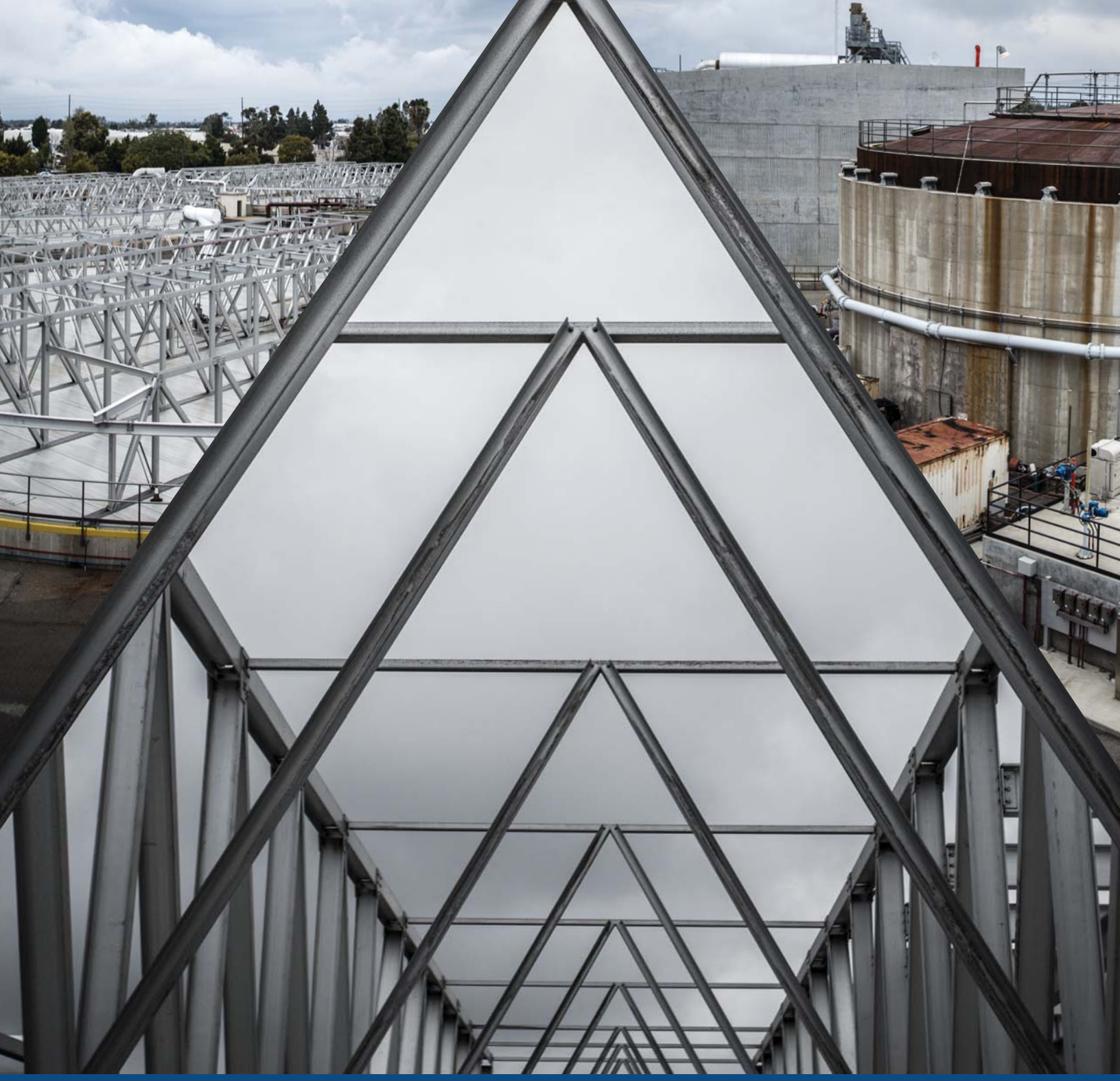

2019 ASSET MANAGEMENT PLAN

Orange County Sanitation District, California

February 2020

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ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Meaning
AM	Asset Management
AMP	Asset Management Plan
AS1	Activated Sludge 1
AS2	Activated Sludge 2
BB	Blower Building
CCTV	Closed-circuit Television
CenGen	Central Generation
CIP	Capital Improvement Program
CP-DIG-LEL	Control Panel - Digesters - Lower Explosive Limit
DAF	Dissolved Air Flotation
DAFT	Dissolved Air Flotation Thickener
DC	Distribution Center
DCJ	Distribution Center J
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
HCl	Hydrochloric Acid
HDPE	High-Density Polyethylene Resin
HP	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
HW	Headworks
I&C	Instrumentation and Controls
IA	Instrument Air
Inst.	Instrument
JB	Junction Box
kV	Kilovolt
kW	Kilowatt
LEL	Lower Explosive Limit
LOS	Level of Service
LOX	Liquid Oxygen
M&D	Metering & Diversion
MCC	Motor Control Center
MGD	Million Gallons Per Day

Acronym or Abbreviation	Meaning
MH	Manhole
ML	Mixed Liquor
MP	Maintenance Project
MSP	Main Sewage Pump
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
OCFCD	Orange County Flood Control District
OCSD	Orange County Sanitation District
OCWD	Orange County Water District
OEM	Original Equipment Manufacturer
OOBS	Ocean Outfall Booster Station
OXI	Oxidizer
P1	Plant No. 1
P2	Plant No. 2
PB	Power Building
PB	Primary Basin
PdM	Mature Predictive Maintenance
PDU	Power Distribution Unit
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
PVC	Polyvinyl chloride
PWPS	Plant Water Pump Station
RAS	Return Activated Sludge
RCP	Reinforced Concrete Pipe
Recir.	Recirculation
RSS	Return Secondary Sludge

Acronym or Abbreviation	Meaning
RUL	Remaining Useful Life
RWQCB	Regional Water Quality Control Board
SALS	Steve Anderson Lift Station
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
TF	Trickling Filter
TFPS	Trickling Filter Pump Station
TFSE	Trickling Filter Secondary Effluent
TL	Trunkline
TPAD	Temperature-phased Anaerobic Digester
UPS	Uninterruptible Power Supply
V	Voltage
VDC	Volts Direct Current
VFD	Variable Frequency Drive
WAS	Waste Activated Sludge
WSS	Waste Sidestream, Waste Secondary Sludge
WSSPS	Waste Sidestream Pump Station
Yr	Year

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EXECUTIVE SUMMARY

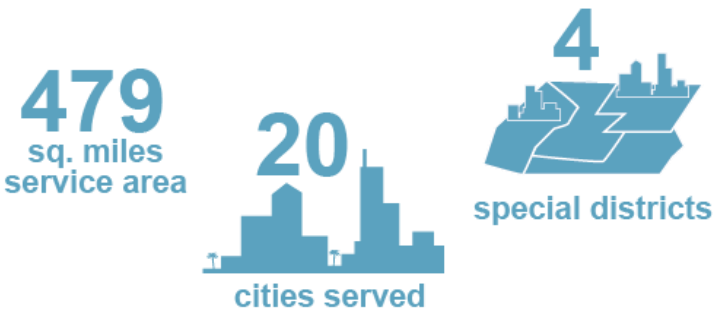
Asset Management Plan Purpose

Over the past two years, Orange County Sanitation District (OCSD) has made a concerted effort to establish an updated and more robust understanding of the condition and performance of all critical and major assets and our ability to meet established levels of service. As OCSD embarks on another year of this renewed asset management program, we have updated our Asset Management Plan to be a tactical document summarizing our plans for addressing asset condition and performance issues.

This Asset Management Plan will be published annually, and we anticipate this document will continue to change in content and structure as our asset management program evolves.

Overview of OCSD's Infrastructure

OCSD is responsible for providing wastewater collection, treatment and recycling services to over 2.6 million people in central and northern Orange County, California. OCSD's two resource recovery and wastewater treatment facilities treat an average daily wastewater flow of 185 million gallons per day (MGD) from residential, commercial and industrial sources.



OCSD owns and operates wastewater collection system infrastructure as well as resource recovery and wastewater treatment facilities. Our collection system infrastructure includes 389 miles of regional trunk sewer pipelines and fifteen pump stations located throughout OCSD's service area. This wastewater is conveyed to Reclamation Plant No. 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach, where resource recovery and wastewater treatment take place.

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

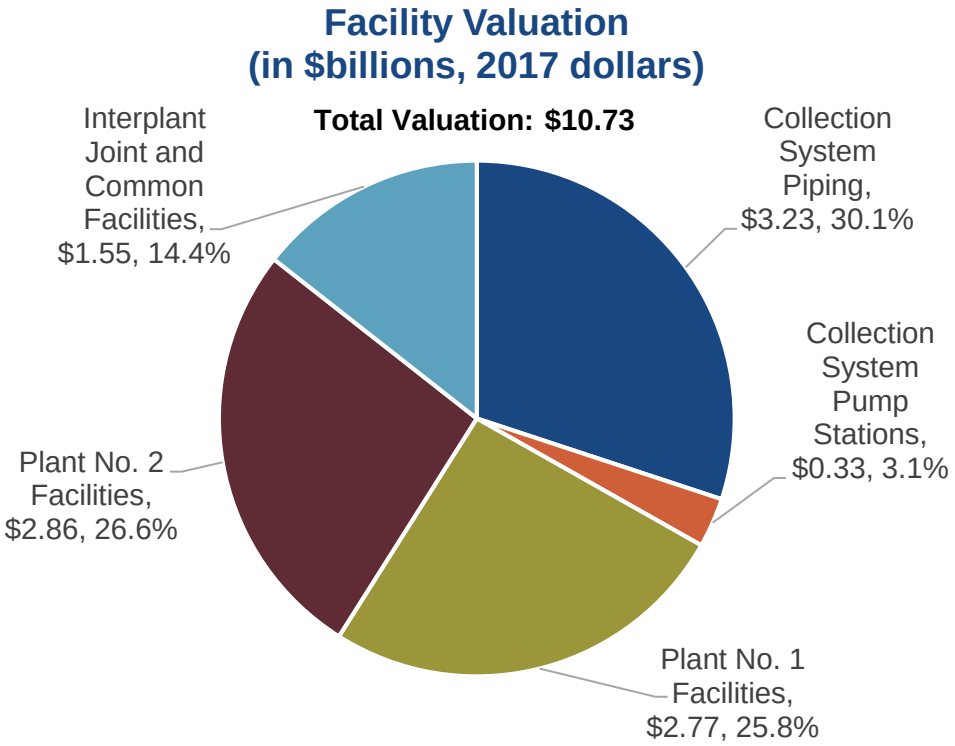


Figure ES.1. Facility Valuation by Location

Asset Management Intent, Policy, and Initiatives

Reliable infrastructure is essential to achieving our mission and vision. We manage infrastructure reliability according to the following stated intent for our asset management program:

> ***"OCSD 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, OCSD General Manager***

In November 2019, OCSD's strategic planning process resulted in the creation of an Asset Management Policy and Asset Management Initiatives.

Asset Management Policy

The Sanitation District 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 nearly $11 billion in assets on a prioritized risk basis to establish rate structures.

Asset Management Organization

Asset management is not new to OCSD. As shown in **Figure ES.2**, every part of our organization is involved in some aspect of ensuring assets are designed, constructed, operated, and maintained to reliably deliver service to our customers.

Figure ES.2. Roles in Asset Management

To fulfill our commitment to our ratepayers for providing safe and reliable services, OCSD has augmented and solidified our asset management program and restructured the organization to better align the Engineering and Operations and Maintenance (O&M) departments. Through this restructuring, OCSD has established an Asset Management Group within the Planning Division consisting of nine Asset Engineers responsible for understanding the key issues or concerns related to the condition of OCSD's assets and for developing and coordinating plans to ensure these assets operate reliably.

State of OCSD's Infrastructure

The following system-level summary tables provide a high-level overview of the Area Asset Management Summaries contained in **CHAPTER 5**. The system-level summaries are organized by:

- Plant No. 1 (**Table ES.1**)
- Plant No. 2 (**Table ES.2**)
- Collection System – Pump Stations (**Table ES.3**)
- Collection – Pipelines (**Table ES.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**[1]: 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 facility valuation.

[1]RUL 5: <5 Years, RUL 4: 5 to 10 Years

Table ES.1. Plant No. 1 Overview

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
10	Preliminary Treatment	1	2	4	4	4	4	56%	4	$351.2
11	Primary Treatment	3	2	4	3	3	3	31%	8	$451.6
12	Secondary Treatment - Activated Sludge	3	2	3	3	4	3	32%	11	$887.3
12	Secondary Treatment - Trickling Filter	1	1	3	4	3	2	10%	6	$61.6
14	Interplant	2	2	3	2	1	2	17%	4	$683.1
15	Solids Handling - Digesters	2	1	2	2	2	2	3%	7	$231.2
15	Solids Handling - Facilities	2	1	2	2	2	2	9%	6	$206.5
16	Central Generation[a]		3	4	4	4	4	50%	12	$154.8
17	Utilities	3	2	3	2	1	2	8%	11	$176.2
18	Electrical Distribution[a]				3		3	48%	10	$74.1
19	Miscellaneous Structures & Grounds	*To Be Determined*					*TBD*	*TBD*	*TBD*	$220.0
	Plant No. 1 Total							**30%**	**79**	**$3,497.7**

RUL Legend:

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

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

Table ES.2. Plant No. 2 Overview

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
20	Preliminary Treatment	3	1	2	2	2	2	2%	11	$324.6
21	Primary Treatment	3	2	3	3	3	3	9%	7	$454.3
22	Secondary Treatment - Activated Sludge	3	2	3	3	3	3	17%	8	$608.5
22	Secondary Treatment - Trickling Filter	2	1	2	3	3	2	1%	7	$310.8
24	Effluent Disposal	2	2	2	3	3	2	12%	10	$817.1
25	Solids Handling - Digesters	3	3	3	4	4	3	45%	12	$322.7
25	Solids Handling - Facilities	2	2	2	2	2	2	16%	7	$201.5
26	Central Generation[a]		3	4	4	4	4	71%	13	$330.2
27	Utilities	2	3	3	2	1	2	5%	9	$98.3
28	Electrical Distribution[a]				3		3	57%	11	$72.7
29	Miscellaneous Buildings & Grounds	*To Be Determined*					*TBD*	*TBD*	*TBD*	$132.7
	Plant No. 2 Total							**29%**	**95**	**$3,673.4**

RUL Legend:

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

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

Table ES.3. Collection System – Pump Station Overview

Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
	Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
15th Street	3	4	3	2	3	3	17%	2	$13.5
A Street	3	4	3	3	2	3	17%	1	$11.7
Bay Bridge	4	4	4	4	4	4	85%	3	$34.0
Bitter Point	2	3	2	1	2	2	15%	1	$32.2
College Avenue	3	2	3	2	1	2	8%	2	$24.0
Crystal Cove	3	3	4	3	2	3	17%	2	$2.5
Edinger	4	3	3	3	3	3	27%	4	$12.9
Lido	1	4	4	3	3	3	42%	5	$20.1
MacArthur	4	3	4	3	1	3	36%	3	$16.3
Main Street	4	3	4	2	2	3	38%	3	$44.0
Rocky Point	1	3	3	2	2	2	15%	2	$16.0
Seal Beach	3	4	5	5	3	4	75%	3	$41.5
Slater	4	4	4	3	2	3	38%	4	$35.2
Westside	3	3	3	2	3	3	0%	1	$30.6
Yorba Linda	3	4	4	3	2	3	27%	1	Not Valued
Total							**31%**	**37+13[a]**	**$334.6**

RUL Legend:

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

[a] 37 projects affect only one pump station. An additional 13 projects affect multiple pump stations.

Table ES.4. Collection System – Pipeline Overview

Trunk	Miles of Pipe with Grade 4 Defects[a]	Miles of Pipe with Grade 5 Defects[a]	Total Miles with Grade 4 or Grade 5 Defects[a]	Total Miles	Percent of Length with Non-Isolated 4s or 5s	Replacement Value ($millions, in 2017 Dollars)
Baker-Main	0.18	0.12	0.30	42.6	0.7%	$275.5
Bushard	-	-	-	21.4	-	$241.6
Coast Hwy	-	-	-	11.4	-	$98.5
Euclid	-	-	-	34.4	-	$269.9
Interplant	-	-	-	16.9	-	$115.3
Knott	0.44	2.04	2.48	73.2	3.4%	$625.0
Miller-Holder	0.23	-	0.23	31.5	0.7%	$296.1
Newhope-Placentia	0.11	0.04	0.15	30.9	0.5%	$209.0
Newport	0.10	-	0.10	31.5	0.3%	$216.3
SARI	0.25	-	0.25	50.3	0.5%	$516.1
Sunflower	0.39	0.23	0.62	34.8	1.8%	$299.9
Talbert	-	-	-	8.4	-	$57.6
Total	**1.70**	**2.43**	**4.13**	**387.4**	**1.1%**	**$3,220.8**

[a] Grade 4 and 5 defects include both isolated (i.e., pipes that can be fixed by point repair) and non-isolated (i.e., pipes that need rehabilitation or replacement) type pipe.

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

Budgetary Considerations

The AMP focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations. OCSD has been striving to more accurately identify medium- to long-term capital cash flow requirements.

Fiscal Year 2019-2020 Budget Update, adopted on June 26, 2019, includes updates to the 20-year CIP outlay. **Figure ES.3** includes current and projected Capital Improvement Program projects.

