	4

Major Assets	Quantities
Santa Ana Corridor	
Large Diameter Piping	3
Fiber Optic Communication	1
Digester Gas Piping	1

Major Assets	Quantities
Brookhurst Corridor	
Large Diameter Piping	1
Ellis/Bushard Corridor	
Fiber Optic Communication	1

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 – PLANT NO. 1 INTERPLANT

Key Issues

Key Issues	Actions and Recommendations
• **PEJB-1** – The sluice gates in PEJB-1 are in very poor condition and no longer properly seal. PEJB-1 structure is also in poor condition.	• Future small project (or future CIP project this work is added to) will rehabilitate the PEJB-1 structure and replace existing sluice gates with new ones.
• **66-inch IPP** – 66-inch pipelines between PEJB-1 and EJB are in poor condition. Conditions have not changed significantly in 12 years.	• Perform reassessment in 5 years. A future project will rehabilitate the 66-inch pipelines between PEJB-1 and EJB.
• **Soil Erosion** – Soil loss has been occurring in the unprotected slopes along the interplant utility corridor paralleling the Santa Ana River for many years. Soil erosion is directly affecting blowoff Vaults 5 and 7 on the Interplant Digester Gas Line.	• Project MP-657 installed temporary erosion control and project FE18-12 will provide a permanent solution north of Hamilton Avenue. Project FRJ-0003 will abandon Vaults 5 and 7 on the Interplant Digester Gas Line.
• **Interplant Digester Gas Line Deficiencies** – Surface corrosion of various severity in all blowoff vaults, water intrusion in Vaults 1-4, Vault 4 outside existing utility easement, measurable gas leaks in Vaults 4, 7, 8, and 10, access difficulties to Vaults 8 and 9, structural damage to Vault 10, lack of dedicated blowdown valves, and areas of inadequate cover over pipeline.	• Project FRJ-0003 will abandon four blowoff vaults, fully replace five vaults, and repair one vault. The project also includes installing blowdown valve manifolds, site work to enclose Vault 3 in secured fencing and improve access to Vault 8, survey and obtain new easement for Vault 4 (if required), as well as install reinforced concrete encasement for shallow bury areas and additional cathodic protection as required.
• **Interplant Digester Gas Line Signage** – Inadequate markers and signage for interplant gas line in plant and public areas.	• PRN-00726 will add needed markers and signage in plant, bike trail, nursery, and other public areas.

Current and Future Projects

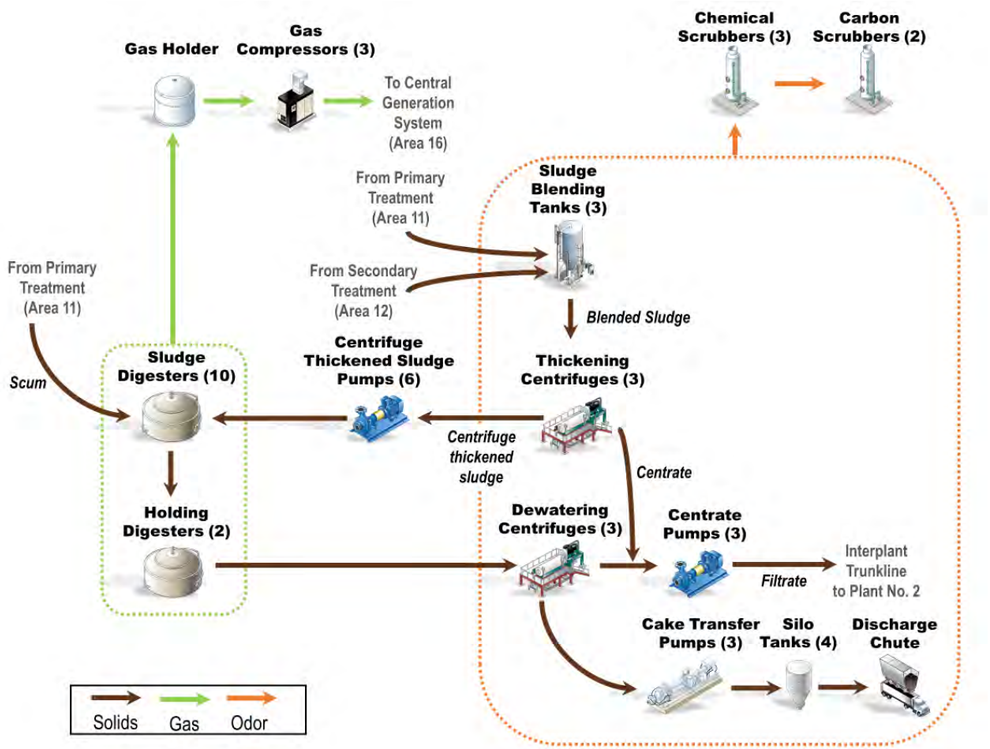
Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
J-117A	Interplant Effluent Pipeline Rehabilitation (Warranty)	84" IPP	• Perform warranty inspection of rehabilitated pipelines.															
J-36-2	GWRS Final Expansion Coordination (Slipline 66" IPP)	66" IPP	• Install new OCWD force main within existing 66-inch interplant pipe.															
PRN-00726	Interplant Gas Line Signage Repair & Improvements	Digester Gas Piping	• Repair existing public warning signs and install additional signs.															
FRJ-0003	Interplant Gas Line Blow Off Repairs	Digester Gas Piping	• Repair coatings to valves and piping, install vault drainage systems.															
AI-332 & 350	Interplant Gas Line Deficiencies	Digester Gas Piping	• Addition of blowdown valves, vault repair and/or abandonment, etc. to address facility risks and code deficiencies.															
FE18-12	Erosion Control at Santa Ana River and Hamilton	Interplant Piping	• Permanent erosion control of earthen slope above the interplant pipes.															
N/A	PEJB-1 Rehabilitation	PEJB-1	• Rehabilitate the PEJB-1 structure and replace existing sluice gates.															
X-XXX	Plant No. 1 66-Inch Interplant Pipelines Rehabilitation	66" PE/SE	• Rehabilitate the Plant No. 1 66-inch piping.															
X-118	Plant No. 1 84-Inch Interplant Pipelines Rehabilitation	84" PE/SE	• Rehabilitate the Plant No. 1 84-inch piping.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; EJB = Effluent Junction Box; FY = Fiscal Year; GWRS = Groundwater Replenishment System; IPP = Interplant Piping; OCWD = Orange County Water District, PE = Primary Effluent; PEJB-1 = Primary Effluent Junction Box 1; SE = Secondary Effluent

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – DIGESTERS

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Digester 5	Digester 6	Digester 7	Digester 8	Digester 9	Digester 10	Digester 11	Digester 12	Digester 13	Digester 14	Digester 15	Digester 16	Ferric System
Civil													
Effluent Piping	2	2	2	2	2	2	2	2	2	2	2	2	-
Structural													
Digester	1	1	1	1	1	1	1	1	1	1	1	1	-
Mechanical													
Piping	2	2	2	2	2	2	2	2	2	2	2	2	4
Chemical Pumps	-	-	-	-	-	-	-	-	-	-	-	-	4
Ferric Control System	-	-	-	-	-	-	-	-	-	-	-	-	4
Sludge Mixing Pumps	3	3	2	2	2	2	2	2	2	2	2	2	-
Sludge Recirculation & Heating System	-	-	2	2	2	2	2	2	2	2	2	2	-
Hot Water System	-	-	2	2	2	2	2	2	2	2	2	2	-
Sludge Transfer Pumps	2		2		2		2		2		2		-
Electrical													
Motor Control Centers	2	2	2	2	2	2	2	2	2	2	2	2	-
Instrumentation													
PLCs & Flow Meters	2	2	2	2	2	2	2	2	2	2	2	2	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:
PLC = Programmable Logic Controller;
RUL = Remaining Useful Life

Major Assets

Major Assets	Quantities
Anaerobic Digesters	
Digesters (7-16)	10
Holding Digesters (5 & 6)	2
Sludge Mixing Pumps	22
Grinders	10+3
Sludge Recirculation Pumps	10

Major Assets	Quantities
Anaerobic Digesters (Continued)	
Hot Water Circulation Pumps	10
Heat Exchangers	10
Bottom Sludge Pumps	5
Digesters Transfer Pumps	3
Ferric System	
Storage Tanks	2
Feed Pumps	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – DIGESTERS

Key Issues

Key Issues	Actions and Recommendations
• **High Rate Mixing Pump Mechanical Seal Failures** – The high rate mixing pumps are experiencing higher than expected failures of the mechanical seals.	• There are several efforts by Maintenance and Engineering to reduce the failure rate including precision alignment of the pumps, studying sludge piping supports (PS19-01), and monitoring the vibrations. PS19-01 recommends adding expansion joints to the discharge of the pumps and pipe supports. PRN-00722 – P1 Digester Pump and Piping Vibration Mitigation was approved to install expansion joints and pipe supports on the pump systems that are vibrating. In progress.
• **Structures** – Seismic risk.	• The PS15-06 Seismic Evaluation of Structures at Plant No. 1 and Plant No. 2 has identified lateral spread as the main seismic risk for the digesters and structures close to the Santa Ana River.

Current and Future Projects

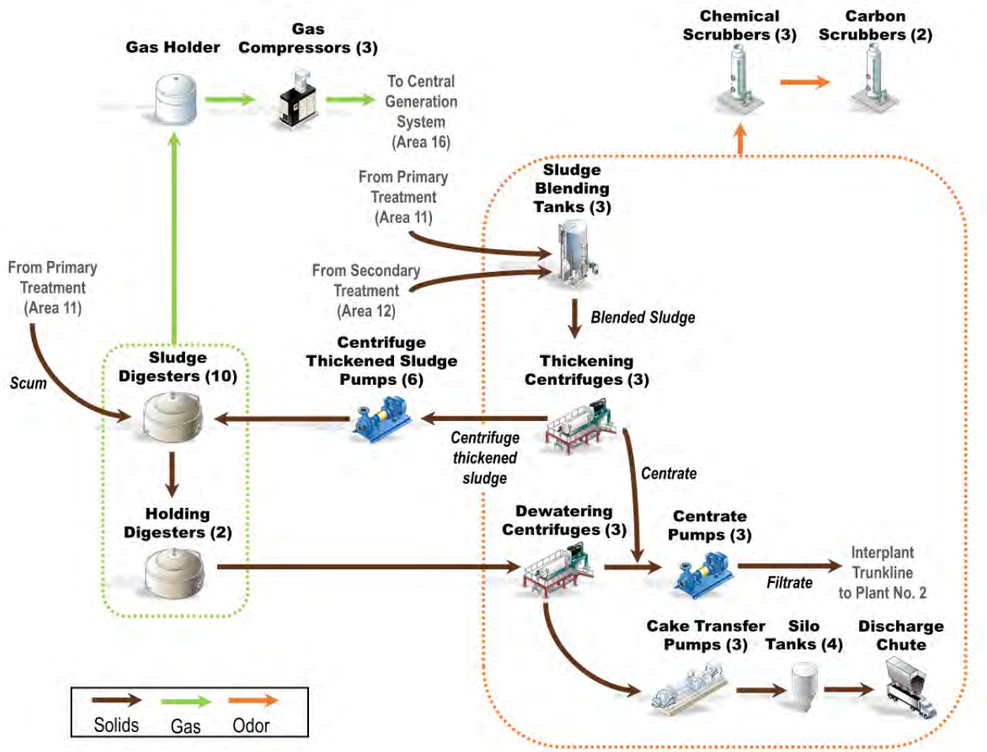
Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
P1-135	Digester Ferric Chloride Piping Replacement at Plant No. 1	Digesters, ferric dosing system	• This project will replace the digester ferric chloride piping, valves, and appurtenances to its point of connection with the digesters.															
PRN-00722	Plant No. 1 Digester Mixing Pump and Piping Vibration Mitigation	Only digesters that experience vibration	• Add expansion joints and pipe supports where needed.															
PRN- 00496	Plant No. 1 Digesters 8 and 11 Area Lighting Installation	Digesters 8 and 11	• Add additional lighting.															
MP- 610	CP-DIG LEL Area Safety Monitoring Obsolescence	The LEL monitoring system in Digester 11 to 16 pump room and tunnels	• Upgrade the LEL monitors.															
RE20-04	Holding Digester 6 Solids Shredder Trial	Holding Digester Mixing Pumps	• Research project RE20-06 will install a shredder to reduce plugging.															
N/A	Digester Cleaning	Ongoing maintenance activity	• Clean the digesters and performing preventive condition assessment every 5 to 7 years.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; CP = Control Panel; DIG = Digester; FY = Fiscal Year; LEL= Lower Explosive Limit; N/A = Not Applicable

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – FACILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Boiler System	Sludge Blending Facility	Thickening System	Dewatering System	Dewatering Odor Control	Truck Loading	Gas Handling	Gas Holder
Civil								
Effluent Piping	-	1	1	1	-	1	-	-
Structural								
Structures	-	1	-	-	-	1	-	3
Buildings	-	-	1	1	-	1	4	-
Mechanical								
Piping	1	-	1	1	1	1	3	3
Pumps-grinders	-	1	1	1	1	1	-	-
Boilers & Heat Exchangers	2	-	-	-	-	-	-	-
Centrifuges	-	-	2	2	-	-	-	-
Carbon Unit	-	-	-	-	2	-	-	-
Chemical/Polymer System	-	-	1	1	2	-	-	-
Gas Compressors	-	-	-	-	-	-	5	-
Gas Dryer	-	-	-	-	-	-	4	-
Gas Flares	-	-	-	-	-	-	4	-
Silo Cake Conveyors	-	-	-	-	-	1	-	-
Silo Sliding Frames	-	-	-	-	-	1	-	-
Electrical								
Variable Frequency Drives	-	2	4	4	-	2	-	-
Motor Control Centers	2	1	1	1	1	1	4	-
Instrumentation								
PLCs & Flow Meters	1	1	1	1	1	1	5	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:
RUL = Remaining Useful Life;
PLC = Programmable Logic Controller

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – FACILITIES

Major Assets

Major Assets	Quantities
Thickening System	
Sludge Blending Tanks	3
Thickening Grinders	3
Centrifuge Feed Pumps	3
Thickening Centrifuges	3
Thickened Sludge Wet Wells	3
Thickened Sludge Pumps	6

Major Assets	Quantities
Thickening System (Continued)	
Centrate Wetwell	1
Centrate Pumps	3
Chemical Equipment	
Thickening Polymer Feed Pumps	3
Dewatering Polymer Feed Pumps	3

Major Assets	Quantities
Chemical Equipment (Continued)	
Polymer Mixing/Aging Tank	6
Polymer Make-Down Unit	4
Dewatering System	
Dewatering Grinders	2
Centrifuge Feed Pumps	3
Dewatering Centrifuges	3
Cake Transfer Pumps	3

Major Assets	Quantities
Dewatering Odor Control	
3-Stage Packed Tower Scrubbers	3
Carbon Media	2
Truck Loading	
Cake Storage Silos	4
Cake Silo Transfer Pumps	4
Standby Truck Loading Bay	1

Major Assets	Quantities
Gas Handling	
Low Pressure Gas Holder	1
Gas Compressors	3
Gas Dryer	1
Gas Flares	3
Boiler	1

Key Issues

Key Issues	Actions and Recommendations
• **Maintainability of the Equipment** – There are several improvements that are needed for Thickening and Dewatering Area including lighting improvement, equipment access for maintenance, instrument air and power access and improving drains.	• Most of the improvements will be done by Maintenance. • PRN-00505 small project for safety improvements. • PRN-00540 small project regarding equipment access and platform installation. • PRN-00815 will replace the diverter gate.
• **Gas Handling System** – Gas compressor system is aging and needs replacement of major units.	• Project J-124 Digester Gas Facilities rehabilitation is in design • Gas compressors repair and gas compressor overhaul by Maintenance.
• **Gas Dryer** – Out of service. Currently, gas goes through a heat exchanger and condensate drop out.	• The gas dryer refrigerator system will be replaced by J-124 Project.
• Corrosion from plant water on equipment is causing premature wear on pumps.	• PS20-09 will evaluate the plant water and make recommendations for improvements.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, and flares	• Replace the entire gas handling system including the gas compressor building.															
FE18-16	New Floor and Equipment Drains for the Truckloading Basement	Truckloading Facility	• Improve the drainage in the basement.															
RE20-01	CTS Sludge Density Meter Evaluation	Thickening centrifuges	• Evaluate several density meters.															
PRN-00505	Safety Improvements at the Thickening and Dewatering Building	Thickening and Dewatering Building	• Improve safety outside of the thickening and dewatering building.															
PRN-00540 FR1-0013	Truckloading silo's slide frame conveyor motor access platform	Truckloading slide frame	• Improve access to the equipment for maintenance activities.															
PS20-09	Thickening and Dewatering Plant Water Study	Thickening and Dewatering Building	• The study will evaluate the plant water used at the T&D building and determine why the water is causing corrosion on equipment.															
RE20-06	Co-thickened Sludge Pump Trial	Co-thickening pumps	• Field test a rotary lobe pump in place of the progressive cavity CTS pump.															

Types of Project Legend:

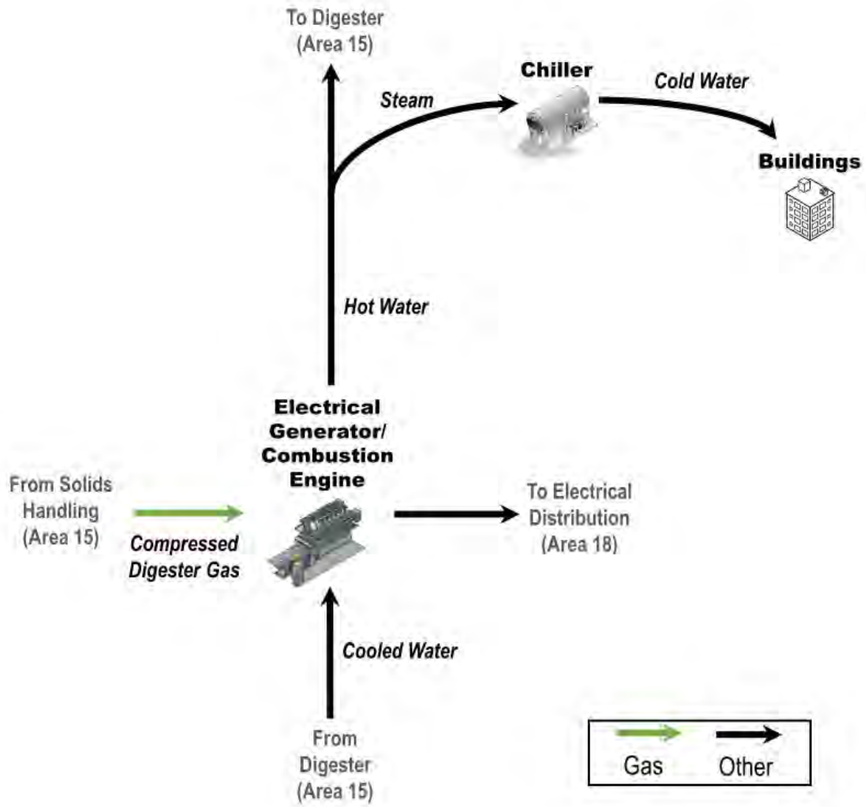
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; CTS = Co-thickened sludge; FY = Fiscal Year

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 16 – PLANT NO. 1 CENTRAL GENERATION

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Engine Generator #1	Engine Generator #2	Engine Generator #3	Absorption Chiller #1	Absorption Chiller #2	Deaerator Vessel	Heat Recovery Boiler #1	Heat Recovery Boiler #2	Heat Recovery Boiler #3	OXI Catalyst	SCR Catalyst	Urea Injection System	Starting Air Compressor #1	Starting Air Compressor #2	Inst. Air Compressor #1	Inst. Air Compressor #2	Battery Backup	Building Elevator	Plant Water Piping	Miscellaneous
Structural																				
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																				
General	5	5	5	3	3	2	3	3	3	3	3	3	4	4	5	5	-	1	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																				
General	4	4	4	-	-	-	-	-	-	-	-	3	3	3	5	5	5	1	-	-
Switchgear	5	5	5	-	-	-	-	-	-	-	-	-	-	--	-	-	-	-	-	-
Instrumentation																				
General	5	5	5	4	4	3	3	3	3	3	3	3	4	4	5	5	5	1	-	-

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:
HVAC = Heating, Ventilation, and Air Conditioning; Inst. = Instrument; OXI = Oxidizer; RUL = Remaining Useful Life;
SCR = Selective Catalytic Reduction

Major Assets

Major Assets	Quantities
Engine Generator	
Gas Engine (12 Cylinders)	3
Electrical Generator	3
Engine Lube Oil System	3
Cooling System	
Absorption Chiller	2
Deaerator Vessel	1

Major Assets	Quantities
Engine Emission Control	
OXI Catalyst	3
SCR Catalyst	3
Urea Injection System	3
Heat Recovery System	
Heat Recovery Boiler	3

Major Assets	Quantities
Building	
Elevator	1
Piping	Various
HVAC	
Ventilation Exhaust Fans	5
Air Compressors	
Engine Starting Air	2
Instrument Air	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 16 – PLANT NO. 1 CENTRAL GENERATION

Key Issues

Key Issues	Actions and Recommendations
• **Gas Engine Generator Set Reliability –** Aging components and systems required to operate the Central Generation Engines are creating reliability issues and need to be addressed.	• Engine #1 undergoing overhaul. • Replace obsolete systems (e.g., Battery Backup, Switch Gear, Ignition System, PLC Upgrade, etc.).
• **Engine Lube Oil System –** The Lube Oil Centrifuges are no longer operational.	• Install new instrumentation and controls onto the existing two units **(**PRN-00211).
• **Plant Water Piping –** The plant water (i.e., cooling water) piping has degraded and needs replacement.	• Replace all plant water piping in the basement of Central Generation (FE19-02).
• **Backup Battery System –** The batteries used to provide backup power for switching of the switch gear during loss of power events, has reached the end of its useful life.	• Replace the lead acid batteries and their respective battery chargers with a suitable backup battery system (FR1-0005).
• **Pressure Vessel Integrity –** The asset integrity of pressure containing vessels needs a detailed assessment.	• The assessment results will be used to formulate an asset management strategy to ensure safety over time (PS20-05).

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE17-03	Battery Storage System	Plantwide	• Install batteries for electricity storage purposes.															
P1-136	Switch Gear Replacement	Engine Generator	• Install new Switch Gear for the engines.															
FE19-02	Plant Water Pipe Rehabilitation	Plant Water Piping	• Replace existing plant water piping with new.															
PRN-00211	Engine Lube Oil System Controls Upgrade	Engine Generator	• Install new instrumentation and controls onto the existing oil centrifuge units.															
MP-227	Starting Air Compressor System Rehabilitation	Starting Air Compressor System	• Rehabilitation of the Air Compressors.															
J-135	Engine Overhauls	Engine Generator	• Perform top/bottom end engine overhauls.															
MP-608	Engine Ignition Timing Sensor Obsolescence Repair	Engine Generator	• Replace and install new Hall Effect Sensors onto each engine.															
FR1-0005	Battery Backup Rehabilitation	Battery Backup	• Replace the existing backup batteries for the switch gear.															
PRN-00697	Engine Cylinder Pressure Sensing and Diagnostics	Engine Generator	• Install Pressure Sensors onto each Cylinder, incl. Software/HMI.															
AI-225	Engine Ignition System Obsolescence Repair	Engine Generator	• Replace and install new Ignition Systems onto each engine.															
PS20-05	Pressure Vessel Integrity Assessment	Pressure Vessels & Heat Exchangers	• Formulate a detailed asset management strategy.															

Types of Project Legend:

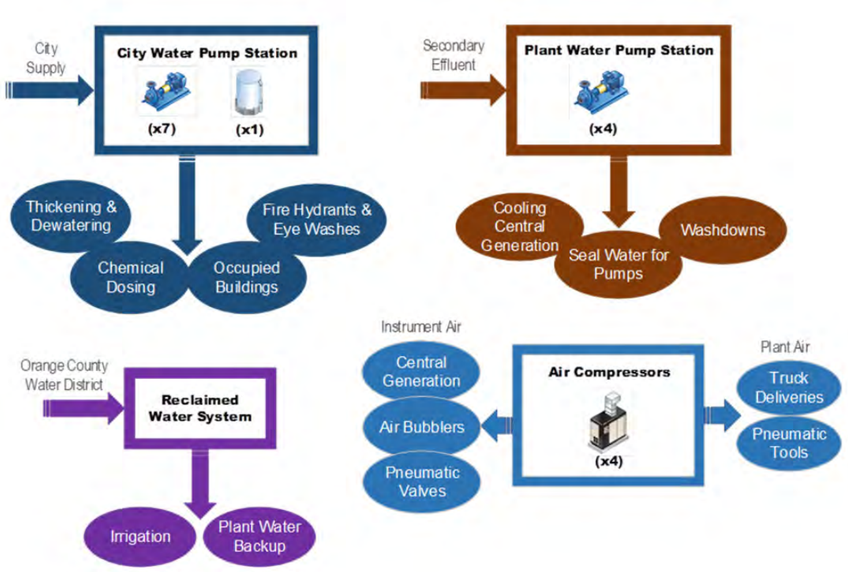
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; HMI = Human Machine Interface; HVAC = Heating, Ventilation, and Air Conditioning; OXI = Oxidizer; RUL = Remaining Useful Life; PLC = Programmable Logic Controller; SCR = Selective Catalytic Reduction

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Process Schematic



Major Assets

Major Assets	Quantities
City Water	
Pumps	7
Tanks	3
Piping	10.6 Miles
Plant Water	
Pumps	4
Strainers	3
Piping	12.5 Miles
Reclaimed Water	
Piping	5.4 Miles
Plant Air	
Compressors	4
Plant Air Piping	4 Miles
Instrument Air Piping	3.5 Miles

Major Assets Remaining Useful Life

Asset Type	City Water System	Plant Water System	Reclaimed Water Piping	Plant Air Systems
Civil				
Piping	3	3	2	3
Structural				
Pump Station	1	3	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	3
Ventilation System	2	3	-	-
Electrical				
Motor Control Centers	2	2	-	-
Variable Frequency Drives	3	2	-	-
Instrumentation				
PLCs, Flowmeters	2	2	-	2

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:
RUL= Remaining Useful Life;
PLC=Programmable Logic Controller

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Key Issues

Key Issues	Actions and Recommendations
• **Plant/Instrument Air Lines –** Possible corrosion issues and leaks.	• Using on-call contractors to perform a condition assessment of the plant air system and identify any leaks or other deficiencies such as improper connections. Current plan is to use the information from the assessment to create larger CIP projects that can improve the piping network throughout the plant. Smaller repairs will be done using on-call contractors and maintenance/asset issues projects.
• **City Water Pump Station** – Pumps are possibly undersized.	• The three medium pumps at the City Water Pump Station continuously run causing excessive wear. There is one smaller jockey pump that runs very infrequently. PRN-00541: Plant No. 1 City Water Demand Flow Assessment is expected to properly size the pumps at the station to meet the current needs of the plant.
• **Plant Water** – Piping failures.	• Due to the corrosive nature of the plant water, the current ductile iron pipes are corroding prematurely and causing failures throughout the plant. FE19-02 will address aging plant water piping at Cen Gen and FE20-05 will address recent plant water pipe failures at the secondary clarifiers. Overall goal for these and future projects is to replace ductile iron pipes with either Fiberglass Reinforced or HDPE piping material.
• **Reclaimed Water System** – This system needs a pressure regulating valve installed.	• Due to recent operational changes at OCWD, Reclaimed water pressure has increased to 100-130psi, however, OC San plant water has remained at 80 psi. In order to prevent using reclaimed water when plant water is plentiful, a pressure regulating valve installed at the OCWD/OC San reclaimed water connection point is necessary.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27	FY27/28	FY28/29	FY29/30	FY30/31	FY31/32	FY32/33	FY33/34	FY34/35	FY35/36
FE19-02	Cen Gen Plant Water Pipe Replacement at Plant No. 1	Central Generation	• Replace approximately 800 feet of plant water pipe within Cen Gen.															
FE18-06	Instrument Air Compressors at Central Generation	Central Generation	• Replace Instrument Air compressors at Central Generation.															
P1-105	Headworks Rehabilitation at Plant No. 1	City Water Pump Station	• Refeed city water pumps from new power building and replace current compressor at headworks with two new compressors.															
FE18-20	DAFT Air Compressor Replacement	DAFT	• Replace current compressor with two new compressors.															
FE20-05	Plant Water Piping Replacement at Secondary Clarifiers	Secondary Clarifiers	• Replace corroded and failing plant water piping around secondary clarifiers.															
P1-126	Primary Clarifier Replacement and Improvement	Primary Clarifier	• Address plant water pipes near primary clarifiers.															
X-038	City Water Pump Station Replacement	City Water Pump Station	• Replace City Water Pump Station.															
X-039	Plant Water Pump Station Rehabilitation	Plant Water Pump Station	• Rehabilitate Plant Water Pump Station.															
XPS-053	City Water Demand Flow Assessment at Plant No. 1	City Water Pump Station	• Study to determine current and future city water needs.															
PS20-09	Plant Water Study at T&D Building	T&D Building & Plant Water Station	• The study will evaluate the plant water used at the T&D building and determine why the water is causing corrosion on equipment.															
AI-201	Re-Pipe Irrigation Piping at Plant No. 1	City Water and Reclaimed Water Systems	• Reduce the use of city water for irrigation purposes.															

Types of Project Legend:

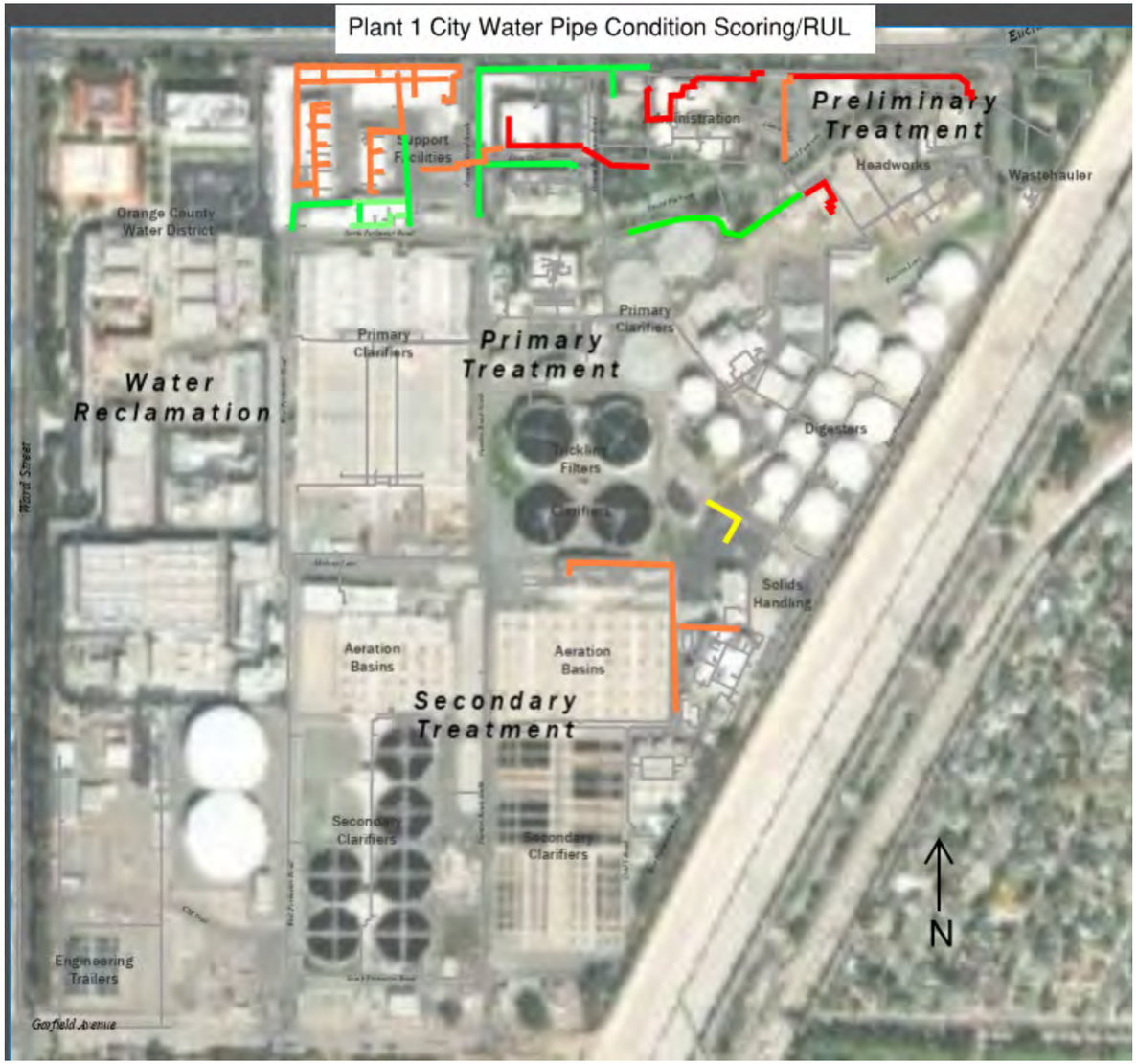
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FE = Facilities Engineering; FY = Fiscal Year; HDPE = High-Density Polyethylene Resin; HP = Horsepower; OC San = Orange County Sanitation District; OCWD = Orange County Water District

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure



RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure

RUL Legend:

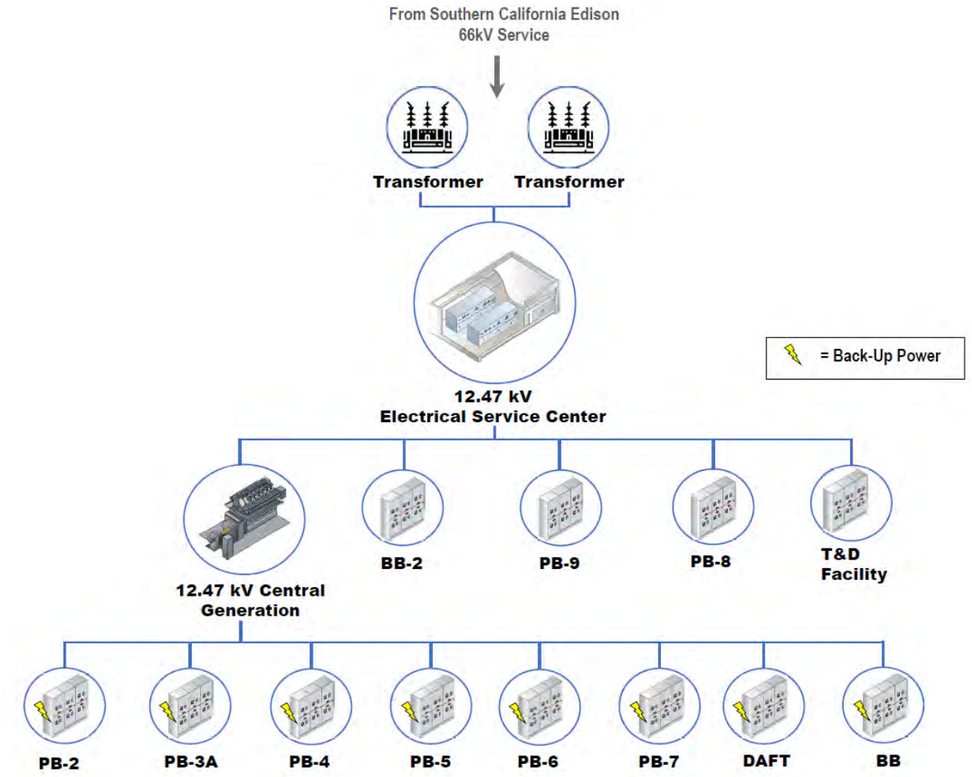
RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 18 – PLANT NO. 1 ELECTRICAL DISTRIBUTION

Process Schematic



Major Assets

Major Assets	Quantities
Transformers	40
Standby Generators	8
12Kv and 5kV Switchgears	16
480V Switchgears	38
125VDC and 24VDC Battery Systems	25
UPS	24

Major Assets Remaining Useful Life

Asset Type	Service Center	Cen Gen	PB-2	PB-3A	PB-4	PB-5	PB-6	PB-7	PB-8	PB-9	DAFT	BB-1	BB-2	T&D FACILITY
Tier I – 12.47kV Primary Distribution Level														
Transformers: 12.47/4.16kV		-	-	-	-		-	-	-	-		3	1	1
Transformers: 12.47/0.48kV	4	4	3	3	3	2	3	1	2	1	3	3	1	1
12.47kV Switchgears	4	4	4	4	4	4	4	-	-	-	-	-	3	1
12.47kV Transfer Switchers	3	-		-		-	-	-	-	-		-	-	-
12.47kV Load Interrupter Switches	3	-	4	4	3	-	-	1	1	1	3	3	-	-
12.47kV Feeders	1	4	4	4	4	4	4	1	1	1	3	3	1	1
Tier II – 4.16kV Distribution Level														
4.16kV Switchgears	-	-	-	-	-	-	-	-	-	-	-	3	1	-
4.16kV Feeders	-	-	-	-	-	-	-	-	-	-	-	3	1	-
Tier IV – 480V Distribution Level														
480V Switchgears	-	4	3	4	-	2	4	1	1	1	3	3	1	1
Transfer Switches	-	-	2	2	4	-	2	-	-	-	4	4	1	-
Generators	-	-	5	5	5	-	-	1	1	-	-	5	-	-
Tier V – Uninterruptible Power Supply														
UPSs Individual	-	1	-	5	-		4	-	3	2	4	3	2	-
Tier VI – 125 VDC and 24 VDC Battery Systems														
125VDC Chargers	5	5	5	5		2	4	3	3	2	3	-	3	1
125VDC Batteries	5	5	5	5		2	4	3	3	2	3	-	3	1
24VDC Chargers	-	5	5	5	5	-	-	3	3	-	-	3	-	1
24VDC Batteries	-	5	5	5	5	-	-	3	3	-	-	3	-	1
Generator Controls														
Generator Controls	-	5	5	5	5	-	-	1	1	-	-	5	-	

Asset RUL Legend:

- **RUL <5 years**
- **RUL 5-10 years**
- **RUL 11-15 years**
- **RUL 16-20 years**
- **RUL >20 years**

Acronym Key:

BB = Blower Building;

Cen Gen = Central Generation Facility;

kV = Kilovolt;

PB = Power Building;

RUL = Remaining Useful Life;

T&D = Thickening and Dewatering;

VDC = Volts of Direct Current;

UPS = Uninterruptible Power Supply

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 18 – PLANT NO. 1 ELECTRICAL DISTRIBUTION

Key Issues

Key Issues	Actions and Recommendations
• **Standby Generators** - Power Building 2, &3A: Overheating at 75%-80% loading. - Power Building 4: Engine unable to drive the generator at 100% loading. - Blower Building 1: Shut down on high temp. at 100%, cannot synchronize both generators.	• P1-105 will install centralized standby system with (4)-2500kW, 12kV diesel generators for Headworks Area, Power Building 2, 5 and Blower Building standby loads. P1-105 will demolish generators at Power Building 3A. P1-126 will demolish Power Building 4 Generator and refeed standby loads from Power Building 8. P1-139 Project will design feeders from new generators to Power Building 2 and Blower Building 1 Standby Loads.
• **Battery Chargers and Batteries –** Aging.	• XPS0061 DC Battery Monitoring and Management Solutions: Study to develop technical solution to monitor existing battery life, develop path forward for replacing aged battery and charger systems. Project FR1-0005 will replace critical batteries and chargers at 12kV Service Center and Cen Gen.
• **Cabling** – Aging medium voltage cabling infrastructure.	• MP-320: Service Contract in place for testing aging medium voltage cables to perform Condition Assessment and develop plan for PM.
• **Variable Frequency Drive** – Obsolescence.	• Developed VFD Replacement Strategy. Plant No. 1 obsoleted VFDs will be addressed under FR1-011 Project.
• **Power Building 2** – Seismic and liquefaction improvements required.	• P1-105 Project will transfer Power Building 2 Loads to T&D Building and eliminate the need for Power Building 2.
• Currently some secondary treatment processes do not have backup power from generators.	• J-98 Project will provide capability for Plant No. 1 Load shedding to implement this along with Emergency Operation Procedures.
• Undervoltage Auto Transferring Scheme upgrades at Plant No. 1 Blower Building 2 and Power Building 9 (current auto transferring scheme does not work correctly; must switchover manually)	• J-98 will upgrade Auto Transferring Scheme and aging protective relays per latest OC San Standards for Blower Building 2 and Power Building 9 12.47kV, 4.16kV and 480V Switchgears.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 35/36
FR1-0005	P1 Cen Gen and Service Center Battery and Charger Upgrade	Plant No. 1 Power Distribution	• Replace existing obsolete125VDC and 24VDC batteries and battery chargers.														
MP-320	On-call P1 and P2 Medium Voltage Cable Testing Services	Plant No. 1 and Plant No. 2 Power Distribution	• Medium voltage cables aging infrastructure assessment.														
FR1-0011	P1 VFD Replacement at Plant No. 1	CWPS, RAS, DAFT, WSS	• Replacement of existing obsolete Plant No. 1 CWPS, RAS, DAFT, WSS VFDs with new VFDs.														
P1-105	Headworks Rehabilitation at Plant No. 1	Plant No. 1 Headworks, Bars Screen, Metering Structure, Power Buildings	• Project will rehabilitate/upgrade Plant No. 1 Headworks and will replace most of electrical power distribution systems and equipment in Power Building 3A. Project will construct new Power Building 3B and new electrical building in vicinity of Headworks loads.														
J-98	Electrical Power Distribution System Improvements	Various Plant No. 1 and Plant No. 2 condition based electrical distribution systems	• Project will perform various Electrical Distribution System Improvements at various areas throughout Plant No. 1. The scope covers both 480V and 12kV Switchgear, Motor Control Centers, breakers, conductors, load shedding and arc flash mitigation.														
P1-132	Uninterruptable Power Supply Improvements at Plant No. 1	Plant No. 1 multiple UPS Loads	• This project will provide a new regional UPS at Power Building 8 to provide critical power to facilities in the northwest region of Plant No. 1.														

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 35/36
XPS-0061	Critical UPS and DC power backup battery condition monitoring and management solution	Plant No. 1 and Plant No. 2 125 VDC Battery Systems	• Project will develop automated approach to actively managing and maintaining battery systems to allow to view the status of battery line ups immediately and predict battery failures well in advance of an actual failures. Project will investigate replacing old batteries and chargers.														
P1-126	Primary Sedimentation Basins No. 3-5 Replacement at Plant No. 1	Plant No. 1 Power Distribution	• Demolish Power Building 4 Diesel Generator, refeed standby loads from Power Building 8.														
P1-136	12.47kV Switchgear replacement at Plant No. 1 Central Generation and Control Center	Plant No. 1 Power Distribution	• The project will be replacing existing 12.47kV electrical switchgears at the Plant No. 1 Central Generation facility and Control Center. The project will also assess existing Central Generation 12.47kV feeders and replace ones that fail electric tests.														