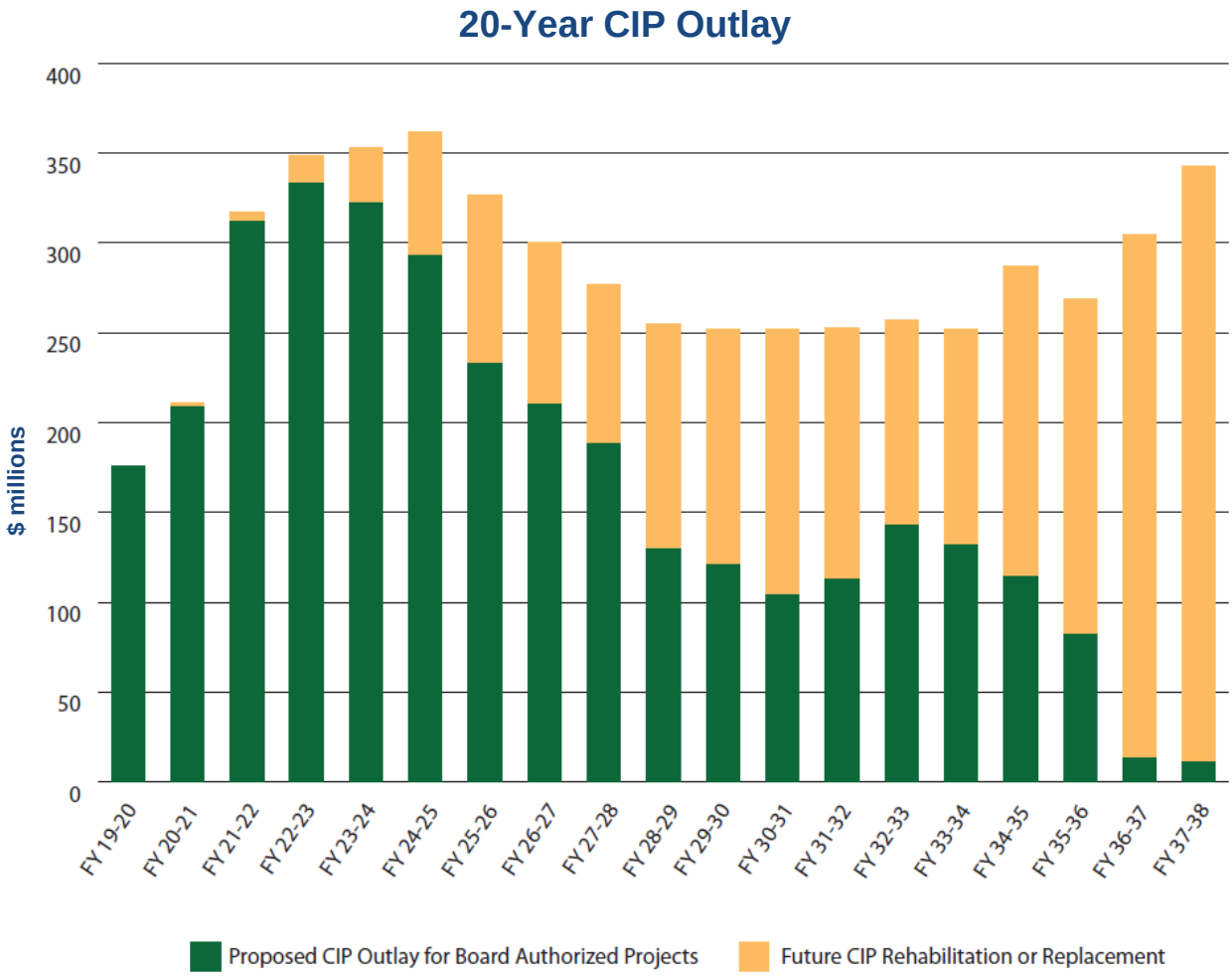


Figure ES.3. 20-Year CIP Outlay

CHAPTER 1 PURPOSE

Over the past two years, the Orange County Sanitation District (OCSD) has made a concerted effort to establish a baseline understanding of the condition and performance of all critical and major assets and our ability to meet established levels of service. As OCSD embarks on another year of this renewed asset management program, we have updated our Asset Management Plan to be a tactical document summarizing our plans for addressing asset condition and performance issues.

This Asset Management Plan will be published annually, and we anticipate this document will continue to change in content and structure as our asset management program evolves. The current structure is organized into the following chapters to meet the needs of stakeholders:

- **Executive Summary:** Summarizes purpose of the Asset Management Plan and main conclusions.
- **Chapter 1 Purpose**: Outlines purpose and organization of the Asset Management Plan.
- **Chapter 2 Overview of OCSD's Infrastructure**: Describes the major infrastructure that OCSD owns and operates.
- **Chapter 3 Asset Management Intent, Policy and Initiatives**: Defines organizational intents, policies, and initiatives driving the asset management program.
- **Chapter 4 Asset Management Organization**: Describes the asset management organizational structure and asset management strategies.
- **Chapter 5 State of OCSD's Infrastructure**: Summarizes the current state of OCSD's infrastructure and plans to address asset condition and performance issues.
- **Chapter 6 Program Monitoring and Improvements**: Documents activities to monitor the asset management program and improvement opportunities.
- **Chapter 7 Budgetary Considerations**: Summarizes CIP and maintenance expenditures, and planned maintenance projects.

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CHAPTER 2 OVERVIEW OF OCSD'S INFRASTRUCTURE

OCSD is responsible for providing wastewater collection, treatment and recycling services to over 2.6 million people in central and northern Orange County, California. OCSD's two resource recovery and wastewater treatment facilities treat an average daily wastewater flow of 185 million gallons per day (MGD) from residential, commercial and industrial sources.

OCSD owns and operates wastewater collection system infrastructure as well as resource recovery and wastewater treatment facilities. Our collection system infrastructure includes 389 miles of regional trunk sewer pipelines and fifteen pump stations located throughout OCSD's service area (shown in **Figure 2.1**). This wastewater is conveyed to Reclamation Plant No. 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach, where resource recovery and wastewater treatment take place.

OCSD's treatment plants currently operate under a permit from the Regional Water Quality Control Board (RWQCB). This was established by 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 Orange County Water District (OCWD). OCWD further treats OCSD'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 OCSD's management.

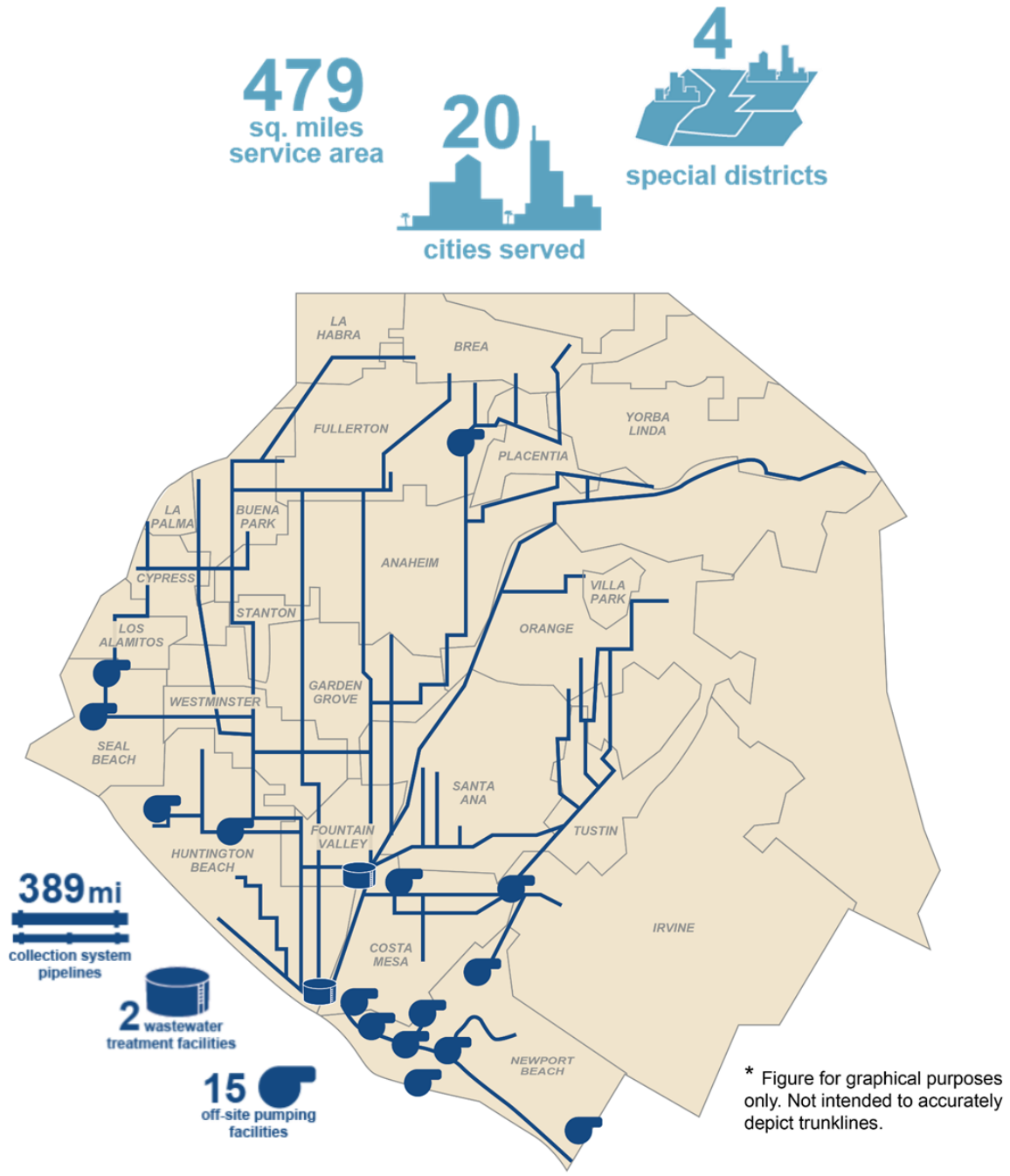
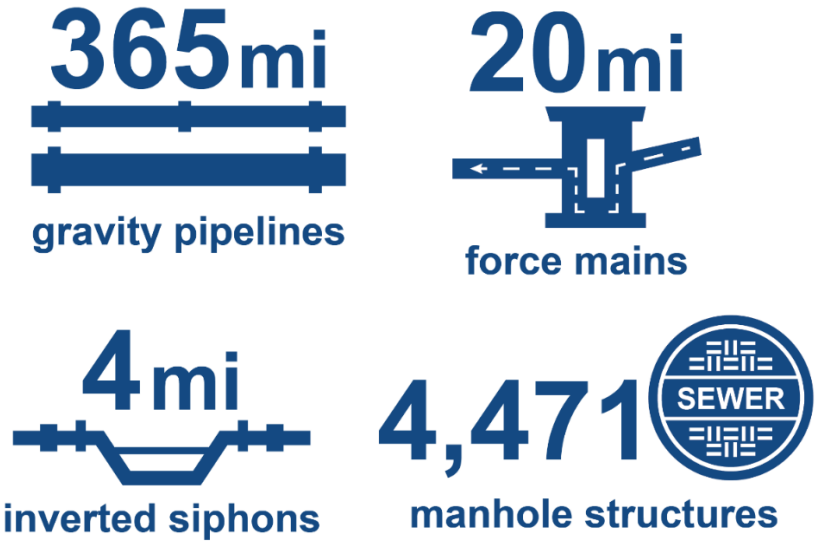


Figure 2.1. OCSD Service Area

2.1 Collection System

OCSD's collection system serves as a regional conveyance system, collecting and conveying flows from 20 cities and four special districts. OCSD's 389 miles of collection system pipelines and 15 pump stations are spread throughout northern Orange County and include 365 miles of gravity pipelines, 20 miles of force mains, four miles of inverted siphons and 4,471 manholes structures.



2.2 Treatment Plant System

OCSD owns and operates two wastewater treatment plants. **Reclamation Plant No. 1** is located in the City of Fountain Valley, approximately four miles inland of the Pacific Ocean and adjacent to the Santa Ana River (shown in **Figure 2.2**). Influent wastewater entering Reclamation 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 basins. Up to 135 MGD of secondary effluent can be diverted to OCWD's facilities for tertiary treatment prior to reuse.

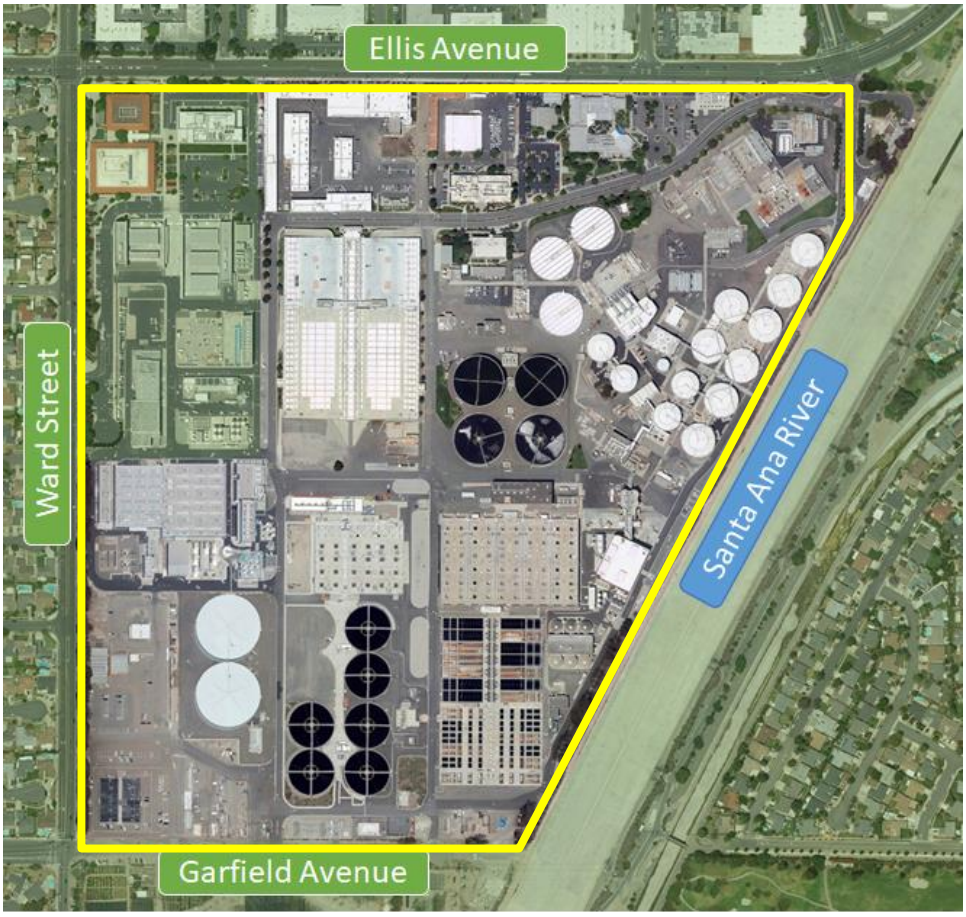


Figure 2.2. Aerial View of Reclamation Plant No. 1

Solids treatment at Reclamation 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, compressed, cleaned, and transferred to the Central Power Generation Facility as a renewable fuel for energy generation. Plant No. 1 also has facilities for odor control and chemical addition.

Treatment Plant No. 2 is located in the City of Huntington Beach, adjacent to the Santa Ana River and east of Pacific Coast Highway (shown in **Figure 2.3**). Raw sewage flow entering Treatment 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 trickling filters/solids contact and is discharged directly to the ocean via the outfall pumping system.

Figure 2.3. Aerial View of Treatment Plant No. 2

Solids treatment at Treatment Plant No. 2 includes in-basin thickening of primary sludge, dissolved air flotation thickening of waste activated sludge and secondary sludge, anaerobic sludge digestion and centrifuge dewatering. 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.

2.3 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 five miles offshore at a depth of approximately 200 feet. It began service in 1971.

OUTFALL NO. 2 PRIMARY OCEAN OUTFALL

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

OUTFALL NO. 1 EMERGENCY OUTFALL

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.

2.4 Facility Valuation

As part of the 2017 Facilities Master Plan, OCSD commissioned consulting engineering firms to conduct a study to determine the 2017 value of all OCSD capital facilities, including Reclamation Plant No. 1, Treatment Plant No. 2, interplant and joint treatment facilities, and the collection system, including sewer pipelines and lift stations.

Figure 2.4 shows the valuation information presented in five general sub-process areas:

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

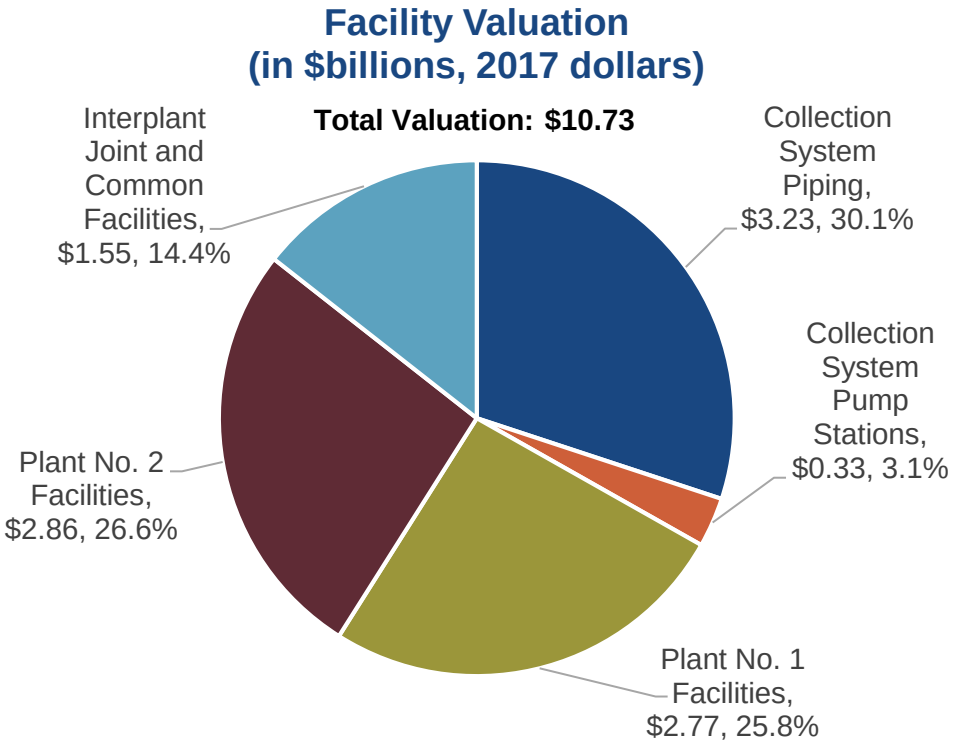


Figure 2.4. Facility Valuation by Area

Figure 2.5 shows the valuation information presented by area designation.

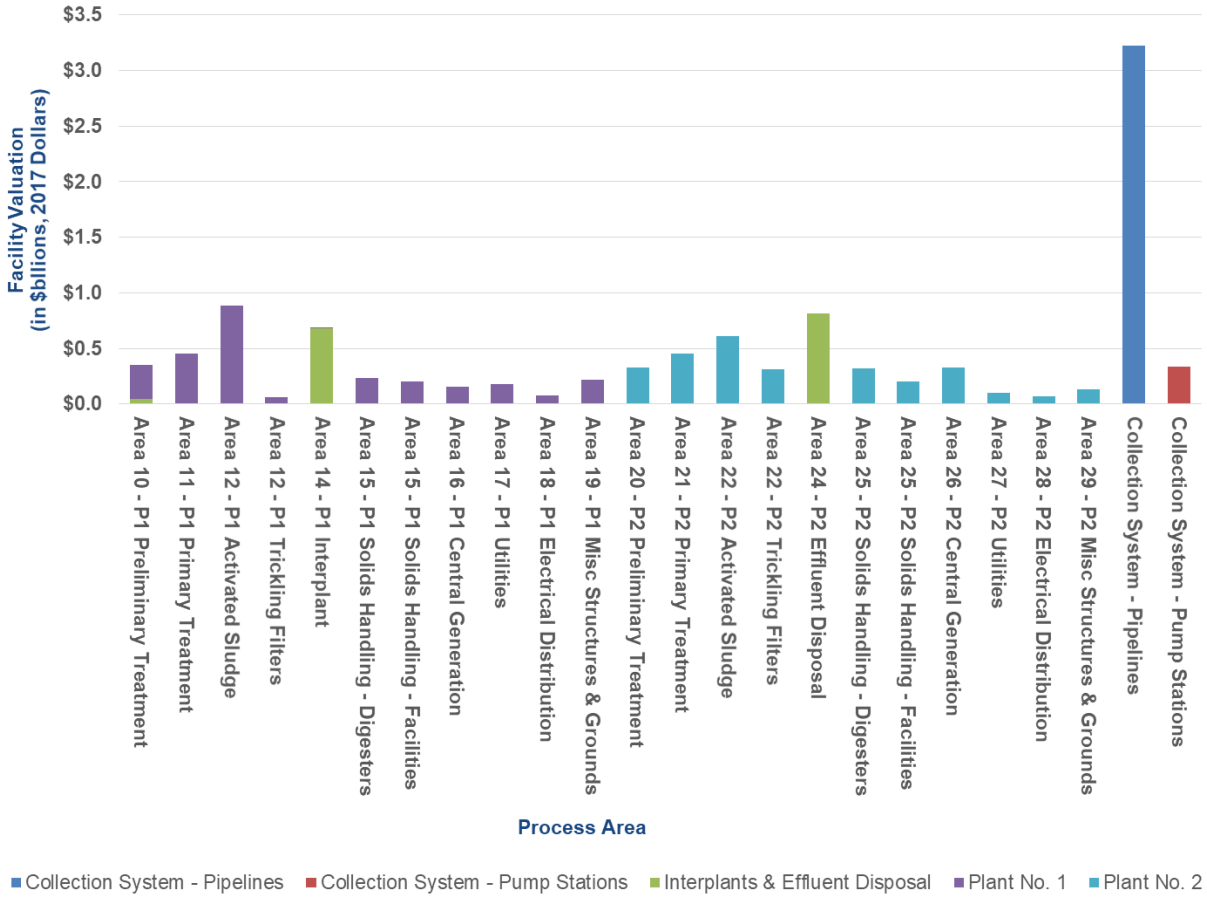
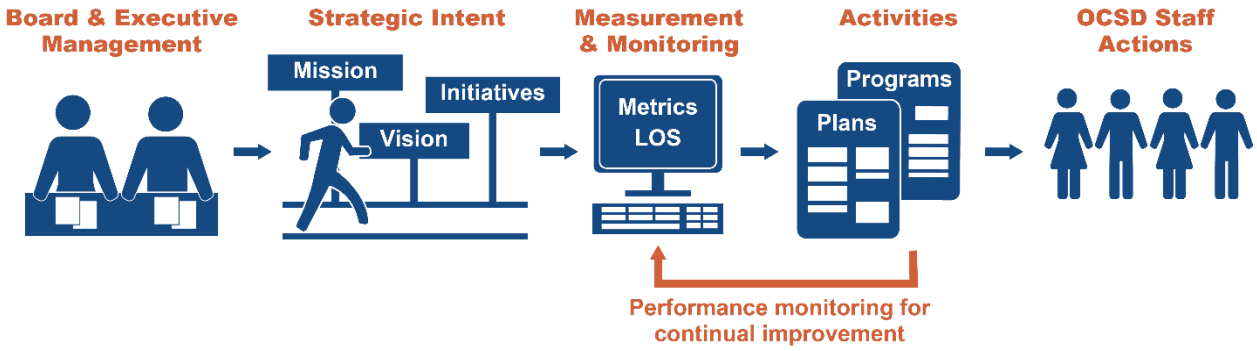


Figure 2.5. Facility Valuation by Area

CHAPTER 3 ASSET MANAGEMENT INTENT, POLICY AND INITIATIVES

The Asset Management Plan is prepared in alignment with OCSD's Mission, Vision, Asset Management Policy and Asset Management Initiatives approved by our Board of Directors. OCSD's Asset Management Initiatives serve as a means for tracking progress towards meeting asset management objectives along with other performance measures.



This Asset Management Plan is a key component of OCSD's overall planning activities. It is aligned with the District's Strategic Plan, includes projects identified in the Facilities Master Plan, and identifies potential new activities requiring funding in the budget development process. **Table 3.1** describes the relationship of the Asset Management Plan to other planning activities.

Table 3.1. 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 OCSD 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 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 OCSD's levels of service.	1-year 5-year 10-year	Annual
Budget Document	Lays out the framework of OCSD's activities and serves as a source of information for our Board of Directors, ratepayers and employees. Includes operational, capital and debt service expenditures necessary to support our mission and execute the Strategic Plan adopted by our Board of Directors. The Asset Management Plan identifies new maintenance and capital improvement activities for consideration in the budget development process.	2-year	Annual

3.1 OCSD Mission and Vision Statements

OCSD's Board of Directors developed Mission and Vision statements to clearly communicate OCSD's purpose to our stakeholders and to articulate OCSD's organizational objectives. OCSD'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

OCSD 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.*

We are achieving this mission through improved asset management practices to better coordinate and plan actions to ensure our collection system, treatment and resource recovery infrastructure works when we need it.

One of the ways we are doing this in asset management is by defining clear roles and responsibilities for identifying the condition and performance needs of our assets. We work as a team to develop solutions and coordinate our efforts to solve these issues before they become problems that impact our ability to achieve our mission. This Asset Management Plan documents the key condition and performance issues identified by OCSD staff and our collective plans for addressing these issues.

3.2 Strategic Plan – Asset Management Policy and Initiatives

Reliable infrastructure is essential to achieving our mission and vision. The stated intent of OCSD's General Manager is:

> *"OCSD 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, OCSD General Manager***

Related to the intent, the key objectives we are building into the asset management program include:

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

In addition, OCSD has a biennial strategic planning process designed to accomplish the following objectives:

- Affirm corporate mission and vision.
- Adjust strategic goals and policies.
- Set agency-wide prioritization of initiatives.
- Provide a disciplined budgeting process.
- Set operational goals at the operating level.
- Hold individual units accountable for performance.

The biennial strategic planning process is instrumental to aligning the activities OCSD's staff performs with the strategic intent of the Board of Directors. In November 2019, OCSD's strategic planning process resulted in the creation of an Asset Management Policy and Asset Management Initiatives.

ASSET MANAGEMENT POLICY

The Sanitation District 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 nearly $11 billion in assets on a prioritized risk basis to establish rate structures.*

Continual improvement in asset management practices is important. We are actively working to improve our implementation of the key objectives and our asset management capabilities, processes and systems through improved coordination in needs identification, solutions development, and project execution.

This Asset Management Plan provides a summary of the condition of the collection system and treatment plants in **CHAPTER 5** along with the upcoming maintenance and capital projects. **CHAPTER 4** describes our approach to coordinating and focusing our efforts on high priority work functions.

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CHAPTER 4 ASSET MANAGEMENT ORGANIZATION

Asset management is not new to OCSD. Every part of our organization is involved in some aspect of ensuring assets are designed, constructed, operated, and maintained to reliably deliver service to our customers.

Figure 4.1. Roles in Asset Management

- **Operations** operates assets to convey, treat and recover resources.
- **Maintenance** performs activities to maintain asset reliability.
- **Engineering Planning** provides engineering support for short- to long-term management of assets.
- **Project Management** manages design and construction of new facilities and the rehabilitation of older facilities.
- **Engineering Design** ensures projects and assets are designed to 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, OCSD has augmented and solidified our asset management program and restructured the organization to better align the Engineering and Operations and Maintenance (O&M) departments. Through this restructuring, OCSD has established an Asset Management Group within the Planning Division consisting of nine Asset Engineers responsible for understanding the key issues or concerns related to the condition of OCSD's assets and for developing and coordinating plans to ensure these assets operate reliably. The Asset Engineers work closely with O&M Area Team

members to maintain familiarity with operational, condition, and maintenance issues within their assigned areas.

4.1 Asset Management Coordination and Solutions Development

The Area Teams are the starting point for leveraging field data to define issues requiring remediation. Area Teams are made up of plant operators, mechanics, electricians, instrument technicians and Asset Engineers. **Figure 4.2** shows how field data is used to support coordination and solutions development for reporting issues to management and gaining project approval.

- **Coordination**: Asset Engineers coordinate with O&M staff to understand asset conditions and needs based on staff knowledge, condition assessments (e.g., closed-circuit television [CCTV], corrosion assessments) and predictive maintenance data (e.g., vibration, infrared, oil quality). Asset Engineers update the area asset registries with estimated remaining useful life and relevant notes. Asset Engineers compile key issues and coordinate potential remediation activities, which are then presented to the Asset Management Council, consists of managers from all divisions within OCSD, during monthly presentations.
- **Solutions**: Asset Engineers support solutions development and tracking. OCSD has developed SharePoint sites to track asset issues (i.e., Asset Issues Tracker) and to track solutions to asset issues executed by other divisions. Asset Engineers also define and prepare the potential work packages for the Clearinghouse review and approval. The Clearinghouse consists of managers from all OCSD divisions who come to a common understanding of issues facing OCSD and prioritize resources necessary to address those issues. After the project is approved by the Clearinghouse, it is turned over to a project team for execution.

There are two sources of funding that may be used for projects approved by the Clearinghouse: Operating Budget and Capital Improvement Program.

- The two-year Operating Budget is adopted biennially with an annual update. This budget includes funding for all programmed maintenance work and repairs to the facilities and infrastructure.
- The Capital Improvement Program sets aside funds for projects that are planned to rehabilitate, replace, or extend the useful life of the facilities and infrastructure.

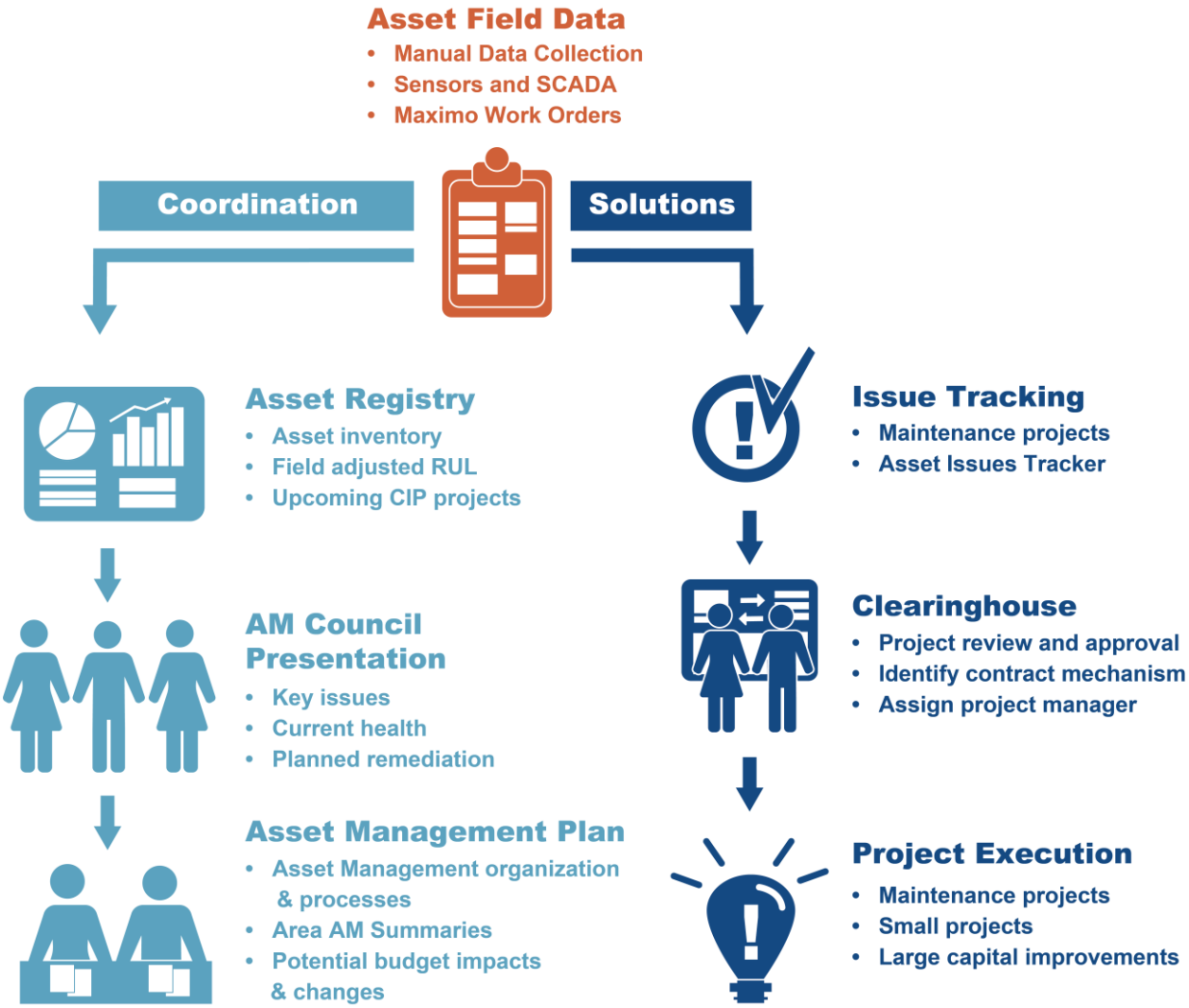

Figure 4.2. Coordination and Solutions Development Processes

The following subsections describe the groups involved in the coordination and solutions development process of asset management.

4.1.1 Operations and Maintenance

Area Teams

The O&M Department has created Area Teams assigned to various process areas within the two wastewater treatment plants with the vision of being a top-notch, high-performing team that increases process efficiency and asset availability.

The Area Teams consist of staff from operations and maintenance covering mechanical, instrumentation and electrical disciplines. Each Area Team is assigned an Area Champion (typically a supervisor) who assists the team through challenges, and aids in team collaboration and oversight. The Area Team is also assigned representatives from maintenance planning and an Asset Engineer from the Planning Asset Management Group (see **Subsection 4.1.2**).

The teams help streamline efforts and align resources within the current organizational structure to integrate the skills, knowledge and insights from all levels of operations, maintenance and engineering. O&M Area Team members provide the Asset Engineer with a direct line of

communication to field staff operating within the process areas and serve as a central resource for information sharing and collaboration for solution development.

4.1.2 Engineering Planning

OCSD's Planning Division provides a comprehensive Capital Improvement Program (CIP) that considers projected capacity requirements, condition of current assets, projected regulatory, level of service changes and business opportunities.

Capital Improvement Program Planning

The Planning Division's CIP Planning Group develops and maintains the 20-year CIP plan consisting of capital improvement projects that maintain reliability, accommodate future growth, as well as meet future regulatory requirements, level of service goals, and strategic initiatives.

In 2017, the OCSD Board of Directors adopted the Facilities Master Plan which provides a 20-year roadmap setting forth OCSD's long term Capital Improvement Program. This roadmap provides a framework for infrastructure improvements needed at our treatment plant facilities, 15 pump stations, and 389 miles of regional sewers. In the 2017 Facilities Master Plan, most of the projects identified are the result of the need to rehabilitate and replace aging infrastructure in the collection system and treatment plants.

Asset Management

The Asset Management Group within the Planning Division consists of nine Asset Engineers who are responsible for OCSD's short- to long-term asset management goals. The primary responsibility of this group is to monitor the condition of assets, develop short to long-term planning for asset maintenance, rehabilitation and replacement, and identification, packaging and prioritization of maintenance and CIP projects.

Asset Engineers are assigned to one or more defined process or collection system areas. They work closely with O&M to maintain familiarity with operational, condition, and maintenance issues within their assigned areas. They also serve as "ambassadors" for each of their assigned areas to ensure that high priority issues are addressed in a timely fashion, and as the first point-of-contact for asset issues to drive root cause analysis and condition assessment. The Asset Management group plans and conducts condition assessments of critical assets utilizing corrosion consulting engineers, and CCTV contracts (**Figure 4.3**).

Figure 4.3. CCTV Inspection

Asset Engineers also engage with maintenance and capital improvement project delivery teams to monitor the scope of work and timing of planned projects, to verify that the projects will address the identified issues in a timely manner. One of their key responsibilities is to define the scope, appropriate timing and budget requirements of future maintenance and CIP projects, which are the basis for future project, operations, and maintenance budget development. Moving forward, the Asset Engineers will have the primary responsibility for submitting CIP projects for Clearinghouse approval.

Knowing the history, background information and the future plans for each specific area, the Asset Engineers are in a unique

position to coordinate asset maintenance and rehabilitation activities among various OCSD divisions. These coordination efforts support the goal of OCSD's Asset Management Program, which is to lower lifecycle costs of infrastructure, at an acceptable level of risk, while continuously delivering OCSD's established levels of service.

Figure 4.4 illustrates the role Asset Engineers have in gathering information and understanding needs to support coordination, planning and communication of changes to the plans.

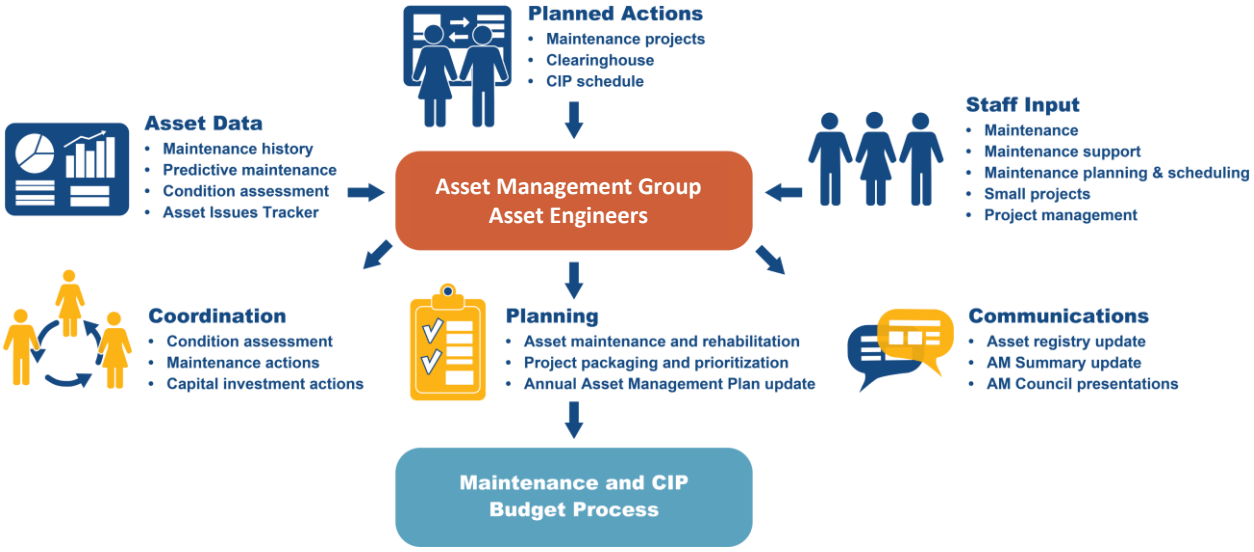

Figure 4.4. Asset Engineer Role within Asset Management

4.2 Maintenance and CIP Project Execution

4.2.1 Project Management Office

OCSD's Project Management Office Division manages the design and construction of new facilities plus the rehabilitation of existing facilities to ensure the safe, cost effective transport, and treatment of influent/effluent. This division is responsible for the delivery of projects from the preliminary design stages through closeout of construction. The division provides standards, processes, and methodologies to improve project quality, cost, and timeliness.

Small Project Delivery

The Small Projects Delivery team is a support arm of the Operations, Maintenance, and Engineering divisions and is responsible for the design and construction of facilities and maintenance projects. The purpose of this team is to deliver short term projects to effectively manage life of existing assets and in doing so deferring construction of capital projects in the longer term.

Project Engineers in the Small Projects Delivery team completes the scope of work, performs project design (in-house or by consultant), bids the project in collaboration with Contracts or Purchasing, and manages construction, implementation, commissioning, change management, and closeout.

Project Management

The Project Management Group consists of engineers functioning as Project Managers for a range of CIP projects including design/construction projects, planning studies, CEQA studies, and research studies.