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; DC = Direct Current; FE= Facilities Engineering; FY = Fiscal Year; HVAC = Heating, Ventilation, and Air Conditioning; kV = Kilovolt; kW = Kilowatt; MCC = Motor Control Center; P1 = Plant No. 1; P2 = Plant No. 2; RAS = Return Activated Sludge; T&D = Thickening and Dewatering; UPS = Uninterruptible Power Supply; V = Volts; VDC = Volts of Direct Current; VFD = Variable Frequency Drive; WSS = Waste Sidestream

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Plant No. 2 Asset Management Summaries

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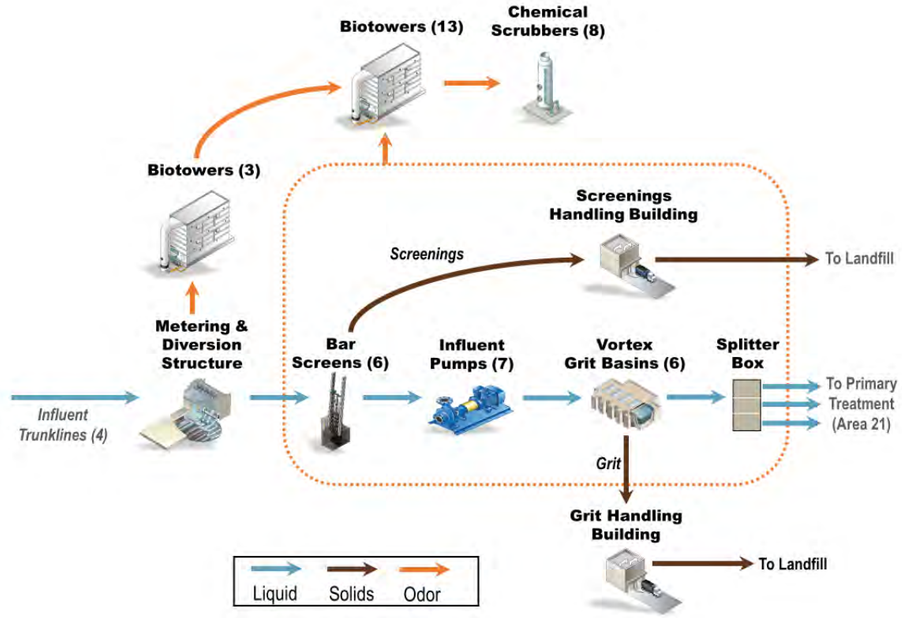
ASSET MANAGEMENT SYSTEM SUMMARY – AREA 20 – PLANT NO. 2 PRELIMINARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Headworks							
	Metering & Diversion	Bar Screens	Main Sewage Pump	Grit Basins	Splitter & Metering	Trunkline Odor Control	Headworks Odor Control	Distribution Center H
Civil								
Effluent Piping	-	-	-	-	1	-	-	-
Structural								
Building	-	1	1	1	-	-	-	1
Concrete & Tanks	1	1	1	1	1	2	2	-
Mechanical								
Piping & Valve	2	2	2	2	2	-	-	-
Pump	-	-	2	2	-	2	2	-
Screening Washer Compactor	-	3	-	-	-	-	-	-
Grit Cyclone/Classifier	-	-	-	3	-	-	-	-
Conveyor	-	3	-	3	-	-	-	-
Fans & Blower	-	-	-	-	-	2	2	-
Control Gate	2	5	2	2	2	-	-	-
HVAC	-	3	3	3	-	-	-	3
Crane	-	2	2	-	-	-	-	-
Electrical								
Process – Motor, MCC, VFD	-	3	3	-	-	2	2	2
Instrumentation								
PLCs, Flow Meters	2	2	2	2	2	2	2	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning;

MCC = Motor Control Center;

PLC = Programmable Logic Controller;

RUL = Remaining Useful Life;

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
Metering & Diversion Structure	
Influent Flow Meter	4
Control Gate	7
Trunk Odor Control	
Supply Fan	3
Biotower	3
Recirculation Pump	6

Major Assets	Quantities
Bar Screens	
Bar Screen	6
Screening Washer Compacter	3
Screenings Conveyor	4
Control Gate	14

Major Assets	Quantities
Main Sewage Pump	
Pump	7
Control Gate	16
Splitter and Metering	
Flow meter	3
Control Gate	26

Major Assets	Quantities
Grit Basins	
Grit Basins	6
Grit Slurry Pump	6
Grit Cyclone/Classifier	4
Control Gate	12

Major Assets	Quantities
Headworks Odor Control	
Supply Fan	21
Biotower	13
Chemical Scrubber	8
Recirculation Pump	42
Bleach Tank	1
Bleach Pump	16

Major Assets	Quantities
Headworks Odor Control (Continued)	
Acid Tank	1
Acid Pump	2
Caustic Tank	1

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 20 – PLANT NO. 2 PRELIMINARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Headworks Low Voltage Cable –** Many of Headworks 480 volts cables are failing, triggering ground faults on 480-volt equipment. Original MP-509 addressed identified grounded cables, but the project continued to discover additional grounded circuits.	• FR2-0024 Headworks 480V Cable Replacement at Plant No. 2 is currently in construction phase. Scheduled to be completed in November 2021 • Standalone MP2-001 Screening Loading Building Exhaust Fan 1 Cable Replacement at Plant No. 2 was created due to its recent failure and urgency
• **M&D Trunkline and Barsceen Grit Build-Up –** Due to low flow and low velocity, heavy grit build-ups were observed at the lowest point of M&D trunklines. This issue may escalate once P2-122 splits the headworks into two trains.	• Operations rotate the trunklines monthly and keep only two trunklines in service to help prevent build-up • Maintenance created a biannual PM to have barscreen inlets cleaned • PRN-00535 Influent Metering Structure Trunkline Probes Relocation is in progress to relocate probes from the grit build-up
• **Washer Compactor Vulnerability –** On August 21, 2021, Plant No. 2 observed a slug of rags that plugged two of Washer Compactors.	• Current equipment cannot handle a large load of debris, and the planning will investigate ways to improve the reliability of the Washer Compactor
• **Headworks Condition Assessment –** Field condition assessment data of the Headworks are limited. It has been around 10 years since the system was operational, so field data are required to build a condition baseline.	• A condition assessment was done between M&D pipeline and barscreen when it was down for P2-122 construction. Asset engineer will continue to work with P2-122 to look for opportunities to perform other assessments

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
P2-122	Headworks Modifications at Plant No. 2 for GWRS Final Expansion	Headworks	• Modify headworks and sidestream routing to create reclaimable and non-reclaimable trains to support GWRS Final Expansion. • Replace 3 of 7 MSPs with more efficient lower capacity pumps.															
FR2-0024	Headworks 480V Cable Replacement at Plant No. 2	Headworks	• In-house engineering design and bid for service contract for repairs on faulty cables.															
MP2-001	Screening Loading Building Exhaust Fan 1 Cable Replacement at Plant No. 2	Headworks	• In-house engineering design and bid for service contract for repairs on Screening Loading Building Exhaust Fan 1 cable.															
PRN-00718	MSP VFD UPS Reconfiguration at Plant No. 2	DC-H	• Reconfigure internal UPS by adding a manual transfer switch to allow the drive to bypass from UPS to control power transformer.															
PRN-00535	Influent Metering Structure Trunkline Probes Relocation at Plant No. 2	M&D Structure	• Relocate pH and conductivity probes for each trunkline in M&D Structure.															
PRN-00731	Trunkline Biotower #3 Repair at Plant No. 2	TL Odor Control	• Repair internal mechanism of the TL Biotower #3.															
N/A	Headworks Scrubber Media Replacement at Plant No. 2	TL & HW Odor Control	• Replace scrubber media for odor control scrubbers.															
X-030	Headworks Rehabilitation at Plant No. 2	Headworks	• Rehabilitate any equipment, electrical, structures, or materials that cannot provide 25 years of useful life.															

Types of Project Legend:

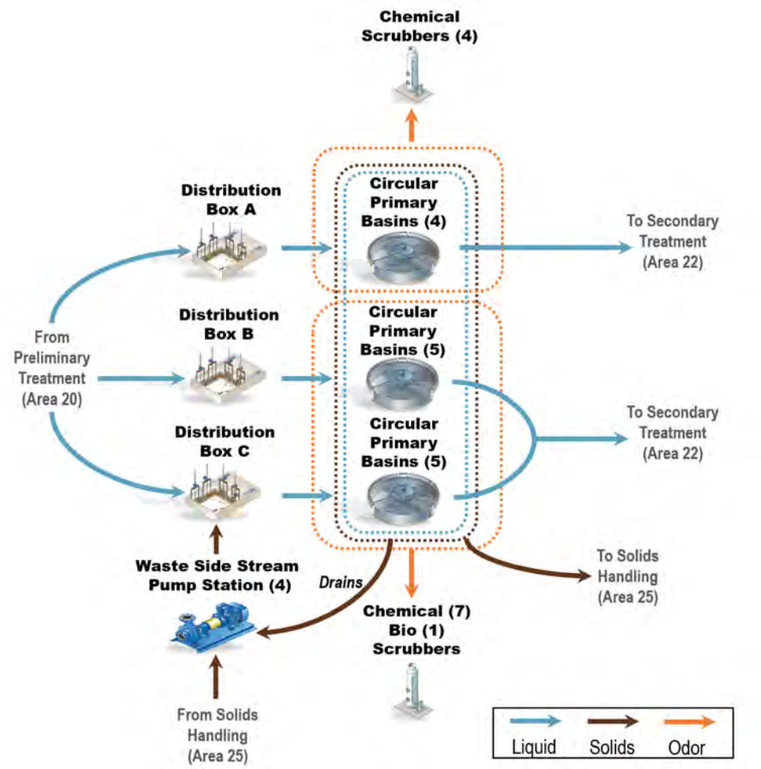
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; DC = Distribution Center; FY = Fiscal Year; GWRS = Groundwater Replenishment System; HW = Headworks; M&D = Metering & Diversion; MSP = Main Sewage Pump; N/A = Not Applicable; PM = Preventive Maintenance; SARI = Santa Ana River Interceptor; TL = Trunkline; UPS = Uninterruptible Power Supply; V = Volts; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 21 – PLANT NO. 2 PRIMARY TREATMENT

Process Schematic



Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning; MCC = Motor Control Center; NSC = North Scrubber Complex; PB = Power Building; PL C= Programmable Logic Controller; RUL = Remaining Useful Life; SSC = South Scrubber Complex; VFD = Variable Frequency Drive; WSSPS = Waste Sidestream Pump Station

Major Assets Remaining Useful Life

Asset Type	A-Side				B-Side					C-Side										
	PB-D	PB-E	PB-F	PB-G	PB-H	PB-I	PB-J	PB-K	PB-L	PB-M	PB-N	PB-O	PB-P	PB-Q	NSC	SSC	Polymer System	Ferric System	Distribution Box	WSSPS-C
Civil																				
Effluent Piping	5	5	5	5	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	3
Structural																				
General	4	4	4	4	3	3	3	3	3	3	2	2	2	2	3	3	3	2	4	1
Dome	4	4	4	4	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-
Mechanical																				
Piping	4	4	4	4	3	1	3	1	1	1	1	1	2	2	3	4	-	2	5	2
Internal Mechanism & Gates	4	4	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	5	-
Fans & Pumps	3		3		3		3		3		3		3		3	3	3	2	-	2
HVAC	3		3		3		3		3		3		3		-	-	-	-	-	-
Drains	4	4	4	4	3	3	3	3	1	1	1	1	3	3	3	4	-	-	-	-
Electrical																				
Process – Motor, MCC, VFD	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	2	-	2
Instrumentation																				
PLC, Flow Meters	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	5	2	-	2

RUL Legend:

RUL <5 years | RUL 5-10 years | RUL 11-15 years | RUL 16-20 years | RUL >20 years

Major Assets

Major Assets	Quantities
Primary Basin – A-Side	
Primary Basin	4
Sludge/Scum Collectors	4
Sludge/Scum Pump	8
Supply Fan	6
Primary Basin – B-Side	
Primary Basin	5
Sludge/Scum Collectors	5
Sludge/Scum Pump	10
Supply Fan	7

Major Assets	Quantities
Primary Basin – C-Side	
Primary Basin	5
Sludge/Scum Collectors	5
Sludge/Scum Pump	10
Supply Fan	8
North Scrubber Complex	
Chemical Scrubber	7
Bio Scrubber	1
Recirculation Pump	16
Supply Fan	8
Caustic Tank	1

Major Assets	Quantities
North Scrubber Complex (Continued)	
Acid Feed Pump	2
Bleach Tank	1
Bleach Feed Pump	14
Caustic Feed Pump	16
Acid Tank	1
South Scrubber Complex	
Supply Fan	4
Scrubbers	4
Recirculation Pump	8
Caustic Tank	1

Major Assets	Quantities
South Scrubber Complex (Continued)	
Caustic Feed Pump	8
Acid Tank	1
Acid Feed Pump	2
Bleach Tank	1
Bleach Feed Pump	3
Polymer System	
Polymer Bulk Tank	3
Polymer Bulk Transfer Pump	4
Polymer Mix Tank	2

Major Assets	Quantities
Polymer System (Continued)	
Polymer Feed Pump	4
Ferric System	
Ferric Bulk Tank	2
Ferric Feed Pump	6
Distribution Boxes	
Structure	3
Sluice Gates	24
Waste Sidestream Pump Station C	
Waste Sidestream Pump	4

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 21 – PLANT NO. 2 PRIMARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Reliability of B-Side Primary Basins –** Distribution Structure B distributes primary influents to Primary Basin H, I, J, K, and L. There are 2 slide gates per basin, and all 10 gates are not operational, preventing operations to control and isolate flows to 5 individual basins.	• On February 2021, OC San conducted a condition assessment around the DS-B, and identified 10 inoperable gates, along with few major corroded parts • PRN-00757 Primary DS-B Gates Repair is in progress, and currently waiting on Board approval in September to start the construction phase.
• **Reliability of Primary Sedimentation Basins -** A-side, B-side, and C-side primary basins were built in 1960s, 1970s, and 1980s, respectively. These basins are close to the end of their useful life and require major rehabilitation to continue to operate reliably for next 30+ years.	• P2-98B performed interim repairs to B- and C-sides of primary basins to extend their useful life for 10-15 years • P2-98A is in a construction phase to replace all four A-side primary basins • Future project P2-133 is in place to perform long-term rebuild on B and C sides of primary basins after the P2-98A completion.
• **Reliability of Polymer System –**The polymer system was built in 1988 and no major project was done since it was built. Replacement of the aged system is included in P2-133 scope, but the system may not last until the project.	• Asset Engineer conducted a job walk with maintenance supervisors and identified assets that would be difficult for maintenance to replace in case of failures. Most of these parts are E&I due to obsolescence. • A new maintenance project will be created to address the issue above, and maintenance will continue to maintain the overall system until P2-133 replacement.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	A-Side Primary Basins	• Demolish and replace four existing A-Side Primary Basins, including piping and distribution box • Demolish and replace the South Scrubber Complex.															
P2-98B	B- and C-Side Primary Clarifiers Interim Repair at Plant No. 2	B- and C-Side Primary Basins	• Repair the structural steel mechanism members of 12 primary basins. • Interim repairs to make basins reliable for 10-15 years during P2-98A construction.															
P2-133	B- and C-Side Primary Clarifiers Rehabilitation at Plant No. 2	B- and C-Side Primary Basins	• Long-term rebuilds to extend RUL of B- and C-side basins to 40 years or greater.															
PRN-00818	Anionic Polymer E&I Replacement at Plant No. 2	Anionic Polymer System	• Replace obsolete E&I assets within the Anionic Polymer System.															
PRN-00757	Primary DS-B Gates Repair at Plant No. 2	Distribution Structure B	• Repair 10 slide gates and replace corroded weir plates.															
X-054	Waste Sidestream Pump Station C Rehabilitation at Plant No. 2	Waste Sidestream Pump Station C	• Replace pumps and associated equipment with chemical resistant material to provide reliable operation.															

Types of Project Legend:

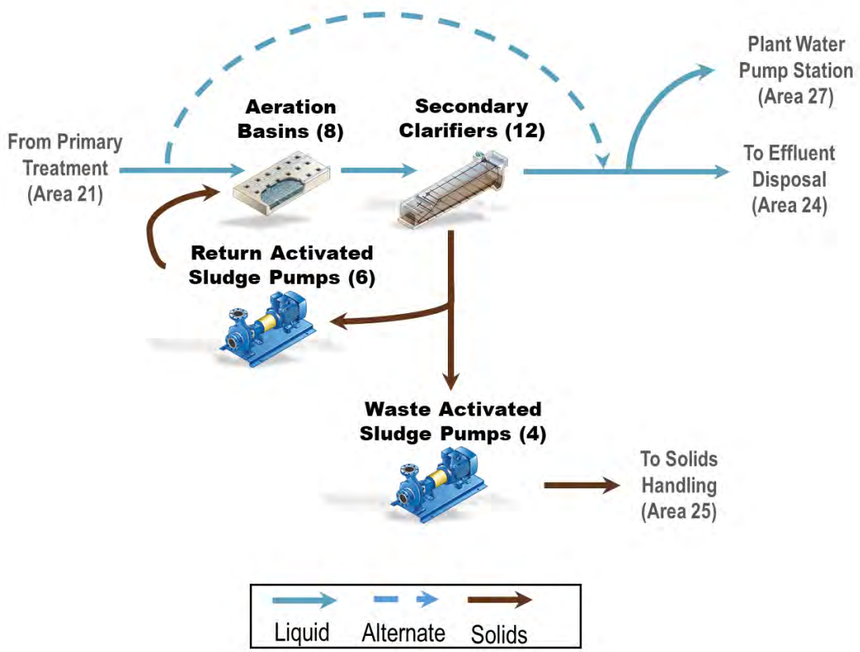
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

DS = Distribution Structure; CIP = Capital Improvement Program; E&I = Electrical & Instrumentation FY = Fiscal Year; OEM = Original Equipment Manufacturer; RUL = Remaining Useful Life; WSSPS = Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE

Process Schematic



Acronym Key:

DAFT = Dissolved Air Flotation Thickener; LOX = Liquid oxygen; MCC = Motor Control Center; PEPS = Primary Effluent Pump Station; PLC = Programmable Logic Controller; PS = Pump Station; RAS = Return Activated Sludge; RUL = Remaining Useful Life; SEJB = Secondary Effluent Junction Box; TWAS = Thickened Waste-activated Sludge; VFD = Variable Frequency Drive; WAS = Waste-activated Sludge; WSSPS = Waste Sidestream Pump Station

Major Assets Remaining Useful Life

Asset Type	PEPS	Aeration Basins	Secondary Clarifiers A-L	SEJB	East RAS /WAS PS	West RAS/WAS PS	Oxygen Facility	DAFTs A-D	DAFTs Polymer System	DAFTs Odor Control	WSSPS
Civil											
Effluent Piping	2	-	3	3	4	4	-	-	-	-	4
Structural											
Building	2	-	-	-	2	2	-	1	-	-	-
Structure	2	4	3	3	-	-	-	1	1	1	-
Mechanical											
Pump	2	-	-	-	3	3	-	2	2	-	3
Aerator	-	4	-	-	-	-	-	-	-	-	-
Piping and Valve	3	4	3	3	3	3	4	2	2	3	3
Clarifier/DAFT Moving Mechanism	-	-	4	-	-	-	-	2	-	-	-
Channel Air Blower	-	-	-	-	-	4	-	-	-	-	-
Control Gate	-	3	2	3	-	-	-	-	-	2	4
LOX Facility	-	-	-	-	-	-	4	-	-	-	-
HVAC and Ventilation	2	-	-	-	3	3	-	-	-	-	-
Crane	3	-	-	-	-	-	-	-	-	-	-
Electrical											
MCC and VFD	4	3	3	-	4	4	-	3	3	3	3
Instrumentation											
PLC and Flow Meter	3	3	3	-	3	3	3	3	3	-	3

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Major Assets	Quantities
Primary Effluent Pump Station	
Building	1
Structure	1
Pumps	4
Aeration Basins	
Basins	8
Surface Aerators	32
Inlet gates	8

Major Assets	Quantities
Secondary Clarifiers A-L	
Basins	12
Inlet gates	36
Sludge collectors	24
Secondary Effluent Junction Box	
Structure	1
Control Gate	1
East RAS/WAS PS	
RAS/WAS Pumps	5

Major Assets	Quantities
West RAS/WAS PS	
RAS Pumps	3
WAS Pumps	2
Channel air blowers	2
Sliding Frames	2
Oxygen Facility	
LOX Storage Tanks	2
Vaporizer	6
Oxygen Purging Fan	2

Major Assets	Quantities
DAFTs A-D	
Concrete Tanks	4
Mechanical Sweep	4
Recycle Pumps	6
Saturation Tank	4
TWAS Pumps	8
DAFTs Polymer System	
Storage Tank	1
Aging Tank	2

Major Assets	Quantities
DAFTs Polymer System (Continued)	
Storage Tank Rec. Pumps	2
Blend Pumps	2
Feed Pumps	6
DAFTs Odor Control	
Biofilters	3
Foul Air Fans	3
Waste Sidestream Pump Station	
Pumps	3

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE

Key Issues

Key Issues	Actions and Recommendations
• **PEPS –** Obsolete VFD parts • Aged PEPS pumps and corrosion on suction pipes • Missing flapper gates on the area drains inlets to the basins	• PRN-00573 (FE19-08) project will replace the PEPS VFDS. • AI-323 generated to perform condition assessment of the pumps. Pump No. 4 had been removed and disassembled by pump repair company in August 2021. All four pumps will be rebuilt or replaced based on the condition assessment findings. • Condition assessment will be performed to determine the condition.
• **Aeration Basins –** Cracks and concrete spalling on aeration basins deck • Aerator motor corrosion and oxygen piping corrosion • Inlet gates not totally sealed • Oxygen leaking from aerator base and access manholes on top of the aeration deck	• P2-118 filled the concrete cracks on west aeration basins, P2-123 filled the concrete cracks on east aeration basins. • AI-266 performed condition assessment of oxygen leaking from aerator bases and manhole, P2-123 change order to seal the leaking locations. • AI-374 to perform condition assessment and temporary repair on oxygen piping. Maintenance coating program will recoat oxygen piping. • P2-136 to replace all oxygen piping, structurally rehab. the aeration basins, replace all aerators, and inlet gates.
• **Clarifiers –** Broken clarifier mechanism need to be repaired or replaced • Corroded Inlet gates need to be replaced • Clarifier entry gate not meeting the OSHA requirement • Loosing handrails • Damaged concrete on the deck	• MP-248 replaced D, L, G, J, C, F, and the remaining six will be replaced by FR2-0018. • MP-638 replaced all the 36 inlet gates in 2021. • FR2-0023 will add safe entry access platform to each secondary clarifier. • AI-375 Condition assessment performed and repair in under planning. • AI-373 Condition assessment done and repair is under construction.
• **RAS/WAS Pump Stations** – Obsolete VFDs • Corroded RAS piping • Clarifier inlet channel air blower, one broken and out of service, and the model is obsolete	• PRN-00573 (FE19-08) will replace the RAS and WAS VFDs. • P2-123 will replace the RAS piping. • AI-322 AS Blower Replacement. Task order to design the replacement by Jacobs completed. Maintenance will do in-house installation.
• **Oxygen Facility** – LOX Tank A out of service due to leaking flange	• Asset engineer is working with O&M for the condition assessment of the Tank.
• **WSSPS** – Wet well drain gate (draining to Coast Trunk) actuator difficult to operate • Flooding of the pump dry well causing WSSPS pump motor damage	• P2-122 bulkheaded and plugged the drain line to avoid the accident draining the flow from the non-reclaimable side to the reclaimable side. • Maintenance replaced the sump pump at the dry well to prevent the flooding. X-007 will replace the pumps with dry pit submersible type.
• **DAFT –** Seismic issues	• X-107 Geotechnical improvements to DAFTs A-C, DAFT D and DAFT A-C Gallery, and structural improvements to DAFT D.
• **AS Plant Replacement**	• X-114 will replace the AS Plant. A planning study will study the replacement options and make recommendations.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FR2-0018	Plant No. 2 AS Plant Clarifiers Rehabilitation - Phase 2	Secondary clarifiers	• Replace Clarifiers A, B, E, G, H, and L moving mechanism.															
AI-322	AS Plant Blower Replacement	Secondary Clarifiers	• Replace both blowers, modify the piping and support skids.															
P2-122	P2-122 - Headworks Modifications at Plant No. 2 for GWRS Final Expansion	AS plant, WSSPS	• Separate the reclaimable and non-reclaimable streams. AS Plant will treat non-reclaimable flow. WSSPS discharge piping to be directed to PEPS.															
P2-123	Return-Activated Sludge Piping Replacement at Plant No. 2	RSS PSs and secondary clarifiers	• Replace RAS piping, area lights and fix the concrete cracks and spalling on east aeration basin decks.															
FE19-08	Plant No. 1, Plant No. 2, Collections VFD Drives Replacement	PEPS, RSS pump stations	• Replace PEPS, RAS and WAS VFDs.															
P2-136	Activated Sludge Aeration Basin Rehabilitation at Plant No. 2	AS Plant aeration basins	• Rehabilitate the AS process.															
X-52	Activated Sludge RAS/WAS/PEPS/Vaporizers Rehabilitation at Plant No. 2	AS Plant	• Rehabilitate the RAS/WAS/PEPS/LOX vaporizers.															
FR2-0023	Activated Sludge Clarifier Entry Improvements at Plant No. 2	Secondary clarifiers	• Add safe entry access platform to each secondary clarifier.															
X-007	Waste Sidestream Pump Station A Upgrade at Plant No. 2	WSSPS A	• Replace the WSSPS pumps with dry pit submersible type.															
X-107	Seismic Improvements to Dissolved Air Flotation Thickeners Area at Plant No. 2	DAFTs	• Geotechnical improvements to DAFTs A-C, DAFT D and DAFT A-C Gallery, and structural improvements to DAFT D.															
PS-XXX	Activated Sludge Facility Replacement Planning Study at Plant No. 2	AS Plant	• Planning study to plan for AS Plant replacement.															
X-114	Activated Sludge Facility Replacement at Plant No. 2	AS Plant	• Replace the entire AS Plant facility.															

Types of Project Legend:

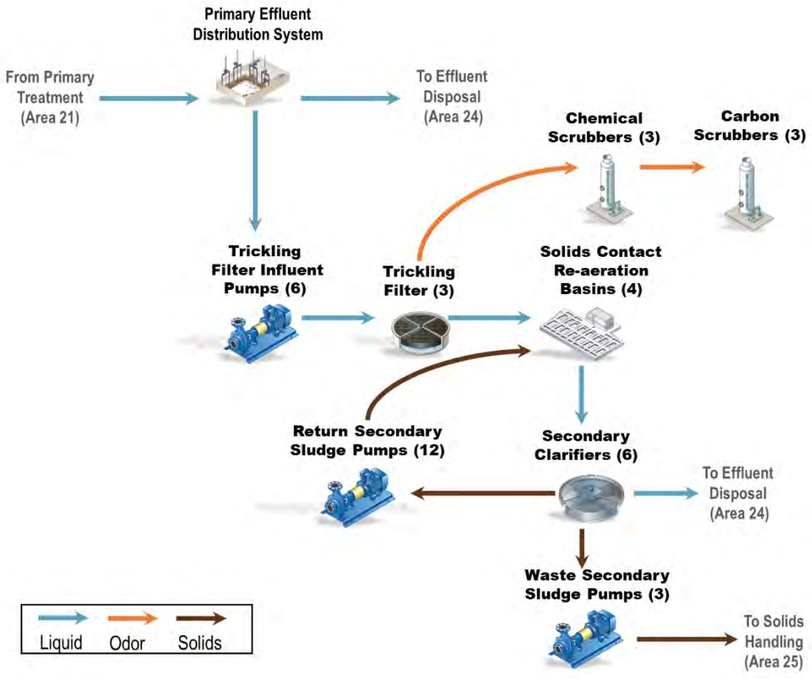
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

AS = Activated Sludge; CIP = Capital Improvement Program; DAFT = Dissolved Air Flotation Thickener; FY= Fiscal Year; GWRS = Groundwater Replenishment System; LOX = Liquid Oxygen; OSHA = Occupational Safety and Health Administration; PEPS = Primary Effluent Pump Station; RAS = Return Activated Sludge; RSS = Return Secondary Sludge; VFD = Variable Frequency Drive; WAS = Waste-activated Sludge; WSSPS=Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 - PLANT NO. 2 SECONDARY TREATMENT – TRICKLING FILTERS AND SOLIDS CONTACT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	TFPS & Elec Room	Trickling Filters A-C	Solids Contact & ML Channel	Blower/ WSS PS Building	Secondary Clarifiers A-F	RSS PS A	RSS PS B	RSS PS C & Elec. Room	DCJ	Odor Control Facility	Chemical Facility
Civil											
Effluent Piping	2	2	2	2	2	2	2	2	-	2	2
Structural											
Building	1	-	-	1	-	1	1	1	-	-	
Structure	1	1	1	-	1	-	-	-	-	2	2
Mechanical											
Pump	2	-	-	2	2	2	2	2	-	2	3
TF Rotary Distributor	-	4	-	-	-	-	-		-	-	-
TF Media	-	3	-	-	-	-	-	-		-	-
Clarifier Sludge Collector	-	-	-	-	3	-	-	-	-	-	-
Blower & Fan	-	2	-	2	-	-	-	-	-	2	-
Control Gate	-	3	3	3	3	-	-	-	-	-	-
Piping and Valve	2	2	2	2	2	2	2	2	-	2	2
Diffusor	-	-	2	-	-	-	-	-	-	-	-
HVAC & Ventilation	2	-	-	2	-	2	2	2	2	-	-
Crane	2	-	-	2	-	2	2	2	-	-	-
Electrical											
MCC & VFD	3	3	-	3	3	-	-	3	3	3	3
Instrumentation											
PLCs & Flow Meters	3	3	-	3	3	3	3	3	3	3	3

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning;
DCJ = Distribution Center J;
Elec. = Electrical;
RUL = Remaining Useful Life;
RSS = Return Secondary Sludge;
MCC = Motor Control Center;
ML = Mixed Liquor;
PLC = Programmable Logic Controller;
PS = Pump Station;
TF = Trickling Filter;
TFPS = Trickling Filter Pump Station;
VFD = Variable Frequency Drive;
WSS = Waste Secondary Sludge

Major Assets

Major Assets	Quantities
Trickling Filter Pump Station	
Building	1
Pumps	6
Trickling Filters A-C	
Basins	3
Rotary Distributor	3
Recirculation Fans	6

Major Assets	Quantities
Solids Contact & ML Channel	
Structures	4 SCRs, 4 SRRs, 2 MLs
Control gates	multiple
Diffusors	multiple
Blower/WSS PS Building	
Building	1
SR Blowers	3
SC Blowers	3
WSS Pumps	3

Major Assets	Quantities
Secondary Clarifiers A-F	
SC Basins	6
Sludge Collector	6
Scum pumps	6
RSS PS A	
Buildings	1
RSS Pumps	4

Major Assets	Quantities
RSS PS B	
Buildings	1
RSS Pumps	4
RSS PS C & Electrical Room	
Buildings	1
RSS Pumps	4
Distribution Center J	
Building	1

Major Assets	Quantities
Odor Control Facility	
Foul Air Fans	3
Chemical scrubbers	3
Carbon Units	3
Chemical System	
Bleach Storage Tanks	2
Caustic Storage Tank	1
Bleach Pumps	7
Caustic Pumps	6

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 - PLANT NO. 2 SECONDARY TREATMENT – TRICKLING FILTERS AND SOLIDS CONTACT

Key Issues

Key Issues	Actions and Recommendations
• **TFPS –** No backup power to TFPS; pump failure could result in primary effluent to ocean outfall and potential contaminating the future GWRS intake flow at P2	• J-117B will provide a plantwide load shedding system to power critical DC-J load from Cen Gen. AI-230 implemented a change to allow the remote resetting and restarting of TFPS pumps from SCADA instead of locally at VFD.
• **TFs –**TF-A distribution arm gears broke again after last year's repair. TF-A and TF-C center column seals leaking	• PRN-00643 (AI-155) Maintenance and asset engineer are working on a series of repairs to bring TF-A back to service. The TF-A and TF-C seals were replaced with Ovivo's newer designed seals in September 2020. TF-A orifices were adjusted and tested to run TF-A hydraulically in October 2020. Ovivo provided a quotation for improved design of the gear and bearing for the distribution arm. P.O.s of parts had arrived in August 2021, and the installation is scheduled this year.
• **Secondary Clarifiers –**Scum pump cannot clear the scum pit	• AI-259 TFSC Scum Pump Issue. Asset engineer will facilitate an investigation of the problem.
• **Snail control –** Signs of snail shell accumulation at process area and excessive wearing on RSS and WSS pipes	• Changed from 25% caustic injection to 50%. • PS18-10 did the evaluation and recommended to change the injection the original design of flooding. Will do flooding test after TF-A is back to service.
• **Site piping –** Deficiency of cathodic protection on some underground piping	• Condition assessment and survey done and the team is developing solutions which may include replacing the existing cathodic protection system.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
PRN-00643	P2 TF-A Rotary Distributor Damage Evaluation and Repair	TF-A	• Repair TF-A distribution arm and adjusting the orifices to run it with hydraulic power while waiting for parts and installation.															
J-117B	Outfall Low Flow Pump Station	DCJ, TFPS	• New PWPS to draw flow from TFSC secondary effluent • Provide a plantwide load shedding system to power critical DC-J load from Cen Gen.															
P2-122	Headworks Modifications at Plant No. 2 for GWRS Final Expansion	TFSC	• TFSC to treat the reclaimable stream.															
J-36-2	GWRS Final Expansion Coordination	TFSC	• New diversion structure and weir box to divert the TFSC effluent to OCWD equalization tanks and pump station at P2.															
X-031	Plant No. 2 TFSC Rehabilitation	TFSC facility	• Overall rehabilitation of TFSC. Replace the TF media.															

Types of Project Legend:

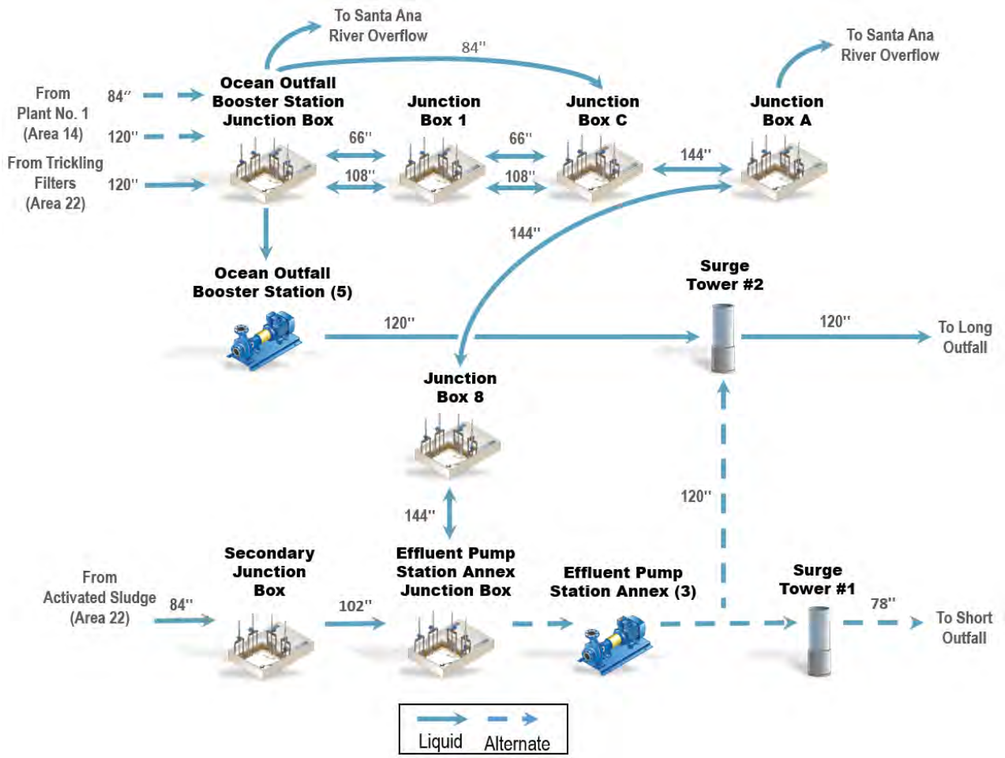
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; DCJ = Distribution Center J; FY = Fiscal Year; GWRS =Groundwater Replenishment System; OCWD = Orange County Water District; PWPS = Plant Water Pump Station; RSS = Return Secondary Sludge; SC = Secondary Clarifier; SCADA = Supervisory Control and Data Acquisition; TF = Trickling Filter; TFPS = Trickling Filter Pump Station; TFSC = Trickling Filter Secondary Clarifier

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 24 – PLANT NO. 2 EFFLUENT DISPOSAL

Process Schematic



Major Assets Remaining Useful Life

Asset Type	OOBS	Junction Boxes				EPSA	Disinfection System	Land Outfalls				120" Ocean Outfall	78" Ocean Outfall
		JB-1	JB-C	JB-A	JB-8			Surge Tower #1	Surge Tower #2	Sample Building	Beach Box		
Civil													
Effluent Piping	1	2	2	2	2	2	-	1	2	1	2	-	-
Structural													
Structures, Buildings	4	2	2	4	2	2	2	1	2	1	2	1	1
Mechanical													
Pumps, Fans	5	-	-	-	-	2	4	-	-	-	-	-	-
Gates	5	3	3	3	3	3	-	-	-	-	-	5	-
Valves	2	-	-	-	-	3	-	3	3	-	-	-	-
Pipes	2	2	2	2	2	2	3	1	2	1	1	-	-
Tank	-	-	-	-	-	-	5	-	-	-	-	-	-
Manhole Covers	-	-	-	-	-	-	-	-	-	-	-	TBD	TBD
Monel Parts	-	-	-	-	-	-	-	-	-	-	-	5	TBD
Ballast	-	-	-	-	-	-	-	-	-	-	-	TBD	TBD
Electrical													
Process – Motor, MCC, VFD	5	-	-	-	-	3	4	2	3	2	-	-	-
Instrumentation													
PLC, Flow Meters	5	-	-	-	-	3	4	2	5	2	-	-	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

EPSA = Effluent Pump Station Annex;

JB = Junction Box;

MCC = Motor Control Center;

OOBS = Ocean Outfall Booster Station;

PLC = Programmable Logic Controller;

RUL = Remaining Useful Life;

TBD =To Be Determined;

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
Ocean Outfall Booster Station	
Pump	5
Wingwall Structure	1
Gate	3
Junction Boxes	
Junction Boxes	4
Wingwall Structure	1
Gate	13

Major Assets	Quantities
Effluent Pump Station Annex	
Pump	3
Gate	14
Disinfection Facility	
Sodium Bisulfite Tank	3
Sodium Bisulfite Feed Pump	6
Bleach Tank	6
Bleach Feed Pump	8

Major Assets	Quantities
Land Outfalls	
Surge Tower	2
Valve	2
Sample Building	1
Flowmeters	3
Beach Box	1
120" Ocean Outfall	
Port hole	500
Manhole cover	47

Major Assets	Quantities
78" Ocean Outfall	
Port hole	125
Manhole cover	14

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 24 – PLANT NO. 2 EFFLUENT DISPOSAL

Key Issues

Key Issues	Actions and Recommendations
• **Reliability of Disinfection System–**OC San no longer discharges primary effluent to the ocean, and in 2015, OC San received an approval to stop disinfection for the Long Outfall. The Bleach Station is minimally used to disinfect plant water, but the Sodium Bisulfite Station was inactive since then. Both systems need to be available in case the Short Outfall is used during emergencies or planned maintenance.	• OC San installed a temporary tote system for sodium bisulfite in case of emergency. • OC San will procure and install a temporary tank to replace the tote system and increase the storage capacity. The tank will be in service until P2-135 Sodium Bisulfite Station Rehabilitation completion. • P2-98A will demolish the existing Bleach Station and build a new Bleach Station that primarily serves as an odor control for new primary sedimentation basins. The new station has a provision to disinfect effluent if needed.
• **Ocean Outfall Capacity and Maintainability Strategy-** After J-117B completion, Low Flow Pump Station will be the main mode of operation, and OOBS and EPSA will stay standby. Due to low flow and low probability of high flow events, assets required for high flow will be difficult to exercise and maintain.	• OC San will start a planning study to evaluate future required outfall capacity and develop a comprehensive plan to maintenance outfall assets.
• **Reliability of Long Ocean Outfall–** PS18-09 Ocean Outfall Condition Assessment and Scoping Study is in progress to develop a detailed scope of work for the future X-053 Long Ocean Outfall Rehabilitation. The project identified few critical parts, such as tie rods, that have corroded and need to be repaired in near future.	• Immediately required repairs will be executed as a standalone project before the X-053 • X-053 Long Ocean Outfall Rehabilitation is scheduled to start in 2023
• **Short Ocean Outfall Assessment –** Short outfall was last used in 2012 to support J-112A construction. Inspection was not a part of compliances until new NPDES permit was renewed in 2021. The outfall was built in 1952 and requires a thorough assessment to ensure its availability and reliability.	• OC San will start a planning study for the Short Outfall similar to the PS18-09 Ocean Outfall Condition Assessment and Scoping Study.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
PS18-09	Ocean Outfall Condition Assessment	120" Ocean Outfall	• Determine condition of Ocean Outfall and provide recommendations to extend its useful life.															
J-117B	Outfall Low Flow Pump Station	OOBS & New Low Flow Pump Station	• Rehabilitate the OOBS and construct a new Low Flow Pump Station. • Replace the Plant Water Pump Station.															
P2-135	Sodium Bisulfite Station Rehabilitation	Sodium Bisulfite Station	• Downsize existing sodium bisulfite facility to address new design conditions and rehabilitate to extend the useful life.															
X-053	Long Ocean Outfall Rehabilitation	120" Ocean Outfall	• Rehabilitate Long Ocean Outfall per PS18-09 recommendations.															
PSXX-XX	Short Ocean Outfall Condition Assessment	78" Ocean Outfall	• Determine condition of Short Outfall and provide recommendations to extend its useful life.															
PSXX-XX	Ocean Outfall Capacity and Maintainability Strategy	OOBS, EPSA, and Disinfection Systems	• Evaluate future required outfall capacity and develop a comprehensive plan to maintain outfall assets.															
SC20-02	OOBS Elevator Rehabilitation	OOBS	• Modernize one hydraulic service elevator and bring it up to the latest codes.															
FE19-06	EPSA Motor Cooling Improvement	EPSA	• Modify motor cooling system to provide adequate cooling to the motor at a lower design speed.															
P2-139	Santa Ana River Wingwall Rehabilitation	OOBS & JB-A	• Rehabilitate wingwalls by OOBS and JB-A per PS17-10 final report recommendations.															
N/A	Outfall External Inspection	120" & 78" Ocean Outfalls	• Ocean outfall external inspection every 2.5 years per the NPDES permit and lease agreement with the California State Lands Commission.															
N/A	Outfall Structural Integrity Report	120" & 78" Ocean Outfalls	• Ocean outfall structural integrity report every 5 years per the NPDES Permit.															