Project Delivery Support

The Project Delivery Support group supports the CIP and small projects with reporting and monitoring tools for budgets, costs, schedules, cost estimates, amendments, change orders, and resource and cash forecasting for all projects.

4.2.2 Design

The Design division ensures that all projects are designed and constructed to be reliable, maintainable, and operable at optimum lifecycle costs in accordance with OCSD's Engineering Standards and codes. The division also ensures that the electrical and control systems on projects are properly and safely constructed, commissioned, and executed in accordance with the contract documents with minimal impact to operations, maintenance, local agencies, and the public. The division provides process control SCADA system hardware, software and data network support for collections and treatment plant processes that are highly reliable, safe, secure, online, and available to monitor, record, control, and operate our facilities. This division's role is also to provide commissioning support services during construction.

The division includes the following groups:

- Civil, Mechanical, and Process
- Electrical and I&C
- Process Controls Integration
- Commissioning

4.2.3 Construction Management

The Construction Management Division ensures timely and quality construction and commissioning execution. This division's role is to provide construction management and inspection services for OCSD projects to ensure they are safely constructed and inspected in accordance with contract requirements and regulatory and legal codes while minimizing impacts to operations, maintenance, local agencies and the public.

The division includes the following groups:

- Plant No. 1 and Pump Stations
- Plant No. 2 and Collections
- Civil Inspection – Plant No. 1 and Pump Stations
- Civil Inspection – Plant No. 2 and Collections
- Electrical and I&C Inspection

4.3 Asset Maintenance

The Maintenance division provides reliable maintenance to OCSD's assets. Maintenance-related asset management involves implementing strategies that ensure OCSD's assets will operate at a required level of service and the lowest lifecycle cost with an acceptable level of risk.

4.3.1 Maintenance

Maintenance Reliability Group

OCSD has developed a mature predictive maintenance (PdM) program, which is a core strategy for maximizing asset reliability for major rotating mechanical and electrical equipment. The premise of PdM is that regular monitoring of the actual mechanical condition of machine trains will lead to optimal intervals between repairs, minimize the number and cost of unscheduled repairs created by machine-train failures, and improve the overall equipment reliability.

The Reliability Technicians use various techniques such as:

- Vibration analysis to measure imbalance in rotating equipment.
- Thermography to measure excessive heat.
- Oil and wear debris analysis to predict failure of lubricants.
- Ultrasound inspection of electrical power distribution equipment for detecting potential for arc flash incidents and mechanical rotating and stationary equipment.

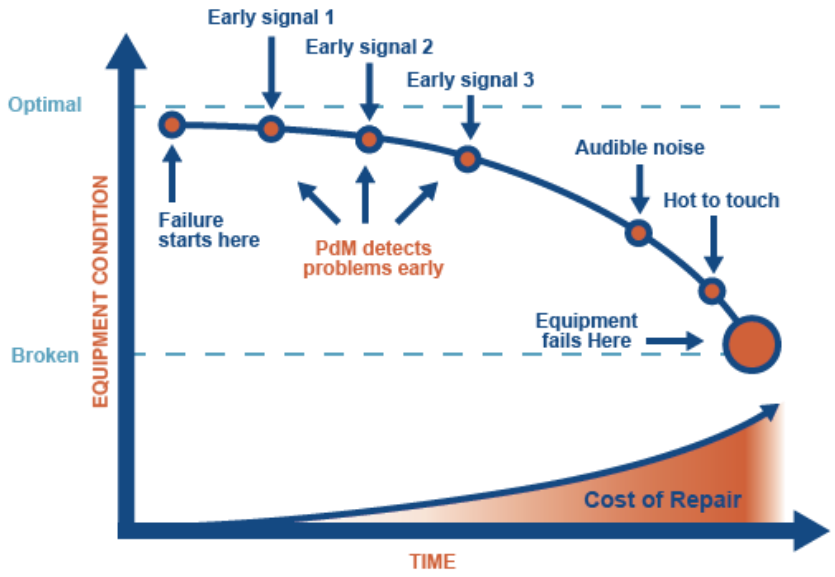

Figure 4.5. PdM Summary

OCSD has a two-decade history of predictive maintenance as summarized in **Table 4.1**.

Table 4.1. High-level Summary of OCSD's PdM 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

OCSD's predictive maintenance and monitoring program is organized around the mechanical, electrical and civil disciplines.

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
- Ultrasonic
- Infrared thermography
- IRIS motion camera (measures deflection and displacement)

Figure 4.6. Vibration Analysis Equipment

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

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

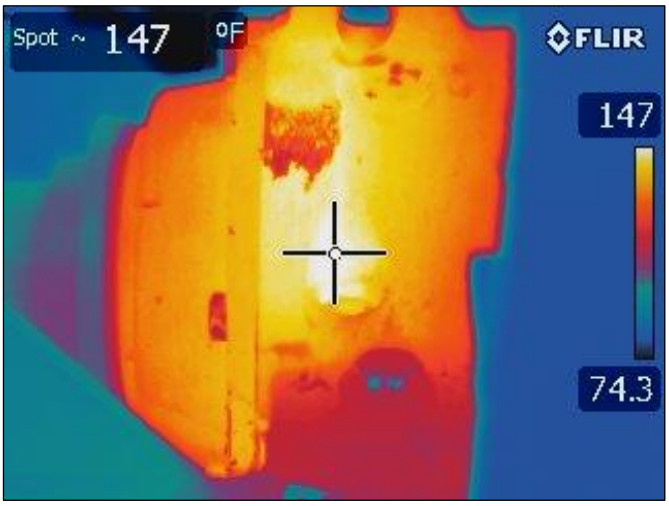

Figure 4.7. Infrared Thermography

Future tests expected to be added include:

- Motor/generator circuit analysis
- Medium voltage feeder cable testing to determine the health of cables and insulation

Civil Discipline

Civil maintenance covers proactive and corrective maintenance tasks for all OCSD civil assets at all facilities located at Plants No. 1 and No. 2, as well as all OCSD pump stations and collection system. Civil maintenance activities complement the existing maintenance programs for mechanical, electrical and instrumentation. Civil maintenance includes the following activities:

- Valve and gate exercising program comprising more than 264 preventive maintenance tasks for over 1,650 valves and gates in both plants and collection system.
- Equipment rotation program to ensure equipment wear is predictable.
- Operating, maintaining and cleaning pump stations and associated facilities.
- Chemical conditioning of the sewage to reduce corrosion and control odors.

In addition to these activities, OCSD also implements life extension measures to increase the useful life of expensive equipment through minor repairs, and corrosion control methods such as coatings and cathodic protection.

Routine Maintenance

Beyond the advanced predictive maintenance strategies used to cost-effectively extend equipment life, OCSD also performs routine time and cycle-based preventive maintenance (PM) activities including:

- Adjustments and mechanical alignments
- Electrical equipment cleaning and tightening
- Sensors and meters calibration
- Changing of lubricants and filters
- Exercising equipment
- Equipment rebuilding and regular testing

Preventative Optimization

OCSD created a new Preventative Maintenance Optimization Group that will be tasked with conducting an in-depth assessment to optimize planned 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 will track, maintain, and manage assets throughout their lifecycles from design, construction, commissioning, beneficial occupancy, operations and maintenance, to the eventual decommissioning or replacement of assets.

This will ensure 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.

Maintenance Planners

Maintenance Planners are responsible for managing blanket maintenance service contracts, planning and scheduling of craft-based maintenance activities, optimizing preventive maintenance activities within Maximo, and coordination of complex maintenance activities involving shutdowns and outages.

Maintenance Planners help drive 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 Planners are the owners of preventive maintenance and job plans. They are responsible for maintaining preventive maintenance and job plan database within Maximo. They continuously improved preventive maintenance by fine tuning job plans based upon input received from field staff, leads, maintenance Supervisors and Engineers.

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CHAPTER 5 STATE OF OCSD'S INFRASTRUCTURE

The Area 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 ten 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 OCSD's plan to address performance and reliability issues of these assets over the one, five-, and ten-year planning horizons.

Every AM Summary is presented to the AM Council once annually. Each month, an Asset Engineer presents one or more of the AM Summaries to the AM Council. The Area AM Summaries are updated as needed and incorporated into the AMP which is published annually.

Asset Engineers maintain a detailed asset registry which is a primary data source for the Area AM Summaries. The asset registries generally include the fields shown in **Table 5.1**.

Table 5.1. Asset Registry Fields

Field	Description/Example
Asset Location	Plant No. 1, Plant No. 2, or Collections
Discipline	Examples: Civil, structural, mechanical, electrical and instrumentation
Category	Examples: Process, non-process
Asset Class Name	Examples: Pump, valve
Asset Description	Example: Primary Clarifier 3
Loop Tag	Location-based asset unique identifier
Asset ID	Asset unique identifier
Year Built	The year the asset was commissioned
Original Project	Code identifying under which project the asset was installed
Useful Life (SP-151)	Useful life estimates developed by project SP-151
Theoretical Remaining Useful Life	Calculated remaining life based on installation date and Useful Life (SP-151)
Field Adjusted RUL Score	Remaining useful life adjusted based on field condition
Upcoming CIP Project No.	Associated CIP project that will impact asset
Notes	Text field including notes from Facility Master Plan or other field observations

5.1 System Summaries

The following system-level summaries provide a high-level overview of the Area Asset Management Summaries contained in **Section 5.2**. The system-level summaries are organized by:

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

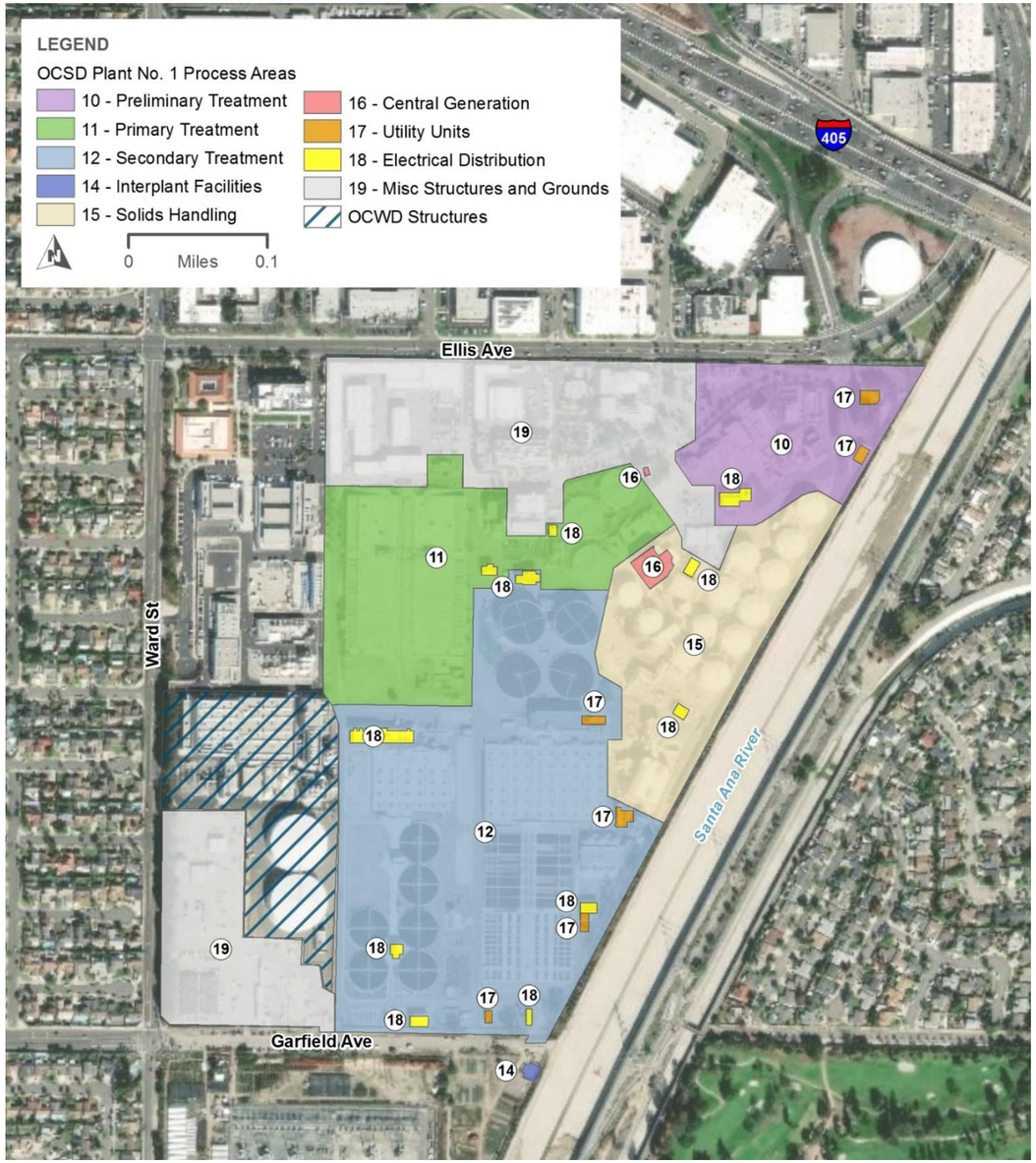
The system-level summaries include an area map showing the general layout of the process areas or collection system, and a table with the following fields:

- **Area No.**
- **Area Name**
- **Average RUL Score**: Estimated average for each discipline (civil, structural, mechanical, electrical, and instrumentation) and area based on the detailed Area AM Summaries.
- **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**[1]: 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 facility valuation.

[1]RUL 5: <5 Years, RUL 4: 5 to 10 Years

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 1 OVERVIEW

Process Area Map



Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
10	Preliminary Treatment	1	2	4	4	4	4	56%	4	$351.2
11	Primary Treatment	3	2	4	3	3	3	31%	8	$451.6
12	Secondary Treatment - Activated Sludge	3	2	3	3	4	3	32%	11	$887.3
12	Secondary Treatment - Trickling Filter	1	1	3	4	3	2	10%	6	$61.6
14	Interplant	2	2	3	2	1	2	17%	4	$683.1
15	Solids Handling - Digesters	2	1	2	2	2	2	3%	7	$231.2
15	Solids Handling - Facilities	2	1	2	2	2	2	9%	6	$206.5
16	Central Generation[a]		3	4	4	4	4	53%	12	$154.8
17	Utilities	3	2	3	2	1	2	8%	11	$176.2
18	Electrical Distribution[a]				3		3	48%	10	$74.1
19	Miscellaneous Structures & Grounds	*To Be Determined*					*TBD*	*TBD*	*TBD*	$220.0
	Plant No. 1 Total							**31%**	**79**	**$3,497.7**

RUL Legend:

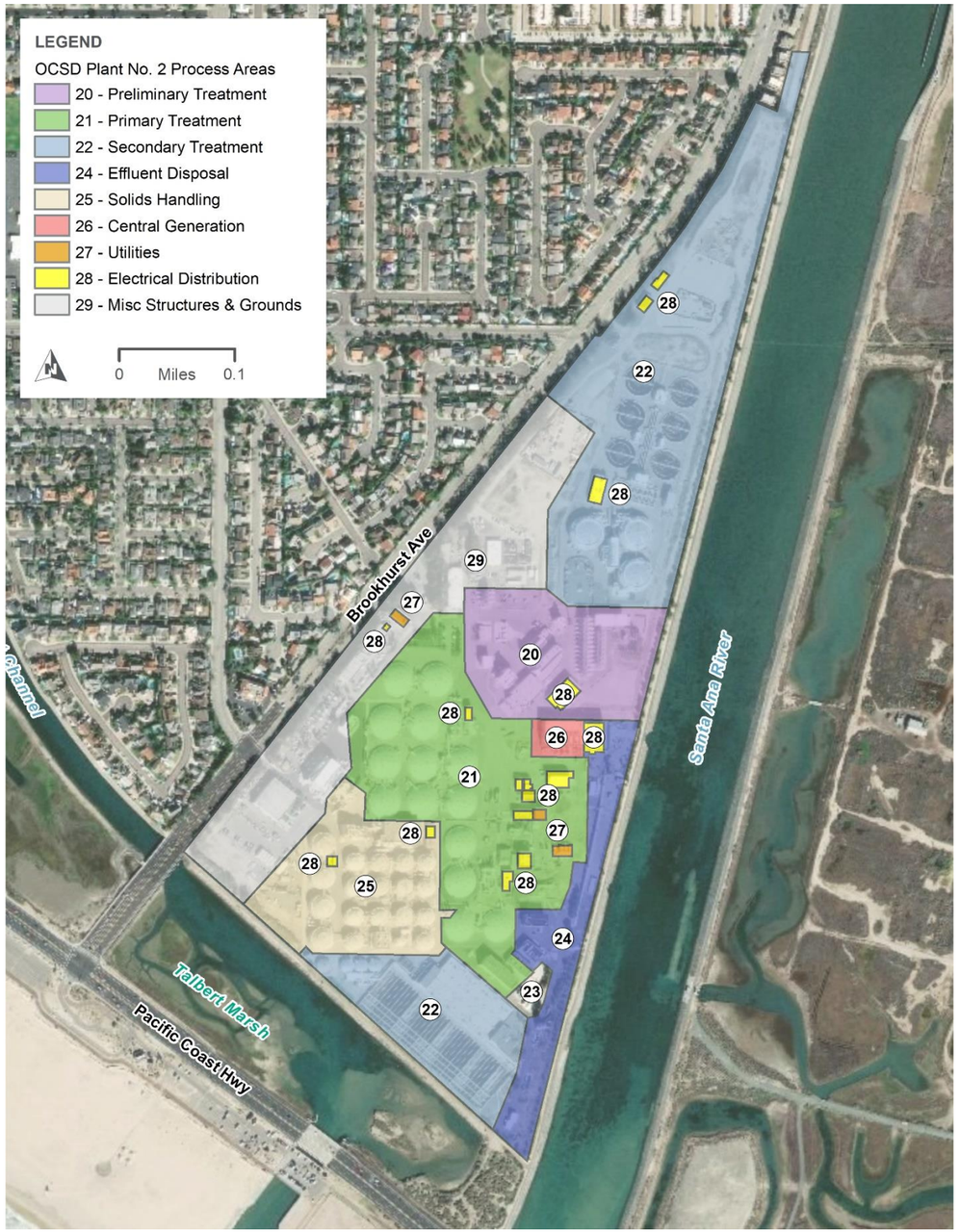
RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:
OCSD = Orange County Sanitation District; OCWD = Orange County Water District; RUL = Remaining Useful Life; TBD = To Be Determined

[a] Gray 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

Process Area Map



Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
20	Preliminary Treatment	3	1	2	2	2	2	2%	11	$324.6
21	Primary Treatment	3	2	3	3	3	3	9%	7	$454.3
22	Secondary Treatment - Activated Sludge	3	2	3	3	3	3	17%	8	$608.5
22	Secondary Treatment - Trickling Filter	3	2	3	3	3	2	1%	7	$310.8
24	Effluent Disposal	2	1	2	3	3	2	12%	10	$817.1
25	Solids Handling - Digesters	3	3	3	4	4	3	45%	12	$322.7
25	Solids Handling - Facilities	2	2	2	2	2	2	16%	7	$201.5
26	Central Generation[a]		3	4	4	4	4	71%	13	$330.2
27	Utilities	2	3	3	2	1	2	5%	9	$98.3
28	Electrical Distribution[a]				3		3	57%	11	$72.7
29	Miscellaneous Buildings & Grounds	*To Be Determined*					*TBD*	*TBD*	*TBD*	$132.7
	Plant No. 2 Total							**29%**	**95**	**$3,673.4**