Types of Project Legend:

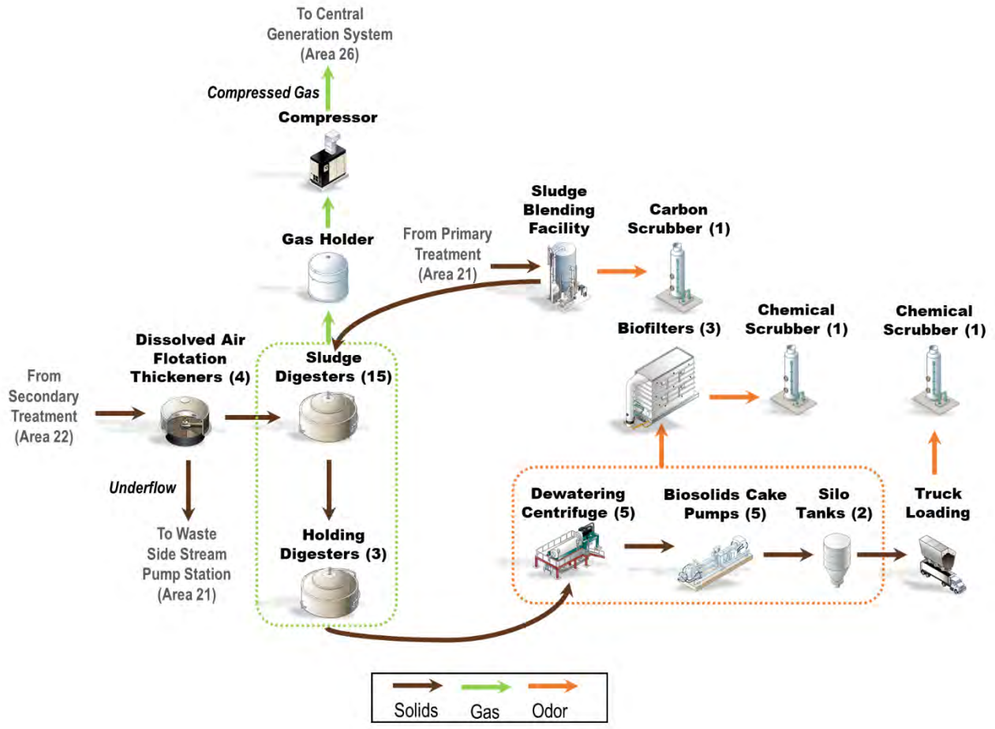
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; EPSA = Effluent Pump Station Annex; FY = Fiscal Year; JB = Junction Box; N/A = Not Applicable; NPDES = National Pollutant Discharge Elimination System; OOBS = Ocean Outfall Booster Station; TO = Task Order; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – DIGESTERS

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Digester C	Digester D	Digester E	Digester F	Digester G	Digester H	Digester I	Digester J	Digester K	Digester L	Digester M	Digester N	Digester O	Digester P	Digester Q	Digester R	Digester S	Digester T	Digester Ferric
Civil																			
Effluent Piping	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
Structural																			
Structure	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	2
Digester Dome	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	-
Mechanical																			
Sludge Mixing Pumps/Jet Mixing	4	4	2	4	4	2	2	2	4	4	4	4	4	2	2	2	2	2	-
Sludge Recirculation and Heating System	4	4	4	4	4	4	2	2	-	4	4	4	4	4	4	4	4	4	-
Hot Water System	4	4	4	4	4	4	2	2	-	4	4	4	4	4	4	4	4	4	-
Sludge Transfer Pump	4			4			2	2	4	4		4		4		4		4	-
Piping & Valve	4	4	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	2
Chemical Pump	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		2
Electrical																			
MCC & VFD	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	2
Instrumentation																			
PLC & Flow Meter	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	2

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Major Assets

Major Assets	Quantities
Anaerobic Digesters (C-T)	
Active Digesters	15
Active/Holding Digesters (I and J)	2
Holding Digesters (K)	1
Sludge Mixing Pumps	15+1+4 (1 each Digester + 1 in Digester K+ 1 backup in each Digester L, M, N, & O)

Major Assets	Quantities
Anaerobic Digesters (C-T) (Continued)	
Jet Mixing Pumps	4 (2 each in Digesters I and J)
Sludge Recirculation Pumps	17
Hot Water Circulation Pumps	17
Heat Exchangers	17
Bottom Sludge Pumps	10

Major Assets	Quantities
Digester Ferric Facility	
Digester Ferric Storage Tanks	2
Ferric Feed Pumps	6

Acronym Key:

MCC = Motor Control Center;

RUL = Remaining Useful Life;

PLC = Programmable Logic Controller;

VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – DIGESTERS

Key Issues

Key Issues	Actions and Recommendations
• **Reliability of Digesters** – Keep the existing digesters in operable condition before the digesters being replaced by new TPAD digesters as planned by the Biosolids Master Plan.	• Condition assessment after digester cleaning and perform urgent repairs found from condition assessment by Maintenance projects. • FE20-02 Digester C, D, F & G Rehabilitation to replace high rate mixing pumps, heat exchangers, sludge recirculation pumps, bottom sludge transfer pumps, and hot water pumps and piping. • P2-137 Digesters Rehabilitation at Plant No. 2 to repair domes, walking bridges, digester walls, handrails, hot water piping and, and replace MCCs. • PRN-00684 P2 Digester Maintenance Projects to replace heat exchangers, sludge recirculation pumps and bottom sludge transfer pumps.
• **Digester Replacement** – Building new digester complex as recommended by Biosolids Master Plan to replace the aging digesters.	• Series of projects identified by Biosolids Master Plan and 2017 Facility Master Plan to replace the digesters with TPAD facility and improve the site, including, P2-128 TPAD Digester Facility; P2-129 - Digester P, Q, R, and S Replacement; XP2-131 - Digester I, J, and K Replacement; XP2-130 - Food Waste Receiving Facility; XP2-132 - Digester Demolition.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY35/36
FR2-0022	Digester O Structural Repairs	Dig. O	• Repair corroded penetration pipes, walkway, pipe supports and concrete spalling.															
FR2-0025	Digester O-T and Q-R Bridge Repair	Dig. O, T, Q, R	• Repair walking bridges between Dig. O-T and Q-R that have structural deficiencies.															
FE19-10	Digesters C, D, F, G, and I Gas Balance Lines Replacement	Dig. C, D, F, G, I	• Replaces digester gas balance lines from PVC to Stainless Steel (C to D, D to I, and F to G).															
PRN-00684	P2 Digester Maintenance Projects	Dig. E, H, L, M, N, O, P, Q, R, S, T	• Replace major mechanical equipment including heat exchangers, sludge recirculation and transfer pumps.															
FE20-02	Digester C, D, F, and G Rehabilitation	Dig. C, D, F, G	• Replace major mechanical equipment including high rate mixing pumps, heat exchangers, sludge recirculation, and transfer pumps, hot water pumps and piping.															
P2-137	Digesters Rehabilitation at Plant No. 2	Dig. C, D, F, G, H, L, M, N, O, P, Q, R, S, T	• Digester domes, walls, large pipe penetration, hot water piping, handrails, walking bridges and MCC rehabilitation.															
P2-124	Interim Food Waste Receiving Facility	All Digesters, gas treatment facilities and Central Generation	• Receive 150 wet ton per day of source separated and processed organic food waste to digesters for Co-digestion.	**Design completed. Construction is pending on food waste contract.**														
P2-128	TPAD Digester Facility	New TPAD Digester Facility	• Build six new thermophilic digesters, batching and cooling facilities and use the existing digesters as the mesophilic phase to treat the sludge by TPAD process.															
P2-129	Digester P, Q, R, and S Replacement	Digester P, Q, R, S	• Replace digester P, Q, R, S as the new mesophilic digesters.															
XP2-130	Food Waste Receiving Facility	All Digesters, gas treatment facilities and Central Generation	• 500 wet tons of preprocessed food waste receiving facility.															
XP2-131	Digester I, J, and K Replacement	All digesters	• Final three new digesters in addition to the new digesters.															
XP2-132	Digester Demolition	All digesters	• Demolish exiting digesters after 13 total new digesters built.															

Types of Project Legend:

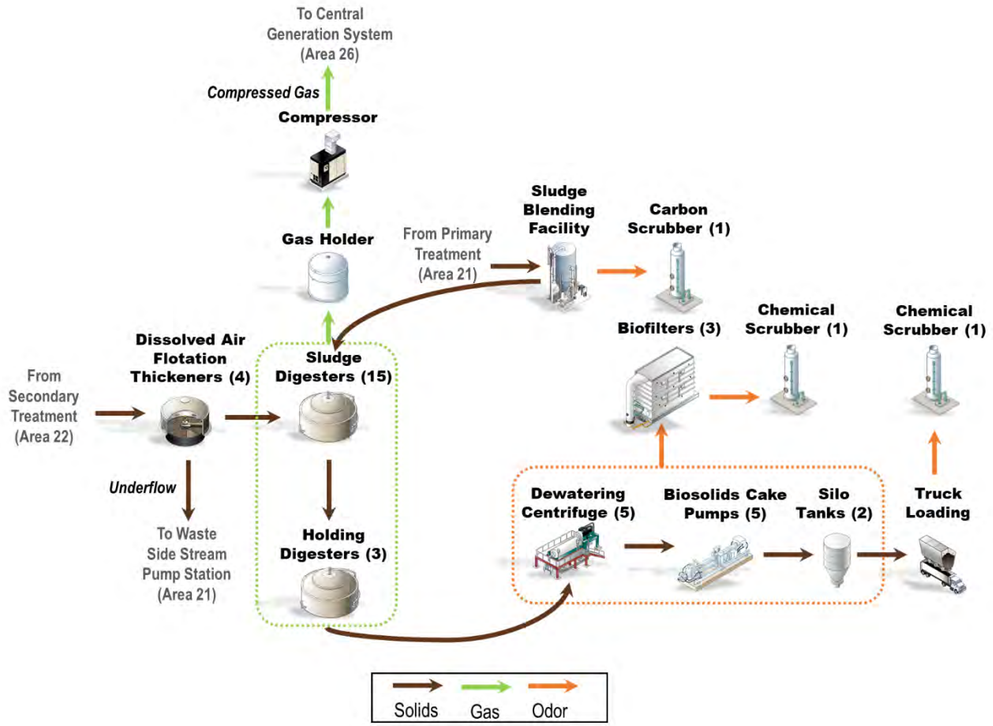
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; MCC = Motor Control Center; N/A = Not Applicable;
TPAD = Temperature Phased Anaerobic Digestion

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – FACILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Sludge Blending Facility	Plant Boiler	Centrifuge Dewatering	Centrifuge Bldg. & Silos Odor Control	Truck Loading Bay Odor Control	Truck Loading	Gas handling	Gas Holder
Civil								
Effluent Piping	2	-	-	-	-	-	-	-
Structural								
Structure	2	-	1	1	1	1	-	3
Building	1	3	1	-	-	-	3	-
Mechanical								
Pump	3	-	1	1	1	-	-	-
Fan	-	-	-	1	2	-	-	-
Boiler & Heat Exchanger	-	4	-	-	-	-	-	-
Centrifuge	-	-	1	-	-	-	-	-
Polymer System	-	-	1	-	-	-	-	-
Biofilter	-	-	-	1	-	-	-	-
Chemical System	-	-	-	1	3	-	-	-
Gas Compressor	-	-	-	-	-	-	5	-
Gas Dryer	-	-	-	-	-	-	3	-
Gas Flare	-	-	-	-	-	-	4	-
Screw Conveyor	-	-	-	-	-	2	-	-
Sliding Frame	-	-	-	-	-	4	-	-
Piping & Valve	3	3	1	1	1	2	3	3
Scale	-	-	-	-	-	4	-	-
Electrical								
MCC & VFD	2	2	2	2	2	3	4	-
Instrumentation								
PLC & Flow Meter	2	2	2	2	2	3	3	-

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

MCC = Motor Control Center;

PLC = Programmable Logic Controller;

RUL = Remaining Useful Life;

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
Sludge Blending Facility	
Sludge Blending Tanks	2
Digester Feed Pumps	6
Electrical Building	1
Plant Boiler Facility	
Building	1
Boilers and Heat Exchangers	2

Major Assets	Quantities
Dewatering	
Centrifuges	5
Sludge Feed Pumps	5
Cake Transfer Pumps	5
Polymer System	1

Major Assets	Quantities
Centrifuge Building & Silos Odor Control	
Biofilters	3
Ammonia Scrubber	1
Gas Handling	
Gas Compressors	3
Gas Dryer	1

Major Assets	Quantities
Gas Flares	3
Gas Holder	
Gas Holder Tank	1
Truck Loading	
Cake Storage Silos	2
Sliding Frames	2
Screw Conveyors	12

Major Assets	Quantities
Truck Loading Bay Odor Control	
2-stage Chemical Scrubbers	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – FACILITIES

Key Issues

Key Issues	Actions and Recommendations
• **Boilers and Heat Exchangers –** Boiler tube leaking; no steam bypass outlet during boilers PM and AQMD required testing; boiler corrosion issues	• FR2-0021 – P2 Boiler Re-tubing to be completed. • FE18-15 – Plant Boiler System Relief at Plant No. 2. • P2-128 decided to add the third boiler to cover exiting boiler capacity. Existing boiler facility demolition will be added to XP2-132 P2 Digester Demolition.
• **Gas Handling System –** Gas compressor system end of useful like and needs replacement	• J-124 – Digester Gas Facilities rehabilitation. • Gas compressors repair and overhaul by Maintenance.
• **Truck Loading –** Aged hydraulic power units • Corroded sliding frame hydraulic cylinders • Truck loading bay fugitive odors escaping • Aged and corroded scales	• Maintenance purchase order to refurbish the HPUs. Silo B-side completed. Silo A-side is under repair. • PRN-00619 P2 Truck Loading Sliding Frame Hydraulic Cylinders Replacement. • PS20-03 Truck Loading Bay Odor Control Improvement Study at Plant No. 2 to develop improvements needed. • Maintenance repairs. PS20-03 will evaluate if scale modification needed. If no modification, will plan direct replacement. • X-032 Truck Loading Rehabilitation. Plan to add the improvements recommended by PS20-03.
• **Truck Loading Odor Control** – Corroded bleach pumps	• PRN-00794 - P2 Truck Loading Bay Odor Control Scrubber Bleach Pump Replacement by Maintenance. First pump installed. Will replace the remaining three after the performance proved.
• **Centrifuge –** Centrifuge #2 flight damage	• PRN-00570 – Centrifuge #2 repair and spare rotating assembly purchase. Centrifuge #2 rotating assembly is replaced with the new one, and the damaged rotating assembly is in the manufacture's shop for refurbishment and will be used as spare one.
• **Sludge Blending Facility –** To be replaced by new sludge blending facility by P2-128	• SBF to be demolished after P2-128 completion. SBF demolition will be added to XP2-132 P2 Digester Demolition.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE18-15	Plant Boiler System Relief at Plant No. 2	Boiler system	• Add steam bypass to release the steam to the atmosphere at boiler bldg. room level.															
FR2-0021	2 Boiler Re-tubing	Boiler system	• Re-tube both boilers.															
N/A	HPU Overhaul	Truck Loading Station	• Overhaul the hydraulic power units and replace the hydraulic hose.															
PS20-03	PS20-03 Truck Loading Bay Odor Control Improvement Study at Plant No. 2	Truck Loading Station	• Plan CIP project to modify existing facility to better capture odor.															
PRN-00619	Truck Loading Sliding Frame Hydraulic Cylinders Replacement	Truck Loading Station	• Replace all the four cylinders driving the sliding frames at both silos.															
PRN-00794	P2 Truck Loading Bay Odor Control Scrubber Bleach Pump Replacement	Truck Loading Bay Odor Control	• Replace all four bleach pumps with newer and simpler model pumps.															
N/A	Gas Compressor Overhaul by Maintenance	Gas compressor facility	• Overhaul all gas compressors.															
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, flares, and holder system	• Replace the entire gas handling system including the gas compressor building.															
X-032	Truck Loading Rehabilitation	Truck Loading Station	• Overall rehabilitation of the truck loading station, and plan to add the modification recommended by PS20-03															

Types of Project Legend:

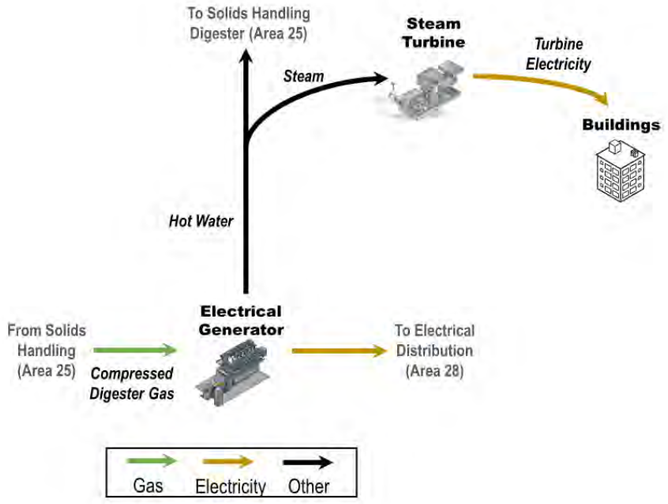
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

AQMD = Air Quality Management District; CIP = Capital Improvement Program; FY = Fiscal Year; HPU = Hydraulic Power Unit; N/A = Not Applicable; NTP= Notice to Proceed; PM = Preventative Maintenance; SBF = Sludge Blending Facility

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 26 – PLANT NO. 2 CENTRAL GENERATION

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Engine Generator #1	Engine Generator #2	Engine Generator #3	Engine Generator #4	Engine Generator #5	Steam Turbine Generator	Steam Condenser	Deaerator Vessel	Heat Recovery Boiler #1	Heat Recovery Boiler #2	Heat Recovery Boiler #3	Heat Recovery Boiler #4	Heat Recovery Boiler #5	OXI Catalyst	SCR Catalyst	Urea Injection System	Starting Air Compressor #1	Starting Air Compressor #2	Starting Air Compressor #3	Inst. Air Compressor #1	Inst. Air Compressor #2	Battery Backup	Plant Water Piping	Miscellaneous
Structural																								
Building	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																								
General	5	5	5	5	5	1	1	3	3	3	3	3	3	4	4	3	3	3	3	5	5	-	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	4	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																								
General	4	4	4	4	4	3	-	-	-	-	-	-	-	-	-	3	3	3	3	5	5	5	-	-
Switchgear	5	5	5	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Instrumentation																								
General	5	5	5	5	5	4	3	3	4	4	4	4	4	3	3	4	4	4	4	5	5	5	-	-

RUL Legend:

RUL <5 years | RUL 5-10 years | RUL 11-15 years | RUL 16-20 years | RUL >20 years

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning; Inst. = Instrument; OXI = Oxidizer; RUL = Remaining Useful Life; SCR = Selective Catalytic Reduction

Major Assets

Major Assets	Quantities
Engine Generator	
Gas Engine (16 Cylinders)	5
Electrical Generator	5
Engine Lube Oil System	5
Steam Turbine Generator	
Steam Turbine	1
Electrical Generator	1
Steam Condenser	1
Deaerator Vessel	1

Major Assets	Quantities
Heat Recovery System	
Heat Recovery Boiler	5
Building	
Building	1
Piping	Various
Engine Emission Control	
OXI Catalyst	5
SCR Catalyst	5
Urea Injection System	5

Major Assets	Quantities
HVAC	
Ventilation Supply Fans	5
Ventilation Exhaust Fans	6
Air Compressors	
Engine Starting Air	3
Instrument Air	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 26 – PLANT NO. 2 CENTRAL GENERATION

Key Issues

Key Issues	Actions and Recommendations
• **Gas Engine Generator Set Reliability –** Aging components and systems required to operate the five Central Generation Engines are creating reliability issues and need to be addressed	• Overhaul engines (J-135). • Replace obsolete systems (e.g., battery backup, switch gear, ignition system, PLC upgrade, etc.) (J-117B, PRN-00627, PRN-00697, AI-225).
• **Engine Lube Oil System –** Lube Oil Centrifuges instrumentation and controls need to be upgraded	• Install new instrumentation and controls onto the existing two units (PRN-00211).
• **Steam Turbine System Rehabilitation –** Steam Turbine has degraded and needs rehabilitation	• Overhaul the Steam Turbine and Steam Condenser (PRN-00262).
• **Plant Water Piping –** Plant water (i.e., Cooling Water) piping has degraded and needs replacement	• Replace all plant water piping in the basement of Central Generation (FE20-04).
• **Emission Control System –** Housings on the Oxidizer Catalysts are failing prematurely	• Analyze and design new Catalyst Housings (PRN-00427).
• **Instrument Air Compressors –** Air Compressors are no longer operational	• Replace the entire Instrument Air System, installing new compressors and appurtenances (PRN-00536).

Current and Future Projects

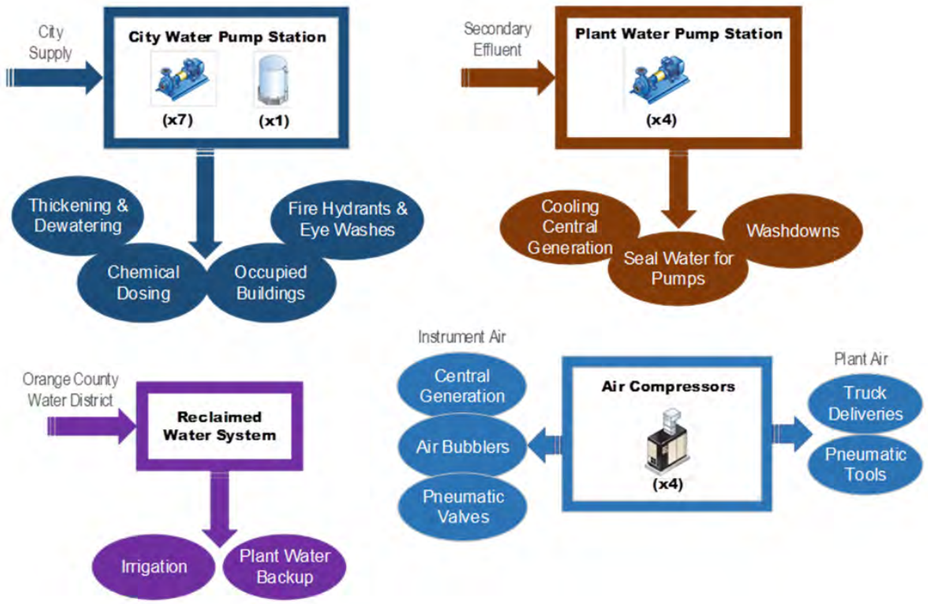
Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
J-117B	Outfall Low Flow Pump Station	Battery Backup, Switch Gear	Replace legacy Battery Backup and Switch Gear equipment.															
PRN-00536	Instrument Air Compressor Replacement	Instrument Air Compressor System, Urea Injection System	Install two new (like for like) Instrument Air Compressors.															
PRN-00394	Steam Turbine Surface Condenser	Steam Turbine Generator	Rehabilitation of the Steam Turbine Surface Condenser.															
PRN-00211	Engine Lube Oil System Controls Upgrade	Engine Generator	Install new instrumentation and controls onto the existing units.															
PRN-00427	Engine Emission Control Redesign	OXI/SCR Catalyst	Analyze and design new Catalyst Housings.															
J-135	Engine Overhauls	Engine Generator	Overhaul the engines as needed.															
PRN-00314	Ventilation Supply Fan Rehabilitation	HVAC	Replace one fan and rehabilitation the fan support structures.															
FE20-04	Plant Water Pipe Rehabilitation	Plant Water Piping	Replace existing plant water piping with new.															
PRN-00627	Engine Ignition Timing Sensor Obsolescence Repair	Engine Generator	Replace and install new Hall Effect Sensors onto each engine.															
PRN-00697	Engine Cylinder Pressure Sensing and Diagnostics	Engine Generator	Install Pressure Sensors onto each Cylinder, incl. Software/HMI.															
AI-225	Engine Ignition System Obsolescence Repair	Engine Generator	Replace and install new engine Ignition Control Systems onto each engine.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; FY = Fiscal Year; HMI = Human Machine Interface; HVAC = Heating, Ventilation, and Air Conditioning; OXI =Oxidizer; RUL = Remaining Useful Life; PLC = Programmable Logic Controller; SCR = Selective Catalytic Reduction

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	City Water System	Plant Water System	Reclaimed Water Piping	Plant Air Systems
Civil				
Pipes	2	3	2	3
Structural				
Pump Station	3	3	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	3
Ventilation System	2	2	-	-
Electrical				
MCC	2	2	-	-
VFD	3	3	-	-
Instrumentation				
PLC, Flowmeter	2	2	-	2

Asset RUL Legend:

- RUL <5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL >20 years

Acronym Key:

MCC = Motor Control Center;

RUL = Remaining Useful Life;

PLC = Programmable Logic Controller;

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
City Water	
Pumps	7
Tanks	4
Piping	8.9 Miles

Major Assets	Quantities
Plant Water	
Pumps	4
Strainers	4
Piping	10.6 Miles

Major Assets	Quantities
Reclaimed Water	
Piping	6 Miles

Major Assets	Quantities
Plant Air	
Compressors	3
Plant Air Piping	6.7 Miles
Instrument Air Piping	1.6 Miles

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Key Issues

Key Issues	Actions and Recommendations
• Plant/Instrument Air Lines have possible corrosion issues and leaks	• Using on-call contractors to perform a condition assessment of the plant air system and identify any leaks or other deficiencies such as improper connections. Current plan is to use the information from the assessment to create larger CIP projects that can improve the piping network throughout the plant. Smaller repairs will be done using on-call contractors and maintenance/asset issues projects.
• Plant Water Piping is corroding and some failures have occurred	• Due to the corrosive nature of the plant water, the current ductile iron pipes are corroding prematurely and causing failures throughout the plant. FE18-14 will address aging plant water piping in the tunnels and PRN-00740 will replace a small portion of plant water piping with HDPE. Overall goal for these and future projects is to replace ductile iron pipes with either Fiberglass Reinforced or HDPE piping material.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27	FY27/28	FY28/29	FY29/30	FY30/31	FY31/32	FY32/33	FY33/34	FY34/35	FY35/36
FE18-14	Plant Water Pipeline Rehabilitation	Piping in tunnels	• Replace 1600 feet of piping in the tunnels.															
J-117B	Outfall Low Flow Pump Station	Plant Water Pump Station	• Replace Plant Water Pump Station and plant water piping near project.															
P2-133	B- and C-Side Primary Clarifiers Rehabilitation	Primary Clarifiers	• Replace City water piping near project.															
P2-98A	Primary Treatment Rehabilitation	City Water Pump Station	• Refeed City Water Pump Station directly from DC-F 480 switchgear.															
X-036	Plant No. 2 City Water Pump Station	City Water Pump Station	• Rehabilitation of City Water Pump Station.															
X-037	Plant No. 2 Plant Water Pump Station Demolition	Plant Water Pump Station	• Demo Plant Water Pump Station as a new Plant Water Station will be built by J-117B.															
AI-36	Air, Reclaimed, & Plant Water Valve Replacements	Cen Gen & Grit Handling Building	• Several failed valves in the area need to be replaced.															
PRN-00740	6 in DIP Plant Water Pipe Replacement	Primary Sedimentation Basin	• Replacing 100 feet of DIP near PSB-P & Q by Maintenance Project.															

Types of Project Legend:

CIP - Planning | **CIP - Design** | **CIP - Construction** | **Maintenance Project**

Acronym Key:

Cen Gen = Central Generation Facility; CIP = Capital Improvement Program; DIP = Ductile Iron Pipe; DC-F = Distribution Center F; FY = Fiscal Year; HP = Horsepower; PSB = Primary Sedimentation Basin

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Remaining Useful Life of Utility Infrastructure

RUL Legend:

RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Remaining Useful Life of Utility Infrastructure

RUL Legend:

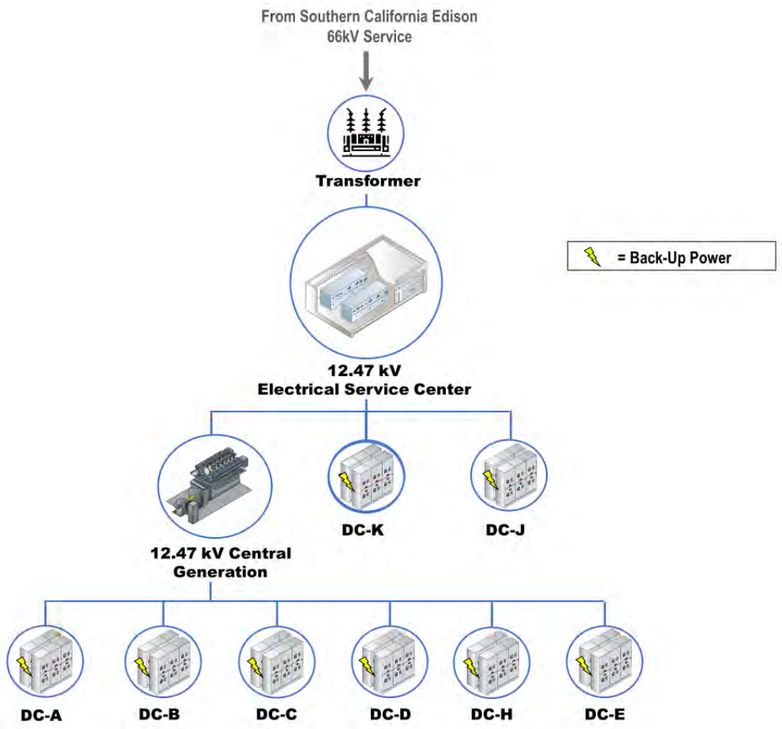
RUL <5 years | **RUL 5-10 years** | **RUL 11-15 years** | **RUL 16-20 years** | **RUL >20 years**

Acronym Key:

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Process Schematic



Major Assets

Major Assets	Quantities
Transformers	58
Standby Generators	9
12kV Switchgears	27
480V Switchgears	32
125VDC and 24VDC Battery Systems	38
UPS	27

Acronym Key:
Cen Gen = Central Generation Facility;
DC = Distribution Center;
EPSA = Effluent Pump Station Annex
kV = Kilovolt;
PB = Power Building;
SPF = Standby Power Facility
RUL = Remaining Useful Life;
VDC = Volts of Direct Current;
UPS = Uninterruptible Power Supply
V = Volts

Major Assets Remaining Useful Life

Asset Type	Service Center	Cen Gen	DC-A	DC-B	DC-C	DC-D	DC-E (EPSA)	EPSA SPF	DC-H (Headworks)	Headworks Standby Building	DC-J	DC-K	PB-A	PB-B	PB-C	PB-D
Tier I – 12.47KV Primary Distribution Level																
Transformers: 12.47/2.4kV	-	-	-		4	-	-	-	-	-	-	-	-	-	-	
Transformers: 12.47/0.48kV	3	4	3	3	4	3	3	-	2	-	2	1	4	4	4	4
12.47kV Switchgears	3	5	3	3	4	4	4	3	2	2	2	1	-	-	-	-
12.47 kV Load Interrupter Switches	-	-	-	3	-	-	-	-	-	-	-	1	4	4	4	4
12.47kV Feeders	4	4	1	1	4	4	4	3	2	2	2	1	1	1	4	4
12.47kV Generators	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-	-
Tier II – 4.16kV Distribution Level																
4.16kV Feeders	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Tier III – 2.4kV Distribution Level																
2.4kV Feeders	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Tier IV – 480V Distribution Level																
480V Switchgears	-	4	3	3	4	4	-	-	2	-	2	1	4	4	4	4
Transfer Switches	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4
Generators	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Tier V – UPS																
UPSs Individual	-	5	-	-	5	4	-	-	4	-	-	4	-	4	-	-
UPSs Regional	-	-	-	1	-	-	1	-	-	-	4	-	-	-	-	-
Tier VI – 125 VDC and 24 VDC Battery Systems																
125VDC Chargers	4	5	5	5	-	-	-	4	4	4	4	2	4	4	-	-
125VDC Batteries	4	5	5	5	-	-	-	4	4	4	4	2	4	4	-	-
24VDC Chargers	-	5	-	-	-	-	-	4	-	4	-	-	-	-	4	4
24VDC Batteries	-	5	-	-	-	-	-	4	-	4	-	-	-	-	4	4
Generator Controls																
Generator Controls	-	5	-	-	-	-	-	3		3	-	-	-	-	4	4

RUL Legend:
RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Key Issues

Key Issues	Actions and Recommendations
• Southern California Edison is currently a single 66kV Feeder Service	• P2-126 Project will install new 66kV Switchyard; Additional 66kV Line; Additional Transformer with automatic Load tap changes, new Electrical Service Center.
• Aging Battery Chargers and Batteries	• XPS0061 DC Battery Monitoring and Management Solutions: Study to develop technical solution to monitor existing battery life, develop path forward for replacing aged battery and charger systems.
• Plant No. 2 Cabling: Aging Medium Voltage Cabling Infrastructure	• MP-320 Service Contract in place for testing aging medium voltage cables to perform Condition Assessment and develop plan for PM.
• Plant No. 2 Cabling: 480V (Headworks) failing cables	• FR2-0024 and other Maintenance Projects will address repairs of Plant No. 2 480V (Headworks) failing cables.
• 12kV Cen Gen Switchgear obsolescence	• J-117B Project will replace 12kV Switchgear.

Acronym Key:

DC = Direct Current; kV = Kilovolt; PEPS = Primary Effluent Pump Station;
PM = Preventive Maintenance; V = Volt

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 33/34	FY 34/35	FY 35/36
FR2-0024	P2 Headworks 480V Cable Replacement	Plant No. 2 Power Distribution/Headworks	• Plant No. 2 Headworks 480V Cable Repairs.														
MP-320/S-2019-1107B	On-Call Plant No. 1 and Plant No. 2 Medium Voltage Cable Testing Services	Plant No. 1 and Plant No. 2 Power Distribution and Cabling Infrastructure	• Condition assessment and Testing of Plant No. 1 and Plant No. 2 Medium Voltage Cabling Infrastructure.														
J-117B	Outfall Low Flow PS	Power Distribution	• Project will replace LOFLO/PWPS 480V Switchgear, 12.47kV Switchgears (Main and Generators) at Cen Gen, OOBS/DC-C 12.47kV and 480V Switchgear, replace electromechanical relays with solid state relays for Service Center and Distribution Center B, add new SCADA Points and Load Shedding System.														
FE19-08	Secondary Treatment VFD Replacements at Plant No. 2	Power Distribution	• This project will replace six 125HP Return-Activated Sludge VFD's, four 50HP Waste-activated Sludge VFD's, four 300HP Primary Effluent Pump Station VFD's, and associated cables and conductors at Plant No. 2														
SC19-06	EPSA Standby Power Generator Control Upgrades at Plant No. 2	Plant No. 2 Power Distribution	• This project will upgrade 12.47kV ESPA Generator Switchgear and Generator controls.														
P2-98A	A-Side Primary Basins Replacement at Plant No. 2	Plant No. 2 Primary Basins, Power Distribution System	• This project will demolish existing electrical distribution equipment at Primary Clarifiers D,E,F,G Electrical Buildings, Power Buildings A, B, C, City Water Pump station, Plant Water Strainers, and other facilities. The Project will provide new electrical services to existing power buildings and new Distribution Center F.														
J-124	Digesters Gas Facility Replacement	Plants No. 1 and Plant No. 2 Compressors, Flares, Power Distribution	• This Project will build Digester Gas Compressor Building and associated electrical/control room, New Distribution Center L.														
P2-128	TPAD Digester Facility at Plant No. 2	Plant No. 2 Digesters, Electrical and Mechanical Systems	• This project will include 2-story Electrical Power Building consisting of electrical distribution equipment to support new TPAD Digester Facility. The Project will decommission Power Building C.														
P2-133	Plant No. 2- B/C-Side Basins Rehabilitation	Plant No. 2 Primary Basins, Mechanical and Electrical Systems	• New B- and C-Side Primary Scrubber Complex construction including relocating the electrical feed to new Distribution Center F and demolition of Power Building D.														
X-103	UPS System Upgrades	Plant No. 2 Power Distribution System	• New 150kV-ampere Regional UPS addition at Plant No. 2.														
P2-126	Warehouse, Electrical Substation and 12kV Service Center Replacement at Plant No. 2	Power Distribution	• This Project will add a second 66 kV feed to Plant No. 2, replace Southern California Edison Substation, replace the Electrical Service Center and Warehouse. The Project will also relocate a major power distribution duct bank to clear space for future Operations and Maintenance Building.	Project is ON HOLD													

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvements Program; FY = Fiscal Year; kV = Kilovolt; LOFLO = Low Flow; NFPA = National Fire Protection Association; OOBS = Ocean Outfall Booster Station; SCADA = Supervisory Control and Data Acquisition; TPAD = Temperature-Phased Anaerobic Digester; UPS = Uninterruptible Power Supply; V = Volt; VFD = Variable Frequency Drive

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Collection System Pump Station and Forcemain Asset Management Summaries

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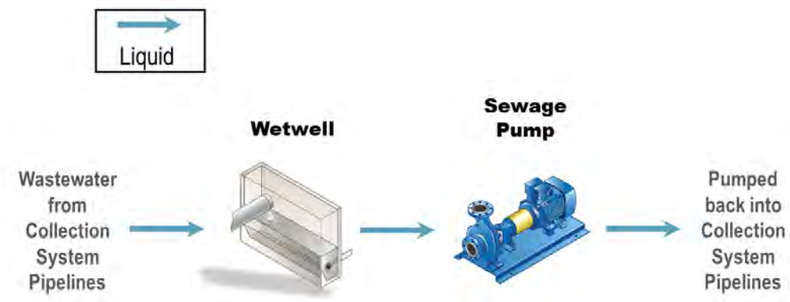
ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Process Schematic



Pump Station	Major Assets – Quantities				
	Wet Wells	Pumps	Force Mains	Valves	Emergency Generators (Y/N)
15th Street	1	3	2	22	N
A Street	1	3	2	19	N
Bay Bridge	1	5	2	17	Y
Bitter Point	1	5	2	23	Y
College	1	3	2	18	N
Crystal Cove	1	2	2	13	Y
Edinger	1	2	1	8	N
Lido	1	3	2	17	N
MacArthur	1	2	1	8	N
Main Street	2	10	3	38	Y
Rocky Point	1	4	2	18	Y
Slater	1	5	2	17	Y
Seal Beach	2	8	2	24	N
Westside	1	4	1	16	Y
Yorba Linda	1	3	1	11	N
Newport Force Mains	--	--	2	--	--
Total	**17**	**62**	**29**	**269**	**-**

Major Assets Remaining Useful Life

Asset Type	15th Street	A Street	Bay Bridge	Bitter Point	College	Crystal Cove	Edinger	Lido	MacArthur	Main Street	Rocky Point	Slater	Seal Beach	Westside	Yorba Linda	Newport Force Mains
Civil - Piping																
Force Mains	3	3	4	2	3	3	4	1	4	4	1	4	3	3	3	1
Structural																
Pump Station	4	4	3	4	1	3	3	3	5	2	4	3	4	2	4	-
Wet Well	4	4	4	1	4	3	3	4	3	4	3	4	4	3	3	-
Mechanical																
Pumps	2	3	5	5	2	4	3	3	4	4	5	5	5	4	4	-
Valves	5	5	5	2	3	5	3	5	4	5	3	5	5	3	5	-
Ventilation System	3	3	4	3	3	3	3	4	4	3	5	3	4	3	2	-
Emergency Generator	-	-	3	5	-	3	-	-	-	2	2	3	-	2	-	-
Electrical																
Motor Control Center	2	2	4	1	1	4	4	3	4	3	2	3	5	2	4	-
Variable Frequency Drive	3	3	5	2	2	-	-	4	3	4	2	3	5	2	-	-
Motors	3	3	4	2	2	3	3	4	3	3	2	3	4	3	3	-
Transformer	2	2	4	1	1	4	2	3	4	2	2	2	4	2	3	-
Instrumentation																
Programmable Logic Controller	1	1	4	2	2	2	1	5	2	2	1	2	3	3	2	-
Flowmeter	3	3	5	2	1	3	4	2	-	4	2	3	4	3	3	-

Asset RUL Legend:

- **RUL < 5 years**
- **RUL 5-10 years**
- **RUL 11-15 years**
- **RUL 16-20 years**
- **RUL > 20 years**

Acronym Key:

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

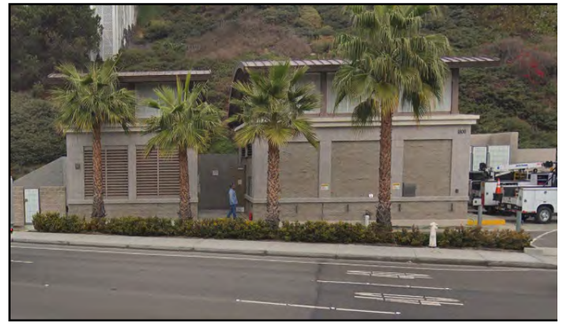
Key Issues	Actions and Recommendations
• **Safety –** Currently, four of OC San's older pump stations do not have atmospheric monitoring (for hydrogen sulfide gases) or standard safety indication lighting. Also, pump station infrastructure is often located in the public right of way making safe access to these facilities an ongoing issue.	• An ongoing planning study (PS18-06) is reviewing and interpreting electrical code and will establish OC San design standards to address this issue. Practicing ongoing safety measures and traffic control when working in the public right of way will continue to be of the utmost importance.
• **Natural Phenomenon –** Edinger pump station is located immediately adjacent to an undersized flood control channel. Crystal Cove pump station is experiencing gradual site settlement. Both natural hazards present a risk to normal operation of the pump stations.	• A capital project (11-33) has been established to replace and relocate Edinger pump station. A planning study (XPS0049) has been established to determine the necessary mitigation measures to remediate site settlement at Crystal Cove pump station.
• **Increased Methane Gas Levels** – Methane gas accumulation has become a safety concern at some pump stations. The amount of gas seems to increase during summer months and presents a unique challenge because of the short response time necessary to address the safety concerns of increased ignition risk.	• OC San crews respond to alarms that indicate increased levels of methane gas. A multi-division task1 force has been established to address this issue. The effort includes in-depth liquid and air sampling, installation of a two-stage unit to treat odorous air pulled from Bitter Pt. pump station, and finally establishing an operation strategy for the force main system.
• **Corrosion** – Corrosion is an ongoing problem in this very harsh environment. In places where the system has been kept from venting and mixing of wastewater is prevalent, such as wet wells, the degree of corrosion has (or will soon) require the replacement/rehabilitation of the assets.	• Visual assessments of known corrosion issues are performed on an ongoing basis. When necessary, cameras are used to evaluate the spreading of corrosion impacts and confined space entry may be performed to gather additional information to determine when the facility needs to be rehabilitated.
• **Groundwater Intrusion** – Groundwater has penetrated four of the newly constructed pump stations in the coastal region of the service area. Groundwater is notoriously corrosive and may compromise the strength of the rebar within the concrete structure walls.	• Execute a planning study (XPS0065) to identify possible mitigation measures.
• **Maintenance Access** – In some cases, such as venting of the Newport Beach force main system, access to critical facilities is limited by safety and public impact concerns. In other cases, such as MacArthur Pump Station force main, access to critical facilities is not possible because redundancy was not considered when the pump station was designed.	• OC San continues to improve planned maintenance processes and inter-agency coordination that allow crews to minimize impacts to the community during necessary maintenance operations. A capital project (7-68) has been established to construct a redundant force main to serve MacArthur Pump Station.
• **Valve Operability and Reliability** – In many aging pump stations, isolation valves, check valves and force main valves are starting to fail or becoming difficult to operate due to age, debris and corrosion. These valves are critical to the operability and reliability of OC San pump stations and will require replacement.	• Multiple valve replacement projects (PRN-00572, PRN-00734, PRN-00790, PRN-00808) have been identified and efforts are being made to prioritize these projects so they can be executed in a timely manner to ensure OC San pump stations can continue to operate reliably.
• **Property Acquisition** – Many of OC San pump stations are located in tight spaces with limited access. This present challenges for crew to perform routine maintenance or execute projects.	• OC San continues to evaluate suitable sites to acquire properties for pump stations that will soon be rehabilitated or replaced, such as Slater and College pump stations.

Acronym Key:

OC San=Orange County Sanitation District

College Pump Station

Main Street Pump Station



Rocky Point Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Current and Future Projects

Project No.	Location	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
5-68	Newport Beach	Newport Beach Pump Station Odor Control Improvements	15th Street, A Street, Bitter Point, Crystal Cove, Lido and Rocky Point Pump Stations	• Installation of venting equipment; phased implementation of chemical use															
FE19-01	Multiple	Portable Generator Connectors at Pump Stations	15th Street, A Street, Bay Bridge, Bitter Point, College, Crystal Cove, Edinger, MacArthur, Main Street, Rocky Point, Seal Beach, Slater and Westside Pump Stations	• Installation of standard portable generator connectors															
PS18-06	Multiple	Go/No-Go Lights and Signage	15th Street, A Street, Baybridge, Bitter Point, College, Crystal Cove, Edinger, Lido, MacArthur, Main Street, Rocky Point, Seal Beach, Slater, Westside and Yorba Linda Pump Stations	• Standardize safety lights and signage															
PRN-00527	Newport Beach	A St. and 15th St. PS Valve Replacement Project	15th Street and A Street Pump Stations	• Replacement of multiple valves at each station															
XPS0065	Newport Beach	Pump Station Groundwater Intrusion Study	15th Street, A Street, Bitter Point and Rocky Point Pump Stations	• Comprehensive study of groundwater management solutions															
XPS0066	Multiple	Force Main Condition Assessment and Bypassing	15th Street, A Street, Baybridge, Bitter Point, College, Crystal Cove, Rocky Point, Slater and Westside Pump Stations	• Comprehensive study of pump station force mains condition and bypassing															
XPS0009	Newport Beach	A Street and 15th Street Pump Station and Force Main Study	15th Street and A Street Pump Stations	• Comprehensive study of pump station condition															
X-022	Newport Beach	15th Street Pump Station and Force Main Project	15th Street Pump Station	• Comprehensive rehabilitation of pump station and force mains															
X-041	Newport Beach	A Street Pump Station and Force Main Project	A Street Pump Station	• Comprehensive rehabilitation of pump station and force mains															
5-67	Newport Beach	Bay Bridge Pump Station Replacement	Bay Bridge Pump Station	• Comprehensive rehabilitation of pump station and force mains															
FRC-0002	Newport Beach	Bay Bridge Pump Station Valve Replacement Project	Bay Bridge Pump Station	• Replacement of pump suction and discharge valves															
FRC-0013	Newport Beach	Bay Bridge Pump Station Forcemain Valve Replacement Project	Bay Bridge Pump Station	• Replacement of force main isolation valves															
PRN-00636	Newport Beach	Generator Radiator Removal and Enclosure Roof Repair at Bitter Point Pump Station	Bitter Point Pump Station	• Replace the generator radiator and repair the standby generator enclosure roof															
XPS0004	Newport Beach	Bitter Point Pump Station Rehabilitation Study	Bitter Point Pump Station	• Comprehensive study of pump station condition															
X-025	Newport Beach	Bitter Point Pump Station Rehabilitation Project	Bitter Point Pump Station	• Comprehensive rehabilitation of pump station															
PS20-07	Costa Mesa	College Pump Station Wet Well Condition Assessment Study	College Pump Station	• Perform detailed condition assessment of the pump station wet well and recommend repair strategy															

Project No.	Location	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
XPS0010	Costa Mesa	College Pump Station Rehabilitation Study	College Pump Station	• Comprehensive study of pump station condition															
X-026	Costa Mesa	College Avenue Force Main Rehabilitation Project	College Pump Station	• Comprehensive rehabilitation of force mains															
X-040	Costa Mesa	College Pump Station Replacement	College Pump Station	• Reconstruction of pump station															
PRN-00724	Newport Beach	Crystal Cove Pump Station - Conduit Wall Penetration Repair	Crystal Cove Pump Station	• Repair pipe penetration and concrete under the pipe															
XPS0049	Newport Beach	Crystal Cove Pump Station Rehabilitation Study	Crystal Cove pump station	• Comprehensive study of pump station condition and capacity															
5-66	Newport Beach	Crystal Cove Pump Station Upgrade and Rehabilitation Project	Crystal Cove Pump Station	• Comprehensive rehabilitation of pump station															
PRN-00808	Newport Beach	Crystal Cove Pump Station Valve Replacement	Crystal Cove Pump Station	• Replacement of multiple valves in the valve pit															
11-33	Huntington Beach	Edinger Pump Station Rehabilitation Project	Edinger Pump Station	• Comprehensive relocation of pump station															
PRN-00790	Newport Beach	Lido Pump Station Valve Replacement	Lido Pump Station	• Replacement of multiple valves and reconfiguration of the wet well return piping															
X-023	Newport Beach	Lido Pump Station Rehabilitation Project	Lido Pump Station	• Comprehensive rehabilitation of pump station															
XPS0017	Newport Beach	Lido Pump Station Rehabilitation Study	Lido Pump Station	• Comprehensive study of pump station condition															
7-63	Newport Beach	MacArthur Pump Station Rehabilitation Project	MacArthur Pump Station	• Comprehensive rehabilitation of pump station															
7-68	Newport Beach	MacArthur Force Main Improvements	MacArthur Pump Station	• Installation of second force main and rehabilitation of existing force main															
7-65	Irvine	Gisler-Redhill Interceptor Rehabilitation	Main Street Pump Station	• Rehabilitation of pump station force mains and replacement of pump suction, discharge and check valves															
XPS0048	Irvine	Main Street Pump Station Rehabilitation Study	Main Street Pump Station	• Comprehensive study of pump station condition															
7-64	Irvine	Main Street Pump Station Rehabilitation Project	Main Street Pump Station	• Comprehensive rehabilitation of pump station															
XPS0005	Newport Beach	Rocky Point Pump Station Rehabilitation Study	Rocky Point Pump Station	• Comprehensive study of pump station condition															
X-024	Newport Beach	Rocky Point Pump Station Rehabilitation Project	Rocky Point Pump Station	• Comprehensive rehabilitation of pump station															
11-34 [a]	Huntington Beach	Slater Pump Station Rehabilitation Project [a]	Slater Pump Station	• Comprehensive rehabilitation of pump station															
MP-207	Huntington Beach	Slater Pump Station Link Seal Repair	Slater Pump Station	• Replace leaking link seal															
PRN-00734	Huntington Beach	Slater Pump Station Valve Replacement	Slater Pump Station	• Replacement of multiple valves															
3-67	Seal Beach	Seal Beach Pump Station Replacement	Seal Beach Pump Station	• Reconstruction of pump station															

Project No.	Location	Project Title	Impacted Facilities	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE19-13	Seal Beach	VFD Replacement at Seal Beach pump Station	Seal Beach Pump Station	• Replacement of VFDs and feeders from the VFDs to the motors															
FRC-0004	Seal Beach	Seal Beach Pump Station Isolation Valve Replacement	Seal Beach Pump Station	• Replacement of multiple pump isolation valves															
3-62	Seal Beach	Westminster Boulevard Force Main Replacement	Seal Beach Pump Station	• Replacement of force mains, force main valves, and addition of bypass piping															
3-68	Los Alamitos	Los Alamitos Sub-trunk Extension	Westside Pump Station	• Demolition of pump station															
2-73	Fullerton	Yorba Linda Pump Station Abandonment Project	Yorba Linda Pump Station	• Abandonment of pump station and force main															
MP-474	Newport Beach	Pacific Coast Highway Force Main Manual Air Release Valve Preventive Maintenance	Newport Force Mains	• Set up regular PM to vent manual air release valves every 6 months															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP=Capital Improvement Project; FY=Fiscal Year; N/A = Not Applicable; PM = Preventive Maintenance;
OC San=Orange County Sanitation District; UPS = Uninterruptable Power Supply; VFD = Variable Frequency Drive

[a] Pending the outcome of potential property negotiations a study may be needed to determine conceptual design of future pump station and the CIP project may be delayed; however, as of this writing Slater PS is scheduled as a rehabilitation project starting in FY21/22.

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Collection System Pipeline Asset Management Summaries

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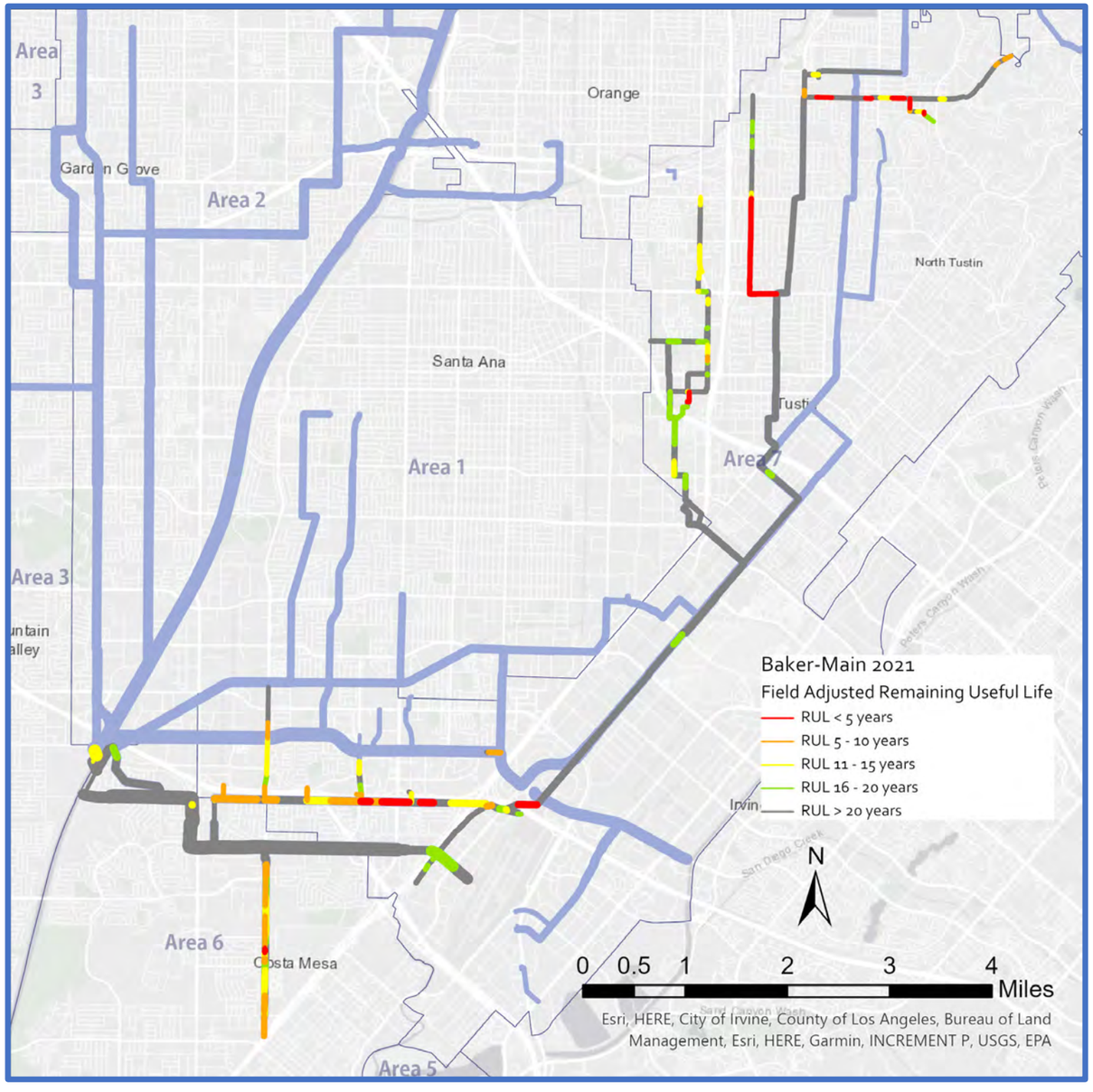
ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	18.8	339	54	28	25
21" - 33" Ø	15.9	246	39	4	17
Reinforced Concrete					
48" - 66" Ø	1.2	16	29	-	-
≥ 72" Ø	3.7	35	27	-	-
Ductile Iron					
42" Ø	0.5	2	30	-	-
Polyvinyl Chloride					
19" - 36" Ø	0.04	2	19	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During peak wet weather flows, capacity issues were identified in a portion of the North Trunk and Tustin Avenue sewers.	• Project 7-69 will upsize a portion of the North Trunk to address existing capacity issues and Project X-084 will upsize a portion of the Tustin Avenue sewer to existing capacity issues.
• **Groundwater Infiltration** – CCTV identified significant areas experience significant groundwater infiltration, primarily concentrated parallel to the I-405 corridor.	• Project 7-65 will address all areas with significant groundwater infiltration by rehabilitating the affected pipeline segments with grout and new interior lining.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. The largest concentration of fractures is concentrated in the Fairview Trunk.	• Project 6-20 will rehabilitate the entire Fairview Trunk to address pipeline fractures. Projects 3-66, 7-65, and X-068 will also address fracturing with rehabilitation work.
• **Root Intrusion** – CCTV identified significant root intrusion in numerous segments of the sewer trunks in Orange and Tustin. Some blockages in OC San sewer mains may have contributed to a local sanitary sewer overflow in 2021.	• A hotspot PM has been created for areas with the worst root intrusion for more frequent cleaning. Additionally, OC San is evaluating the need for a blanket contract for chemical treatment for root control. Project X-068 will address the permanent rehabilitation of pipeline segments damaged by root intrusion.
• **Point Repairs** – There are isolated pipe segments with structural and operational defects that are not part of a current project. Most isolated areas are north of the Project 7-65 work area and an additional spot in between the FE18-08 and X-084 project areas.	• OC San staff will evaluate the extent of the necessary repairs in these locations and recommend blanket contract work orders or small projects to address the most significant defects. It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in sewers upstream of the Santa Ana River siphon.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.
• **Manhole Access** – OC San staff has identified specific locations where manholes are difficult to access for maintenance. Current issues exist with manholes in some OC San easement areas and along the Santa Ana River.	• OC San staff will track and prioritize access issues to address key concerns. High priority access improvements will be recommended as a small project or addition to an existing project.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE18-08	West Trunk Bypass Sewer Realignment	• Realignment of sewer facilities in the City of Santa Ana															
3-66	Interstate 405 Widening Impact on OC San Sewers	• OC San staff support for the realignment/conflicts of District facilities as part of Orange County Transportation's proposed widening of the I-405															
7-65	Gisler-Redhill Interceptor Rehabilitation	• Rehabilitation of sewer facilities in the City of Costa Mesa															
6-20	Fairview Trunk Sewer Rehabilitation	• Rehabilitation of sewer facilities in the City of Costa Mesa															
7-69	North Trunk Improvements	• Upsizing of pipe segments to increase capacity in the City of Tustin															
X-068	North Trunk/Tustin-Orange Sub-Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Orange															
X-084	Tustin Avenue Sewer Improvements	• Upsizing of pipe segments to increase capacity in the City of Santa Ana															

Types of Project Legend:

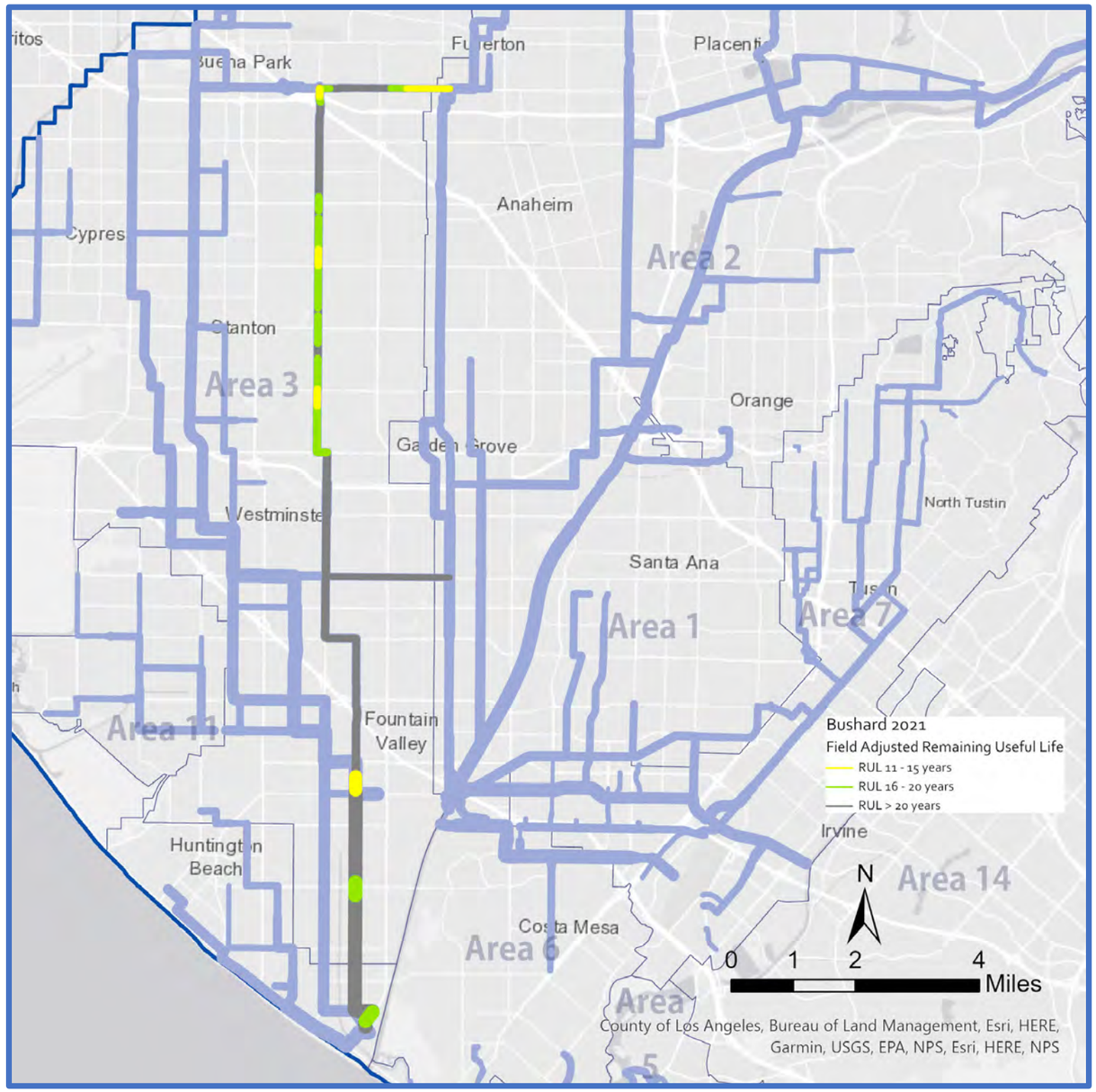
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; I-405 = Interstate 405; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	0.03	3	37	-	-
24" - 27" Ø	5.1	73	49	-	-
39" Ø	3.6	26	47	-	-
Reinforced Concrete					
≤ 42" Ø	2.4	14	57	-	-
60" - 66" Ø	0.2	7	19	-	-
≥ 72" Ø	4.5	33	21	-	-
Fiberglass					
36" - 42" Ø	4.4	26	56	-	-
48" Ø	0.3	1	71	-	-
Unreinforced Concrete					
42" - 48" Ø	1.0	10	38	-	-
High-Density Polyethylene					
22" Ø	0.1	2	23	-	-
Polyvinyl Chloride					
≤ 16" Ø	0.2	6	17	-	-
24" Ø	0.1	2	19	-	-
Steel					
12" Ø	0.04	3	12	-	-
26" Ø	0.02	1	12	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Bushard Diversion Box** - The Bushard Diversion Box is not able to operate as originally intended (flow modulation between Plant No. 1 and Plant No. 2 based on flows).	• A planning study was completed that recommended immediate repairs that will be completed under MP-307, as well as future improvements that are included in project X-096. MP-307 is currently under construction to restore partially functionality to the Bushard Diversion Box.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in the pipelines immediately upstream of the Bushard Diversion Box.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.
• **Manhole Access** – OC San staff has identified specific locations where manholes are difficult to access for maintenance.	• OC San staff will track and prioritize access issues to address key concerns. High priority access improvements will be recommended as a small project or addition to an existing project.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
MP-307	Bushard Diversion Structure Repair	• Repair of structural assets and replacement of electrical and instrumentation and control components															
X-096	Bushard Diversion Structure Improvements	• Replacement of mechanical equipment															

Types of Project Legend:

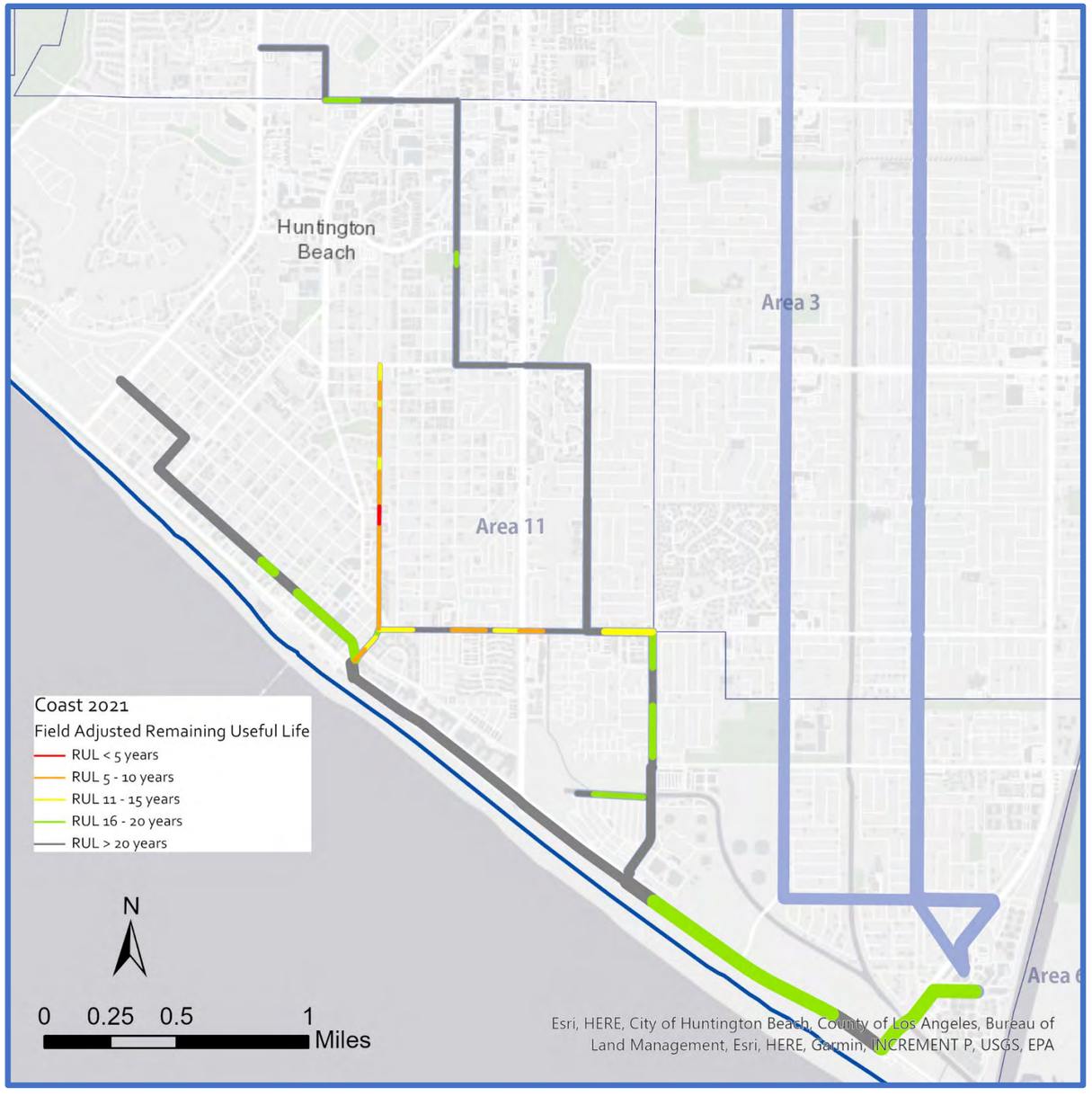
CIP - Planning | CIP - Design | CIP - Construction | Maintenance Project

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18” Ø	2.1	32	62	1	16
21” - 36” Ø	4.4	58	60	-	-
Reinforced Concrete					
48” - 54” Ø	3.3	43	39	-	-
≥ 72” Ø	1.6	12	38	-	-
Polyvinyl Chloride					
54” Ø	0.05	1	40	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Clustered Defects** – There are several contiguous pipe segments with significant fracturing and some root intrusion and nearby isolated pipelines with fracturing in Huntington Beach that are not part of a current project.	• OC San staff will validate the creation of a new future project Lake Avenue/Atlanta Interceptor Rehabilitation to address all of these defects.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in the 84-inch pipelines immediately upstream of Plant No. 2 headworks.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
X-XXX	Lake Avenue/Atlanta Interceptor Rehabilitation	• Rehabilitation of sewer facilities in the City of Huntington Beach															

Types of Project Legend:

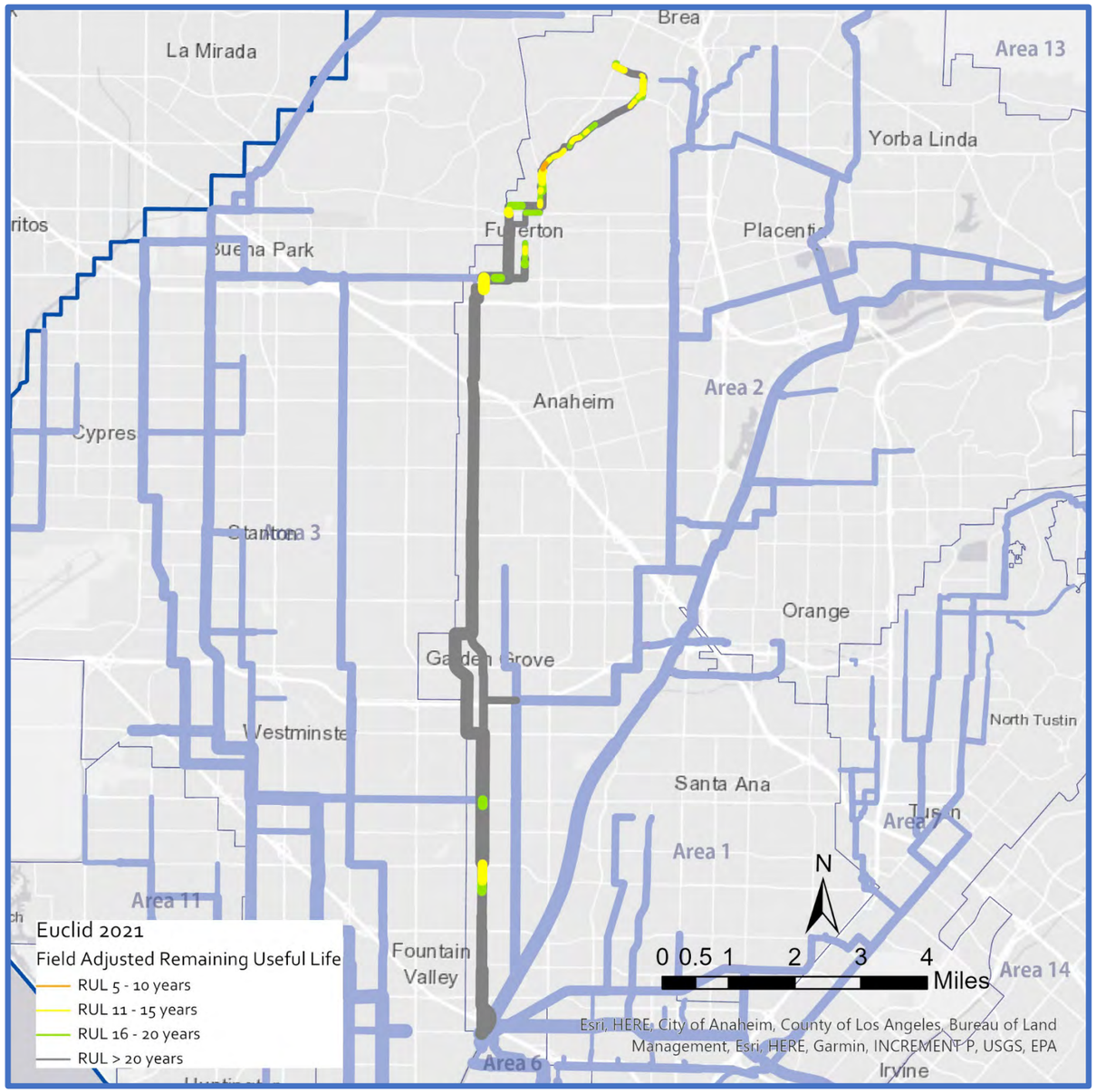
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; OC San = Orange County Sanitation District;
RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	4.4	78	58	-	1
21" - 27" Ø	3.9	52	38	-	-
≥ 30" Ø	12.1	153	49	-	-
Reinforced Concrete					
≤ 42" Ø	2.4	16	47	-	-
45" - 60" Ø	11.6	129	32	-	-
Polyvinyl Chloride					
≤ 18" Ø	0.05	5	22	-	-
24" - 30" Ø	0.1	7	12	-	-
Steel					
10" Ø	0.01	3	12	-	-
High-Density Polyethylene					
26" Ø	0.05	1	12	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Clustered Defects** – There are several contiguous groups of manholes in the City of Fullerton with liner detachment, surface aggregate visible, and structural reinforcement visible that are not part of a current project. The manholes with structural defects are a mix of concrete as well as brick and mortar wall manholes. Lastly, in the same vicinity there are some pipelines with fracturing and that are not part of a current project.	• OC San staff will validate the creation of a new future project Fullerton-Brea Interceptor/Rolling Hills Sub-Trunk Rehabilitation to address all of these defects.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in the 54-inch pipelines immediately upstream of Plant No. 1 headworks.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
X-XXX	Fullerton-Brea Interceptor/Rolling Hills Drive Sub-Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Fullerton															

Types of Project Legend:

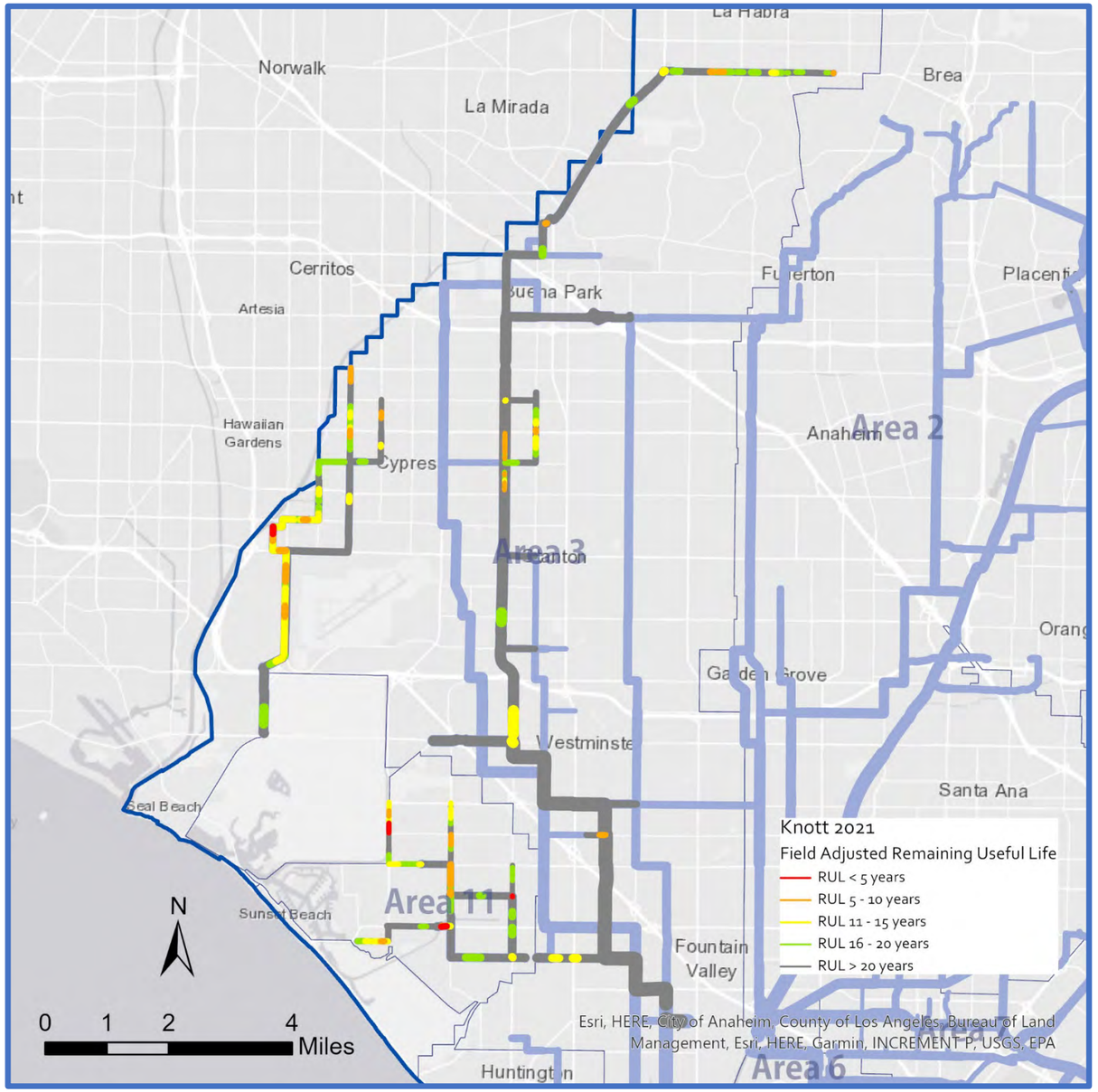
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	9.1	129	53	2	18
21" - 27" Ø	20.5	298	49	2	11
≥ 30" Ø	17.1	220	41	-	4
Reinforced Concrete					
≤ 42" Ø	2.0	23	36	-	-
45" - 66" Ø	7.8	72	44	-	-
≥ 72" Ø	9.4	66	47	-	-
Polyvinyl Chloride					
≤ 18" Ø	1.2	17	16	-	-
High-Density Polyethylene					
18" Ø	0.01	2	8	-	-
24" - 32" Ø	0.03	3	12	-	-
Fiberglass					
16" – 24" Ø	0.1	2	12	-	-
Ductile Iron					
20" Ø	0.02	1	62	-	-
4" Ø	0.02	1	12	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Groundwater Infiltration** – CCTV identified significant areas experience significant groundwater infiltration, primarily concentrated in the western regional trunk sewers.	• Projects 3-64A, B, and C will address all areas with significant groundwater infiltration by rehabilitating the affected pipeline segments with grout and new interior lining. Project X-071 will address some areas with infiltration and other areas are with less severe issues are recommended for continued monitoring.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. The largest concentration of fractures are concentrated in northern Huntington Beach, in Buena Park near the 91 and 5 freeways, and with small diameter sewers owned and operated by the City of Anaheim in the northern central area of the trunk.	• Projects 3-60 and X-071 will rehabilitate the pipelines in Huntington Beach and Buena Park to address major fracturing issues. Project X-061 will also rehabilitate some of the pipelines in Imperial Highway to address fracturing. OC San staff will coordinate with the City of Anaheim pertaining to operation and maintenance of the local small diameter sewers.
• **Point Repairs** – There are isolated pipe segments with structural and operational defects that are not part of a current project. Most isolated areas are in northern Huntington Beach and Westminster.	• OC San staff will evaluate the extent of the necessary repairs in these locations and recommend blanket contract work orders or small projects to address the most significant defects. It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Vault Vibration Issues** – Three sewer vaults in Warner Avenue cause local vibration/resonance issues to nearby residences when cars pass over them.	• Project FRC-0010 will rehabilitate each of the Warner Avenue vaults to eliminate local vibration/resonance issues.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in the pipelines immediately upstream of the Bushard Diversion Box.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
3-64A	Orange Western Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the cities of Cypress, Anaheim, and Buena Park															
FRC-0012	Springdale-Relief Concrete Encasement Extension at Wintersburg Channel	• Extend existing encasement of sewer pipeline in City of Huntington Beach															
3-64B	Los Alamitos Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the cities of Seal Beach, Los Alamitos, and the community of Rossmoor															
FRC-0010	Warner Avenue Vault Cover Improvements	• Rehabilitation of sewer vaults in the City of Huntington Beach															
FE20-10	Adolfo Lopez Chemical Dosing Station Installation	• Install odor control chemical dosing facility in the City of Seal Beach															
3-64C	Cypress Trunk Sewer Rehabilitation - West	• Rehabilitate sewer facilities in the cities of Los Alamitos, Cypress and La Palma															
3-60	Beach Trunk/Knott Interceptor/Miller-Holder Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Buena Park															
X-071	Bolsa Chica/Edinger/Springdale Rehabilitation	• Rehabilitation of sewer facilities in the City of Huntington Beach															
3-68	Los Alamitos Sub-Trunk Extension	• Extension of the Los Alamitos Sub-Trunk to facilitate abandonment of Westside Pump Station															
X-061	Imperial Relief Interceptor/Miller-Holder Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of La Habra															

Types of Project Legend:

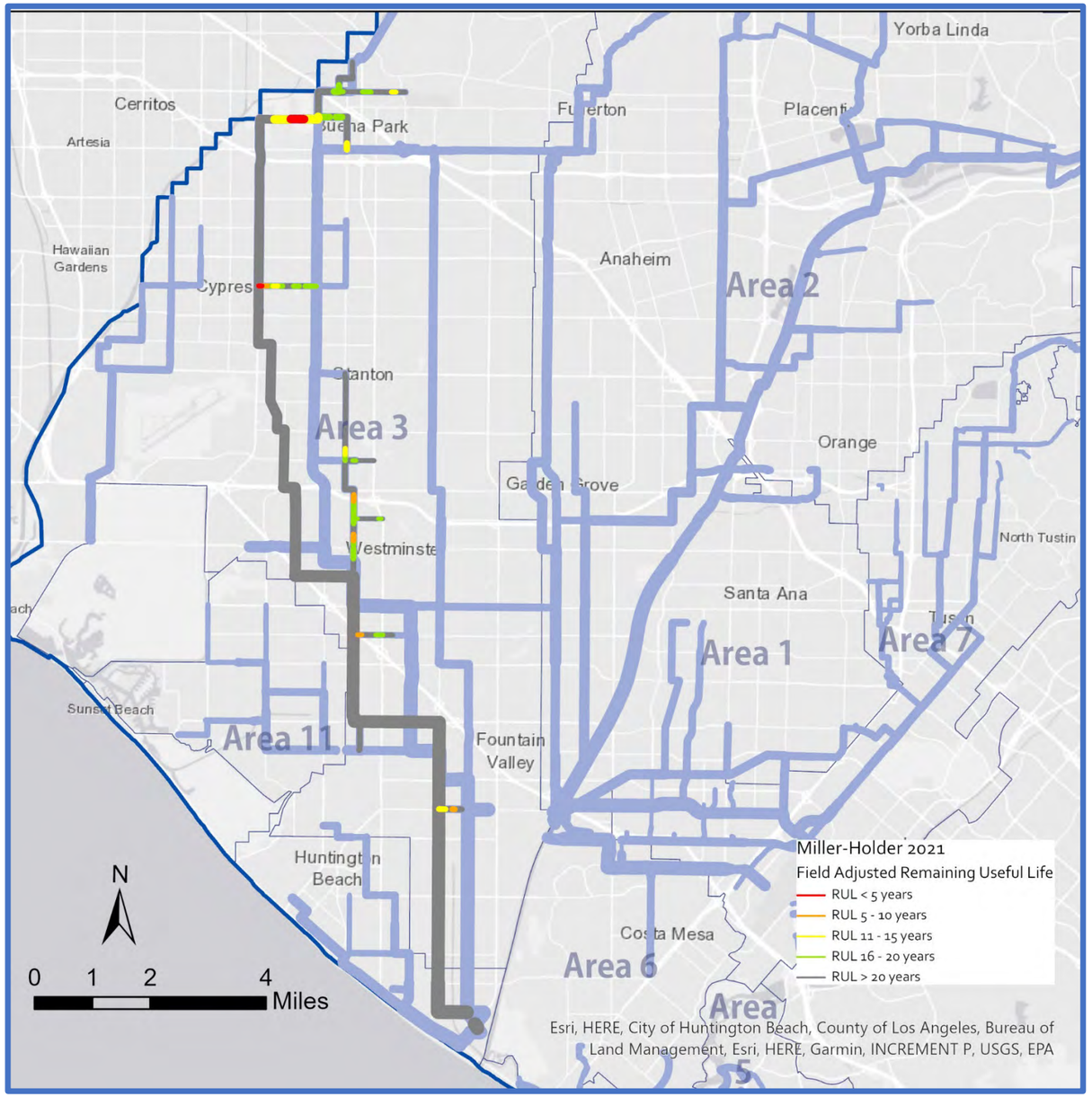
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	2.9	50	61	-	1
21" - 27" Ø	6.9	87	60	1	4
≥ 30" Ø	2.5	27	59	1	-
Reinforced Concrete					
45" - 69" Ø	13.5	76	62	-	-
≥ 72" Ø	5.8	25	71	-	-
Ductile Iron					
≤ 18" Ø	0.1	5	39	-	-
Polyvinyl Chloride					
24" Ø	0.02	1	19	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During peak wet weather flows, capacity issues were identified in a portion of the Hoover-Western Sub-Trunk.	• Project X-085 includes upsizing a portion of the Hoover-Western Sub-Trunk to address existing capacity issues.
• **Groundwater Infiltration** – CCTV identified significant areas experience significant groundwater infiltration, primarily concentrated in the western regional trunk sewers.	• Projects 3-64A will address most areas with significant groundwater infiltration by rehabilitating the affected pipeline segments with grout and new interior lining. Project 3-60 and X-085 will also address some areas with infiltration.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Buena Park near the 91 and 5 freeways.	• Project 3-60 will rehabilitate the pipelines in Buena Park to address major fracturing issues. Project X-061 will also rehabilitate some of the pipelines in Imperial Highway to address fracturing.
• **Point Repairs** – There are isolated pipe segments with structural and operational defects that are not part of a current project. There are two isolated areas are in southern Huntington Beach and Westminster.	• OC San staff will evaluate the extent of the necessary repairs in these locations and recommend blanket contract work orders or small projects to address the most significant defects. It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline.	• OC San staff has reviewed recent sonar inspection data that identifies amount of debris in select large diameter pipelines. No major risks were identified in the Miller-Holder Trunk large diameter pipelines.
• **Manhole Access** – OC San staff has identified specific locations where manholes are difficult to access for maintenance, including access issues due to property owners encroaching into OC San's easement area near the Wintersburg Channel in Huntington Beach.	• OC San staff will track and prioritize access issues to address key concerns. High priority access improvements will be recommended as a small project or addition to an existing project.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
3-64A	Orange Western Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the cities of Cypress, Anaheim, and Buena Park															
3-60	Beach Trunk/Knott Interceptor/Miller-Holder Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Buena Park															
X-085	Hoover-Western Sub-Trunk/Lampson Branch Improvements	• Upsizing of sewer segments to increase capacity and rehabilitation of sewer facilities in the cities of Westminster and Garden Grove															
X-061	Imperial Relief Interceptor/Miller-Holder Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of La Habra															