RUL Legend:

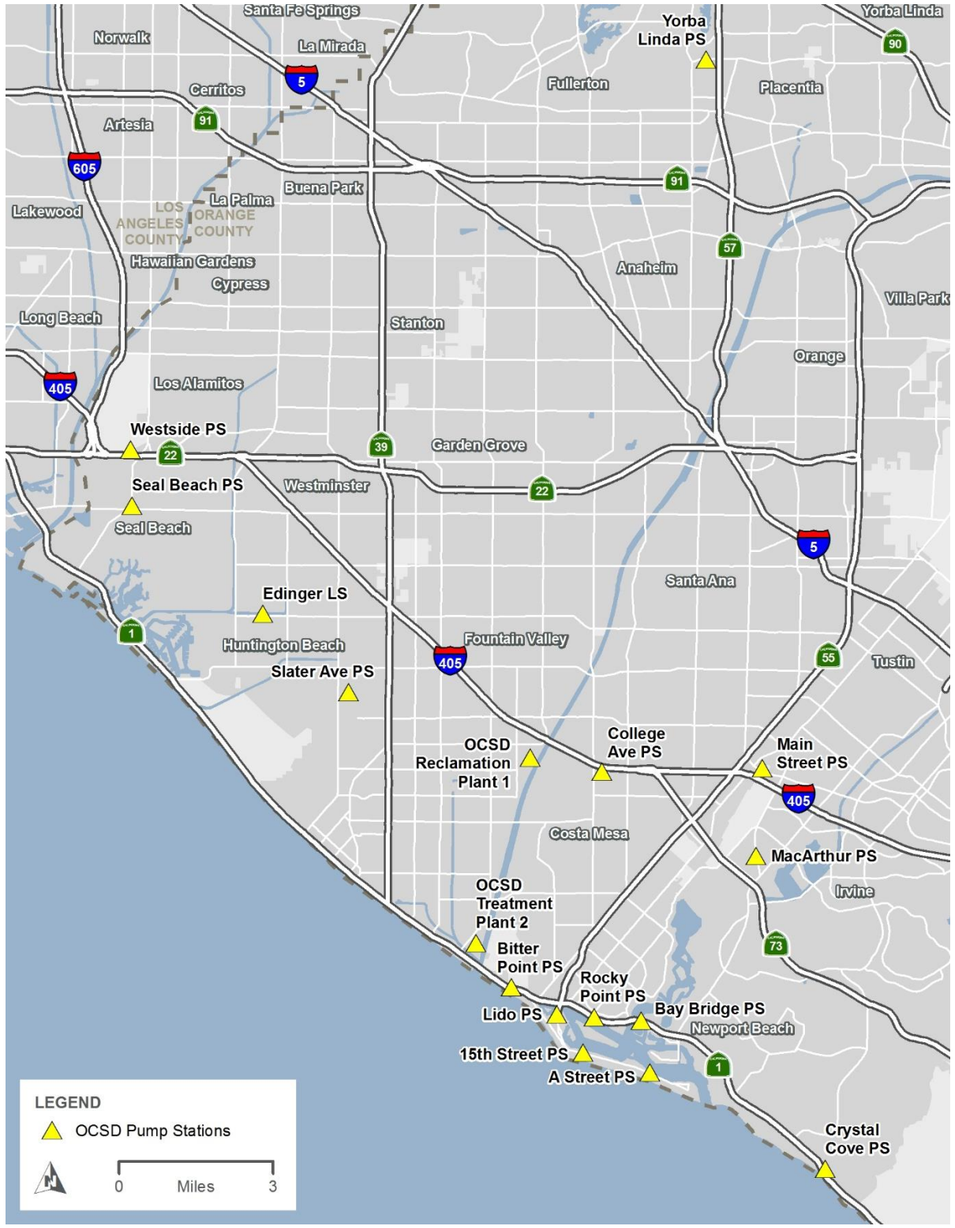
RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:
OCSD = Orange County Sanitation District; RUL = Remaining Useful Life; TBD = To Be Determined

[a] Gray 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

Collection System Pump Stations Location Map



Remaining Useful Life and Replacement Value Summary

Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Number of Projects to Address 4s & 5s	Replacement Value ($millions, in 2017 Dollars)
	Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets			
15th Street	3	4	3	2	3	3	17%	2	$13.5
A Street	3	4	3	3	2	3	17%	1	$11.7
Bay Bridge	4	4	4	4	4	4	85%	3	$34.0
Bitter Point	2	3	2	1	2	2	15%	1	$32.2
College Avenue	3	2	3	2	1	2	8%	2	$24.0
Crystal Cove	3	3	4	3	2	3	17%	2	$2.5
Edinger	4	3	3	3	3	3	27%	4	$12.9
Lido	1	4	4	3	3	3	42%	5	$20.1
MacArthur	4	3	4	3	1	3	36%	3	$16.3
Main Street	4	3	4	2	2	3	38%	3	$44.0
Rocky Point	1	3	3	2	2	2	15%	2	$16.0
Seal Beach	3	4	5	5	3	4	75%	3	$41.5
Slater	4	4	4	3	2	3	38%	4	$35.2
Westside	3	3	3	2	3	3	0%	1	$30.6
Yorba Linda	3	4	4	3	2	3	27%	1	Not Valued
Totals							**31%**	**37+13[a]**	**$334.6**

RUL Legend:

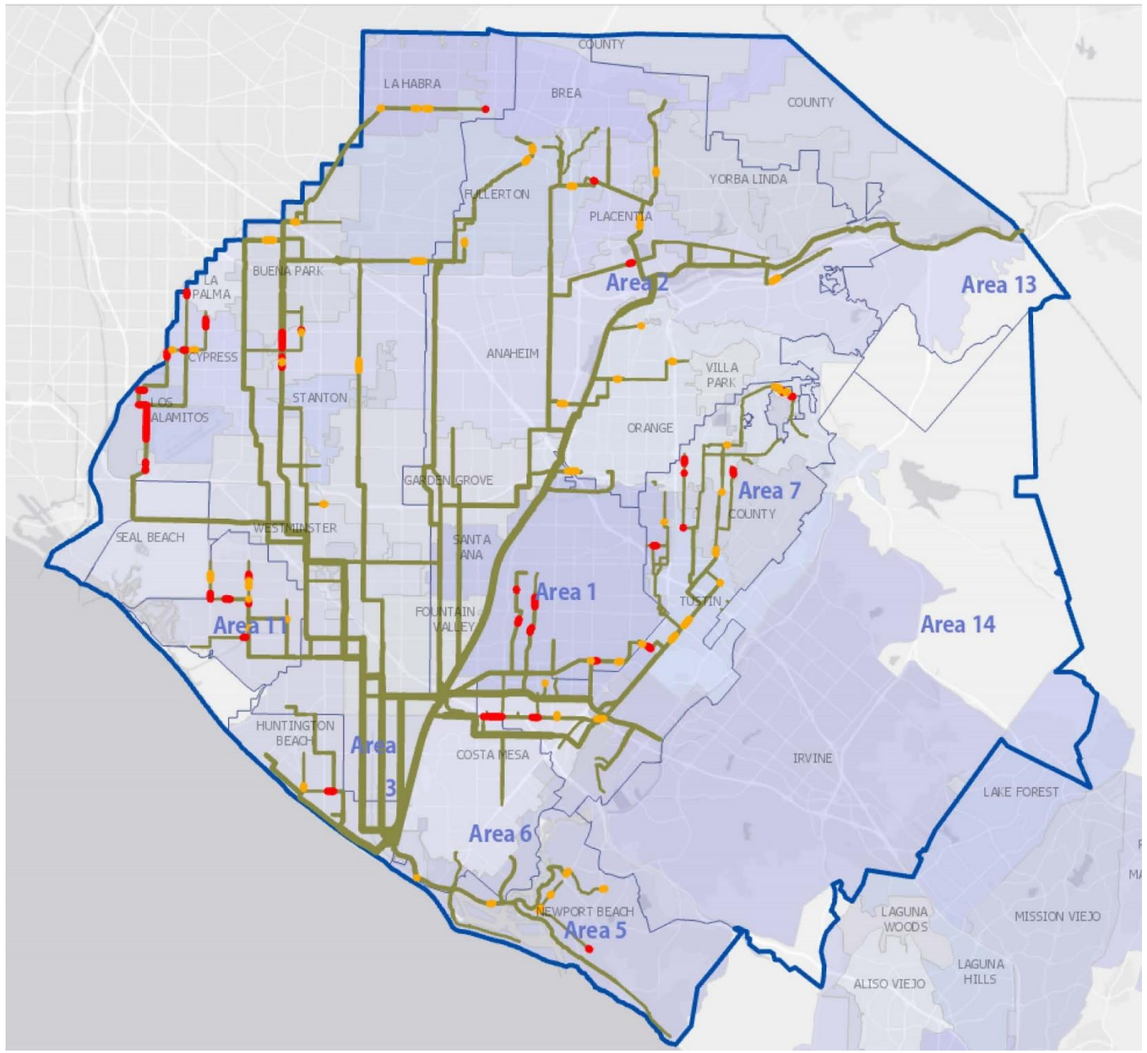
RUL <5 years **RUL 5-10 years** **RUL 11-15 years** **RUL 16-20 years** **RUL >20 years**

Acronym Key:
LS = Lift Station; OCSD = Orange County Sanitation District; PS = Pump Station; RUL = Remaining Useful Life

[a] 37 projects affect only one pump station. An additional 13 projects affect multiple pump stations.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PIPELINES OVERVIEW

Collection System Pipelines – Service Area Map



Structural Grade Defect Legend:
Grade 5 Grade 4

Pipeline Condition and Replacement Value Summary

Trunk	No. of Structural Grade 4 or 5 Defects[a]	No. of Pipes with Structural Grade 4 or 5 Defects[a]	Total Number of Pipes	Percent of Pipe Segments with Isolated Grade 4 or Grade 5 Defects	Replacement Value ($millions, in 2017 Dollars)[b]
Baker-Main	10	9	637	1.4%	$275.5
Bushard	3	3	194	1.5%	$241.6
Coast Hwy	3	2	145	1.4%	$98.5
Euclid	3	3	428	0.7%	$269.9
Interplant	0	0	165	0.0%	$115.3
Knott	33	24	821	2.9%	$625.0
Miller-Holder	2	2	266	0.8%	$296.1
Newhope-Placentia	5	3	345	0.9%	$209.0
Newport	6	5	510	1.0%	$216.3
SARI	9	6	580	1.0%	$516.1
Sunflower	30	26	494	5.3%	$299.9
Talbert	3	3	112	2.7%	$57.6
Total	**107**	**86**	**4,697**	**1.8%**	**$3,220.8**

[a] Grade 4 and 5 defects include both isolated (i.e., pipes that can be fixed by point repair) and non-isolated (i.e., pipes that needs rehabilitation or replacement) type pipe.
[b] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.

Trunk	Miles of Pipe with Grade 4 Defects[a]	Miles of Pipe with Grade 5 Defects[a]	Total Miles with Grade 4 or Grade 5 Defects	Total Miles	Percent of Length with Non-Isolated 4s or 5s
Baker-Main	0.18	0.12	0.3	42.6	0.7%
Bushard	-	-	-	21.4	-
Coast Hwy	-	-	-	11.4	-
Euclid	-	-	-	34.4	-
Interplant	-	-	-	16.9	-
Knott	0.44	2.04	2.49	73.2	3.4%
Miller-Holder	0.23		0.23	31.5	0.7%
Newhope-Placentia	0.11	0.04	0.15	30.9	0.5%
Newport	0.1		0.1	31.5	0.3%
SARI	0.25		0.25	50.3	0.5%
Sunflower	0.39	0.23	0.62	34.8	1.8%
Talbert	-	-	-	8.4	-
Total	**1.7**	**2.43**	**4.13**	**387.4**	**1.1%**

[a] The miles of pipe with grade 4 or 5 defects are indicated only for non-isolated pipes.

5.2 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

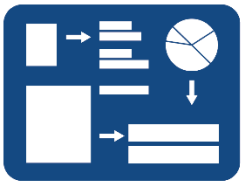
Plant No. 2 Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – Activated Sludge
- Secondary Treatment – Trickling Filters
- 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 in **Figure 5.1** below.

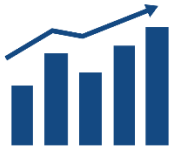


Process Schematic

Provides high-level process schematic to communicate area function and interrelation of key assets

Count of Major Assets

Provides a count of major assets within area



Major Assets Remaining Useful Life

Provides high-level condition summary of area systems and asset types

Key Issues, Actions & Recommendations

Identifies key issues and planned or recommended actions to remedy issues

Current & Future Projects Over Next Ten Years

Identifies timing of current and planned projects impacting major assets within area

Figure 5.1. Area Asset Management Summary Structure

5.2.1 Plant No. 1 Asset Management Summaries

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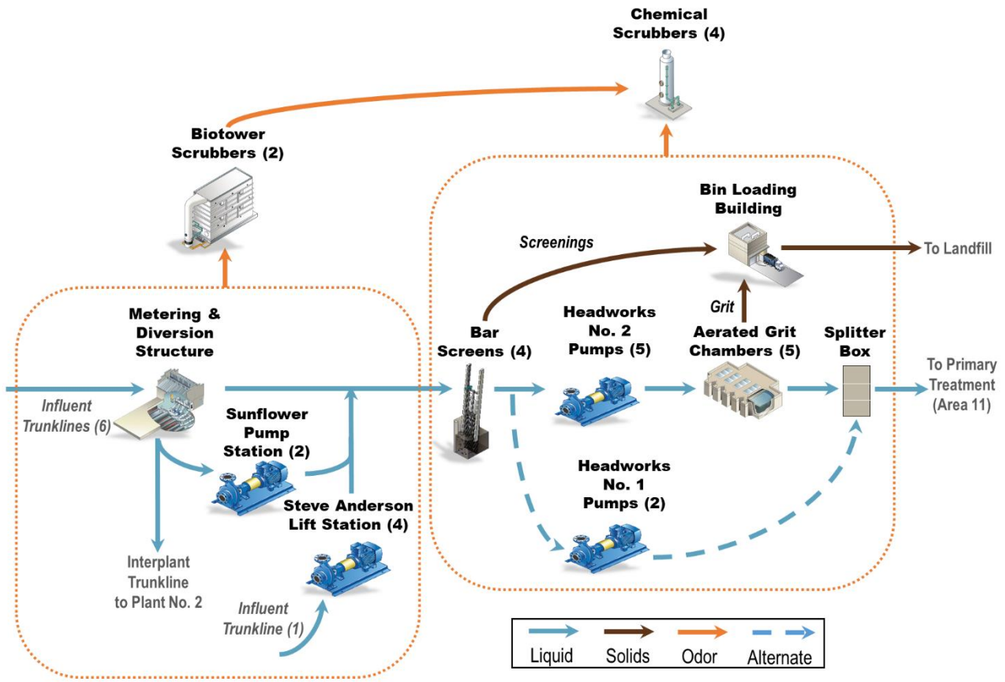
ASSET MANAGEMENT SYSTEM SUMMARY – AREA 10 – PLANT NO. 1 PRELIMINARY TREATMENT

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	-	-	-	-	-	-	1	-	-
Structural									
General	2	2	1	2	2	2	2	3	3
Mechanical									
Piping	5	-	1	-	1	-	-	-	-
Gates/Valves	5	5	2	5	5	5	5	-	3
Gearboxes	-	2	-	1	-	-	-	4	-
Screens	-	-	-	4	-	-	-	-	-
Pumps	-	3	3	-	3	-	-	-	3
Conveyors	-	-	-	4	-	-	-	4	-
Fans/Blowers	4	3	1	4	4	4	-	4	5
Electrical									
Operators	5	-	-	-	-	-	5	-	-
Motors	-	3	3	1	5	-	-	5	-
Variable Frequency Drives	-	-	3	-	4	-	-	-	4
Motor Control Centers	5	5	2	5	5	5	-	5	5
Instrumentation									
General	4	4	3	4	4	-	4	-	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 far in the future. Some assets have very little remaining life or have failed already and will need interim solutions before they are addressed by the project.	• 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. In some instances, failed equipment may need to be replaced and removed from the P1-105 scope, but this approach should be minimized.
• **Steve Anderson Lift Station –** Steve Anderson Lift Station has experienced vibration issues and equipment failures over the past few years.	• New pumps without vibration issues are being installed to replace the existing pumps. These replacements are planned to continue until all four pumps have been replaced. Vibration of the new pumps should continue to be monitored to confirm their performance.
• **Rags –** Rags have become an ongoing issue throughout the preliminary and primary process areas. The prevalence of rags is likely due to the rise in popularity of "flushable wipes". Rags passing the barscreens have caused failures and increased wear on various mechanical equipment.	• P1-105 will be replacing the existing 1-inch barscreens with 5/8-inch barscreens. This should reduce the number of rags passing the barscreens into the treatment process.

Current and Future Projects

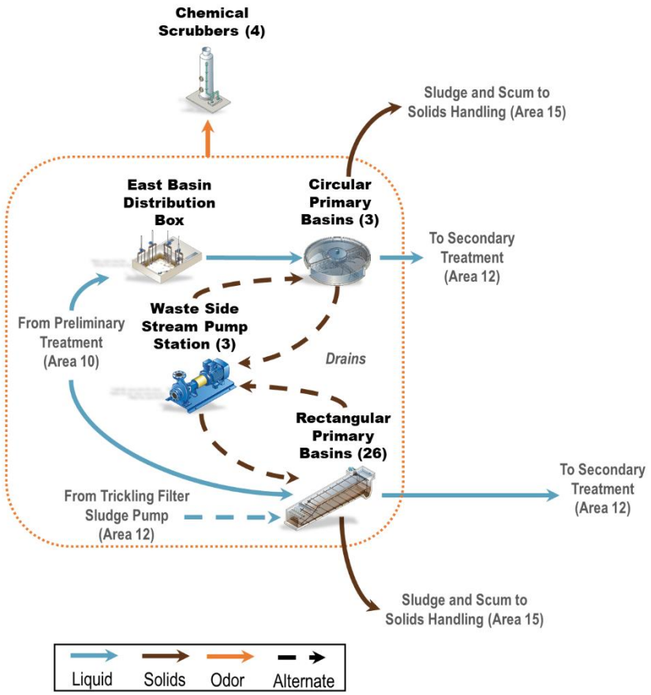
Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
P1-105	Headworks Rehabilitation at Plant No. 1	Metering & Diversion, Sunflower Pump Station, Barscreens, Main Sewage Pumps, Grit Chambers, Splitter Box, Bin Loading, Odor Control	• Rehabilitate structures of impacted facilities. • Replace mechanical/electrical/instrumentation as-needed throughout impacted facilities. • Improve grit handling.															
FE19-04	Sunflower Pump Station Repairs	Sunflower Pump Station	• Rehabilitate Sunflower Pump Station.															
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-044	Steve Anderson Lift Station Rehabilitation	Steve Anderson Lift Station	• Rehabilitate 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

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

Process Schematic



Major Assets Remaining Useful Life

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

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
Waste Sidestream Pump Station 1	
Pumps	3

Major Assets	Quantities
Primary Odor Scrubber Complex	
Chemical Scrubbers	4
HCl Tanks	1
HCl Pumps	2
NaOH Tanks	1
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;
PB = Primary Basin; PISB: Primary Influent Splitter Box;
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 that require maintenance. These issues require ongoing attention from maintenance and can affect Plant No. 1 treatment capacity.	• A number of projects are planned to address rectangular primary basin issues and reliability including MP-462, P1-133, and X-017. However, these projects cannot make the rectangular basins maintenance free. OCSD should expect to dedicate a significant amount of maintenance labor to these basins, especially during times when capacity is reduced by projects. Also, a planned Preventative Maintenance approach should be taken for continued maintenance on the mechanical parts within the basins after work is complete on MP-462.
• **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. Perform a study to understand if phasing the replacement of the circular primary basins under P1-126 is feasible.
• **GWRS Final Expansion –** The final expansion of OCWD's GWRS system is expected to be complete in 2023 and will produce 130 MGD of purified recycled water. This will require OCSD to provide more flow to OCWD.	• OCSD is executing a number of projects to prepare for the GWRS Final Expansion. The most directly applicable is P2-122 which will provide additional flow to OCWD from Plant No. 2 while also increasing OCSD's flexibility to route flows between Plant No. 1 and Plant No. 2. The optimization of flow routing will be an ongoing consideration for OCSD operations and should be periodically re-evaluated as operating conditions change.