Types of Project Legend:

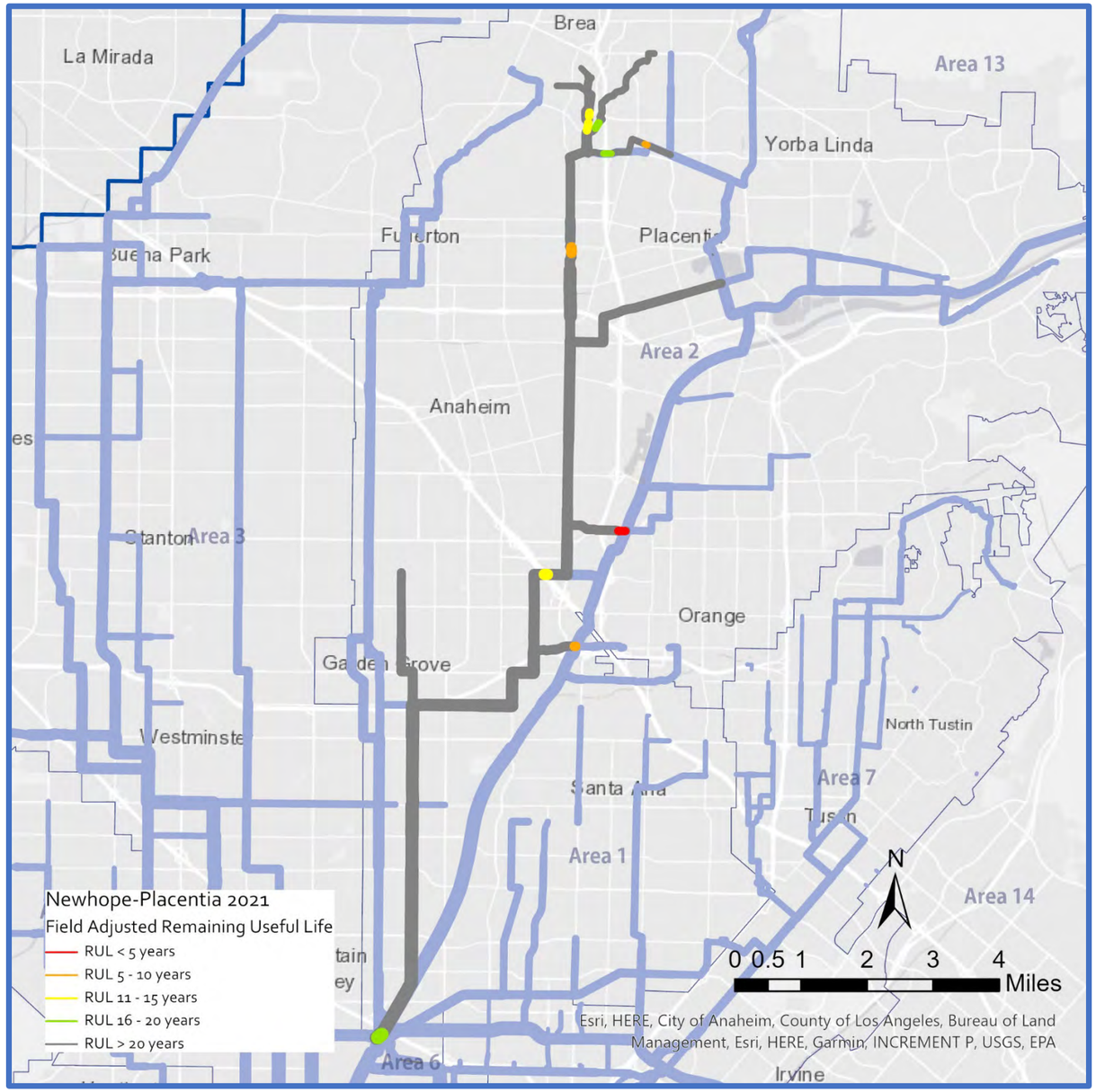
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	4.0	70	48	-	1
21" - 27" Ø	2.7	39	53	-	-
≥ 30" Ø	13.1	159	43	-	2
Reinforced Concrete					
42" Ø	0.01	1	29	-	-
45" - 54" Ø	8.3	49	52	-	-
Polyvinyl Chloride					
≤ 18" Ø	0.03	2	27	-	-
24" - 30" Ø	0.01	3	17	-	-
Fiberglass					
48" Ø	0.03	1	4	-	-
Ductile Iron					
≤ 18" Ø	1.0	18	28	-	-
20" - 36" Ø	0.4	7	46	1	-
Steel					
12" Ø	0.07	6	12	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During peak wet weather flows, capacity issues were identified in the northern portion of the Newhope Trunk.	• Project 2-72B upsizes a portion of the Newhope Trunk Sewer to address existing capacity issues.
• **Manhole Defects** – There are isolated groups of manholes with liner detachment, surface aggregate missing, and visible reinforcement in Fullerton that are not part of a current project and no future CIP project in the vicinity.	• OC San staff will validate the creation of a new future project Fullerton-Brea Interceptor/Rolling Hills Sub-Trunk Rehabilitation to address defects in the northern portion of the trunk. OC San staff has evaluated current condition data and recommended some manholes for replacement (PRN-00795) and others to be added to annual blanket contract work for rehabilitation.
• **Point Repairs** – There are isolated pipe segments in Orange and Fullerton with fracturing that are not part of a current project.	• OC San staff will evaluate the extent of the necessary repairs in these locations and recommend blanket contract work orders or small projects to address the most significant defects.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42”) are not cleaned and CCTV footage does not identify sediment or debris below the waterline.	• OC San staff has reviewed recent sonar inspection data that identifies amount of debris in select large diameter pipelines. No major risks were identified in the Newhope Trunk large diameter pipelines.
• **Manhole Access** – OC San staff has identified specific locations where manholes are difficult to access for maintenance. Specifically, there are issues accessing various manholes in Craig Regional Park.	• Project FE10-21 addresses access issues to manholes in Craig Regional Park. OC San staff will track and prioritize access issues to address key concerns. High priority access improvements will be recommended as a small project or addition to an existing project.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
2-72B	Newhope Placentia Trunk Sewer Replacement	• Upsizing of segments of sewer to increase capacity															
FE10-21	Craig Regional Park Manhole Improvements	• Manhole access improvements throughout Craig Regional Park															
X-XXX	Fullerton-Brea Interceptor/Rolling Hills Drive Sub-Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Fullerton															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

System Overview

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	6.0	128	44	-	9
21" - 27" Ø	4.5	102	37	-	6
≥ 30" Ø	3.8	76	34	-	-
Ductile & Cast Iron					
≤ 18" Ø	1.4	21	29	-	-
24" - 30" Ø	1.5	22	30	-	1
Polyvinyl Chloride					
≤ 18" Ø	0.1	2	7	-	-
30" - 36" Ø	2.6	36	21	-	-
Cured-in-Place					
24" Ø	1.1	13	23	-	-
High-Density Polyethylene					
≤ 20" Ø	0.8	14	28	-	-
30" - 42" Ø	0.02	2	22	1	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Broken Pipeline** – In the influent sewer upstream of Bitter Point Pump Station, previous repairs of fractures and breaks have failed along with heavy infiltration.	• Project FRC-0009 will address all issues with the influent sewer to Bitter Point Pump Station via rehabilitation.
• **Point Repairs** – There are isolated pipe segments throughout the Newport Trunk collections system with fracturing and/or groundwater infiltration that are not part of a current project.	• OC San staff will evaluate the extent of the necessary repairs in these locations and recommend blanket contract work orders or small projects to address the most significant defects. It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FRC-0009	Bitter Point Trunk Sewer Repair at Bitter Point Pump Station	• Rehabilitation of sewer facilities in the City of Newport Beach															

Types of Project Legend:

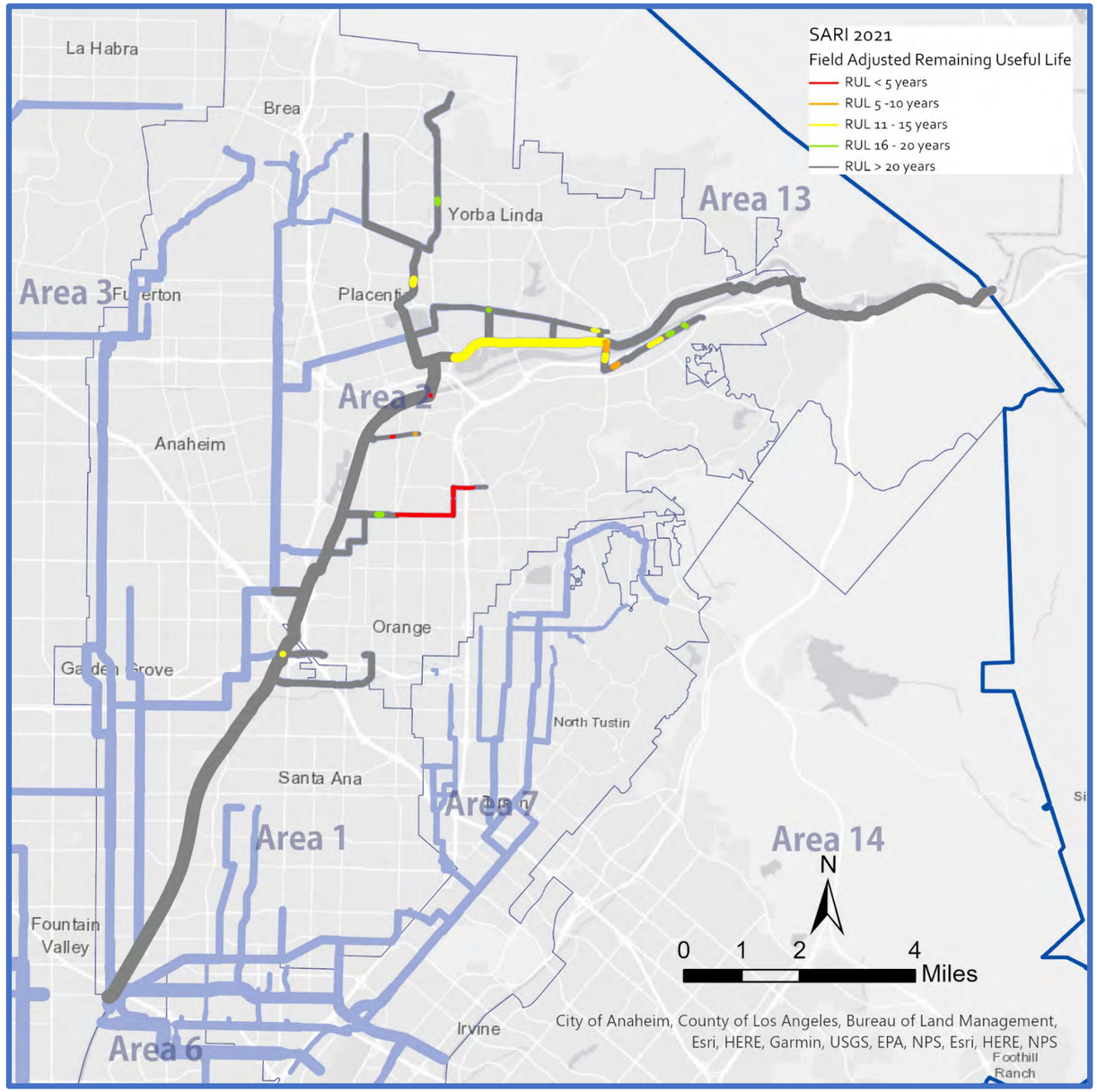
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV=Closed-Circuit Television; FY=Fiscal Year; OC San=Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18” Ø	5.0	113	56	37	1
21” - 27” Ø	11.4	184	46	-	1
≥ 30” Ø	6.8	86	37	-	1
Reinforced Concrete					
42” Ø	1.5	20	35	-	-
45” - 66” Ø	9.0	60	43	-	-
≥ 72” Ø	10.0	50	46	-	-
Fiberglass					
36” – 54” Ø	3.9	40	10	-	-
High-Density Polyethylene					
≤ 18” Ø	0.5	4	7	-	-
30” Ø	0.7	3	10	-	-
Ductile Iron					
24” - 30” Ø	0.8	10	34	-	-
48” Ø	0.4	2	47	-	-
Steel					
30” Ø	0.03	2	10	-	-
Cured-in-Place					
33” Ø	0.3	4	12	-	-
Polyvinyl Chloride					
12” Ø	0.01	1	5	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life;

SARI=Santa Ana River Interceptor

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During future peak wet weather flows, capacity issues were identified in the Taft Branch and a northern portion of the SARI system.	• Project 2-49 will address capacity issues in the Taft Branch and Project X-086 will address capacity issues in a northern portion of the SARI system.
• **Groundwater Infiltration** – CCTV identified two areas experiencing significant groundwater infiltration, one in eastern Anaheim and the other in northern Orange.	• Project X-063 will address part of the groundwater infiltration issues in Anaheim and OC San is evaluating a blanket contract for grouting to resolve the defect in northern Orange (and other locations).
• **Pipeline Fracturing** – CCTV identified a few areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Anaheim near Imperial Highway.	• Project X-063 will address the fracturing issues near Imperial Highway and OC San is evaluating a blanket contract for point repair to resolve the defects in northern Orange (and other locations). It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Broken Siphon** – In 2020, pipeline inspection discovered the Olive Sub-Trunk siphon has a hole in the pipeline. In addition, CCTV showed corrosion issues in upstream manholes due to an ineffective air jumper.	• Project FE20-08 will replace a portion of the Olive Sub-Trunk siphon, rehabilitate other portions, reconstruct the air jumper, and restore the siphon into service.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in a northern branch of the SARI system.	• OC San staff will review recent sonar inspection data that identifies amount of debris in select large diameter pipelines. Based on the results, OC San staff will recommend additional sonar inspection or large diameter cleaning where necessary.
• **Manhole Access** – OC San staff has identified specific locations where manholes are difficult to access for maintenance, specifically along the southern portion of the Santa Ana River.	• OC San staff will track and prioritize access issues to address key concerns. High priority access improvements will be recommended as a small project or addition to an existing project.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FRC-0011	Richfield Sub-Trunk Encasement for BNSF Railway Addition	• Extend existing encasement of sewer pipeline in City of Anaheim															
FE20-08	Olive Sub-Trunk Repair	• Rehabilitation of an inverted siphon in the cities of Anaheim and Orange															
2-49	Taft Branch Improvements	• Upsizing of sewer segments to increase capacity in the City of Orange															
X-063	Santa Ana River Interceptor Rehabilitation at Imperial Highway/91 Freeway	• Rehabilitation of sewer facilities in the City of Anaheim															
X-086	Santa Ana River Interceptor Improvements	• Upsizing of sewer segments to increase capacity in the City of Anaheim															

Types of Project Legend:

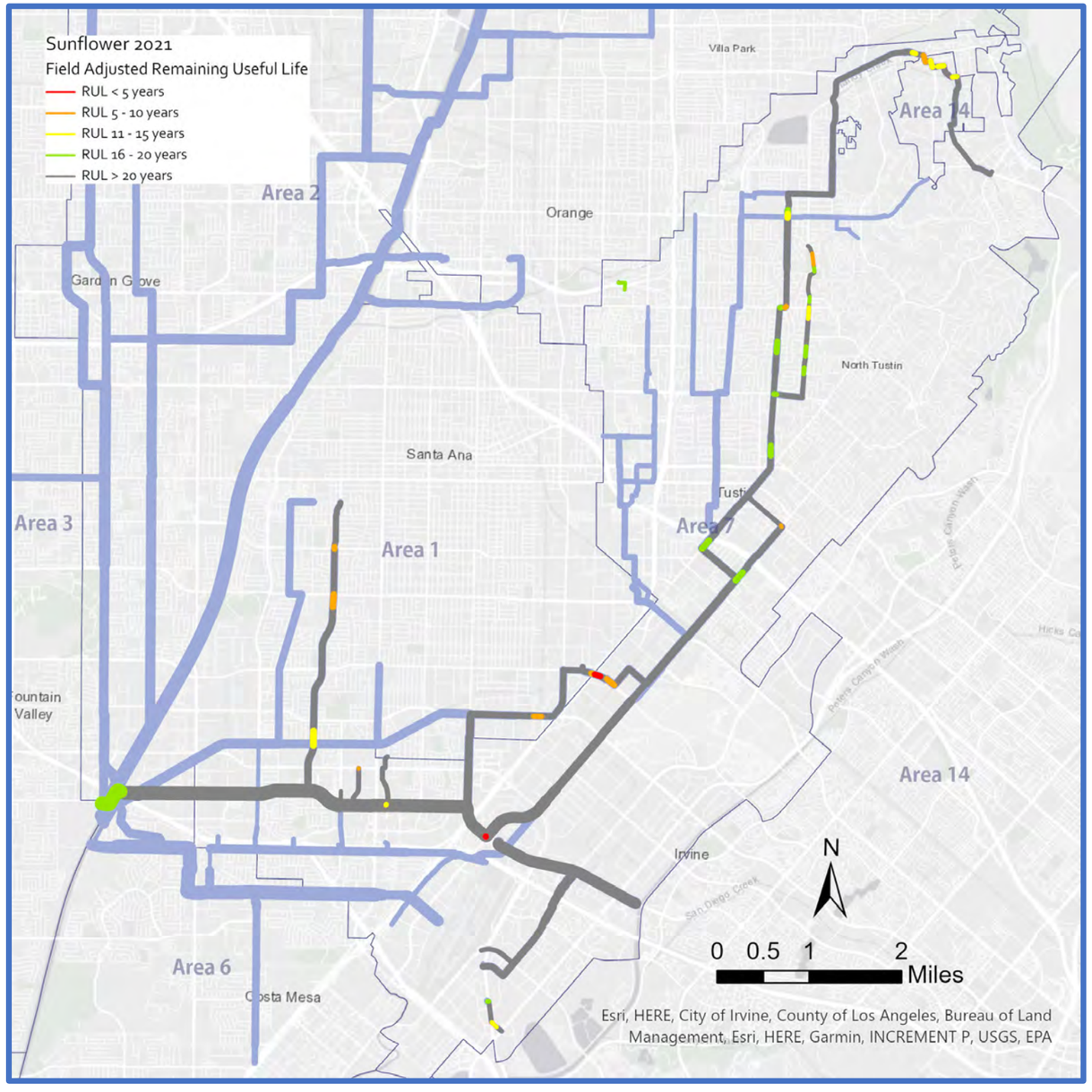
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

BNSF = Burlington Northern & Santa Fe; CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	7.1	145	44	-	4
21" - 27" Ø	13.6	208	49	2	6
≥ 30" Ø	4.8	57	43	-	-
Reinforced Concrete					
42" Ø	1.3	9	50	-	-
48" - 66" Ø	3.4	39	39	-	-
≥ 72" Ø	3.7	25	33	-	-
Ductile Iron					
20" Ø	0.5	11	22	-	-
Polyvinyl Chloride					
30" Ø	0.05	3	13	-	-
Reinforced Plastic Mortar					
15" Ø	0.1	3	50	-	-
Asbestos Cement					
10" Ø	0.04	1	57	-	-

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Groundwater Infiltration** – CCTV identified several areas experiencing significant groundwater infiltration, primarily located in Santa Ana as well as one location in Irvine.	• OC San is evaluating a blanket contract for point repair to resolve the defects in Santa Ana and Irvine (and other locations). It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Pipeline Fracturing and Liner Failures** – CCTV identified several areas with significant fracturing of VCP pipelines and large diameter pipe with liner failures. Most fractures are concentrated in Orange in the northern portions of the trunk system. Liner failures were found north of John Wayne Airport in the large diameter trunk pipeline.	• Liner failures in the large diameter trunk are being addressed with Project 7-66. Project FRC-0007, X-065, X-066, and X-068 address fractured pipeline in various locations throughout the trunk system. Isolated defects in Santa Ana, Irvine, and Tustin not included or near a CIP project are being evaluated for a blanket contract for point repair. It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline.	• OC San staff has reviewed recent sonar inspection data that identifies amount of debris in select large diameter pipelines. No major risks were identified in the Sunflower Trunk large diameter pipelines.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
7-66	Sunflower and Red Hill Interceptor Repairs	• Rehabilitation of sewer facilities in the cities of Santa Ana and Costa Mesa															
FE18-13	Redhill Relief Sewer Relocation at State Route 55	• Relocate sewer facilities in the City of Santa Ana															
FRC-0007	Redhill Relief Sewer Liner Repair at State Route 55	• Rehabilitation of sewer facilities in the City of Santa Ana															
X-068	North Trunk/Tustin-Orange Sub-Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Orange															
X-065	Tustin-Orange Interceptor Rehabilitation	• Rehabilitation of sewer facilities in the City of Orange															
X-066	Tustin-Orange Interceptor/Orange Park Acres Trunk Rehabilitation	• Rehabilitation of sewer facilities in the City of Orange															

Types of Project Legend:

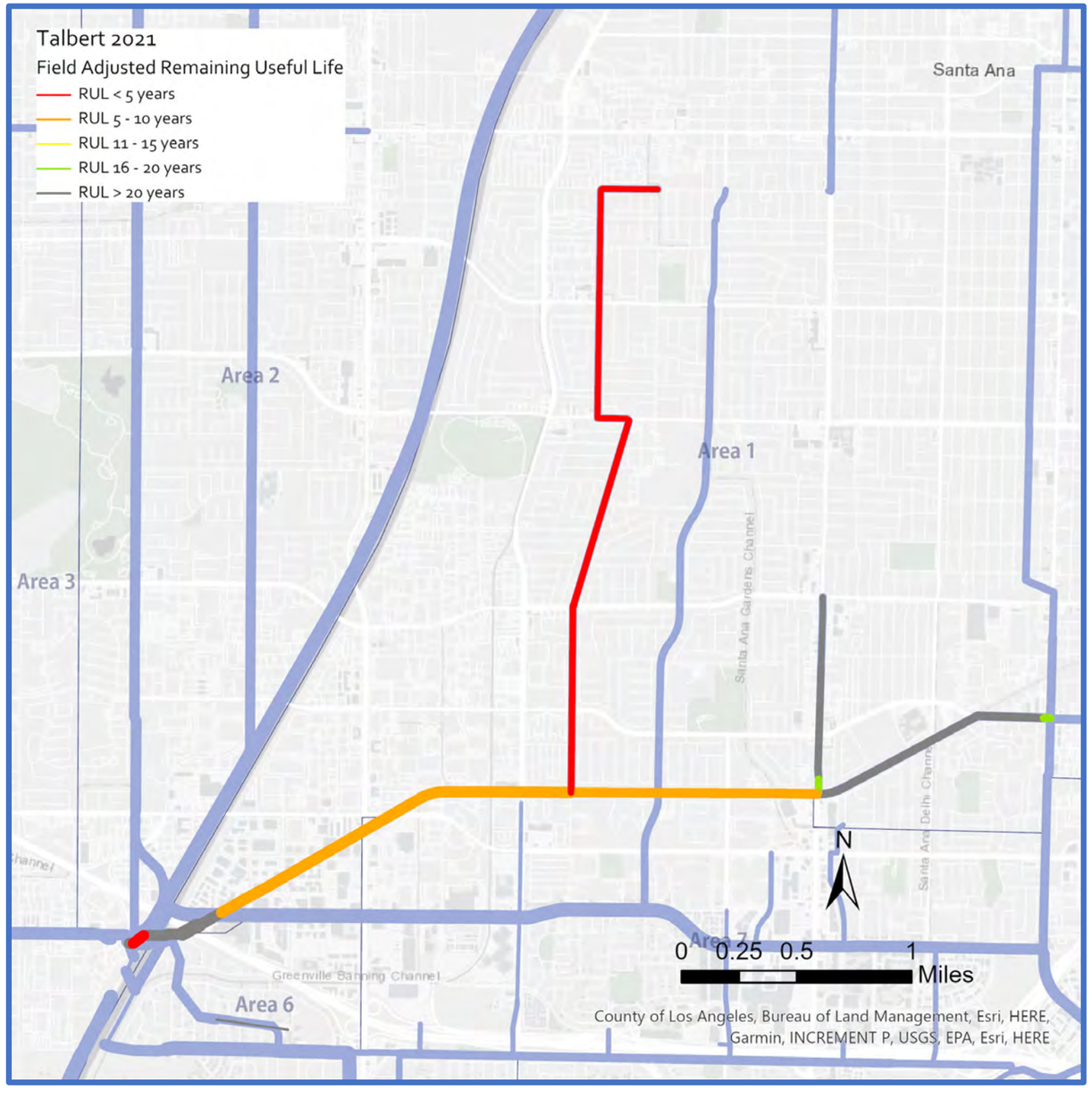
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV=Closed-Circuit Television; FY=Fiscal Year; OC San=Orange County Sanitation District; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of Pipes with RUL Score of 5	# of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	0.1	6	46	2	1
21" - 27" Ø	3.4	46	68	38	2
≥ 30" Ø	1.7	23	68	1	-
Reinforced Concrete					
42" Ø	1.1	10	52	-	10
48" - 60" Ø	2.1	29	50	1	19

Acronym Key:

Ø = Diameter; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During future peak wet weather flows, capacity issues were identified in the entire Greenville Trunk.	• Project 1-24 will upsize the entire Greenville Trunk to address capacity issues.
• **Surface Aggregate Damage** – Most of the RCP pipeline of the Talbert Trunk between Plant No. 1 and Bristol Street has moderate to severe surface aggregate loss in areas not rehabilitated by past project 1-17.	• Project FE20-07 will address the most severe segment of concrete wall damage in the Talbert Trunk by rehabilitating the segment just outside Plant No. 1. Project 1-23 will rehabilitate the remaining pipeline segments with moderate to severe surface aggregate loss.
• **Cleaning and Condition Assessment of Siphons and Large Diameter Pipelines** – Siphons are regularly cleaned but are not inspected because they are inaccessible using CCTV equipment. Large diameter pipe (> 42") are not cleaned and CCTV footage does not identify sediment or debris below the waterline.	• OC San staff has reviewed recent sonar inspection data that identifies amount of debris in select large diameter pipelines. No major risks were identified in the Talbert Trunk large diameter pipelines.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE20-07	Plant No. 1 Influent Trunk Sewer Rehabilitation	• Rehabilitation of influent trunk line in the City of Fountain Valley															
1-23	Santa Ana Trunk Sewer Rehabilitation	• Rehabilitation of sewer facilities in the cities of Santa Ana and Costa Mesa															
1-24	Greenville Trunk Improvements	• Upsizing of sewer segments to increase capacity in the City of Santa Ana															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year;
OC San = Orange County Sanitation District; RUL = Remaining Useful Life

3 Program Monitoring and Improvements

3.1 Program Monitoring

OC San is continually evaluating Asset Management Program progress and realized benefits. To support the evaluation, OC San developed metrics for monitoring. The metrics described below have been chosen to directly relate to the Asset Management Program objectives. The key objectives OC San is building into the Asset Management Program are as follows:

1) Take a proactive approach to repair, rehabilitation, and replacement.
2) Ensure assets are reliable and operating when needed.
3) Minimize unplanned outages and equipment downtime.
4) Manage risks associated with asset or service impairment through asset performance optimization.
5) Develop cost-effective management strategies for the long term.
6) Strive to implement world class asset management strategies through continual improvement in our asset management practices.

Starting last year, OC San has chosen to focus on the first three objectives and in so doing, has also met the intention of objective number six, continual improvement. The following metrics were chosen not only to demonstrate the effectiveness of the Asset Management Program but also to establish a baseline for which to gauge future performance. It is expected that the Asset Management Council will meet and after reviewing the information in this report, will discuss Asset Management Program metrics in greater length including the utility of the metrics chosen for the 2021 Asset Management Plan and the possibility of setting agency goals.

The proactive maintenance percent, the percent of PM as a total of all maintenance, demonstrates the effectiveness of the maintenance program (proactive vs. reactive). It also may reflect the condition (including age) of the assets. *Availability percent* demonstrates the average asset availability by process area and speaks to whether the assets are operating when needed. It is implied that when the assets are available, they are also reliable; however, this may or may not be the case. OC San staff tried diligently to develop a metric that measures reliability; however, current data capture processes limit how the data can be used and the nature of the chosen reliability metric was not appropriate for the level at which the data are being reported. For now, availability is our best measure of objective number two. *Break-In percent* illustrates the amount of emergency work (or reactive work) as a percent of total work in the process area. The break-in percent metric will give OC San personnel a better understanding of unplanned outages and the causes of equipment downtime. Finally, *maintenance costs and labor hours* are presented by process area to illustrate the total resources devoted to maintaining the process areas. The methods used to calculate each metric are included in Appendix F.

3.1.1 Data

The data used for the following analysis comes from two different sources. The data used for asset availability were sourced from the OC San Major Equipment Status (MES) Dashboard database. The original intent of the MES Dashboard was to provide a targeted overview of critical asset availability allowing management to gauge if the area can meet OC San level of service commitments. The MES data source provides a narrow and targeted group of major assets that are critical to the operation of the process areas. Each piece of equipment is placed “in” or “out” of service by staff.

All other metric data were sourced from the computerized maintenance management system of record, Maximo. In contrast to the availability metric, the other metrics presented include most assets in each process area, some of which are not as critical to the successful operation of the process area. A mitigation to using this larger subset of assets exists in the break-in (reactive work) metric, which includes work that is deemed “emergency” or “urgent” by staff. By implication, this population of assets includes higher risk assets. The data from each database are from FY2018-19, 2019-20, and 2020-21 and is included in Appendix F for reference.

3.2 Program Metrics

3.2.1 Proactive Maintenance Percent

The Proactive Maintenance Percent is the percent of PM as a total of all maintenance performed. An increase in proactive maintenance percent represents a shift from reactive to a proactive maintenance program. As shown in Tables 3-1 and 3-2, the proactive maintenance percent for both Reclamation Plant No. 1 and Treatment Plant No. 2 is consistent and does not show any remarkable increase or decrease for either facility. A proactive maintenance percent of 80% is considered best in class value based on manufacturing industry standards which may not be comparable to a critical facility as wastewater treatment but helpful to have as a guideline. Many of the areas at both plants were at or below 60% indicating that improvement in this area is likely over time as proactive maintenance programs are implemented and older facilities are replaced.

Table 3-1. Proactive Maintenance Percent for Reclamation Plant No. 1

Process Area	FY 18/19	FY 19/20	FY 20/21
Preliminary	25%	39%	39%
Primary	29%	39%	32%
Interplant	69%	84%	82%
Activated Sludge	58%	53%	64%
Trickling Filters	55%	56%	53%
Digesters	34%	46%	46%
Solids Handling Facilities	31%	34%	42%
Central Power Generation	40%	64%	62%
Electrical Distribution	77%	68%	65%
Utilities	43%	33%	30%

Table 3-2. Proactive Maintenance Percent for Reclamation Plant No. 2

Process Area	FY 18/19	FY 19/20	FY 20/21
Preliminary	55%	64%	59%
Primary	37%	25%	35%
Activated Sludge	54%	48%	53%
Trickling Filters	64%	67%	57%

Table 3-2. Proactive Maintenance Percent for Reclamation Plant No. 2

Process Area	FY 18/19	FY 19/20	FY 20/21
Effluent Disposal	61%	57%	35%
Digesters	39%	39%	55%
Solids Handling Facilities	35%	41%	53%
Central Power Generation	58%	42%	50%
Electrical Distribution	84%	70%	74%
Utilities	34%	39%	44%

At Plant No. 2, the proactive percent for the solids handling facility increased in FY20/21 when the new dewatering facility started operating, and the older belt press facility was decommissioned and demolished. The proactive percent for primaries was 25% in FY19/20 because a construction project was rehabilitating the primaries.

Although the pump stations have proactive maintenance percentages over 60% shown in Table 3-3, the amount of percent change is the defining characteristic of the data. Decreases of 20% are indicative of emergency work that was required and will be reflected in the break-in percentage illustrated later in this chapter. For instance, Bay Bridge required emergency work to replace leaking valves for contractor work and Lido had tree root intrusion that requirement immediate attention. Common CM work orders include replacing leaking valves, replacement of pump packing, de-ragging pumps, and attending to equipment that is making excessive noise when operating will also reduce the proactive percent.

Table 3-3. Proactive Maintenance Percent for Pump Stations

Pump Station	FY 18/19	FY 19/20	FY 20/21
'A' Street	84%	86%	85%
15th Street	88%	88%	85%
Lido	47%	80%	42%
Bay Bridge	69%	65%	34%
Rocky Point	76%	96%	84%
Bitter Point	84%	82%	76%
Seal Beach	58%	55%	65%
Westside	79%	75%	74%
Edinger	74%	81%	79%
Slater	63%	86%	86%
College	98%	91%	69%
Crystal Cove	82%	57%	91%
Yorba Linda	72%	30%	92%
Main Street	36%	66%	66%
MacArthur	97%	66%	88%

3.2.2 Availability Percent

Availability percent demonstrates the average asset availability by process area and speaks to whether the assets are operating when needed. In general, the major equipment was available over 88% of the time ensuring the level of service was met for all process areas. For a list of availability percent by process area for FY 20/21, refer to Table 3-4.

Table 3-4. Asset Availability for FY 20/21

Process Area	Plant No. 1	Plant No. 2
Preliminary	99%	92%
Primary	97%	88%
Activated Sludge	93%	92%
Trickling Filters	100%	91%
Effluent Disposal	94%	89%
Digesters	99%	88%
Solids Handling Facilities	99%	99%
Central Power Generation	96%	92%
Electrical Distribution	100%	95%
Utilities	98%	94%

In the primary treatment area, availability percent is reduced due to an increase in the number of major equipment components needed during the wet weather season, not because the equipment was taken out of service. Plant No. 2 shows lower availability percent in the primary and effluent disposal facilities because equipment is out of service for contractor work. The digesters at Plant No. 2 saw a decrease because Digester were intentionally removed from service for cleaning and repairs. This is an extensive effort to make the digesters more reliable with the implementation of several maintenance rehabilitation projects over the next 6 years.

Major equipment was predominately available at the pump stations with availability percent greater than 90% for FY 20/21 shown in Table 3-5.

Table 3-5. Availability Percent for the Pump Stations

Pump Station	FY 19/20	FY 20/21
'A' Street	100%	98%
15th Street	97%	98%
Lido	98%	94%
Bay Bridge	86%	94%
Rocky Point	96%	98%
Bitter Point	100%	99%
Seal Beach	90%	91%
Westside	94%	96%

Table 3-5. Availability Percent for the Pump Stations

Pump Station	FY 19/20	FY 20/21
Edinger	100%	99%
Slater	98%	96%
College	100%	100%
Crystal Cove	100%	100%
Yorba Linda	86%	94%
Main Street	95%	98%
MacArthur	99%	100%

3.2.3 Break-In Percent

Break-In Percent illustrates the amount of emergency work (or reactive work) as a percent of total work in the process area. Typically, the break-in percent metric should track closely with the inverse of the proactive maintenance percent as one is a measure of proactive maintenance program and the other a measure of unplanned outages or a reactive maintenance response. However, at Plant No. 1 – Interplant Area for FY19-20, there was an increase in both the proactive maintenance percent and the break-in percent. The data indicate that this is an anomaly due to the low number of work orders for the area. At Plant No. 2, the data show an increase in both metrics in the solids handling facilities. This is simply a reminder that CM work orders that are assigned a high priority are in fact a small percentage of total CM work orders and it is entirely possible to have an increase in both data populations. Literature for the manufacturing industry (SMRP, 2013) indicates that high performers can expect a break-in percent of less than 10%. Break-in percent for Plant No. 1 is shown in Table 3-6 and Plant No. 2 in Table 3-7. Success is measured as a consistent trend downward overtime.

Table 3-6 Break-in Percent for Reclamation Plant No. 1

Process Area	FY 18/19	FY 19/20	FY 20/21
Preliminary	16%	20%	24%
Primary	30%	28%	23%
Interplant	0%	16%	7%
Activated Sludge	14%	14%	11%
Trickling Filters	4%	10%	18%
Digesters	38%	20%	27%
Solids Handling Facilities	37%	22%	24%
Central Power Generation	29%	11%	14%
Electrical Distribution	5%	5%	10%
Utilities	26%	21%	26%

Table 3-7. Break-in Percent for Reclamation Plant No. 2

Process Area	FY 18/19	FY 19/20	FY 20/21
Preliminary	20%	8%	11%
Primary	17%	17%	23%
Interplant	11%	14%	10%
Activated Sludge	9%	17%	19%
Trickling Filters	18%	17%	15%
Digesters	20%	16%	13%
Solids Handling Facilities	24%	32%	21%
Central Power Generation	23%	20%	20%
Electrical Distribution	13%	7%	14%
Utilities	32%	31%	15%

The pump station break-in percent is shown in Table 3-8. Bay Bridge and Lido pump stations both saw an increase in break-in percent. This is reflected in the proactive maintenance percent decrease for those pump stations due to leaking valves, pump ragging, and check valve failures.

Table 3-8 Break-in Percent for Pump Stations

Process Area	FY 18/19	FY 19/20	FY 20/21
'A' Street	12%	4%	6%
15th Street	2%	7%	6%
Lido	36%	27%	35%
Bay Bridge	11%	18%	31%
Rocky Point	20%	4%	7%
Bitter Point	9%	14%	14%
Seal Beach	27%	14%	20%
Westside	3%	7%	3%
Edinger	12%	18%	0%
Slater	17%	7%	3%
College	0%	2%	11%
Crystal Cove	5%	32%	6%
Yorba Linda	0%	29%	10%
Main Street	60%	4%	4%
MacArthur	3%	28%	11%

Maintenance and Engineering teams work together to find solutions and resolve issues that are identified in the facilities. The teams can respond and react more effectively to resolve urgent issues. This includes a streamlined approach for equipment replacement and contractor support. Engineers work closely with mechanics and electricians to identify issues early and collaborate on solutions. The reduction in break-in or emergency call out work as shown in Figures 3-1 and 3-2 is one example of the impact the Asset Management Program has had on Maintenance and its productivity.

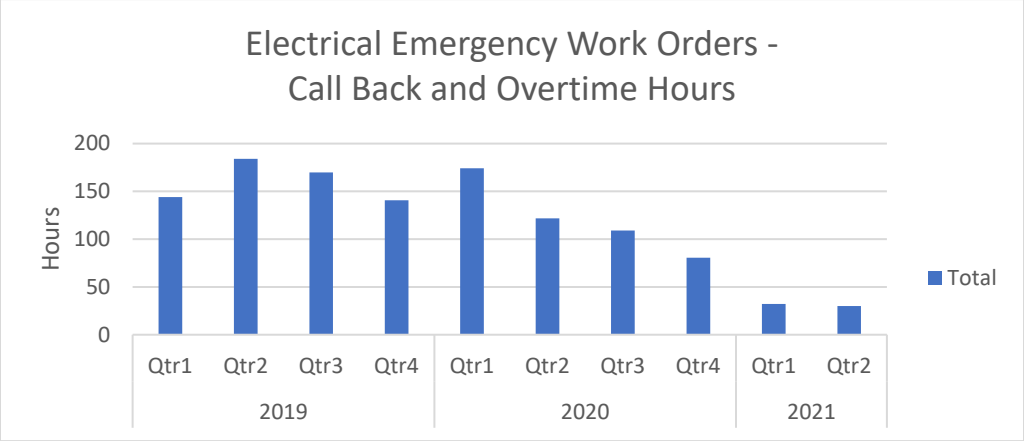


Figure 3-1. Electrical Emergency Work Orders

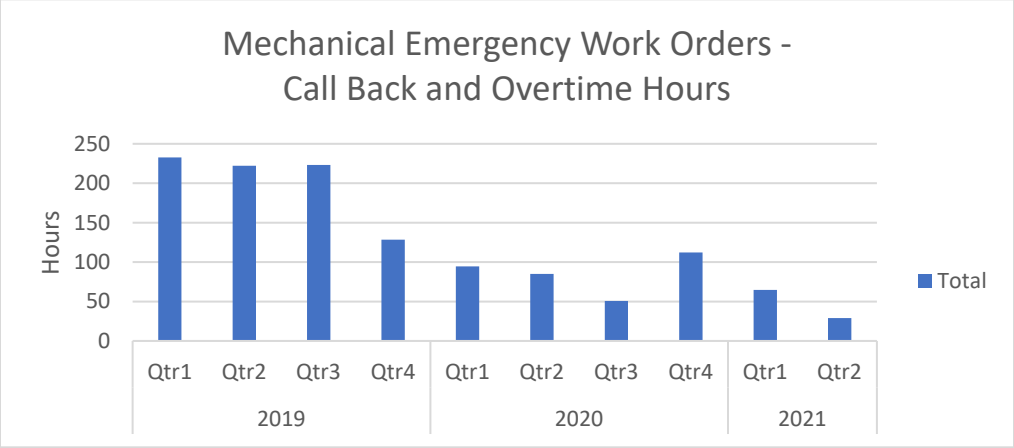


Figure 3-2. Mechanical Emergency Work Orders

The number of electrical “emergency” work orders and associated hours have reduced more than 3 times during the first 9 months in 2021 compared to the same period in 2020. The mechanical emergency work has decreased more than five times comparing the first two quarters of 2019 to the first two quarters of 2021.