Current and Future Projects

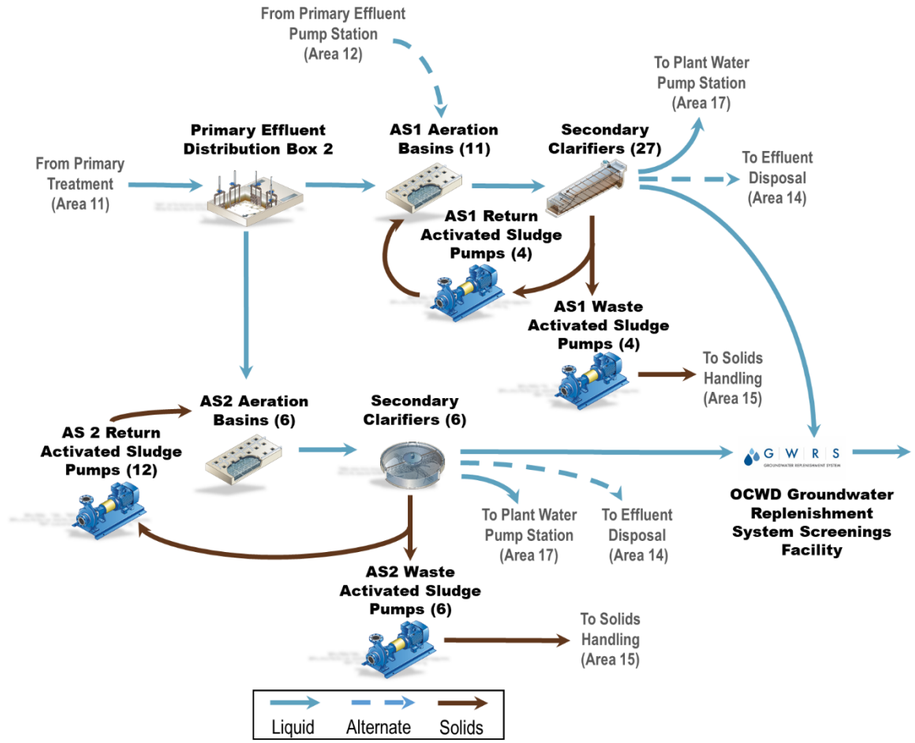
Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
PRN-00563	P1-33/37 Scum Study	Primary Basins 6-31	• Perform a study to determine the best solution to the various scums system issues, such as issues for the scum pumping system.															
MP-462	Primary Basin Sludge Collections System Rehabilitation at Plant No. 1 (Phase 3)	Primary Basins 6-15	• Replacement of mechanical parts in 9 rectangular basins. This is Phase 3 of a three phased approach for the scum/sludge collection system.															
PRN-00567	Plant No. 1 Primary Basin Rebar Protection Blanket Contract	Primary Basins 6-15	• Repair protect exposed rebar.															
P1-133	Primary Sedimentation Basins No. 6-31 Reliability Improvements at Plant No. 1	Primary Basins 6-31	• Upgrade of the sludge pumping system. Structural repair of launders in PISB. Repair of foul air system.															
P1-126	Primary Clarifiers Replacements and Improvements at Plant No. 1	Primary Basins 3, 4, and 5	• Replace primary basins 3, 4, and 5. Rehabilitate associated conveyance pipes and structures. Demolish Primary Basins 1-2.															
X-017	Plant No. 1 Primary Clarifiers 6-37 Rehabilitation	Primary Basins 6-31	• Major rehabilitation of primary basins 6-31.															
X-079	Primary Scrubber Rehabilitation Project at Plant No. 1	Odor Control	• Replacement of the Plant No. 1 primary basin air scrubbing system.															
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; OCSD = 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.	• Corrosion assessment in 2016 showed several locations of corrosion on the wall between reactors and steel re-bar support chairs missing. Baffle wall supports and vertical airpipes were damaged on some of the basins and are monitored on remaining basins. • 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.
• **Primary Effluent Distribution Box 2**	• Demolished by P1-126.
• **Primary Effluent Pump Station**	• PEPS Pump 1 will be repaired in 2020 and the pump station will be demolished by a future project (P1-126).

Major Assets Remaining Useful Life

Asset Type	PEDB1	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	4	-	3	3	3	5	-	-	-	-	-	-	-	1	1	1	4	-
Structural																		
Buildings	-	2	2	-	-	2	-	-	1	-	-	-	-	-	-	-	4	-
Structures	4	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	-	5	-	-	-	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	4	-	-	3	3	-	-	-	-	2	2	-	-	1	2	-	-	-
HVAC & Ventilation	-	3		-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Chemical/polymer Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Electrical																		
Variable Frequency Drives	-	2	-	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-																		
PLCs, 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

Acronym Key:
AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; DAFT = Dissolved Air Flotation Thickeners;
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 – ACTIVATED SLUDGE

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
PRN-00516	PEPS Pump #1 Mechanical Repair	PEPS	• Repair of PEPS Pump #1.																
PRN-00520	AS1 Blower flowmeter modifications	AS1 Blowers	• Add flow conditioner to improve flow readings.																
PRN-00478	Plant No. 1 AS2 Clarifier #31 Catwalk - Coatings	AS2 Clarifier #31	• Coating repair.																
PRN-00375	Plant No. 1 AS2 blower silencer piping modification	AS2 blowers	• Provide access to service the blowers.																
PRN-00402	Plant No. 1 activated sludge clarifier lighting replacement	AS1 Clarifiers 1 to 14 lighting	• Replace 16 light poles and fixtures.																
MP-395	AS1 Influent gate assessment and repair	AS1 Basins 3, 4, 5, 6	• Modify the AS1 Basins 3 to 6 influent gates.																
P1-129	Return Activated Sludge Piping Replacement at AS1	AS1 RAS Pipes	• Replace the RAS pipes from the RAS pumps to the basins.																
FE 15-07	Secondary Treatment and Plant Water VFD Replacement	Replacing RAS pumps VFDs	• Replace RAS pumps.																
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.																
X-048	AS1 Aeration Basin and Blower Rehabilitation	AS1 Aeration Basin and Blower	• Major rehabilitation of the basins and blowers.																
X-049	AS1 Clarifier and RAS PS Rehabilitation at Plant No. 1	AS1 Clarifier and RAS PS	• Major rehabilitation of the clarifiers and RAS pump station.																

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; PS=Pump Station; RAS = Return Activated Sludge; WAS = Waste Activated Sludge; TWAS = Thickened Waste Activated Sludge

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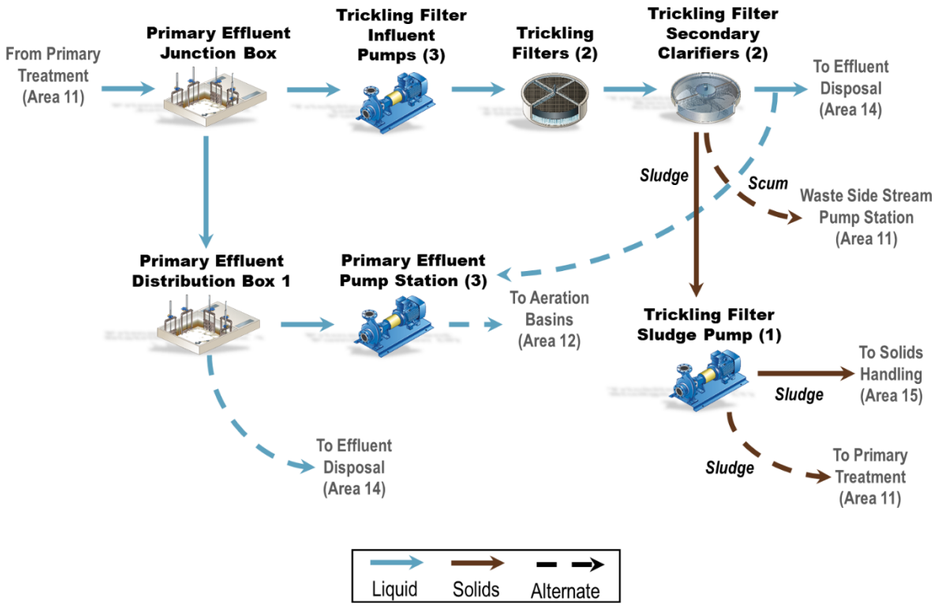
ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – TRICKLING FILTERS

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
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 was created to replace the trickling filter's sludge and 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 adding a second source of power from SWGR-TFB bus to Drive #1.
• **Electrical –** Low voltage cable failure.	• 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).
• **Odor Control –** The Trickling Filters are open and are a source of foul air at Plant No.1.	• Trickling Filter Bleach Test at Plant No. 1 (RE18-1) to study the performance of adding bleach to control the odors.

Current and Future Projects

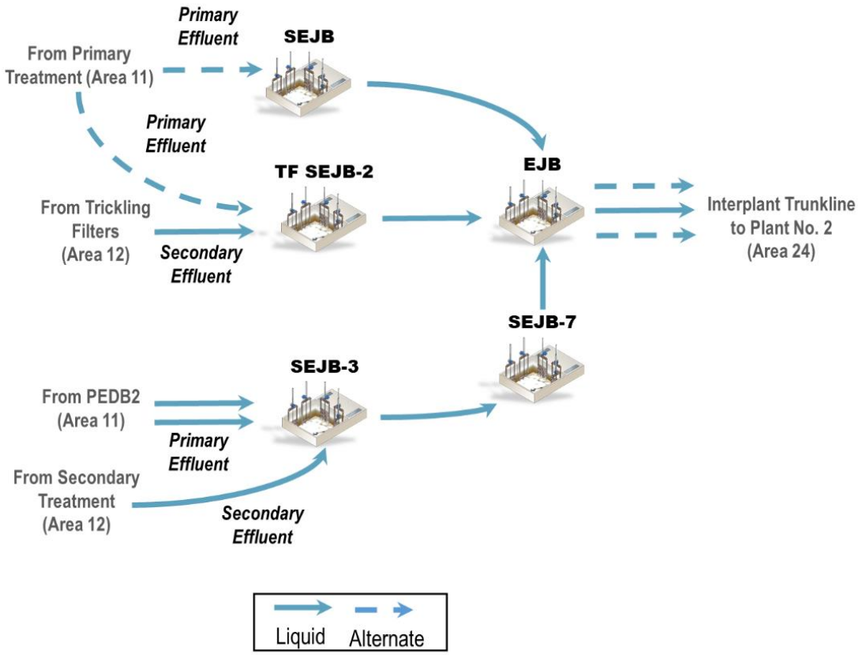
Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
FE19-03	FE19-03 Trickling Filter Sludge and Scum Pumps Replacement at Plant No. 1	Sludge pumping	• Replace the sludge pump with two new pumps, and remove 3 scum pumps with straight piping.																
PRN-00414	Snail Control at Plant No. 1 Trickling Filters	Trickling Filters	• Install permanent caustic dosing pumps and pipes to dose caustic to the Trickling Filters. Currently, Operations is using caustic totes.																
PRN-00492	Plant No. 1 Trickling Filter Pumps VFD replacement (3 pumps)	Trickling Filters Pump Station	• Replace the obsolete VFDs on the Trickling Filter influent pumps.																
PRN-00409	Low Voltage Cable Assessment	Low voltage cables from Power Building 8 to the Trickling Filters	• Assess and replace the damaged cables.																
RE18-01	Trickling Filter Bleach Test at Plant No. 1	Trickling Filters	• A research project to study the impact of dosing bleach in controlling the odors.																
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	SEJB	SEJB3	SEJB7	PEJB1	SEJB2	108"PE/SE	66"PE	84"SE	120" SE	16"Gas		
Civil													
Effluent Pipe	-	-	-	-	-	-	3	2	4	1	-	2	-
Gas	-	-	-	-	-	-	-	-	-	-	1	-	-
Structural													
Structure	1	3	2	1	4	1	-	-	-	-	-	-	-
Mechanical													
Sluice Gates	3	-	3	1	-	-	-	-	-	-	-	-	-
Butterfly Valves	5	-	-	-	-	-	-	-	-	-	-	-	-
Electrical													
Fiber Optic	-	-	-	-	-	-	-	-	-	1	-	-	1

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; SEJB = Secondary Effluent Junction Box 7; TF = Trickling Filter

Major Assets

Major Assets	Quantities
Plant No. 1 Facility	
Junction Boxes	6
Gates	13
Butterfly Valves	5
Large Diameter Piping	6

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
• **Maintenance of Gates, Valves, & Mechanical Equipment –** Mechanical components of the various junction structures are not typically operated during normal plant operation.	• Ensure that mechanical equipment is routinely exercised to prolong its life and ensure its availability/function when needed.
• **Warranty of J-117A –** Determine the status of the recent interplant piping repairs that were performed as part of J-117A.	• Make necessary repairs and corrections as identified.

Current and Future Projects

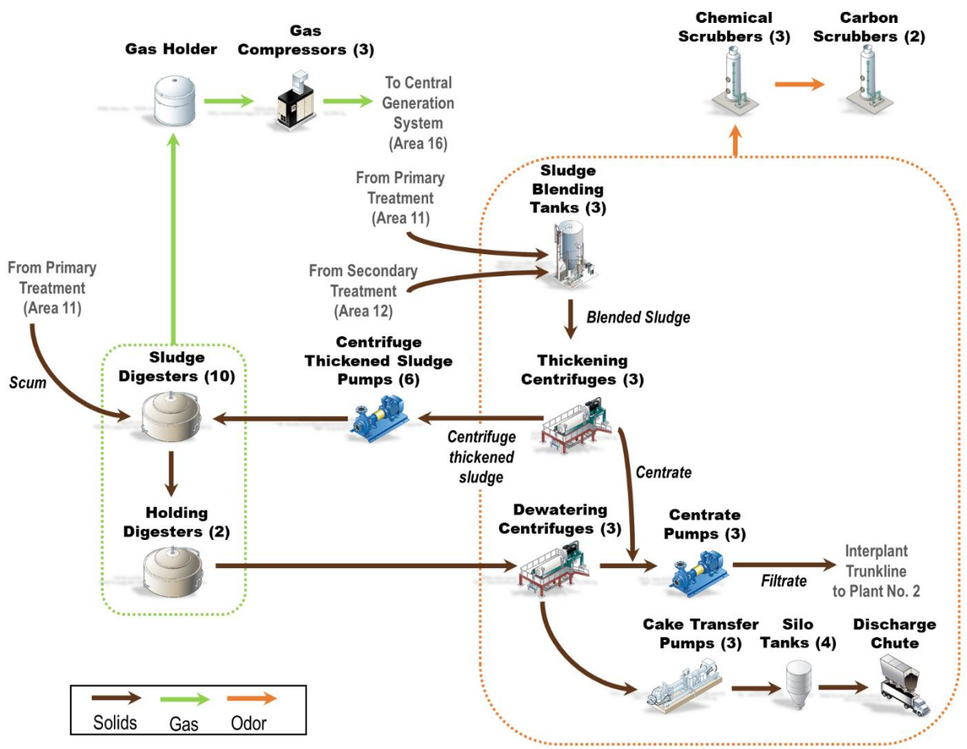
Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
GWRS	GWRS Pump Station	66” PE	• Install new OCWD force main within existing 66” interplant pipe															
PRN-00522	EJB Coating Repairs	EJB	• Replacement and recoating of various piping and supports															
MP-657	Santa Ana River Erosion Control	Interplant Piping	• Correction of existing earthen slope above the interplant pipes															
X-XXX	PEJB-1 & Piping Rehabilitation	PEJB-1	• Rehab the existing junction structure and associated 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 Program; OCWD = Orange County Water District; PE = Primary Effluent; PEJB = Primary Effluent Junction Box; 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	2	2	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 Pumps mechanical seals failure** – 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.
• **Structures** – Seismic risk.	• The PS15 - 06 Seismic Evaluation of Structures at Plant Nos. 1 and 2 has identified lateral Spreading as the main seismic risk for the digesters.