3.2.4 Maintenance Costs and Labor Hours

OC San uses the maintenance costs and number of labor hours over time as trend indicators to indicate the amount of resources devoted to reliably maintaining the process areas. The data indicates that there has been a large increase in maintenance costs accompanied by a slight increase in maintenance labor hours in the Treatment Plant No. 1 Solids Handling (Figure 3-3 and Figure 3-4). This is due to high cost to maintain the equipment and contracts with manufactures of the equipment.

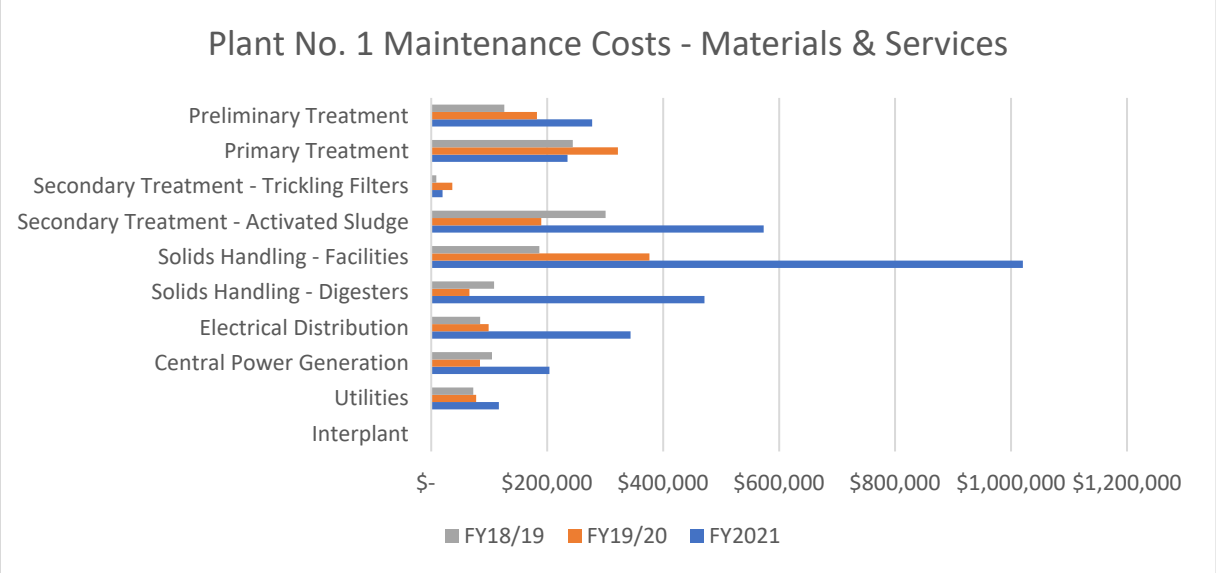


Figure 3-3. Graph of Maintenance Costs (Materials and Services) at Plant No. 1

The labor hours doubled at the Plant No.1 solids handling facility from FY 18/19 because the new thickening and dewatering facility started operating in 2019 that included a new solids thickening process with more complex equipment that requires more staff to operate and maintain.

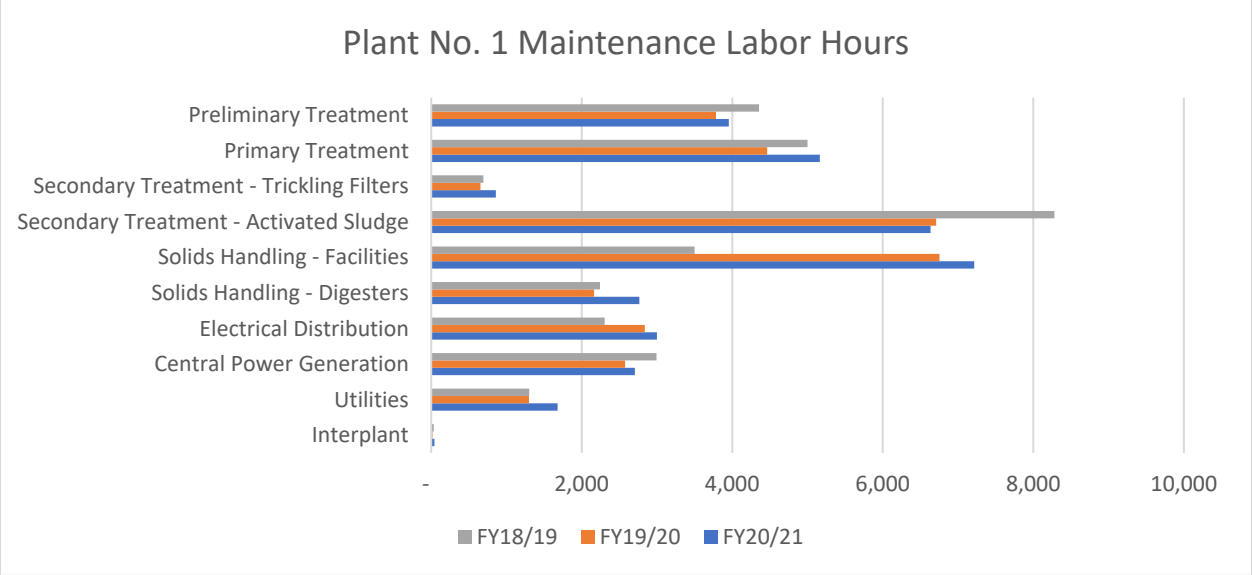


Figure 3-4. Representative Graph of Maintenance Labor Hours

The maintenance cost at Plant No. 2 were higher for FY20/21 for the central generation process because the engines are being rebuilt and higher for the trickling filters because of major equipment failures. The solids handling facility maintenance cost have decreased at Plant No. 2 with the startup of the new dewatering facility and with the demolition of the older belt press building and biosolids storage silos illustrated on Figure 3-5.

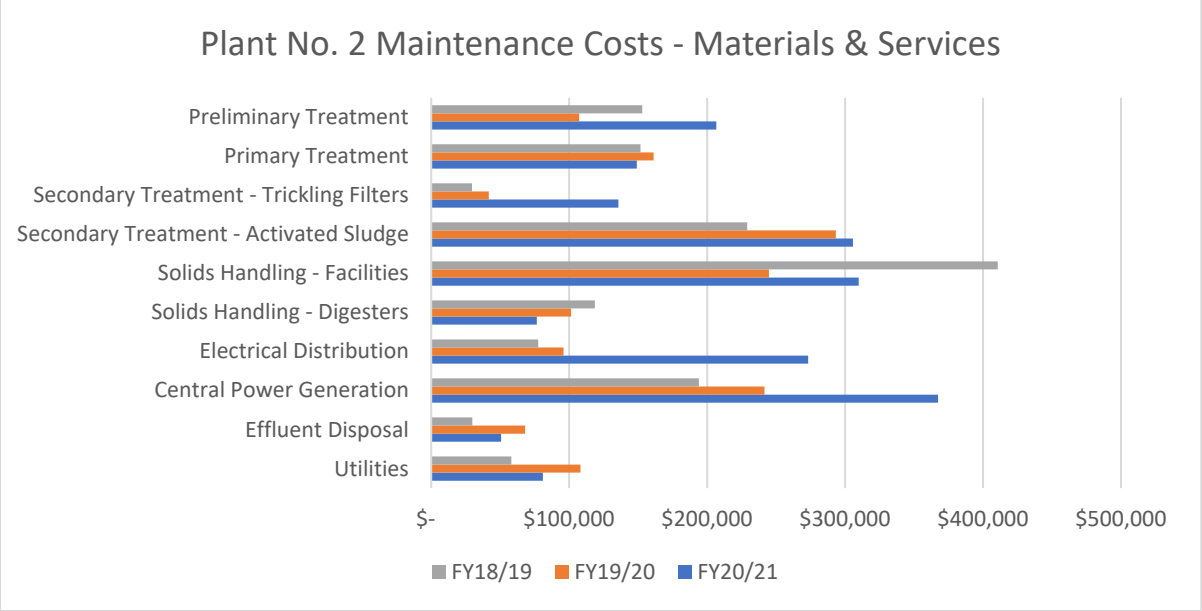


Figure 3-5. Graph of Maintenance Costs (Materials and Services) at Plant No. 2

Maintenance labor hours and costs for the pump stations are included in Appendix F. Regarding the Bay Bridge Bay Bridge pump station, there is a large increase in both maintenance costs and labor hours due to emergency replacement of critical valves. This was also noticed with the increase in break-in percent and decrease in the proactive percentage.

3.3 Maintenance Planning

OC San uses Maximo as the computerized maintenance management system. All maintenance related activities are stored in Maximo. In short, the information in Maximo makes up OC San's Maintenance Plan. Maintenance planning primarily consists of PM and PdM work orders. Currently, OC San proactively maintains over 60,000 stored in Maximo. For the assets. associated with process and treatment, there are approximately 4,282 active PM work orders. Approximately 229 of those PMs are related to predictive maintenance activities. A summary and breakdown of the PMs and PdMs are shown on Figure 3-6.

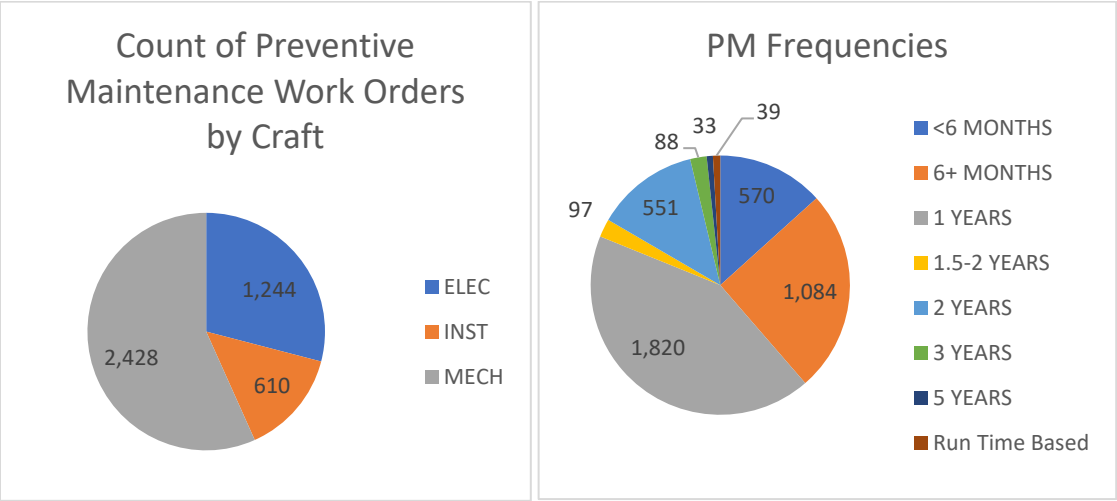


Figure 3-6. PM Workorder Broken Down by Both Craft and Frequency

OC San proactively maintains over 67,000 assets. This includes non-process related assets such as HVAC equipment, lighting, mobile equipment, etc.

3.3.1 Projected Maintenance Costs

The projected maintenance costs over the next two fiscal years in shown in Table 3-9. This accounts for materials and services only but is inclusive of both treatment plants and the collection system. For historical maintenance expenditures, please refer to Chapter 4.

Table 3-9. Projected Maintenance Costs Next 2 Fiscal Years

	FY 21/22	FY 22/23
Projected Maintenance Costs	$26.7M	$24.2M

3.4 Asset Management Program Accomplishments

Another way to measure Asset Management Program performance and success is by exploring the accomplishments. The accomplishments identified in the sections below are important because they focus on both long-term planning and accomplishments that helped extend the useful life of critical assets, increase reliability, reduce unexpected failures and break-ins allowing OC San to meet the key objectives of the Program.

3.4.1 Condition Assessment Program

A critical component of the program is the condition assessments performed on a regular basis. The Asset Management Group has completed approximately 50 different condition assessments last fiscal year utilizing an outside consultant and contractor. The assessments included assessing clarifiers, digesters, air and gas piping, primary influent piping, chemical storage tanks, structural assets, manholes, pumpstation wetwells, cathodic protection, and sump pumps to name a few. These assessments identify deficiencies and the general condition, but more importantly recommendations for repairs or replacement and general timing based on RUL estimations. The condition assessments have resulted in the identification of several new projects that are required to keep OC San facilities safe and reliable.

3.4.2 Collection System Assets

Our pump stations, force mains and gravity sewer system are vital asset in conveying flow to the treatment plants. The Asset Management Program is continuously evaluating ways to improve resiliency and reliability of the system while maintaining level of service in all flow conditions. Some of the collection system initiatives and accomplishments are identified below.

3.4.2.1 Manhole Inspections

In November 2020, OC San started conducting routine inspections of the regional collections system manholes. A total of 855 manholes have been inspected to date since the start of the program. Reports are provided to OC San with asset details as well as defects discovered during the inspection per National Association of Sewer Service Companies (NASSCO) standards. Similar to pipeline CCTV data, OC San has been collating all manhole CCTV inspection data into the Asset Management Program Info Asset Planner for further evaluation and to continue building a comprehensive database of CCTV inspection data.

3.4.2.2 Gravity Collections Remaining Useful Life

Over the past 2 years, OC San has aggregated all gravity sewer, siphon, air jumper, and manhole data into a single comprehensive Gravity Collections Asset Registry. Data in the asset registry include NASSCO scoring, theoretical RUL, and upcoming projects affecting an asset. In the past year, the entire Gravity Collections system was analyzed in order convert NASSCO scoring into RUL to complete the asset registry. High risk assets were further evaluated by considering the consequence of failure. In short, the Gravity Collections Asset Registry has evolved into a very useful tool for developing, validating, and refining the Asset Management Plan and CIP for the Gravity Collections system.

3.4.2.3 Pump Station Isolation

Reliability of the pump stations are critical. In the past, emergency break-in work has been required due to failure of critical assets such as isolation valves at some of the pump stations. With Asset Management Team taking ownership of the pump stations in recent years, OC San is now taking a proactive approach to rehabilitation and repair at the pump stations. For example, approximately seven valve replacement projects have been identified to replace aging or non-functioning pump station valves. The timing of these projects considers risk and criticality to minimize the risk of emergency work.

3.4.3 Central Generation Facility Planning

The internal combustion engines at Plant No. 1 and Plant No. 2 have significant run time and need a major overhaul to maintain reliability for the next 10 years or longer. One planning study has evaluated the feasibility of maintaining the engines in the long term (about 20 years), and what work needs to be done to keep the engines reliable for the foreseeable future, while ensuring parts and major components are readily available and that reputable service contractors in the marketplace can perform the necessary overhauls. Another study in the works is an update to the OC San Energy Master Plan that will evaluate viable alternatives for energy production and digester gas management, considering emerging technologies, market conditions and potential permitting constraints with the understanding that OC San's existing engines are becoming obsolete and increasingly unreliable. The Asset Management Team and Maintenance are working together to ensure OC San has a long-term plan to manage energy use, energy production, and handling of digester gas.

3.4.4 Treatment Plant Project Delivery

A major focus of Asset Management Team is streamlining the replacement or repair of our critical plant assets. The Asset Management Team works in tandem with Maintenance to identify projects, provide construction bid documents and manage project implementation of Maintenance Projects. Here are just a few of the projects that have or are close to being completed that were driven by Asset Management and Maintenance Teams:

Reclamation Plant No. 1:

- Several maintenance projects were implemented to allow Primary Clarifiers 3 and 4 to be available for the 21/22 wet weather season. Final repairs are anticipated to be completed by mid-December 2021.
- Through a planned condition assessment of activated sludge reactors at Activated Sludge No. 1 Facility, the RAS piping was found to be severally corroded and at risk of failure. A small project is being implemented to replace corroded piping and pipe supports.
- Several of our critical pumping systems are equipped with VFDs that have come obsolete and can no longer be maintained properly. Projects are in place to replace the old VFDs.

Treatment Plant No. 2:

- The Truck Loading facility at Plant No. 2 was need of mechanical equipment replacement or refurbishment. Several Maintenance managed projects have addressed aging and failed equipment at this facility.
- The major process pumps at the Trickling Filter Solids Contact Facility at Plant No. 2 needed major refurbishment due to corrosion and reliability concerns. Over the course of a few years, a total of 18 large capacity vertical turbine pumps were refurbished.
- Eleven Plant No. 2 digesters and associated bridges were inspected over past couple years when the tanks were taken out of service for cleaning. Many urgent repairs were performed and new Maintenance projects identified. Asset Management is coordinating all the digester-related projects to assure the projects are successfully executed without disruption to O&M activities.
- Three projects were carefully phased and implemented to replace the mechanical mechanisms in all 12 secondary clarifiers at the Plant No. 2 Activated Sludge Facility.
- The main sewage pumps at Plant No. 2 required both an overhaul of the motors and a 10-year PM work on the associated VFDs. This important work was carefully sequenced to maintain plant operations and was delivered on time.
- Several of our critical pumping systems are equipped with VFDs that have come obsolete and can no longer be maintained properly. Projects are in place to replace the old VFDs.

3.5 Asset Management Program Improvement Opportunities

The Asset Management Program continues to evolve with an emphasis on continuous improvement. The foundational elements of the program have been in place for a few years now. The Asset Management Team continues to identify new projects and update the short, medium, and long-term asset management plans to keep OC San assets reliable and available when called upon. Asset Management also continues to support and validate the 20-year CIP.

Asset management involves managing lots of data and information. The Asset Engineer considers available information and stakeholder perspectives when making recommendations and estimating asset condition and RUL. The general long-term strategy for the program is to move towards a data-driven program where decisions are made are defensible and work within defined constraints and limitations. The long-term improvement opportunities discussed below must be consistent with OC San strategies and priorities and align with the vision, mission, and key objectives of the program.

3.5.1 Short-to-Medium-Term Improvement Opportunities

Condition Assessments:

- Improve the condition assessment tracking of our critical assets and have a plan to assess them on a determined frequency.
- Track future condition assessments in the Asset Registries and proactively plan ahead with Operations for assessments that require out of service assets.
- Take field measurements to better understand how our major civil and mechanical assets degrade (deteriorate) over time allowing more accurate determination of RUL.

Remaining Useful Life:

- Define RUL such that it is clear RUL typically means replacement or major rehabilitation of an asset or group of assets
- Consider the risk and consequence of failure when determining condition scores and RUL and the timing of asset replacement or rehabilitation
- Create more condition scoring categories in the 1-10 year range as RUL accuracy improves over time as asset management improves data management and condition scoring guidelines

Asset Registries

- Ensure all critical assets are being monitored and tracked in the Asset Registries.
- Standardize the format and information in the asset registries. Combine them into a single database for consistency and ease of filtering.
- Create better alignment with Maximo by ensuring critical assets are clearly defined and asset descriptions are consistent with Maximo.
- Allow the asset registries to communicate and pull information with other OC San systems including Maximo and Geographical Information Systems.

Asset Hierarchy

- Create an OC San asset hierarchy that works for both Maximo and the Asset Registries.
- Ensure the level of asset tracking in the Asset Registries is adequate and meets the needs of OC San stakeholders.

3.5.2 Longer-Term Strategy and Improvement Opportunities

The OC San Asset Management Program will look to move towards a data-driven program taking advantage of the information, tools, and technologies available to make better decisions and minimize asset life cycle costs. Utilizing available data to the fullest extend and developing a dynamic Asset Management Plan will be key in helping the program be successful in the long term. Some potential long-term strategies include:

- Automating and developing real-time dashboards of asset condition based on performance condition assessments
- Developing a dynamic risk model to better prioritize maintenance activities and project implementation
- Moving towards a dynamic Asset Management Plan where asset health and estimated remaining life are available down the asset level
- Prioritizing capital projects and associated spending using both cost and risk based modeling considering constraints and limitations
- Creating Key Performance Index (KPI) dashboards to monitor performance and trends and overall program success
- Evaluating asset failures to determine maintenance and rehabilitation improvements

Long-term strategies will be re-evaluated on a periodic basis as the asset management industry and the needs of OC San evolve. Additional or changes to the program metrics or KPIs are envisioned as we better understand the life cycle cost of our major assets and do our best to

“deliver the required level of service, at the lowest life cycle cost, with an acceptable level of risk.”

3.6 Reference

Society for Maintenance and Reliability Professionals (SMRP). 2013. *Maintenance and Reliability Best Practices.* 4th Edition.

4 Budgetary Considerations

The Asset Management Plan focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations. OC San has been striving to identify more accurate medium- to long-term capital cash flow requirements. Specifically, the Planning Division has been working on developing a 20-year CIP by creating project plans for forecasted rehabilitation, replacement, improvements and expansion for the collection system and treatment plants. The CIP budget is evaluated and updated on an ongoing basis as new information becomes available.

4.1 Capital Improvement Expenditures

FY21-22 Budget Update, the second year of the 2-year budget adopted in June 2020, includes updates to the 20-year CIP outlay. Figure 4-1 shows the 20-year CIP outlay, which includes current and projected future CIP projects. FY21-22 CIP outlay is further divided into process categories shown on Figure 4-2.

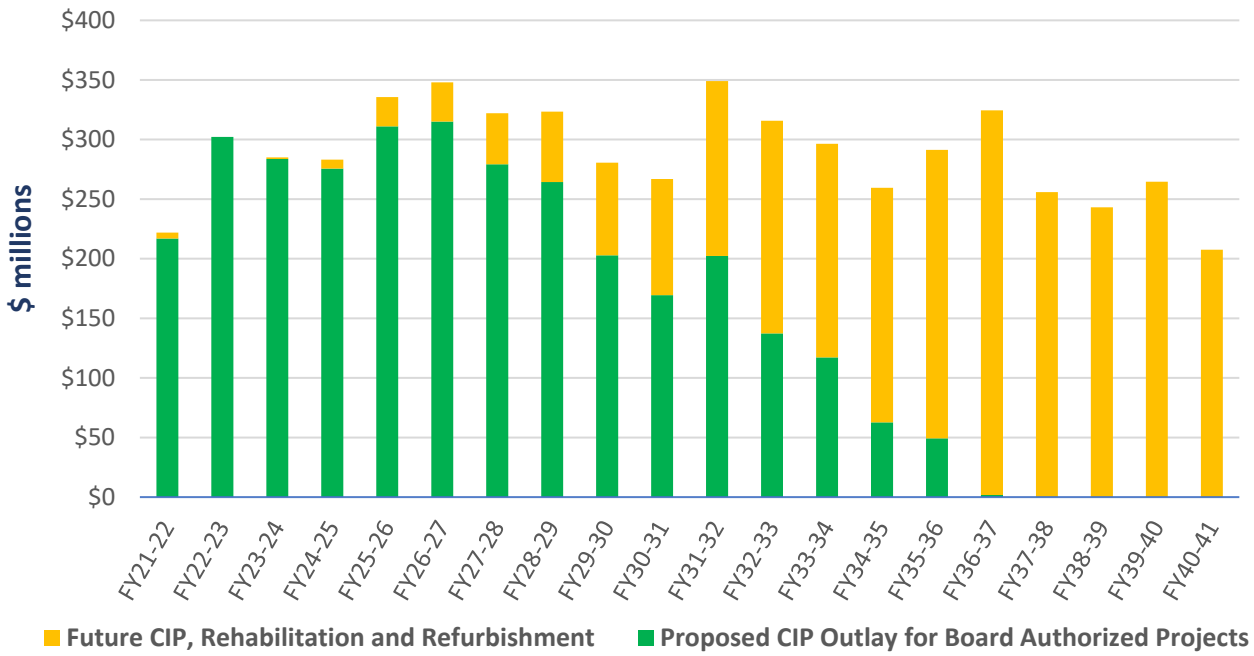


Figure 4-1. 20-Year CIP Outlay

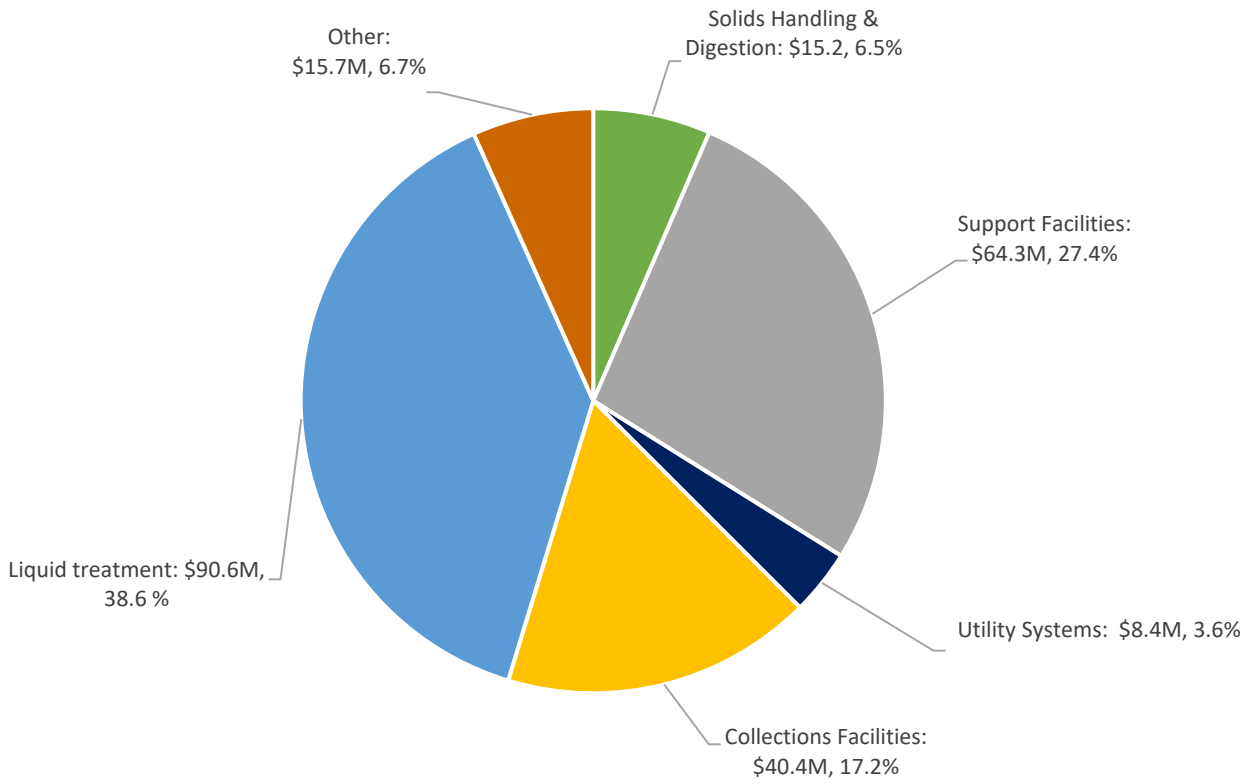


Figure 4-2. FY21-22 CIP Outlay by Process – $234.6 Million

4.2 Maintenance Expenditures

4.2.1 Five-Year Historical Maintenance Expenditures

Figure 4-3 and Figure 4-4 show the historical actual spent versus budgeted operational and maintenance expenditures for the treatment plants and collection system, respectively.

- The treatment plant expenditures include maintenance services and materials (budget objects 54010, 54020).
- The collection system expenditures include maintenance services and materials (budget objects 54010, 54020, 53180).
- These costs represent the operations and maintenance costs of fixed assets, including operationally funded repair/replacement projects.

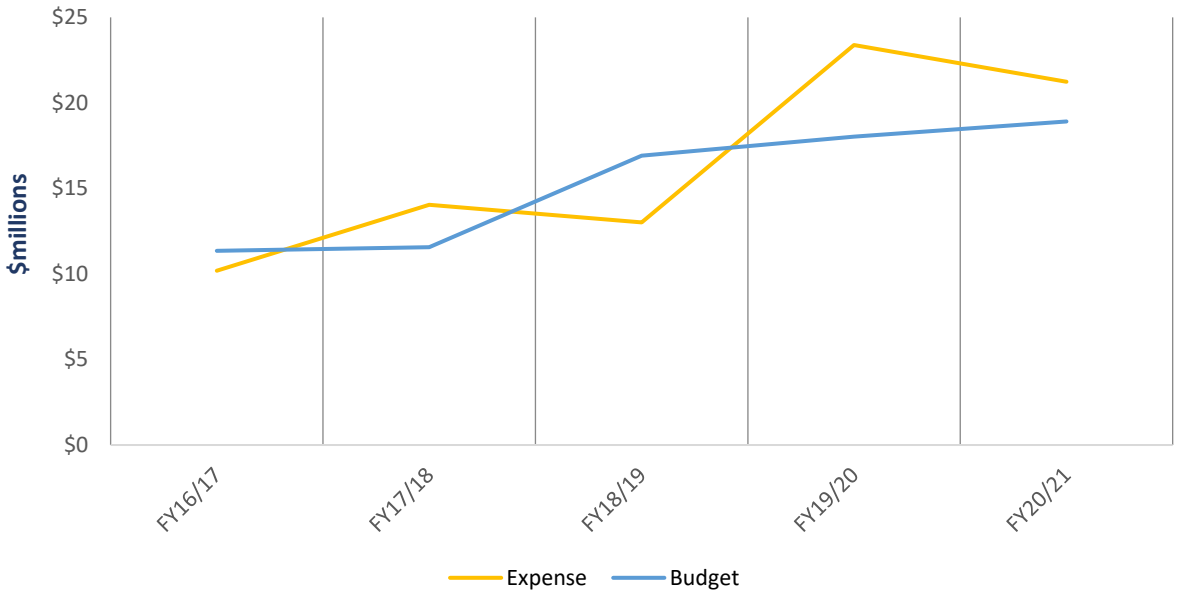


Figure 4-3. Five-Year Historical Maintenance Costs for Treatment Plants

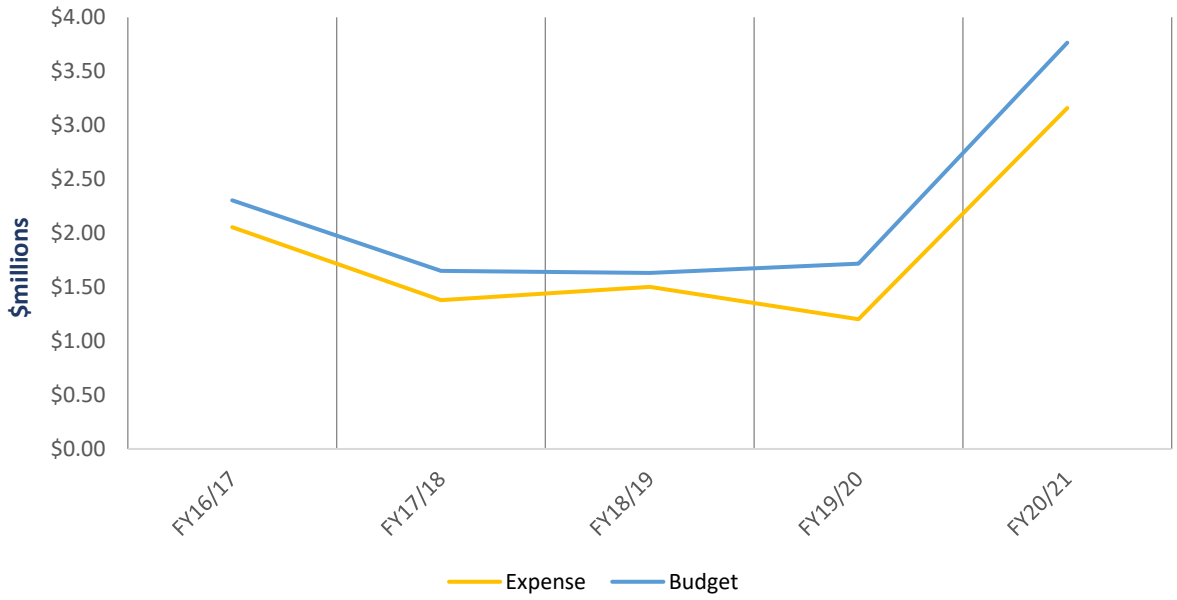


Figure 4-4. Five-Year Historical Maintenance Costs for Collection System

4.2.2 Three-Year Look-Ahead Maintenance Expenditures

Table 4-1 shows operational-funded projects identified to date and includes the projected annual expenditures. The projects are grouped by location (Plant No. 1, Plant No. 2, Joint, and Collection System), and then sorted by the project start fiscal year. The list encompasses projects identified as of August 31, 2021, with an expected construction cost exceeding $50,000. It is likely FY21-22 and beyond will fluctuate based on the condition of assets as they age. Additionally, projects in the following list represent expenditures that are operationally funded and capital in nature.

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
Collection System Projects						
PRN-00159	MP-307	Bushard Diversion Structure Repair		$1,421,409		$1,421,409
PRN-00449	FRC-0002	Bay Bridge Pump Station Valve Replacement	$803,875			$803,875
PRN-00527		A Street and 15th Street pump station valve replacement and assessment	$300,000	$300,000		$600,000
PRN-00584	FRC-0004	Seal Beach suction and isolation valve Replacement	$470,480			$470,480
PRN-00592	FRC-0007	Redhill Relief Sewer Liner Repair at SR-55		$170,062		$170,062
PRN-00677		Removal of Yorba Linda Spur Biofilter Odor Control	$65,000			$65,000
PRN-00713		Manhole Access Improvements on the Santa Ana River Trail	$65,000			$65,000
PRN-00728	FRC-0009	Repair of Incoming Sewer at Bitter Point Pump Station		$373,491		$373,491
PRN-00730	FRC-0010	Warner Avenue Vault Cover Replacements	$230,000	$180,763		$410,763
PRN-00734		Slater Pump Station Valve Replacement Project	$175,000			$175,000
PRN-00766	FRC-0011	Richfield Sub-trunk Encasement at	$64,870			$64,870

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
		BNSF Crossing at Orangethorpe Ave. and Richfield Rd.				
PRN-00767		Lido PS - Bathroom Reconfigure	$50,000			$50,000
PRN-00779	FRC-0012	Springdale-Relief Concrete Encasement Extension at Wintersburg Channel	$220,894			$220,894
PRN-00790		Lido PS Valve Replacement	$210,000			$210,000
PRN-00793	FRC-013	Bay Bridge Pump Station Force Main Valve Replacement	$433,648			$433,648
PRN-00803		Wintersburg Channel Miller-Holder Siphon Assessment		$120,000		$120,000
	7-66	Sunflower Trunkline Liner Repairs	$3,945,372	$700,000		$4,645,372
		Rhone and Heil Easement Restoration	$250,000			$250,000
Joint Projects						
PRN-00627		P1/P2 Cen Gen Engine Ignition Control System Obsolescence Repair		$250,000		$250,000
PRN-00630	FRJ-0003	Interplant Gas Line Blow Off Vaults		$186,703	$186,704	$373,407
PRN-00699		Cen Gen (Joint) Basement Access Hatch Fall Restraint		$50,000		$50,000
PRN-00729		Cen Gen, Digester and DAFT Tunnels Comb. Gas Detection Systems	$150,000	$300,000	$300,000	$750,000
PRN-00754		District HVAC Assessment for	$383,000			$383,000

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
		Infectious Aerosol Mitigation				
Plant No. 1 Projects						
PRN-00409		P1 Trickling Filter Low Voltage Cable Assessment		$337,680		$337,680
PRN-00478		P1 AS2 Clarifier #31 Catwalk - Coatings	$81,230			$81,230
PRN-00492	FR1-0011	P1 VFD Replacements		$250,000	$300,000	$550,000
PRN-00517		PB-7 Generator Radiator Repair	$86,400			$86,400
PRN-00520		P1 AS1 Blower Flowmeter Replacement	$76,500			$76,500
PRN-00525	FR1-0005	P1 Cen Gen 125VDC and 24DC Battery System	$100,000	$618,464		$718,464
PRN-00540	FR1-0013	Truckloading, Digesters 9 and 10, and Silo Cake Pumps Platform Request		$325,604		$325,604
PRN-00567		P1 Primary Basin Rebar Protection Blanket Contract	$90,566			$90,566
PRN-00569		P1 Emergency Generator Relay Upgrade	$190,000			$190,000
PRN-00580		An Interim Solution for Thickening Centrifuges Flow and TSS Readings		$54,000		$54,000
PRN-00598		Standby Generator Diesel Day Tank Improvements at Plant No.1		$60,000		$60,000
PRN-00618	FR1-0014	P1 Laboratory HVAC Controls Repair	$212,830			$212,830

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
PRN-00632	FR1-0012	Rebuild Shop Wood Floor Replacement & JIB Crane	$75,000	$75,393		$150,393
PRN-00676		Digester Ferric Injection Pipe	$65,000			$65,000
PRN-00696		Primary Scrubber H_2S Analyzer Retrofits at Plant No.1	$70,000			$70,000
PRN-00698		AS1 Waste-activated Sludge Pump Capacity	$0	$500,000		$500,000
PRN-00722		P1 Digester Mixing Pump and Piping Vibration Mitigation	$280,000			$280,000
PRN-00725		MSP#4 Feeder Cable Low Mega-ohm Reading to Ground on Phase B	$245,000			$245,000
PRN-00735		Plant 1 PEPs No. 3 Variable Speed Drive Replacement	$113,889			$113,889
PRN-00739		Plant No. 1 Cake Pump Water Box Improvements	$586,400			$586,400
PRN-00744		Plant 1 Power Building 5 Motor Control Centers Process Loads Configuration	$550,000			$550,000
PRN-00758	FR1-0015	P1 Waste Hauler Station Security Trailer Power	$73,800			$73,800
PRN-00771		P1 Bldg 6 Elevator Modernization		$182,000		
PRN-00782		AS1 72-inch Influent Valve Coating Repair	$45,900			$45,900
PRN-00792		Plant 1 AS1 Blower Building Turbine Generator Controls Upgrade		$700,000		$700,000

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
PRN-00797		Access Ladder Replacement at the T&D Odor Control Facility	$60,000			$60,000
PRN-00799		P1-33/37 Primary Effluent Piping Pressure Manhole at Plant 1		$100,000		$100,000
PRN-00800		Trickling Filter Clarifier Drain Valve Replacement	$125,000			$125,000
PRN-00804		Influent Pipe Repairs of Primary Sedimentation Basins 3 and 4 at Plant No. 1		$280,000		$280,000
		P1 Digester Cleaning	$1,300,426	$300,000		$1,600,426
		P1 Centrifuge Maintenance	$823,000	$100,000		$923,000
		Med. Voltage Cable Testing SVCs	$251,655	$240,000		$491,655
		On-call HVAC Services	$150,000	$150,000		$300,000
Plant No. 2 Projects						
PRN-00314		P2 Cen Gen Supply Air Fan Rehabilitation	$297,000			$297,000
PRN-00401	FR1-0008	P2 Headworks Low Voltage Cable Assessment	$277,000	$315,347		$592,347
PRN-00438	FR2-0013	Trickling Filter Waste Sludge Pump Room Exhaust Fan Relocation at Plant No. 2	$369,700			$369,700
PRN-00499		P2 EPSA VFD Upgrades	$22,935	$22,935		$45,870
PRN-00513		P2 Truckloading Auger Replacement	$190,000			$190,000
PRN-00536		Plant No. 2 Cen Gen Instrument Air			$250,000	$250,000

Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
		Compressor Replacement				
PRN-00571	FR2-0022	P2 Digester 'O' Structural Repairs	$188,285			$188,285
PRN-00572	FR2-0018	P2 AS Plant Clarifier Rehab (6) - Phase II		$3,700,000	$1,565,000	$5,265,000
PRN-00616		Cen Gen Generator #5 Electrical Svc and Repair		$85,000		$85,000
PRN-00619		P2 Truck Loading Sliding Frame Hydraulic Cylinders Replacement	$60,000			$60,000
PRN-00633	FR2-0023	P2 AS Plant Secondary Clarifier Safety Entry Improvements		$647,574		$647,574
PRN-00634		P2 TFSC RSS Pumps Repair for Low Seal Water Flow	$38,846			$38,846
PRN-00643		P2 TF-A Rotary Distributor Damage Evaluation and Repair	$100,000			$100,000
PRN-00680		P2 Distribution Center H: 480V Switchgear Relay Replacement & Auto Transferring	$61,500			$61,500
PRN-00682		P2 Screenings Loading Building Catwalk Installation		$54,000		$54,000
PRN-00684		P2 Digester Maintenance Projects	$1,249,441	$793,000		$2,042,441
PRN-00690	FR2-0024	480V Cable Replacement at P2	$338,126			$338,126
PRN-00731		P2 Trunkline Biotower #3 Inspection and Media Sampling	$99,650			$99,650

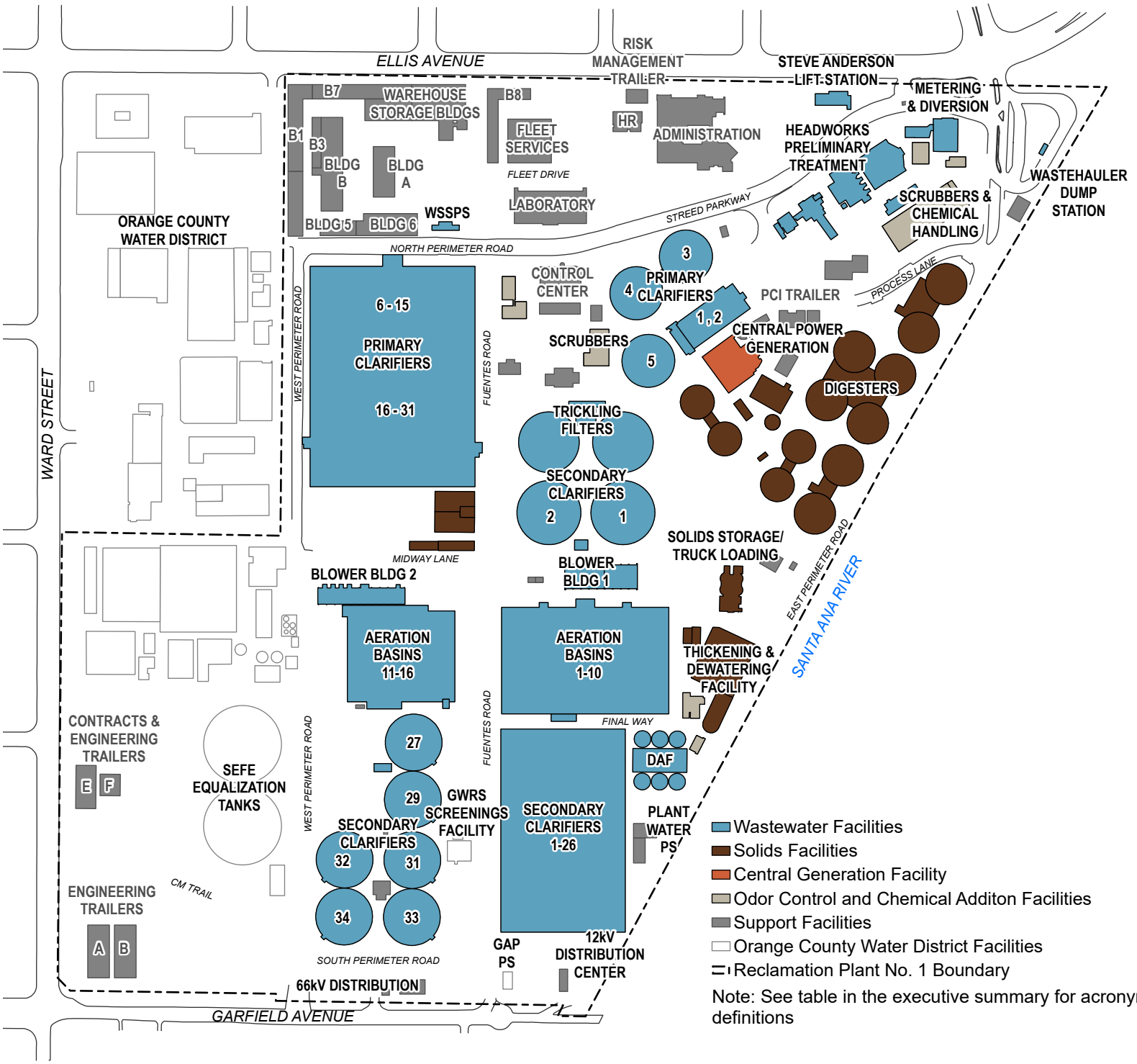
Table 4-1. Planned Operational-Funded Maintenance Projects in FY21-22 through FY23-24 (as of August 31, 2021)