Current and Future Projects

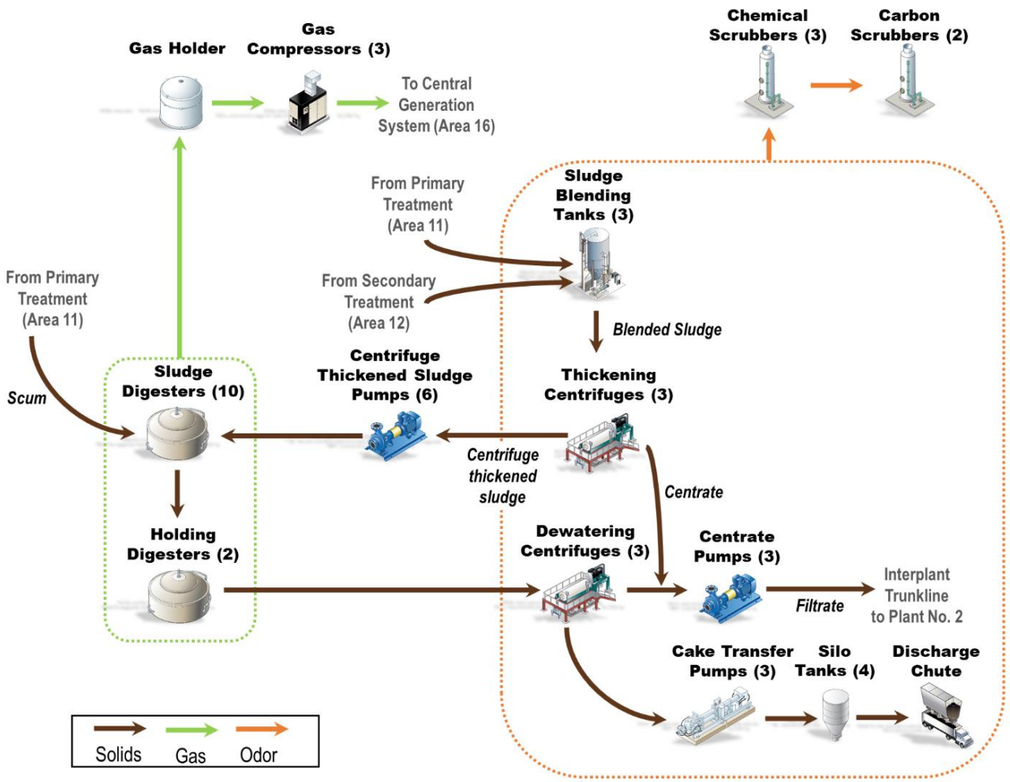
Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 33/34	FY 34/35
P1-135	Digester Ferric Chloride Piping Replacement at Plant No. 1	Digesters, ferric dosing system	• This project will replace the digester ferric chloride piping, valves and appurtenances to its point of connection with the digesters.															
MP- 563	Plant No. 1 digester 9 & 10 Pump Work Platform Replacement	Digesters 9 and 10 mixing pumps	• Adding access platforms for maintenance activities.															
MP - 561	Plant No. 1 Digesters 8 and 11 Area Lighting Installation	Digesters 8 and 11	• Relocate existing warehouse.															
MP- 588	Digester 7 & 8 Sludge Pipeline Improvements	Digester 7 and 8 sludge pipes	• Adding flexibility in transferring sludge.															
MP- 610	CP-DIG LEL Area Safety Monitoring Obsolescence	The LEL monitoring system in Digester 11 to 16 pump room and tunnels	• Upgrading the LEL monitors.															
PS19-01	Digester 6 Pipe Stress Analysis at Plant No. 1	Digester 6 high-rate mixing pumps	• Performing pipe stress analysis to improve pipe supports if needed.															
N/A	Digester Cleaning	On-going maintenance activity	• Cleaning 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 Level; 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	3	3
Structural								
Structures	-	1	-	-	-	1	-	3
Buildings	-	-	1	1	-	1	2	-
Mechanical								
Piping	1	-	1	1	1	1	3	-
Pumps-grinders	-	1	1	1	1	1	-	-
Boilers & Heat Exchangers	2	-	-	-	-	-	-	-
Centrifuges	-	-	1	1	-	-	-	-
Biofilters and carbon media	-	-	-	-	1	-	-	-
Chemical/polymer System	-	-	1	1	1	-	-	-
Gas Compressors	-	-	-	-	-	-	4	-
Gas Dryer	-	-	-	-	-	-	5	-
Gas Flares	-	-	-	-	-	-	4	-
Silo Cake Conveyors	-	-	-	-	-	1	-	-
Silo Sliding Frames	-	-	-	-	-	1	-	-
Electrical								
Variable Frequency Drives	-	2	2	2	-	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
Stand-by 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 was approved by the Clearinghouse for safety improvements. • MP-669 was approved by the Clearinghouse regarding equipment access and platform installation.
• **Gas Handling System –** Gas compressor system is aging and needs replacement of major units**.**	• J-124 – Digester Gas Facilities rehabilitation in • 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.

Current and Future Projects

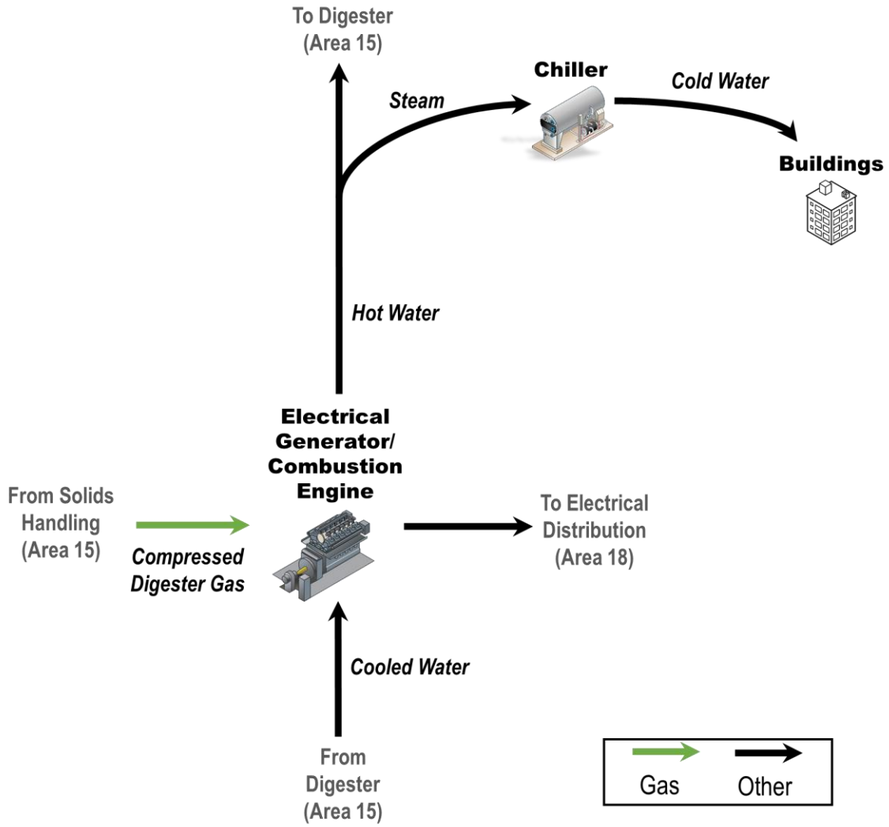
Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, and flares	• Replace the entire gas handling system including the gas compressor building.																
MP-659	New Floor and Equipment Drains for the Truckloading Basement	Truckloading Facility	• Improving the drainage in the basement.																
P1-101	Sludge Dewatering and Odor Control at Plant No. 1	Thickening centrifuges, dewatering centrifuges and odor control	• Construction of new thickening and dewatering and odor control facility and major rehabilitation of truck loading facility.																
FE 16-06	Fuel Cell Facilities Demolition	None	• Demolition of concrete pads, pavement and buried utilities.																
PRN-00505	Safety Improvements at the Thickening and Dewatering Building	Thickening and Dewatering Building	• Improving safety outside of the thickening and dewatering building.																
MP-669	Truckloading and silo's slide frame conveyor motor platform	Truckloading slide frame	• Improve access to the equipment for maintenance activities.																

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

Acronym Key:
CIP=Capital Improvement Program; 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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1
Mechanical																				
General	4	4	4	3	3	2	3	3	3	3	3	3	5	5	5	5	-	5	-	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Lube Oil System	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																				
General	4	4	4	-	-	-	-	-	-	-	-	3	3	3	3	5	5	5	-	-
Switchgear	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Instrumentation																				
General	5	5	5	3	3	3	3	3	3	3	3	3	4	4	5	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 (12 Cylinder)	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

Major Assets	Quantities
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 Reliability –** Monies shall be spent to address aging components and systems required to operate the Central Generation Engines.	• Engine Overhauls (ongoing). • Replace obsolete systems (i.e. Battery Backup, Switch Gear, etc.).
• **Engine Lube Oil System –** The Lube Oil Centrifuges are no longer operational.	• Install new instrumentation and controls onto the existing 2 units.
• **Plant Water Piping –** The plant water (i.e., Cooling Water) piping has degraded and is in need of replacement.	• Replace all plant water piping in the basement of Central Generation.
• **Emission Control System –** The Housings on the Oxidizer Catalysts are failing prematurely.	• Analyze existing deficiencies and design new Catalyst Housings.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	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
P1-127	Central Generation Rehabilitation	Central Generation Facility Wide	• Rehabilitation of Gas Engine Support Systems.															
FE17-03	Battery Storage System	Plant Wide	• Install batteries for electricity storage purposes.															
X-077	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-187	Public Address System Rehabilitation	Central Generation Facility	• Replace the Public Address System at the Central Generation Facility.															
MP-227	Starting Air Compressor System Rehabilitation	Starting Air Compressor System	• Rehabilitation of the Air Compressors.															
PRN-00248	Engine Overhauls	Engine Generator	• Overhaul the engines as needed (ongoing).															
PRN-00283	Elevator Rehabilitation	Building Elevator	• Rehabilitate the existing elevator.															
PRN-00322	Lube Oil Filter Catwalk	Engine Generator	• Install Lube Oil Filter catwalks for maintenance purposes.															
MP-608	Engine Ignition and Controls Upgrade	Engine Generator	• Replace the existing engine ignition, controls, and fuel system.															
PRN-00525	Battery Backup Rehabilitation	Battery Backup	• Replace the existing backup batteries for the switch gear.															

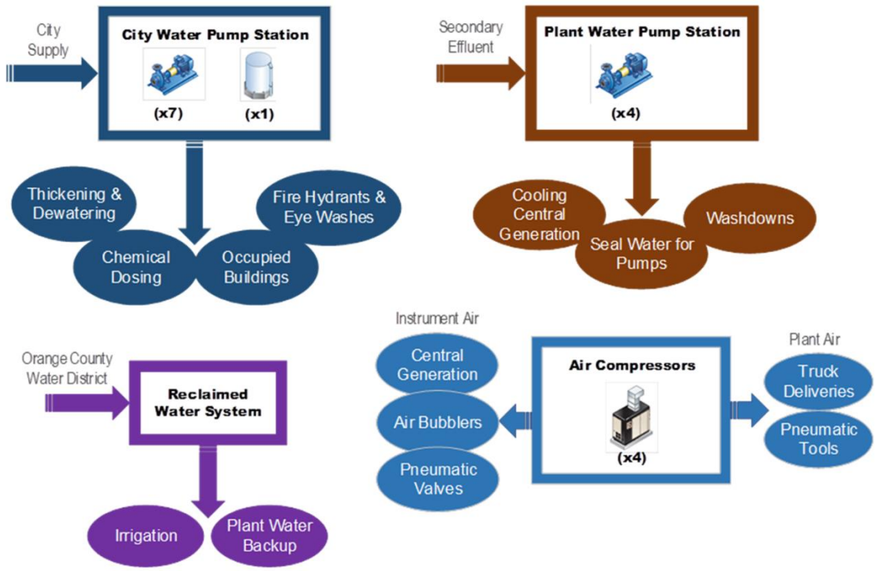
Types of Project Legend:

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

Acronym Key:
CIP=Capital Improvement Program; FY=Fiscal Year

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	-
Structural				
Pump Station	1	3	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	5
Ventilation System	2	3	-	-
Electrical				
Motor Control Centers	1	2	-	-
Variable Frequency Drives	3	1	-	-
Instrumentation				
PLCs, Flowmeters	1	1	-	1

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 –** Severe corrosion issues.	• Current plan is to run to fail and repair the lines as they fail. In addition, if opportunity arises through future CIP or FE projects within areas where known air system deficiencies exist, we will address them at the time.
• **City Water Pump Station** – Pumps are possibly undersized.	• The three medium pumps at the City Water Pump Station continuously run causing excessive wear. There are 1 smaller jockey pumps that run very infrequently. Study is needed to properly size the pumps at the station to meet the current needs of the plant.
• **Reclaimed Water System** – This system needs a pressure regulating valve installed.	• Reclaimed water is meant to be a back up to plant water and to provide necessary support to Central Generation. When the pressure on the plant water side drops, the plant becomes in need of reclaimed water to compensate for the loss. Currently, the reclaimed water pressure varies between 100psi to 130psi, depending on the operational conditions at OCWD. OCSD plant water is at 80 psi, so with the current valves, reclaimed water with the higher psi tends to replace plant water, even when we are not in need. This causes unnecessary reclaimed water charges. Installing a pressure regulating valve at the OCWD/OCSD reclaimed water connection point will help reduce unnecessary charges and better manage our reclaimed water usage.

Current and Future Projects

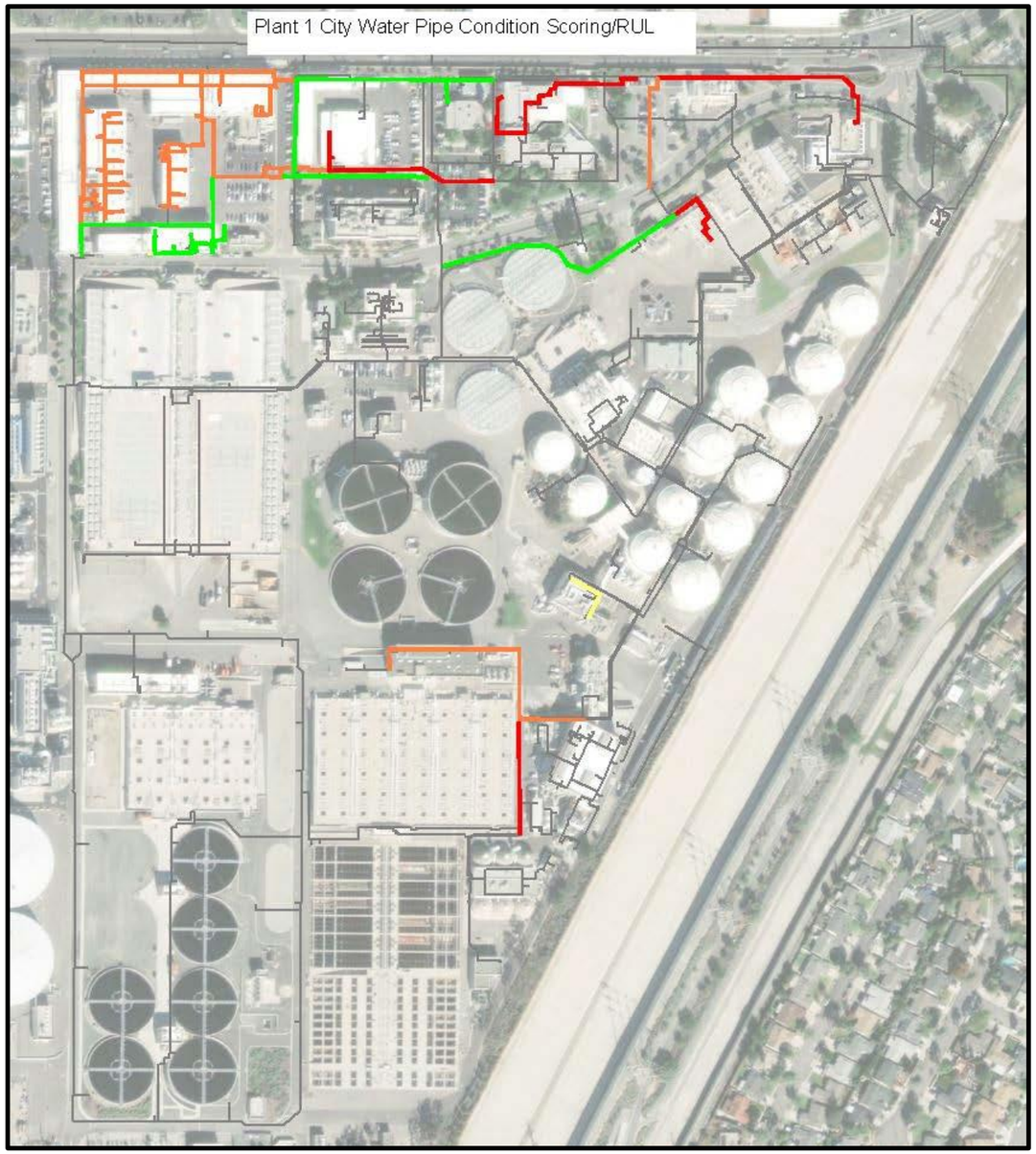
Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27	FY27/28	FY28/29	FY29/30	FY30/31	FY31/32	FY32/33	FY33/34
FE15-07	Secondary Treatment and Plant Water Variable Frequency Drive Replacement	Plant Water Pump Station	• Replace Variable Frequency Drives at the Plant Water Pump Station.															
FE18-06	Instrument Air Compressors at Central Generation	Central Generation	• Replace Instrument Air compressors at Central Generation.															
P1-105	Headworks Rehabilitation and Expansion	City Water Pump Station	• Refeed city water pumps from new power building and replace current compressor at headworks with 2 new compressors.															
FE18-20	Blower Building Compressor Replacement	Blower Building	• Replace current compressor with 2 new compressors.															
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	• Rehabilitate City Water Pump Station.															
X-039	Plant Water Pump Station Rehabilitation	Plant Water Pump Station	• Rehabilitate Plant Water Pump Station.															
FE-XX1	Dissolved Air Flotation Thickeners Air Compressor Replacement	Dissolved Air Flotation Thickeners	• Relocate existing 100 HP Air Compressor.															
FE-XX2	Plant Water Piping Replacement	Activated Sludge: Train 1	• Replace portions of the plant water piping near Activated Sludge Plant No. 1.															
PRN-00518	Air Compressor replacement Headworks	Headworks	• Replace in kind compressor at headworks (100 HP).															
PRN-00568	Air Compressor replacement Blower Building	Blower Building	• Replace in kind compressor at blower building (60 HP).															