PRN NO.	Alt Project No.	Project Title	FY21-22	FY22-23	FY23-24	3-Year Total Cost
PRN-00736		Men's Shower Stall Replacement at Plant No. 2	$74,300			$74,300
PRN-00742	FR2-0025	P2 Digester O-T, R-Q Bridge Repairs	$80,000	$213,406		$293,406
PRN-00757		Primary Distribution Structure B Gates Repair at Plant No. 2	$309,500			$309,500
PRN-00764		EPSA Generator Set Engine Oil Leak Repair	$70,000			$70,000
PRN-00770		P2 PEPS Pump Condition Assessment		$80,000		$80,000
PRN-00780		Plant No. 2 Trickling Filter Pump Station VFD Replacement	$234,000			$234,000
PRN-00788		P2 Maintenance Cubicle Renovation	$53,846			$53,846
PRN-00801		Plant No. 2 Screening Loading Exhaust Fan 1 Feeder Cable Repair		$56,000		$56,000
PRN-00811		120-in Ocean Outfall Immediately Required Repairs		$800,000		$800,000
		P2 Digester Cleaning	$1,000,000	$500,000		$1,500,000
		P2 Centrifuge Maintenance	$78,789	$101,000		$179,789
		P2 Headworks and EPSA Generator Load Bank Testing	$75,840			$75,840

PRN = Project Request Number

APPENDIX A

RESOURCE RECOVERY PLANT NO. 1 MAP


ELLIS AVENUE
RISK MANAGEMENT TRAILER
STEVE ANDERSON LIFT STATION
METERING & DIVERSION
WASTEHAULER DUMP STATION
B7
WAREHOUSE STORAGE BLDGS
B8
B1
B3
BLDG B
BLDG A
FLEET SERVICES
FLEET DRIVE
HR
ADMINISTRATION
HEADWORKS PRELIMINARY TREATMENT
SCRUBBERS & CHEMICAL HANDLING
LABORATORY
STREED PARKWAY
BLDG 5
BLDG 6
WSSPS
ORANGE COUNTY WATER DISTRICT
NORTH PERIMETER ROAD
WARD STREET
WEST PERIMETER ROAD
6 - 15
PRIMARY CLARIFIERS
16 - 31
FUENTES ROAD
CONTROL CENTER
3
4
PRIMARY CLARIFIERS
1 , 2
PCI TRAILER
PROCESS LANE
SCRUBBERS
5
CENTRAL POWER GENERATION
DIGESTERS
TRICKLING FILTERS
SECONDARY CLARIFIERS
2
1
MIDWAY LANE
BLOWER BLDG 2
BLOWER BLDG 1
SOLIDS STORAGE/ TRUCK LOADING
EAST PERIMETER ROAD
SANTA ANA RIVER
AERATION BASINS 11-16
AERATION BASINS 1-10
THICKENING & DEWATERING FACILITY
FINAL WAY
CONTRACTS & ENGINEERING TRAILERS
E
F
SEFE EQUALIZATION TANKS
27
29
GWRS SCREENINGS FACILITY
DAF
SECONDARY CLARIFIERS
32
31
SECONDARY CLARIFIERS 1-26
PLANT WATER PS
CM TRAIL
ENGINEERING TRAILERS
A
B
34
33
SOUTH PERIMETER ROAD
GAP PS
12kV DISTRIBUTION CENTER
66kV DISTRIBUTION
GARFIELD AVENUE
Wastewater Facilities
Solids Facilities
Central Generation Facility
Odor Control and Chemical Additon Facilities
Support Facilities
Orange County Water District Facilities
Reclamation Plant No. 1 Boundary
Note: See table in the executive summary for acronym definitions

APPENDIX B

RESOURCE RECOVERY PLANT NO. 1 PROCESS DIAGRAM

Unit Process Schematic

OC San Reclamation Plant No. 1

rev. 10/21/20

Caustic
Bleach
Scrubbers 1,2,3,4
Grit to Landfill
Scrubbers 5–8
Caustic
Bleach
Headworks No. 1 Pumps (2)
Gravity Grit Chambers (2)
Dilution Water
Polymer
East Basin Distribution Structure
Primary Clarifiers 1–5
Primary Effluent Junction Box (PEJB)
(recirculation line)
Trickling Filter Influent Pumps (3)
Trickling Filters (2)
TFE Box
Trickling Filter Secondary Clarifiers (2)
TFSE Junction Box 1
TFSE Junction Box 3
TFSE Junction Box 4
TFSE Junction Box 5
Bleach
Sludge
Scum
Drain
TF Sludge
Trickling Filter Sludge Pumps (4)
78-Inch Interplant Trunkline to Plant No. 2
Waste Side Stream Pump Station (WSSPS) (3 pumps)
(overflow only)
Redwood Weir (PEDB1)
Primary Effluent Pump Station (PEPS) (3)
Facility Use
Plant 1 Water Pump Station
Wastehauler Station
Ferric Chloride & Hydrogen Peroxide
(separate lines to each box)
(peroxide not in use)
Splitter Box
84-inch line
66-inch line
SEJB
Interplant Line
Hydrogen Peroxide (not in use)
Scrubber 9
Scrubber 10 (Biotower)
Hydrogen Peroxide (not in use)
Hydrogen Peroxide (not in use)
Junction Box A
SE Junction Box 1
Bleach
TFSE Junction Box 2
Effluent Junction Box (EJB)
Sludge & Scum Decant
GAP Backwash
Ferric Chloride
Polymer
Dilution Water
Primary Effluent Distribution Box (PEDB2)
Bleach
Aeration Basins 1-10
Secondary Clarifiers 1-26
Scum
SE Junction Box 5
SE Junction Box 4
OCWD-owned Pump Station for GAP Water
GAP Backwash
to OCSD WSSPS
GWRS Water (emergency flow)
84-inch
120-inch
66-inch
Interplant Trunkline to Plant No. 2 Outfall
6 Influent Trunklines
Metering & Diversion (M&D) Structure
Sunflower Pump Station
Steve Anderson Lift Station
Influent
Bar Screens 1,2,5,6
Screenings to Landfill
Headworks No. 2 Pumps (5)
Aerated Grit Chambers 1,2,3,4,5
Grit to Landfill
Primary Clarifiers 6–31
Sludge
Drain
Scum
GWR Backwash (BWW)
to Plant No. 2 interplant line
GWRS Wastestreams (42"ROC) (24"Brine)
RAS Pumps (5)
WAS Pumps (4)
(2) 108-inch lines
SE Junction Box 2
SE Junction Box 3
SE Junction Box 7
(2) 108-inch lines
Bleach
(weir overflow)
SE Junction Box 6
OCWD-owned GWR System Screenings Facility
OCWD-owned GWR System Facilities
GWRS Water (emergency flow)
to Santa Ana River
Sump Waste (SW)
Lime Waste (2 lines)
to OCSD 78-inch Interplant Trunkline to Plant No. 2 Influent
GWRS Wastestreams (42"ROC) (24"Brine)
Backwash (BWW)
to OCSD PEDB2 (effluent 108-inch)
to OCSD Primary Clarifiers 6-31
Aeration Basins 11-16
Secondary Clarifiers 27-34
Scum
Return-Activated Sludge (RAS) Pumps (12)
Waste-Activated Sludge (WAS) Pumps (6)
Float
Thickened Waste-Activated Sludge (TWAS)
Underflows
Dissolved Air Flotation Thickners (DAFTS) (6)
Gas Flares (3)
Gas Compressor Bldg
Boiler 2 (Hot Water Boiler)
Interplant High Pressure Digester Gas Line
to Plant No. 2 CenGen
Carbon Scrubbers (2)
Ferric Chloride (as required)
Central Power Generation System (3 engines, 3 boilers)
Hot Water (to Heat Exchanger)
Cold Water
Hot Water
to Cooling/Heating Admin. Bldg, Lab, Control Center
Sulfuric Acid
Caustic Soda
Bleach
Thickening and Dewatering Scrubbers 1, 2, 3
Holding Digesters No. 5 & 6
Sludge Digesters 7–16
Overflow only)
Junction Box C
Junction Box B
Centrifuge Thickened Sludge
Polymer
Centrate Pumps Station (3)
Centrate
Dewatering Centrifuges (3)
Dewatered Cake
Cake Transfer Station (3 pumps)
Truckloading Hopper (1)
Storage Silos 1,2,3,4
Pumps (4)
Centrifuge Thickened Sludge
Interplant Trunkline to Plant No. 2
Trickling Filters
Aeration Basins (AS2)
Sludge Blend Tanks (3)
Polymer
Thickening Centrifuges (3)
Biosolids Recycle

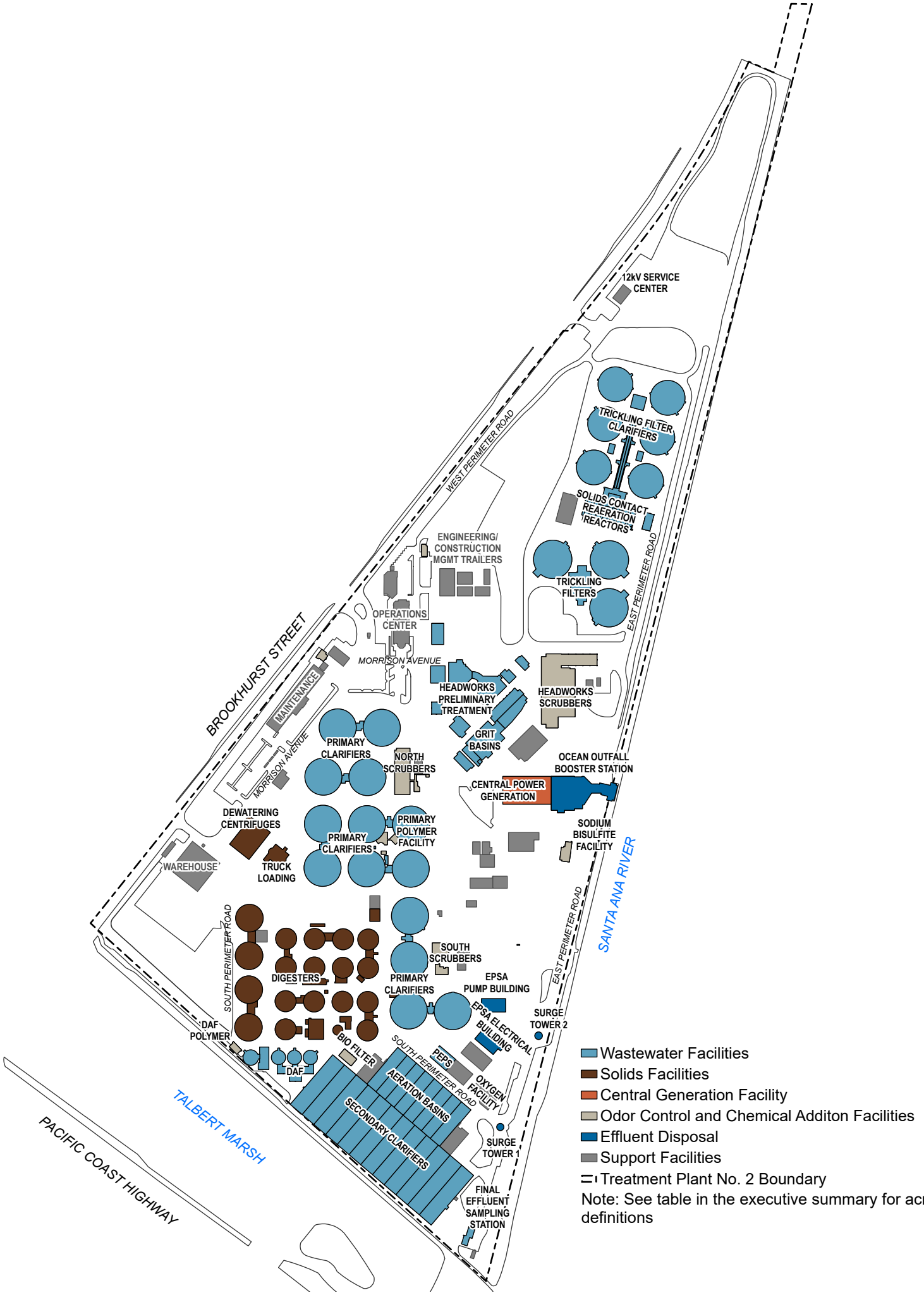
LEGEND

- Plant Influent
- Primary Influent
- Primary Effluent
- Secondary Effluent
- Plant Discharge
- Alternate Routing
- Solids
- Chemical Addition
- Foul Air
- Digester Gas
- from OCWD

NOTE: Thicker lines denote main flow direction.

APPENDIX C

TREATMENT PLANT NO. 2 MAP


12kV SERVICE CENTER
TRICKLING FILTER CLARIFIERS
SOLIDS CONTACT REAERATION REACTORS
WEST PERIMETER ROAD
ENGINEERING/ CONSTRUCTION MGMT TRAILERS
TRICKLING FILTERS
EAST PERIMETER ROAD
OPERATIONS CENTER
BROOKHURST STREET
MORRISON AVENUE
MAINTENANCE
HEADWORKS PRELIMINARY TREATMENT
HEADWORKS SCRUBBERS
GRIT BASINS
PRIMARY CLARIFIERS
NORTH SCRUBBERS
OCEAN OUTFALL BOOSTER STATION
CENTRAL POWER GENERATION
DEWATERING CENTRIFUGES
PRIMARY POLYMER FACILITY
PRIMARY CLARIFIERS
SODIUM BISULFITE FACILITY
WAREHOUSE
TRUCK LOADING
SANTA ANA RIVER
SOUTH PERIMETER ROAD
SOUTH SCRUBBERS
DIGESTERS
PRIMARY CLARIFIERS
EPSA PUMP BUILDING
EPSA ELECTRICAL BUILDING
SURGE TOWER 2
DAF POLYMER
BIO FILTER
DAF
FEPS
OXYGEN FACILITY
AERATION BASINS
SECONDARY CLARIFIERS
SURGE TOWER 1
FINAL EFFLUENT SAMPLING STATION
TALBERT MARSH
PACIFIC COAST HIGHWAY
Wastewater Facilities
Solids Facilities
Central Generation Facility
Odor Control and Chemical Additon Facilities
Effluent Disposal
Support Facilities
Treatment Plant No. 2 Boundary
Note: See table in the executive summary for acronym definitions

APPENDIX D

TREATMENT PLANT NO. 2 PROCESS DIAGRAM – BEFORE GWRS EXPANSION

ORANGE COUNTY SANITATION DISTRICT
PROTECTING THE ENVIRONMENT

Caustic
Bleach
Headworks Odor Control
(8 Chemical Scrubbers
& 13 Biotowers)
Rag Handling
& Loading (4)
Grit Handling
& Loading (4)
Splitter
Box
A
B
C
Ferric Chloride
& Bleach
(separate lines
to each box)
Polymer
Dilution
Water
Distribution
System
Primary
Metering
Caustic
Bleach
South
Scrubber
Complex U–Z
Primary
Clarifiers
D–G
Primary
Clarifiers
H–L
Primary
Clarifiers
M–Q
Junction
Box 4
Facility
Use
Plant Water
Pump Station
Bleach
High Purity Oxygen
Aeration
Basins (8)
Secondary
Clarifiers
A–L
Bleach
Santa Ana River
Overflow (SARO)
(Serial Port 003)
Emergency
78-inch
Outfall
(Serial Port 002)
Surge
Tower
No. 1
Sodium
Bisulfite
Effluent
Pump
Station
Annex
(EPSA)
(3 pumps)
Hydrogen
Peroxide
(not in use)
Trunkline
Odor Control
(3 Biotowers)
Wetwell
Vortex
Grit
Basins
(6)
Primary Effluent
Pump Station
(PEPS) (4)
Return-
Activated
Sludge (RAS)
Pumps (6)
Bleach
Junction
Box 8
(JB8)
Junction
Box A
(JBA)
Sodium
Bisulfite
Final Sampler
Bldg.
Wetwell
120-inch
Outfall
(Serial Port 001)
Surge
Tower
No. 2
Ocean Outfall
Booster Station
(OOBS) (5 pumps)
Emergency Overflow
Chemical
Scrubber &
Carbon
Scrubbers
(A-C)
Solids Contact
Re-aeration
Basins (A-D)
Trickling
Filters (A,B,C)
120-inch line
66-inch line
84-inch line
Interplant
Trunklines (from
Plant No.1 EJB)
Trickling Filter
Influent Pumps
(6)
Return Secondary
Sludge (RSS)
Pumps (12)
Secondary
Settling
Clarifiers
(A-F)
Bleach
Scrubbers G
(Biotower)
Polymer
Dilution
Water
Sludge and
Scum Decant
Waste Secondary
Sludge (WSS)
Pumps (3)
Waste-Activated
Sludge (WAS)
Pumps (4)
Primary Effluent
Distribution
Structure (PEDS)
A through C DAFTS (underflow)
Float
Thickened Waste-Activated Sludge (TWAS)
DAFT D (underflow)
& AS Plant Process Drainage
Dissolved Air Flotation
Thickners (DAFTs)
A–D
Caustic
Bleach
North Scrubber
Complex M–T
(Q Biotower)
Sludge
& Scum
Waste
Stream
Pump
Station
Carbon
Scrubber
Sludge Blending
Facility
Sludge
Digesters
Ferric
Chloride
A
Segment
(F,G,H,
N,O,T)
B
Segment
(P,Q,R,S)
C
Segment
(C,D,E,
L,M)
Holding
Digesters
(I,J,K)
Centrifuge (5)
Polymer
Dilution
Water
Cake
Transfer
(5 pumps)
Hoppers
A, B
and
Truckloading
Truckloading
Odor Scrubber
Biosolids
Recycle
Dewatering
Scrubbers
Biofilter
Centrate
Central Power
Generation System
(5 engines, 5 boilers,
1 steam turbine)
Gas
Flares (3)
Gas Compressor Cooling Water
Interplant High Pressure
Digester Gas Line from
Plant No. 1
Gas
Compressor
Bldg.
Carbon
Scrubbers
(3)
Hot Water
(to Heat Exchanger)
5 Influent
Trunklines
including 78-Inch
Interplant Trunkline
(Raw Sewage from
Plant No. 1 M&D
and GWRS
wastestreams)
Diversion
Struture
Metering
Structure
Bar
Screens
(6)
Headworks D
Pumps (7)

LEGEND

- Plant Influent
- Primary Influent
- Primary Effluent
- Secondary Effluent
- Plant Discharge
- Alternate Routing
- Solids
- Chemical Addition
- Foul Air
- Digester Gas
- Grit and Screenings

NOTE: Thicker lines denote main flow direction.

Unit Process Schematic

OC San Treatment Plant No. 2

rev. 12/01/20

APPENDIX E

TREATMENT PLANT NO. 2 PROCESS DIAGRAM – AFTER GWRS EXPANSION

Unit Process Schematic — OC San Treatment Plant No. 2

Future Process after GWRS Final Expansion in 2023

78-interplant line containing SARI, P1 recycle flow, and GWRS wastestreams (Non-Reclaimable)

4 Influent Trunklines (Reclaimable)

Hydrogen Peroxide (not in use)

Trunkline Odor Control (3 Biotowers)

Headworks Odor Control (8 Chemical Scrubbers & 13 Biotowers)

Caustic Bleach

Diversion Structure — 1 Non-Reclaimable, 3 Reclaimable

Metering Structure

Bar Screens (6) — 3 Non-Reclaimable, 3 Reclaimable

Wetwell

Headworks D Pumps (7) — 3 Non-Reclaimable, 4 Reclaimable

Rag Handling & Loading (4)

Grit Handling & Loading (4)

Vortex Grit Basins (6) — 3 Non-Reclaimable, 3 Reclaimable

Splitter Box (A, B, C)

Ferric Chloride & Bleach (separate lines to each box)

Primary Metering (A, B, C)

Polymer

Dilution Water

Distribution System (A, B, C)

*Primary Clarifiers D–G

Primary Clarifiers H–L

Primary Clarifiers M–Q

Caustic Bleach

South Scrubber Complex U–Z

Caustic Bleach

North Scrubber Complex M–T (Q Biotower)

Junction Box 4

Primary Effluent Pump Station (PEPS) (4)

High Purity Oxygen

*Aeration Basins (8)

Return-Activated Sludge (RAS) Pumps (6)

*Secondary Clarifiers A–L

Facility Use

Plant Water Pump Station

Bleach

Santa Ana River Overflow (SARO) (Serial Port 003)

Emergency 78-inch Outfall (Serial Port 002)

Surge Tower No. 1

Sodium Bisulfite

Effluent Pump Station Annex (EPSA) (3 pumps)

Bleach

Junction Box 8 (JB8)

Junction Box A (JBA)

Sodium Bisulfite

Final Sampler Bldg.

120-inch Outfall (Serial Port 001)

Surge Tower No. 2

Wetwell

Ocean Outfall Booster Station (OOBS) (5 pumps)

120-inch line

66-inch line

84-inch line

Overview Weir Box

Interplant Trunklines (from Plant No.1 EJB)

Diversion Structure

OCWD EQ Tank and Pumps

To GWRS through the existing 66-inch Interplant Line

To GWRS intake at Plant No. 1

Bleach

Primary Effluent Distribution Structure (PEDS)

Emergency Overflow

Chemical Scrubber & Carbon Scrubbers (A-C)

Trickling Filters (A,B,C)

Trickling Filter Influent Pumps (6)

Solids Contact Re-aeration Basins (A-D)

Return Secondary Sludge (RSS) Pumps (12)

Secondary Settling Clarifiers (A-F)

Waste Secondary Sludge (WSS) Pumps (3)

Waste-Activated Sludge (WAS) Pumps (4)

Scrubbers G (Biotower)

Polymer

Dilution Water

Sludge and Scum Decant

Dissolved Air Flotation Thickners (DAFTs) A–D

Float

Thickened Waste-Activated Sludge (TWAS)

DAFT D (underflow) & AS Plant Process Drainage

A through C DAFTS (underflow)

Sludge & Scum

Waste Stream Pump Station

Sludge Blending Facility

Carbon Scrubber

Centrate

Central Power Generation System (5 engines, 5 boilers, 1 steam turbine)

Gas Flares (3)

Gas Compressor Cooling Water

Interplant High Pressure Digester Gas Line from Plant No. 1

Carbon Scrubbers (3)

Gas Compressor Bldg.

(to Heat Exchanger)

Hot Water

Dewatering Scrubbers Biofilter

Sludge Digesters

Ferric Chloride

A Segment (F,G,H, N,O,T)

B Segment (P,Q,R,S)

C Segment (C,D,E, L,M)

Holding Digesters (I,J,K)

Centrifuge (5)

Polymer

Dilution Water

Cake Transfer (5 pumps)

Hoppers A, B and Truckloading

Truckloading Odor Scrubber

Biosolids Recycle

After 2023, A-side primary clarifiers and AS Plant will treat the non-reclaimable flow, and B&C-sides primary clarifiers and TF/SC will treat the reclaimable flow to GWRS.
* Major non-reclaimable flow treatment process units

LEGEND

- Plant Influent
- Primary Influent
- Primary Effluent
- Secondary Effluent
- Plant Discharge
- Solids
- Chemical Addition
- Foul Air
- Digester Gas
- Grit and Screenings
- GWRS
- Alternate Routing

NOTE: Thicker lines denote main flow direction.

rev. 10/21/20

APPENDIX F

AM KPI SUPPLEMENTAL INFORMATION

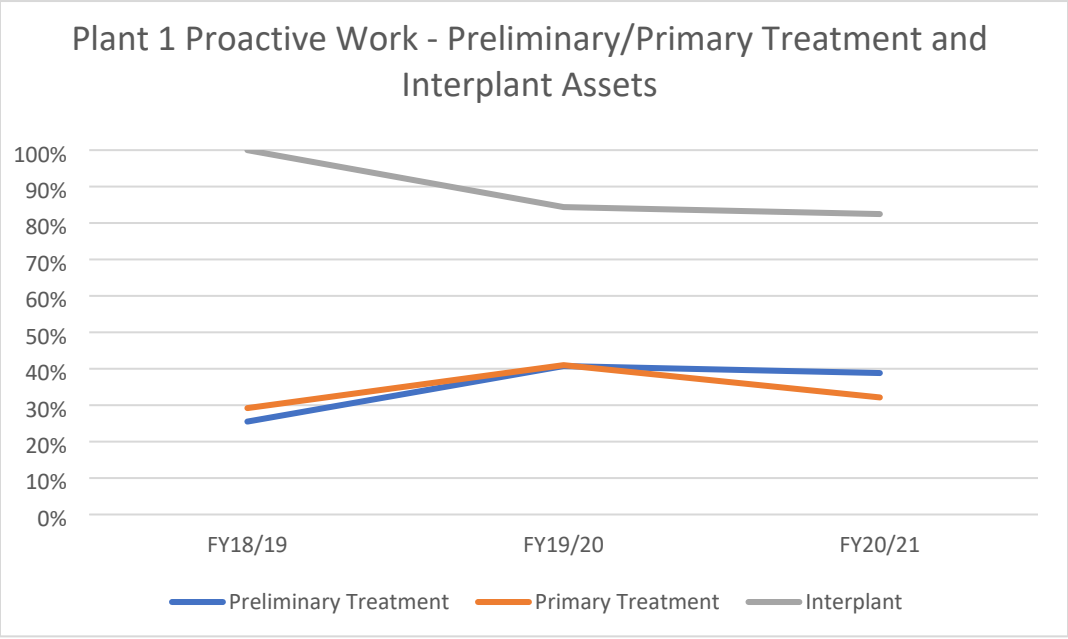
Appendix F

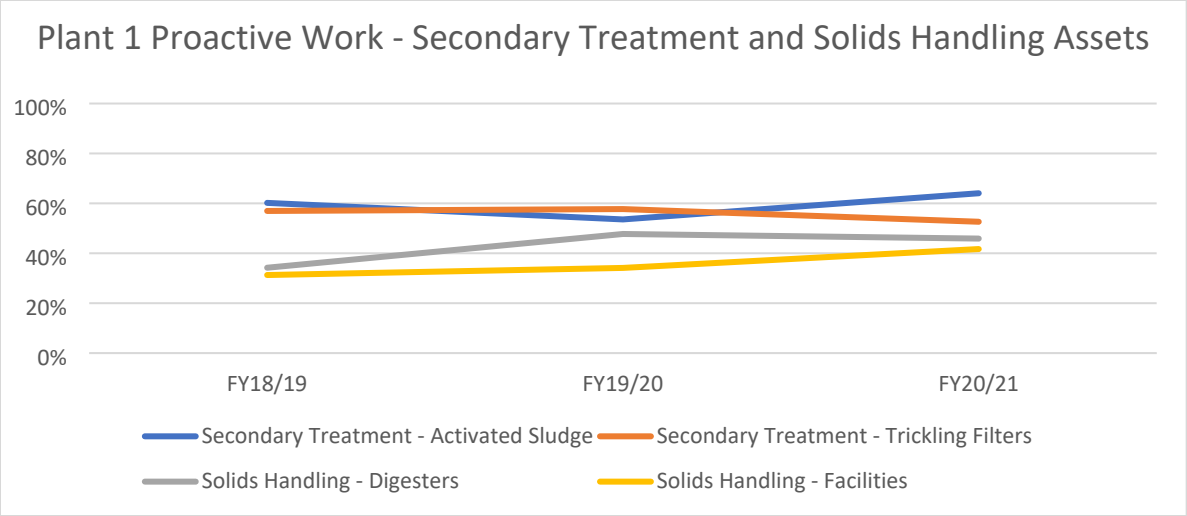
Tables and Graphs

Plant No. 1

Table 3. 1 Proactive Maintenance (PM) Percent for Reclamation Plant No. 1			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
Preliminary	25%	39%	39%
Primary	29%	39%	32%
Interplant	69%	84%	82%
Activated Sludge	58%	53%	64%
Trickling Filters	55%	56%	53%
Digesters	34%	46%	46%
Solids Handling Facilities	31%	34%	42%
Central Power Generation	40%	64%	62%
Electrical Distribution	77%	68%	65%
Utilities	43%	33%	30%

Table 3. X Proactive Maintenance (PM) Percent for Reclamation Plant No. 1 Secondary			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
Activated Sludge 1	61%	47%	65%
Activated Sludge 2	51%	59%	62%
Trickling Filters	55%	56%	53%




Plant 1 Proactive Work - Secondary Treatment and Solids Handling Assets
100%
80%
60%
40%
20%
0%
FY18/19
FY19/20
FY20/21
Secondary Treatment - Activated Sludge
Secondary Treatment - Trickling Filters
Solids Handling - Digesters
Solids Handling - Facilities

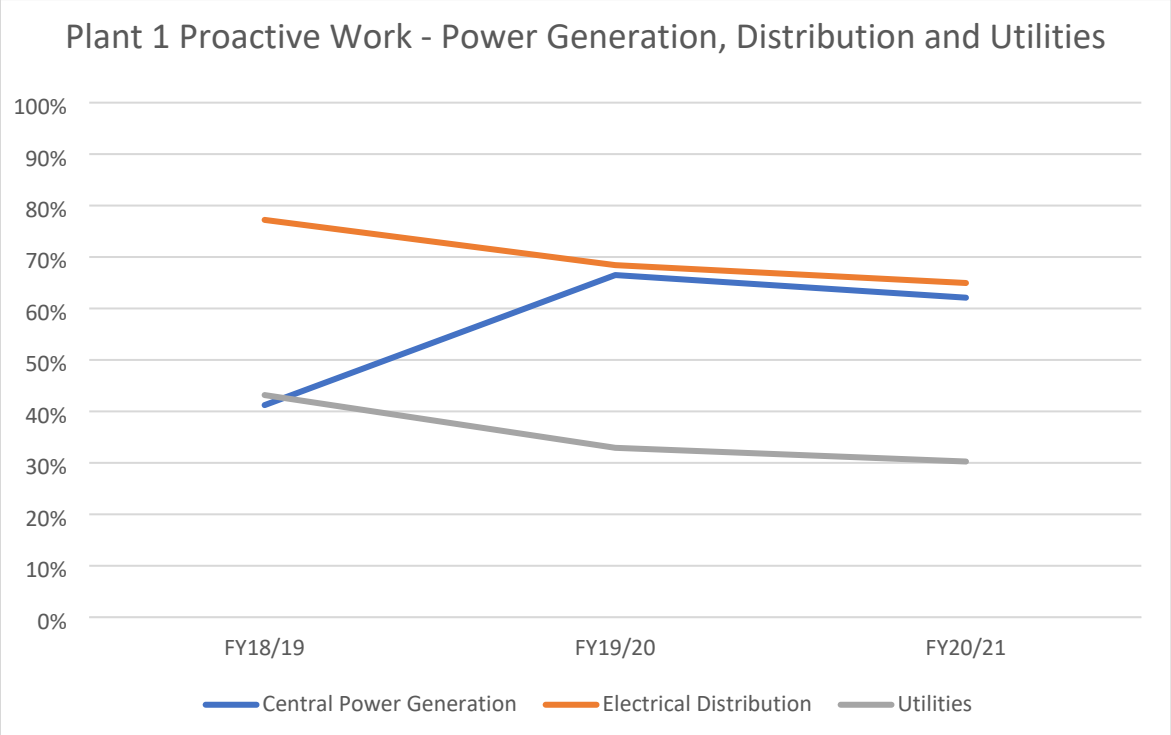
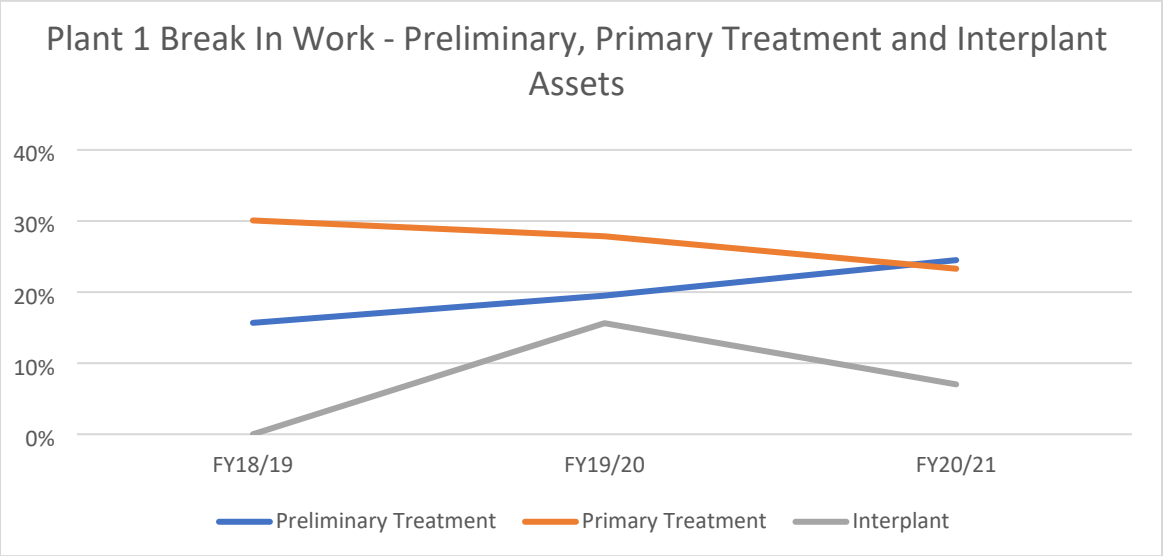
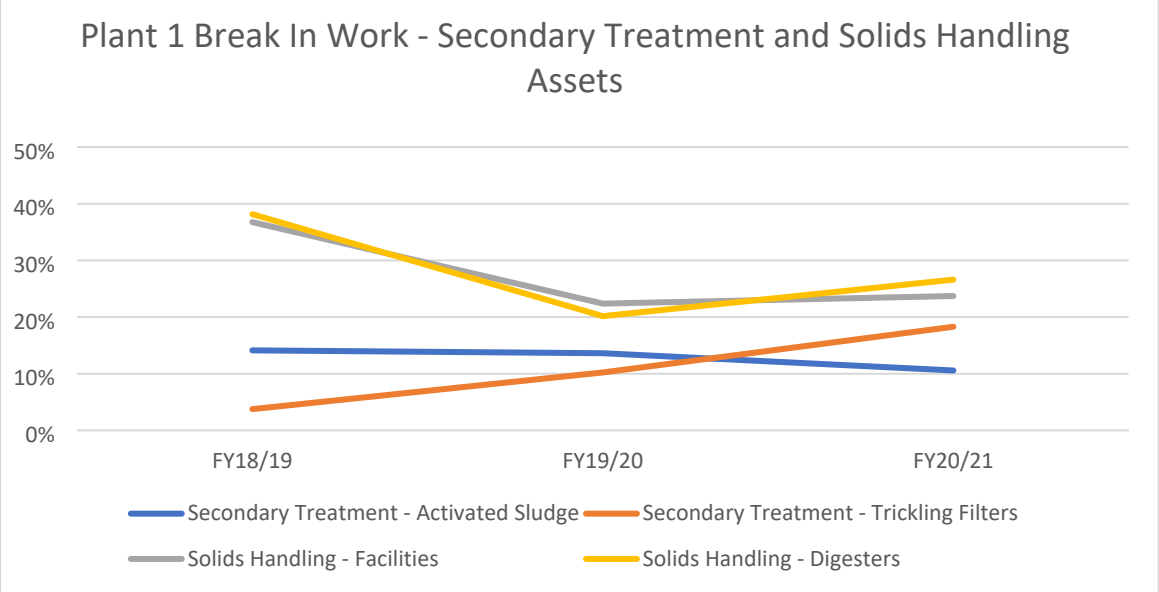
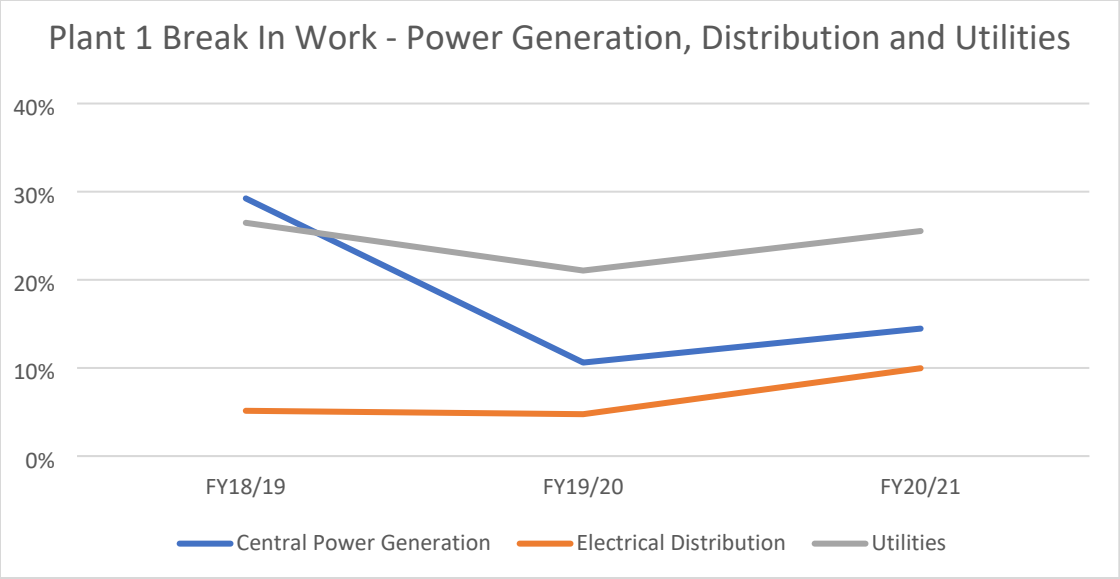

Plant 1 Proactive Work - Power Generation, Distribution and Utilities
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
Central Power Generation
Electrical Distribution
Utilities

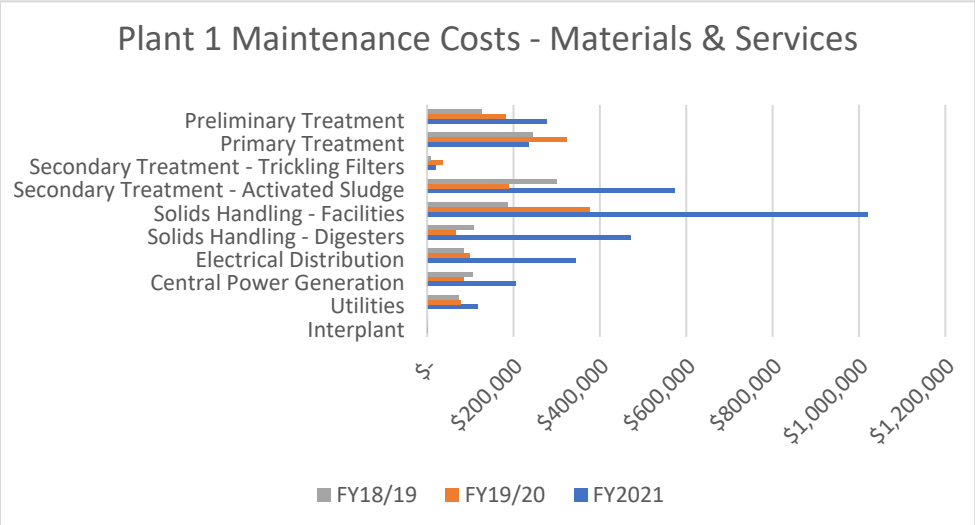
Table 3. 5 Break-in Percent for Reclamation Plant No. 1			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
Preliminary	16%	20%	24%
Primary	30%	28%	23%
Interplant	0%	16%	7%
Activated Sludge	14%	14%	11%
Trickling Filters	4%	10%	18%
Digesters	38%	20%	27%
Solids Handling Facilities	37%	22%	24%
Central Power Generation	29%	11%	14%
Electrical Distribution	5%	5%	10%
Utilities	26%	21%	26%



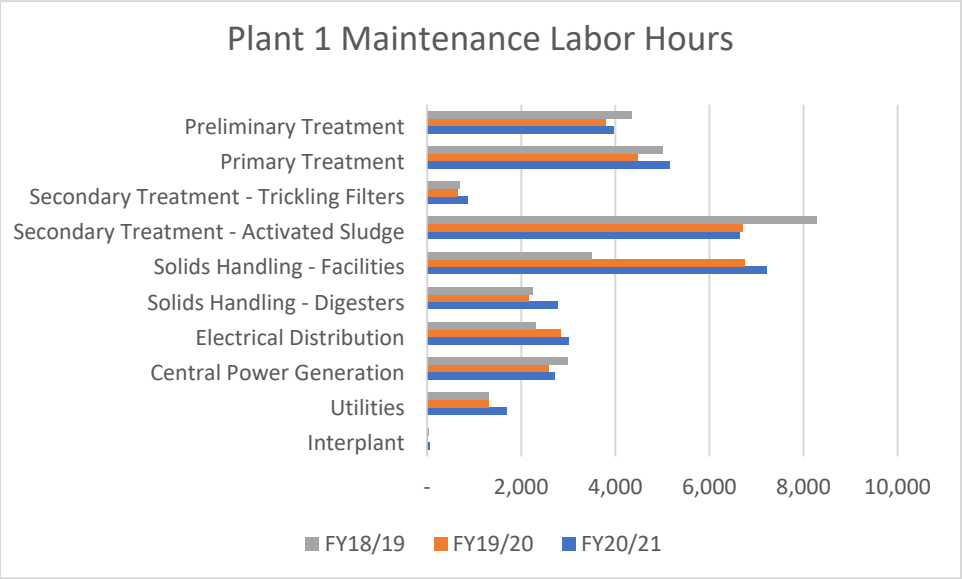




Plant 1 - Maintenace Cost			
	FY2021	**FY19/20**	**FY18/19**
Interplant	$ 1,274	$ 129	$ 98
Utilities	$ 116,792	$ 77,631	$ 72,507
Central Power Generation	$ 203,897	$ 84,162	$ 104,694
Electrical Distribution	$ 343,786	$ 99,052	$ 84,335
Solids Handling - Digesters	$ 471,345	$ 65,939	$ 108,286
Solids Handling - Facilities	$ 1,020,481	$ 376,349	$ 186,478
Secondary Treatment - Activated Sludge	$ 573,375	$ 189,689	$ 300,845
Secondary Treatment - Trickling Filters	$ 19,661	$ 36,448	$ 8,680
Primary Treatment	$ 235,044	$ 322,086	$ 244,157
Preliminary Treatment	$ 277,461	$ 182,331	$ 126,066



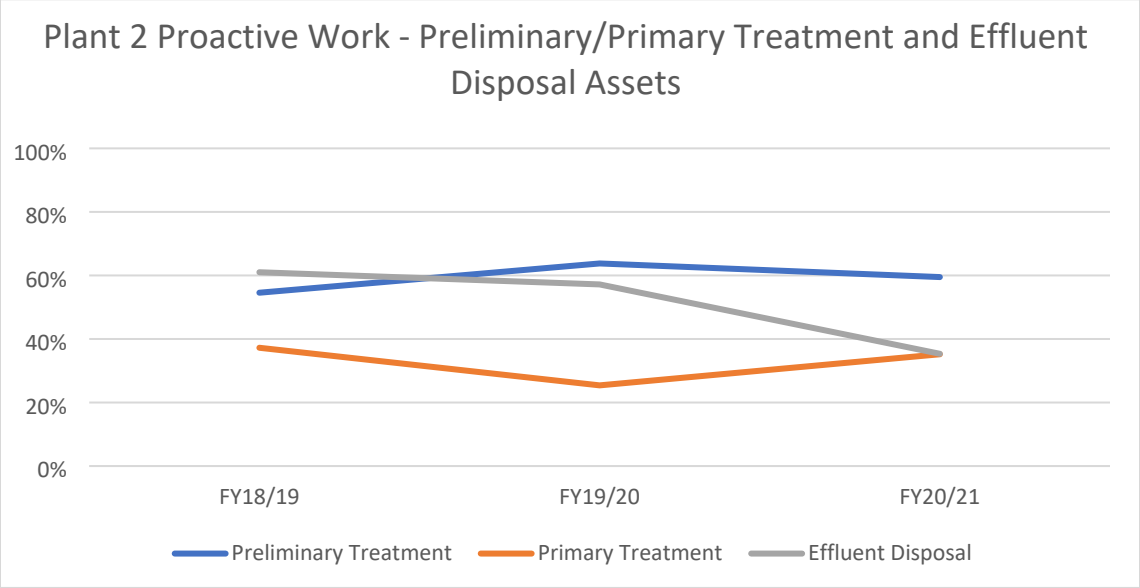
Plant 1 -Maintenance Labor Hours			
	FY20/21	**FY19/20**	**FY18/19**
Interplant	43	16	33
Utilities	1,680	1,299	1,304
Central Power Generation	2,706	2,577	2,994
Electrical Distribution	2,999	2,838	2,305
Solids Handling - Digesters	2,765	2,165	2,243
Solids Handling - Facilities	7,215	6,754	3,499
Secondary Treatment - Activated Sludge	6,634	6,709	8,281
Secondary Treatment - Trickling Filters	860	655	692
Primary Treatment	5,164	4,464	5,000
Preliminary Treatment	3,954	3,784	4,355

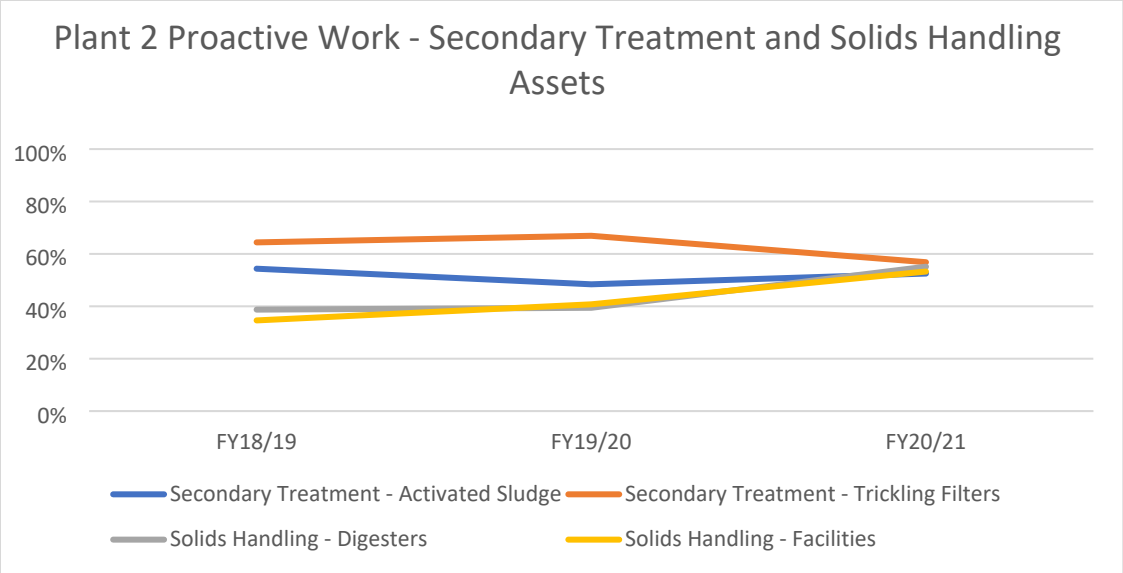


Plant 1 - Availability	Percent Availability		
	FY18/19	FY19/20	FY20/21
Preliminary Treatment	91%	95%	99%
Primary Treatment	88%	95%	97%
Interplant	100%	100%	94%
Secondary Treatment - Activated Sludge	94%	92%	93%
Secondary Treatment - Trickling Filters	97%	100%	100%
Solids Handling - Digesters	99%	98%	99%
Solids Handling - Facilities	99%	99%	99%

Plant No.2

Table 3. 2 Proactive Maintenance (PM) Percent for Reclamation Plant No. 2			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
Preliminary	55%	64%	59%
Primary	37%	25%	35%
Activated Sludge	54%	48%	53%
Trickling Filters	64%	67%	57%
Effluent Disposal	61%	57%	35%
Digesters	39%	39%	55%
Solids Handling Facilities	35%	41%	53%
Central Power Generation	58%	42%	50%
Electrical Distribution	84%	70%	74%
Utilities	34%	39%	44%




Plant 2 Proactive Work - Secondary Treatment and Solids Handling Assets
100%
80%
60%
40%
20%
0%
FY18/19
FY19/20
FY20/21
Secondary Treatment - Activated Sludge
Secondary Treatment - Trickling Filters
Solids Handling - Digesters
Solids Handling - Facilities

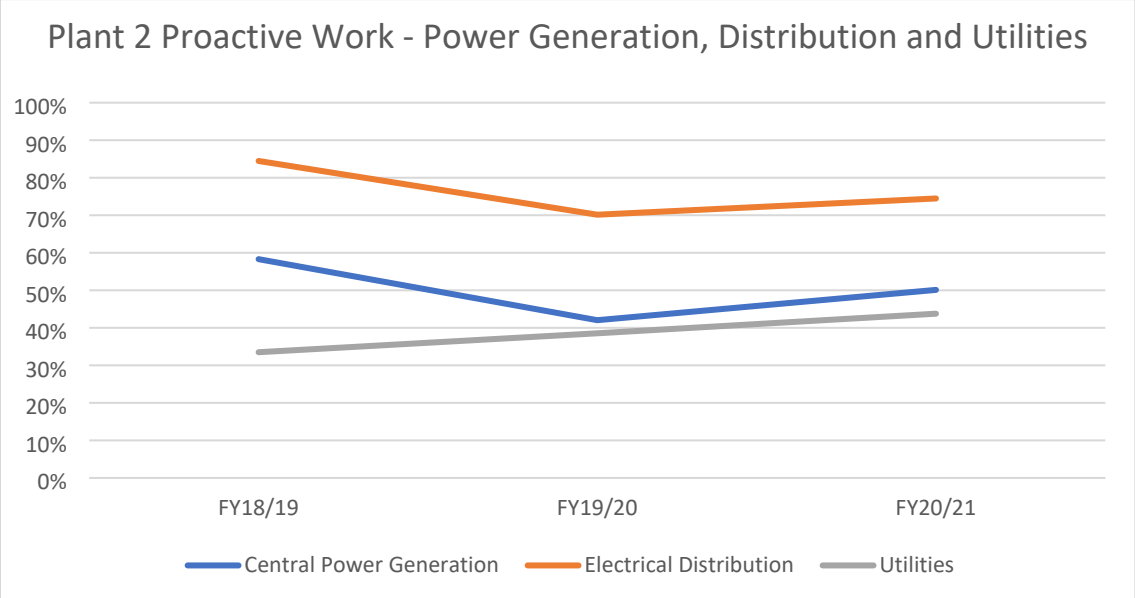
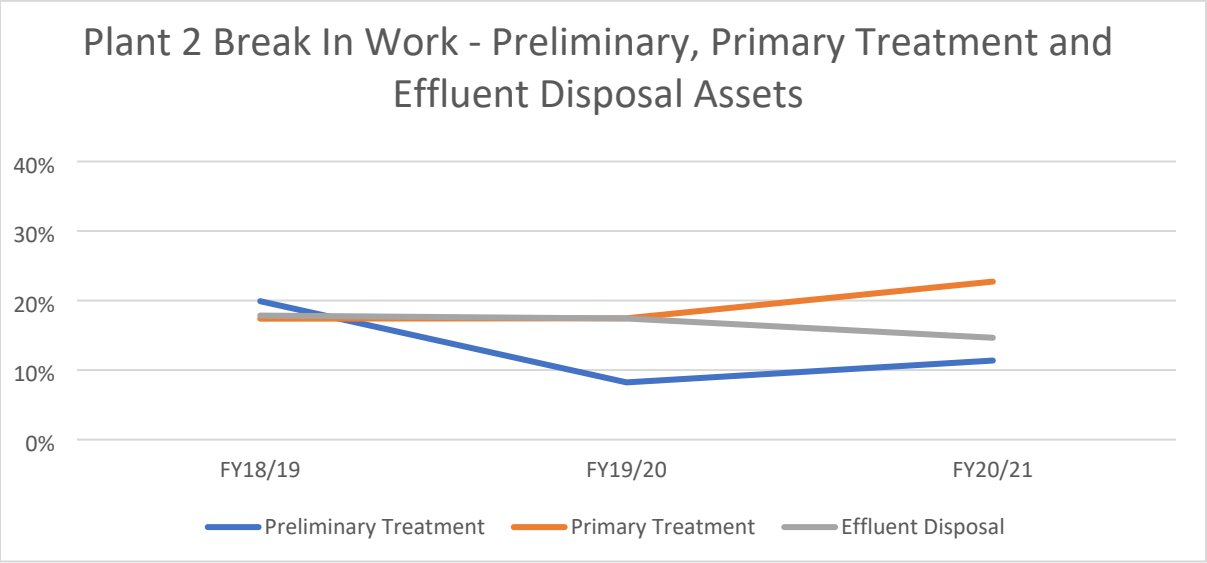
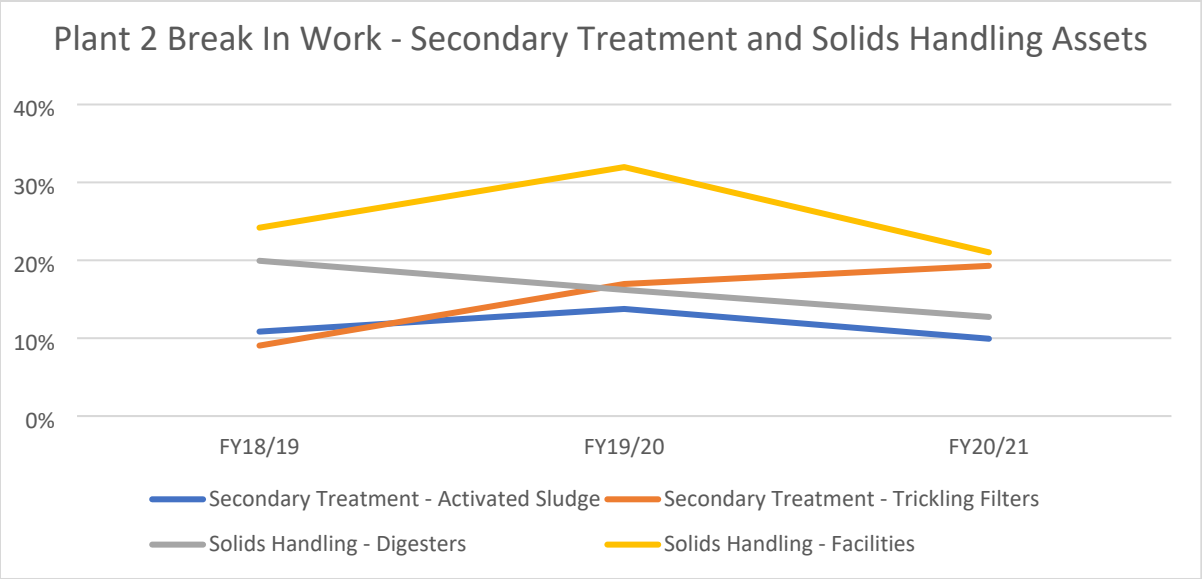
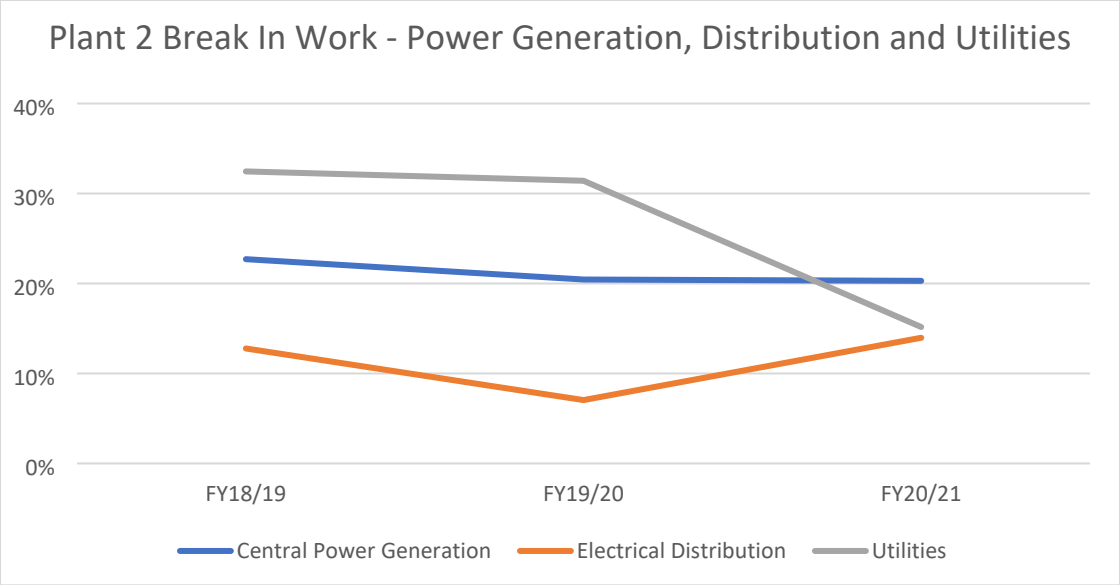

Plant 2 Proactive Work - Power Generation, Distribution and Utilities
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
Central Power Generation
Electrical Distribution
Utilities

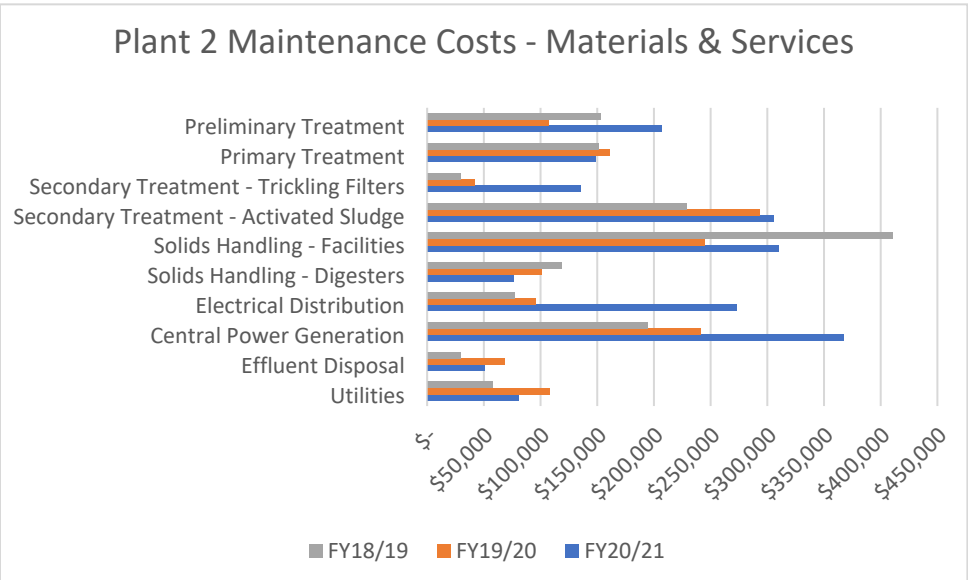
Table 3. 6 Break-in Percent for Reclamation Plant No. 2			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
Preliminary	20%	8%	11%
Primary	17%	17%	23%
Activated Sludge	11%	14%	10%
Trickling Filters	9%	17%	19%
Effluent Disposal	18%	17%	15%
Digesters	20%	16%	13%
Solids Handling Facilities	24%	32%	21%
Central Power Generation	23%	20%	20%
Electrical Distribution	13%	7%	14%
Utilities	32%	31%	15%



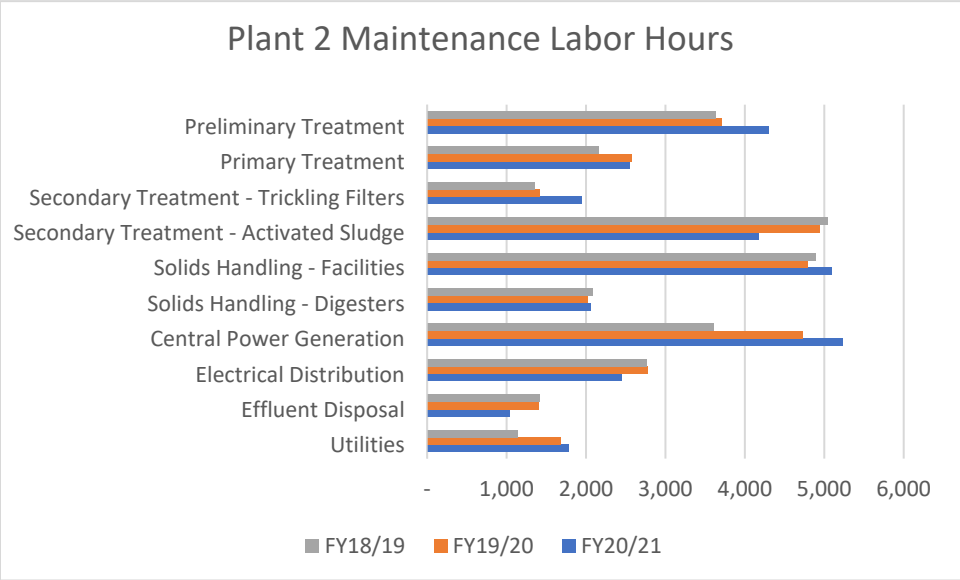




Plant 2 - Maintenance Cost			
	FY20/21	**FY19/20**	**FY18/19**
Utilities	**$ 80,937**	$ 108,149	$ 58,099
Effluent Disposal	**$ 50,630**	$ 68,107	$ 29,777
Central Power Generation	**$ 367,368**	$ 241,524	$ 194,064
Electrical Distribution	**$ 273,276**	$ 95,924	$ 77,611
Solids Handling - Digesters	**$ 76,496**	$ 101,361	$ 118,599
Solids Handling - Facilities	**$ 309,869**	$ 244,815	$ 410,645
Secondary Treatment - Activated Sludge	**$ 305,721**	$ 293,271	$ 228,999
Secondary Treatment - Trickling Filters	**$ 135,668**	$ 41,765	$ 29,523
Primary Treatment	**$ 149,015**	$ 161,145	$ 151,689
Preliminary Treatment	**$ 206,639**	$ 107,316	$ 153,001



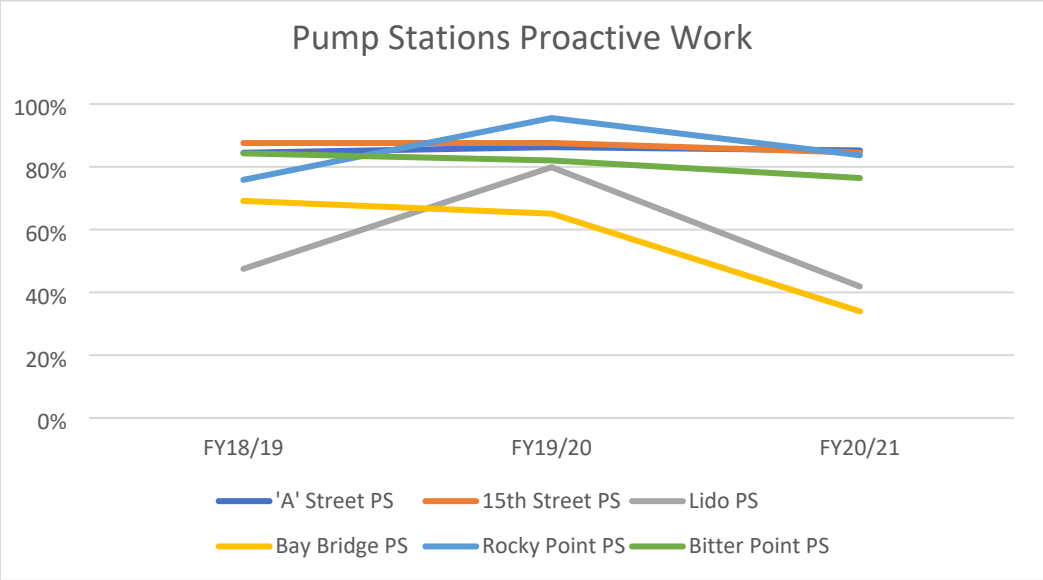
Plant 2 - Maintenace Labor Hours			
	FY20/21	**FY19/20**	**FY18/19**
Utilities	1,782	1,677	1,146
Effluent Disposal	1,038	1,401	1,418
Electrical Distribution	2,443	2,773	2,763
Central Power Generation	5,232	4,726	3,607
Solids Handling - Digesters	2,064	2,015	2,082
Solids Handling - Facilities	5,098	4,789	4,891
Secondary Treatment - Activated Sludge	4,180	4,944	5,049
Secondary Treatment - Trickling Filters	1,940	1,412	1,354
Primary Treatment	2,547	2,581	2,165
Preliminary Treatment	4,301	3,710	3,639

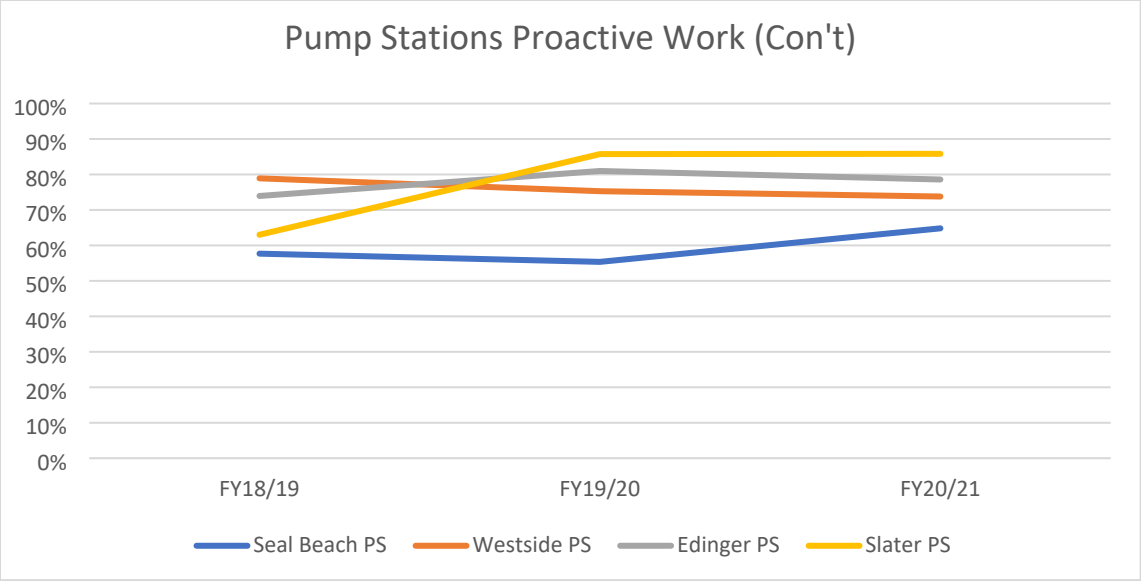


Plant 2	Percent Availability		
	FY18/19	FY19/20	FY20/21
Preliminary Treatment	92%	94%	92%
Primary Treatment	94%	84%	88%
Effluent Disposal	72%	71%	89%
Secondary Treatment - Activated Sludge	91%	86%	92%
Secondary Treatment - Trickling Filter	93%	92%	91%
Solids Handling - Digesters	98%	82%	88%
Solids Handling - Facilities	100%	98%	99%

Pump Stations

Table 3. 3 Proactive Maintenance (PM) Percent for Pump Stations			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
'A' Street	84%	86%	85%
15th Street	88%	88%	85%
Lido	47%	80%	42%
Bay Bridge	69%	65%	34%
Rocky Point	76%	96%	84%
Bitter Point	84%	82%	76%
Seal Beach	58%	55%	65%
Westside	79%	75%	74%
Edinger	74%	81%	79%
Slater	63%	86%	86%
College	98%	91%	69%
Crystal Cove	82%	57%	91%
Yorba Linda	72%	30%	92%
Main Street	36%	66%	66%
MacArthur	97%	66%	88%




Pump Stations Proactive Work (Con't)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
Seal Beach PS
Westside PS
Edinger PS
Slater PS

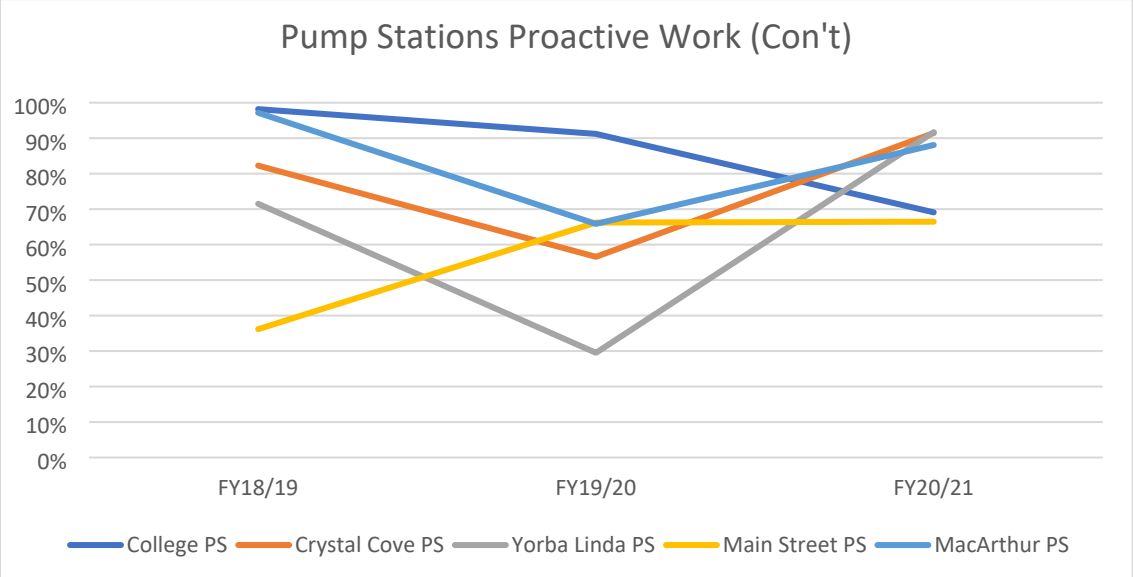
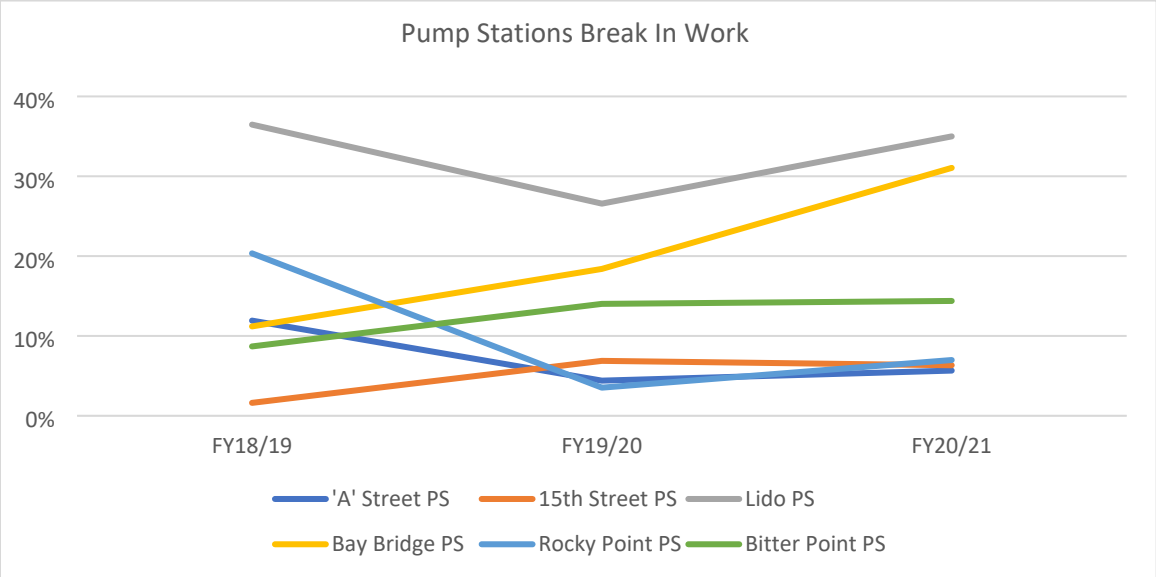
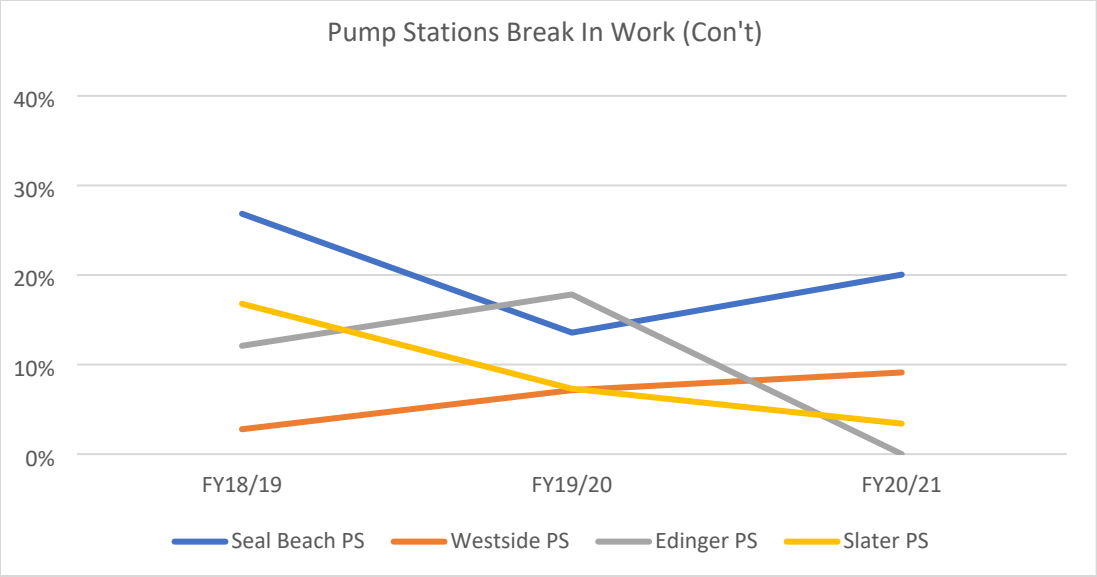
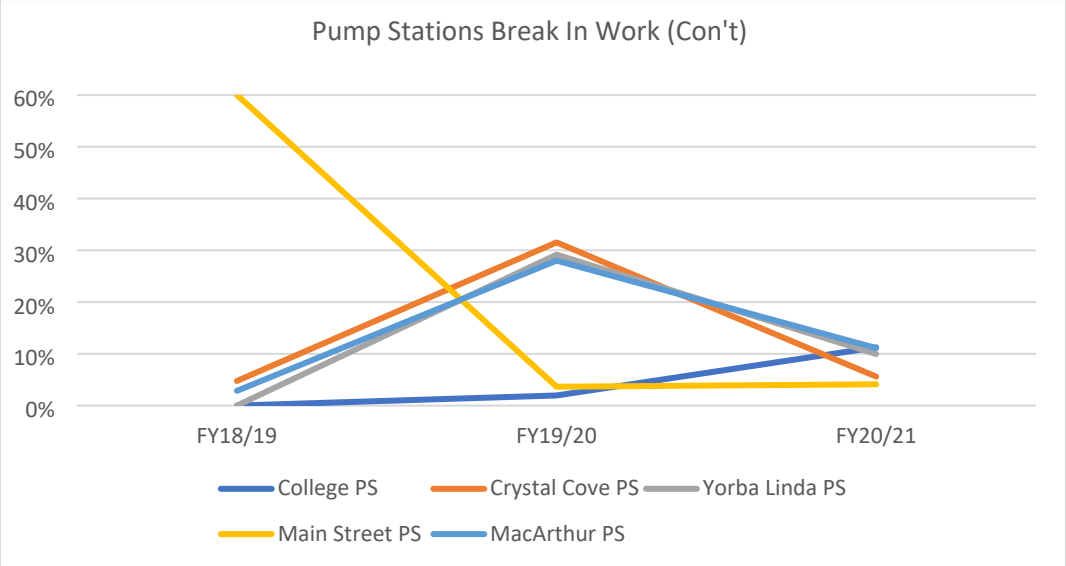

Pump Stations Proactive Work (Con't)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
College PS
Crystal Cove PS
Yorba Linda PS
Main Street PS
MacArthur PS

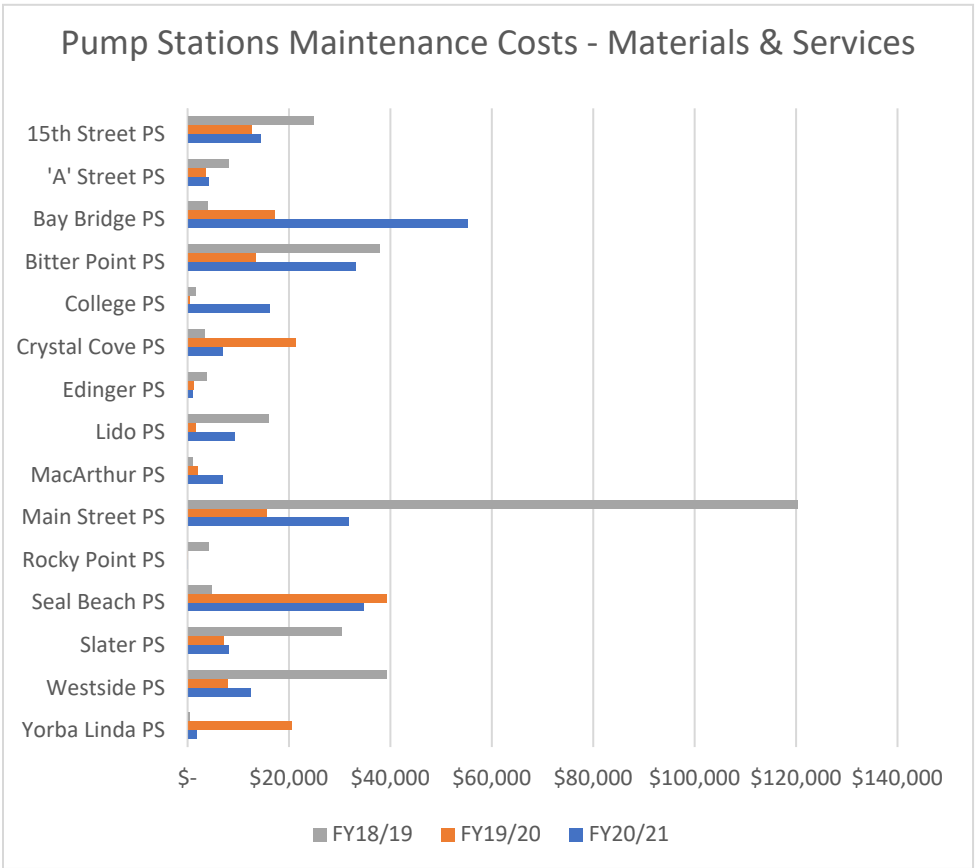
Table 3. 7 Break in Percent for Pump Stations			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
'A' Street	12%	4%	6%
15th Street	2%	7%	6%
Lido	36%	27%	35%
Bay Bridge	11%	18%	31%
Rocky Point	20%	4%	7%
Bitter Point	9%	14%	14%
Seal Beach	27%	14%	20%
Westside	3%	7%	3%
Edinger	12%	18%	0%
Slater	17%	7%	3%
College	0%	2%	11%
Crystal Cove	5%	32%	6%
Yorba Linda	0%	29%	10%
Main Street	60%	4%	4%
MacArthur	3%	28%	11%




Pump Stations Break In Work (Con't)
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
Seal Beach PS
Westside PS
Edinger PS
Slater PS


Pump Stations Break In Work (Con't)
60%
50%
40%
30%
20%
10%
0%
FY18/19
FY19/20
FY20/21
College PS
Crystal Cove PS
Yorba Linda PS
Main Street PS
MacArthur PS

Pump Stations - Maintenance Cost			
	FY20/21	FY19/20	FY18/19
Yorba Linda PS	$ 1,899	$ 20,572	$ 467
Westside PS	$ 12,561	$ 7,862	$ 39,372
Slater PS	$ 8,200	$ 7,190	$ 30,382
Seal Beach PS	$ 34,840	$ 39,357	$ 4,877
Rocky Point PS	$ 126	$ 95	$ 4,270
Main Street PS	$ 31,724	$ 15,705	$ 120,387
MacArthur PS	$ 6,951	$ 1,974	$ 1,144
Lido PS	$ 9,256	$ 1,564	$ 16,070
Edinger PS	$ 1,040	$ 1,303	$ 3,915
Crystal Cove PS	$ 7,000	$ 21,309	$ 3,489
College PS	$ 16,210	$ 461	$ 1,578
Bitter Point PS	$ 33,194	$ 13,573	$ 37,860
Bay Bridge PS	$ 55,315	$ 17,214	$ 4,052
'A' Street PS	$ 4,188	$ 3,683	$ 8,184
15th Street PS	$ 14,467	$ 12,704	$ 24,944



Pump Stations - Labor Hours			
	FY20/21	FY19/20	FY18/19
Yorba Linda PS	255.5	450	193
Westside PS	416.75	311.5	288
Slater PS	719.25	661	634.5
Seal Beach PS	729.75	905	550.5
Rocky Point PS	232.75	213	263
Main Street PS	837	905	1311.5
MacArthur PS	186.5	203.5	175.5
Lido PS	531.5	298.25	433.25
Edinger PS	165.75	147.25	146.75
Crystal Cove PS	321.5	676.25	410
College PS	339.75	255.75	191.75
Bitter Point PS	884.75	701	558.5
Bay Bridge PS	740.75	417.25	377.5
'A' Street PS	296	329.5	279
15th Street PS	502	516.25	448.75

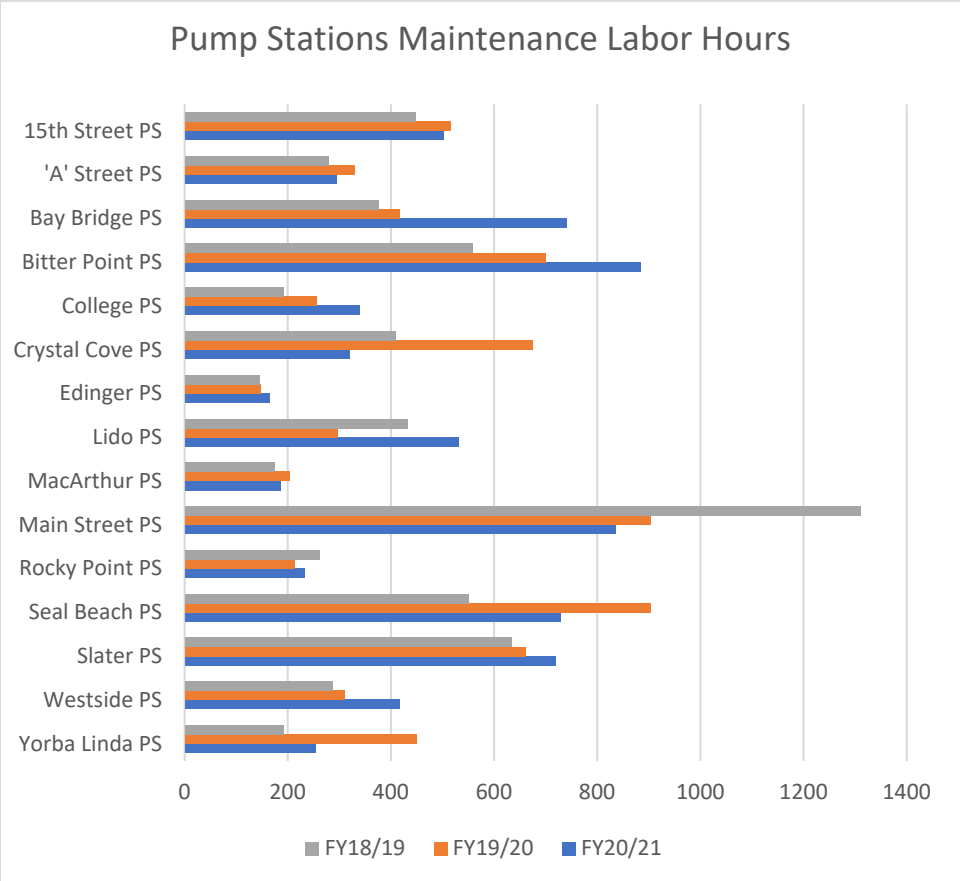


Table 3. X Availability Percent for Pump Stations			
Process Area	**FY 18/19**	**FY 19/20**	**FY 20/21**
'A' Street	99%	100%	99%
15th Street	100%	97%	100%
Lido	98%	98%	98%
Bay Bridge	94%	86%	100%
Rocky Point	94%	96%	98%
Bitter Point	100%	100%	100%
Seal Beach	88%	90%	97%
Westside	88%	94%	94%
Edinger	100%	100%	100%
Slater	94%	98%	96%
College	100%	100%	100%
Crystal Cove	100%	100%	100%
Yorba Linda	76%	86%	88%
Main Street	92%	95%	96%
MacArthur	100%	99%	100%