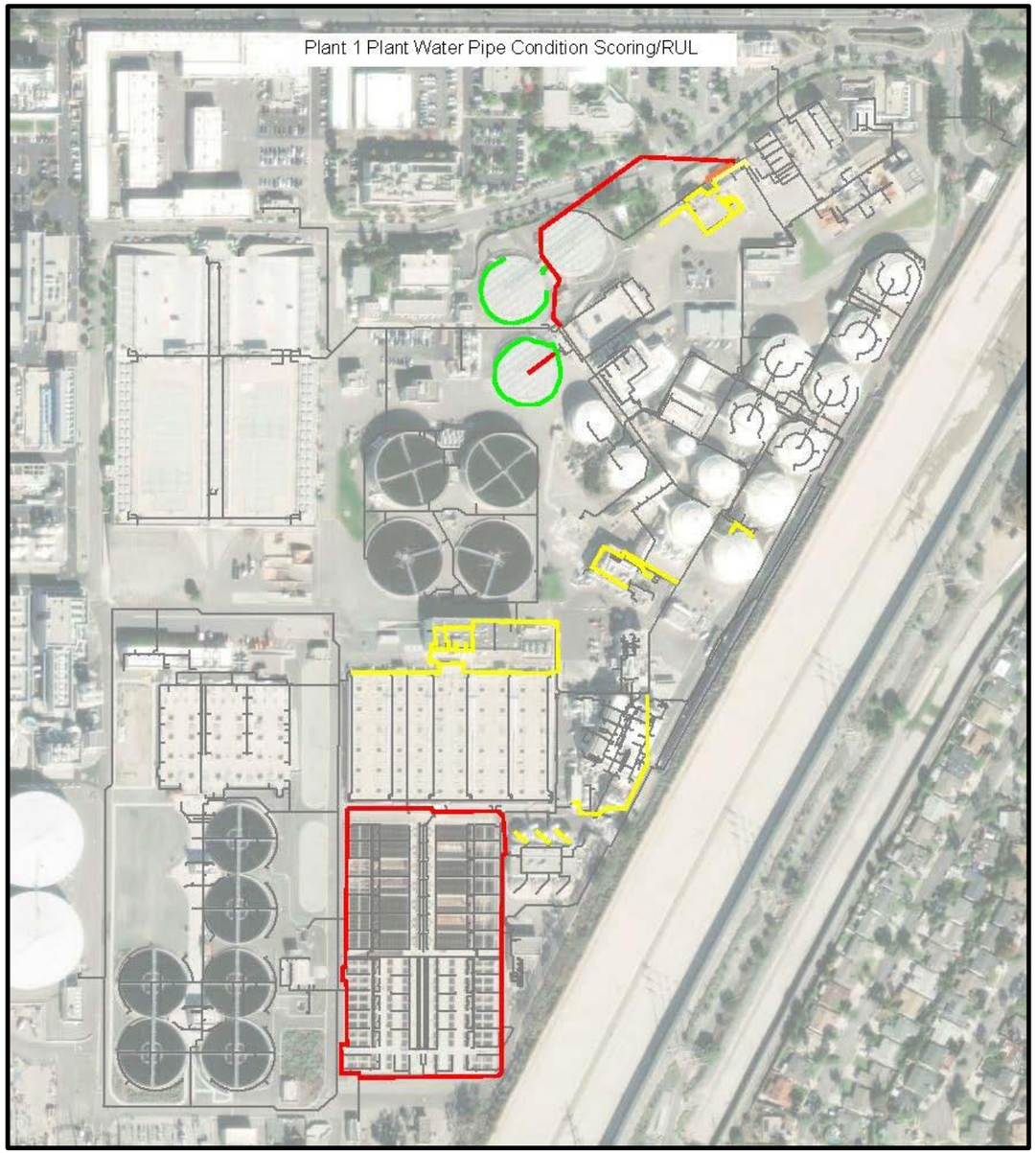
Types of Project Legend:
CIP - Planning **CIP – Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP=Capital Improvement Program; FE= Facilities Engineering; FY=Fiscal Year; HP=Horsepower; OCSD=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





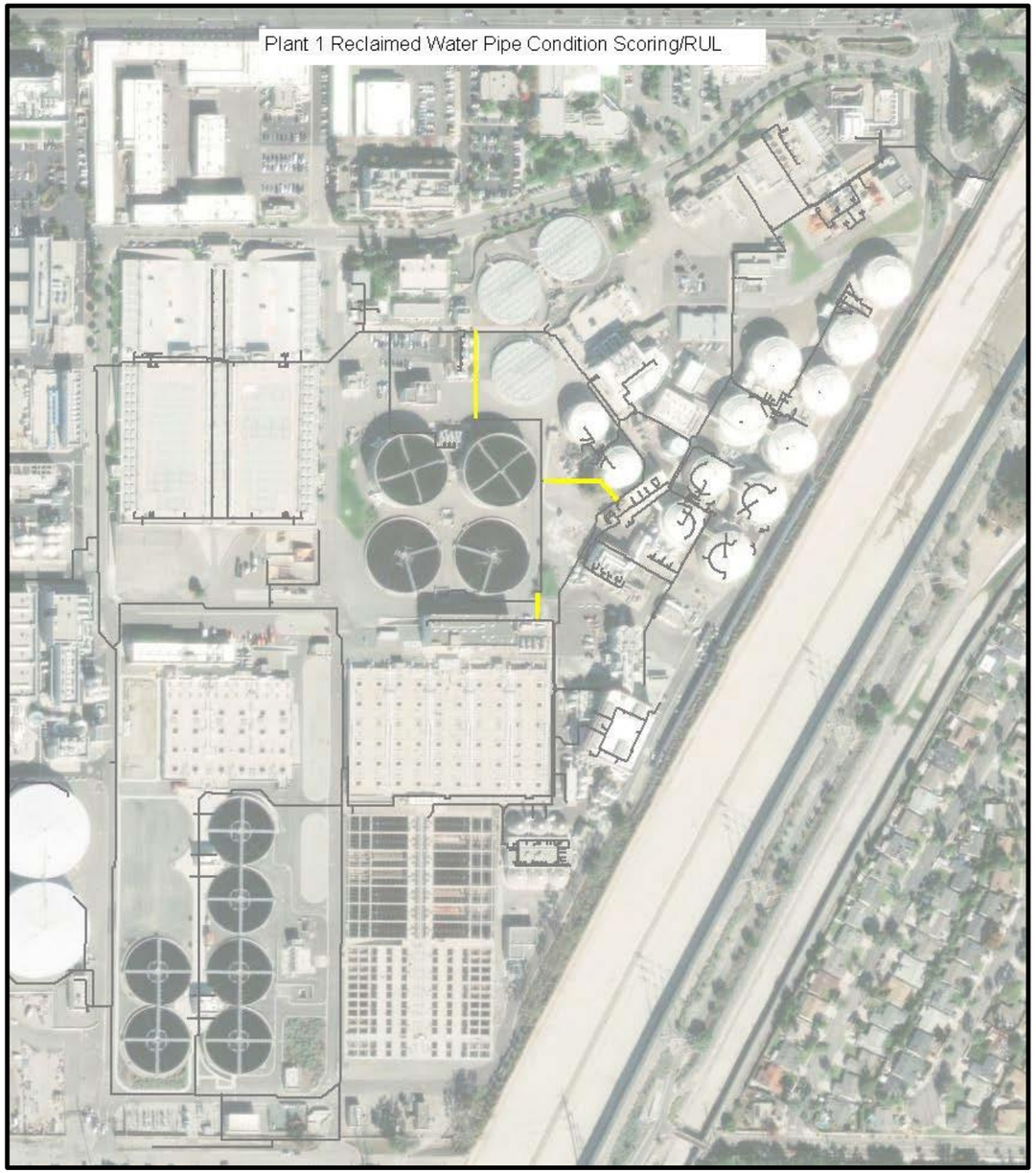
RUL Legend:

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



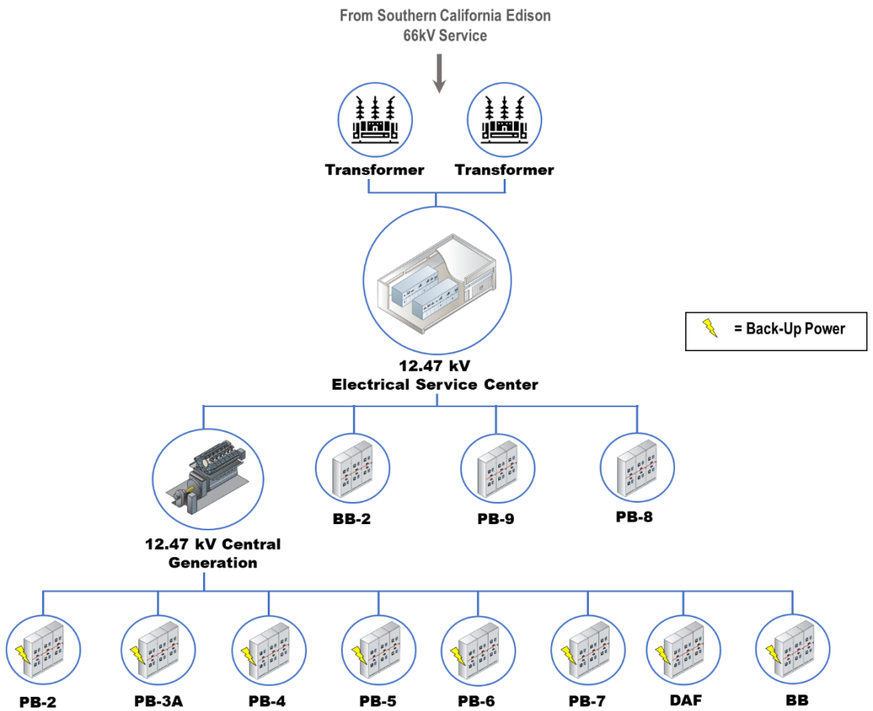
RUL Legend:

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	35
Standby Generators	8
12kV Switchgears	19
480V Switchgears	5
125VDC and 24VDC Battery Systems	22
UPS	25

Major Assets Remaining Useful Life

Asset Type	Service Center	CENGEN	PB-2	PB-3A	PB-4	PB-5	PB-6	PB-7	PB-8	PB-9	DAF	BB-1	BB-2
Tier I – 12.47kV Primary Distribution Level													
Transformers: 12.47/4.16kV	-	-	-	-	-		-	-	-	-		4	1
Transformers: 12.47/0.48kV	1	4	2	2	4	1	4	1	1	1	3	4	1
12.47kV Switchgears	3	4	4	4	4	4	4	-	-	-		-	1
12.47 kV Transfer Switchers	4	-		-		-	-	-	-	-		-	
12.47 kV Level Indicator Switches	-	-	4	4	4	-	-	1	1	1	3	4	
12.47kV Feeders	1	4	4	4	4	4	4	1	1	1	4	4	1
Tier II – 4.16kV Distribution Level													
4.16kV Switchgears	-	-	-	-	-	-	-	-	-	-	-	4	1
4.16kV Feeders	-	-	-	-	-	-	-	-	-	-	-	4	1
Tier IV – 480V Distribution Level													
480V Switchgears	-	4	2	2	-	2	4	1	1	1	3	4	1
Transfer Switches	-	-	2	2	4	-	2	-	-	-	4	4	1
Generators	-	-	5	5	5	-	-	1	1	-	-	5	-
Tier V – Uninterruptible Power Supply													
UPSs Individual	-	5	-	5	-		3	-	3	2	3	3	3
Tier VI – 125 VDC and 24 VDC Battery Systems													
125VDC Chargers	5	5	5	5		3	3	3	3	2	3	-	3
125VDC Batteries	5	5	5	5		3	3	3	3	2	3	-	3
24VDC Chargers	-	5	5	5	5	-	-	3	3	-	-	3	-
24VDC Batteries	-	5	5	5	5	-	-	3	3	-	-	3	-
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;
CENGEN=Central Generation;
kV=Kilovolt;
PB=Power Building;
RUL=Remaining Useful Life;
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 re-feed standby loads from Power Building 8. Future Projects will design feeders from new generators to Power Building 2 and Blower Building 1 Standby Loads.
• **Battery Chargers and Batteries –** Aging.	• MP-233: Monitor existing battery life, develop path forward for replacing aged battery and charger systems.
• **Cabling** – Aging medium voltage cabling infrastructure.	• MP-320: Testing aging Medium Voltage Cabling to perform Condition Assessment and develop plan for preventive maintenance.
• **Variable Frequency Drive** – Obsolescence.	• Identified obsolete Variable Frequency Drive. Proceed with Variable Frequency Drive Replacement Strategy
• **Power Building 2** –Seismic issues.	• Plan to transfer Power Building 2 Loads to T&D Building and demo the building. Consider feeding Power Building 2 standby loads from future Blower Building standby power.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
MP-233	P1 and P2 Battery System Upgrade	Plant No. 1 Power Distribution	• Battery Systems are old and in need of refurbishment. The Project will look into replacing old batteries and chargers.															
MP-320	P1 Medium Voltage Cable PM Services	Plant No. 1 Power Distribution	• Medium Voltage Cables Condition Assessment and Testing.															
MP-666,667,668	Obsolete Variable Frequency Drive Replacement Strategy	Plant No. 1 Power Distribution	• Replacement of obsolete Variable Frequency Drive at Plant No. 1.															
FE17-03	Battery Storage System at P1	Plant No. 1 Power Distribution	• Project will arrange for installation, operation, maintenance, and management of behind- the-meter battery energy storage system at Plant No. 1 to reduce peak electrical demand chargers.															
P1-126	Primary Clarifiers Replacement and Improvements at P1	Plant No. 1 Power Distribution	• Demolish Power Building 4 Diesel Generator, re-feed standby loads from Power Building 8.															
X-077	P1 Central Generation Switchgear replacement	Plant No. 1 Central Generation Switchgear Replacement	• Project will replace existing 12.47kV Central Generation Switchgear, install new 12.47kV Feeder from Electrical Service Center to Central Generation. Install new 12.47kV feeders from Central Generation to Dissolved Air Flotation and Blower Building 1.															
P1-105	P1 Headworks Rehabilitation	Plant No. 1 Power Distribution/Headworks	• Project will rehabilitate and upgrade facilities at the Plant No. 1 Headworks. Project will install (3) new Electrical Power Buildings: Power Building 3, Standby Power Electrical Building and Headworks Electrical Building. Project will install new centralized standby generator system; (4) 2500kW Generators.															
X-038	City Water Pump Station Rehabilitation at P1	Plant No. 1 Power Distribution/Mechanical Equipment/Instrumentation	• Project will retrofit the building, replace HVAC, replace electrical distribution equipment and control equipment, such as transformers, switchgears, MCCs, VFDs, and surge arrestors.															
P1-132	UPS Improvement at P1	Plant No. 1 Power Distribution/UPS Systems	• Project will install new regional UPS at Power Building 8 to provide critical power to facilities northwest region of the plant. New electrical distribution and branch circuits panelboards will replace existing old and obsolete equipment.															
J-98	Electrical Power Distribution Improvements	Plant No. 1 & Plant No. 2 Power Distribution	• Project provides various electrical distribution system improvements at Plant No. 1 and Plant No. 2 as recommended by J-25-4 Study.															

Types of Project Legend:

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

Acronym Key:
CIP=Capital Improvement Program; 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; T&D=Thickening and Dewatering; VFD=Variable Frequency Drive; UPS=Uninterruptible Power Supply

5.2.2 Plant No. 2 Asset Management Summaries

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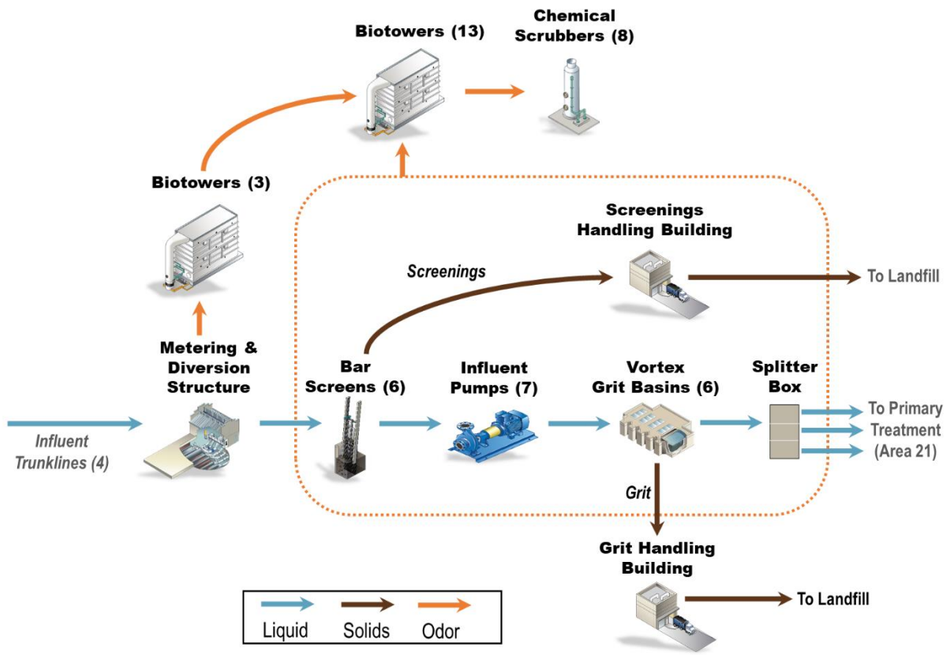
ASSET MANAGEMENT SYSTEM SUMMARY – AREA 20 – PLANT NO. 2 PRELIMINARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Headworks					Trunkline Odor Control	Headworks Odor Control
	Metering & Diversion	Bar Screens	Main Sewage Pump	Grit Basins	Splitter & Metering		
Civil							
Effluent Piping	-	-	-	-	3	-	-
Structural							
Building	-	1	1	1	-	-	-
Concrete & Tanks	1	1	1	1	1	1	1
Mechanical							
Piping & Valve	1	1	1	1	1	-	-
Pump	-	-	1	2	-	2	2
Screening Washer Compactor	-	3	-	-	-	-	-
Grit Cyclone/ Classifier	-	-	-	2	-	-	-
Conveyor	-	2	-	2	-	-	-
Fans & Blower	-	-	-	-	-	2	2
Control Gate	2	2	2	2	2	-	-
Heating, Ventilation & Air Conditioning	-	2	2	2	-	-	-
Crane	-	1	1	-	-	-	-
Electrical							
Process – Motor, MCC, VFD	2	2	4	2	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:
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–** There are 480V cables and circuits that are currently grounded, causing ground faults on 480 volt equipment. Last incident happened in July 2019, when the Grit Classifier A was lost due to the ground fault. Due to the complexity of the repair job and its impact to operations, need to develop a replacement plan for known failed cables.	• 880E located a spare wire for the Grit Classifier A and put back in service. • PRN-00409 P2 Headworks 480V Grounded Cable Repair was approved by the Clearinghouse to do the engineering design in-house and bid for service contract for repairs on damaged cables. The bid was awarded and will be presented to the December board for approval.
• **Main Sewage Pump System –** P2-122 Headworks Modifications at Plant No. 2 for GWRS Final Expansion will replace 3 of 7 MSP pumps, but use the existing VFDs and Motors. They are due for overhaul to ensure that they continue to be reliable during and beyond the P2-122 construction. Also, current vibration monitoring system, which is Emerson CSI 4500, for MSP is obsolete and no longer supported after this year.	• Variable frequency drives are halfway through their anticipated life cycle, so PRN-00528 P2 MSP Variable Frequency Drive Year 10 Preventative Maintenance was approved by the Clearinghouse to perform Year 10 Preventative Maintenance on the drives by the original equipment manufacturer. • PRN-00529 Plant No. 2 MSP Motor Overhaul was approved by the Clearinghouse to have the motors overhauled in the motor shop • Recommend replacing the obsolete vibration system with GE Bently Nevada since the District plans to standardize the vibration monitoring system.
• **Headworks –** Asset life of P2-66 Headworks is relatively new, since it was completed in 2012. No condition assessment has been done in the past. There is a need to perform condition assessment at the Headworks to build a condition baseline.	• With P2-122 construction starting next year, area engineer will coordinate with the project team and Operation and Maintenance to conduct condition assessments on areas that will be down for the construction.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	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
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.															
PRN-00409	Plant No. 2 Headworks 480V Grounded Cable Repair	Headworks	• In-house engineering design, and bid for service contract for repairs.															
PRN-00528	Plant No. 2 MSP VFD Year 10 PM	MSP	• Refurbish all 7 MSP VFDs by performing Year 10.															
PRN-00529	Plant No. 2 MSP Motor Overhaul	MSP	• Overhaul all 7 MSP motors in the motor shop.															
PRN-00561	Plant No. 2 MSP Vibration System Modernization	MSP	• Modernize obsolete MSP vibration system. • Replace and install new vibration sensors on pumps.															
FE18-11	Headworks Explosive Gas Monitoring Systems at Plant No. 2	TL & HW Odor Control	• Install an Early Warning System to provide early indication of combustible gas at the influent of the plant.															
FE18-17	Trunkline Sampler Power Feed at Plant No. 2	Trunkline	• Provide 120V power for four automated samplers at 4 trunkline sample collection points.															
MP-699	Plant No. 2 Trunkline Biotower #3 Repair	TL Odor Control	• Repair internal mechanism of the Biotower #3 vessel.															
N/A	Plant No. 2 Biotower Media Replacement	TL & HW Odor Control	• Replace biotower media of 16 biotowers.															
N/A	Plant No. 2 Chemical Scrubber Media Replacement	HW Odor Control	• Replace scrubber media of 8 chemical scrubbers.															
X-030	Plant No. 2 Headworks Rehabilitation	Headworks	• Rehabilitate any equipment, electrical, structures, or materials that cannot provide 25 years of useful life.															

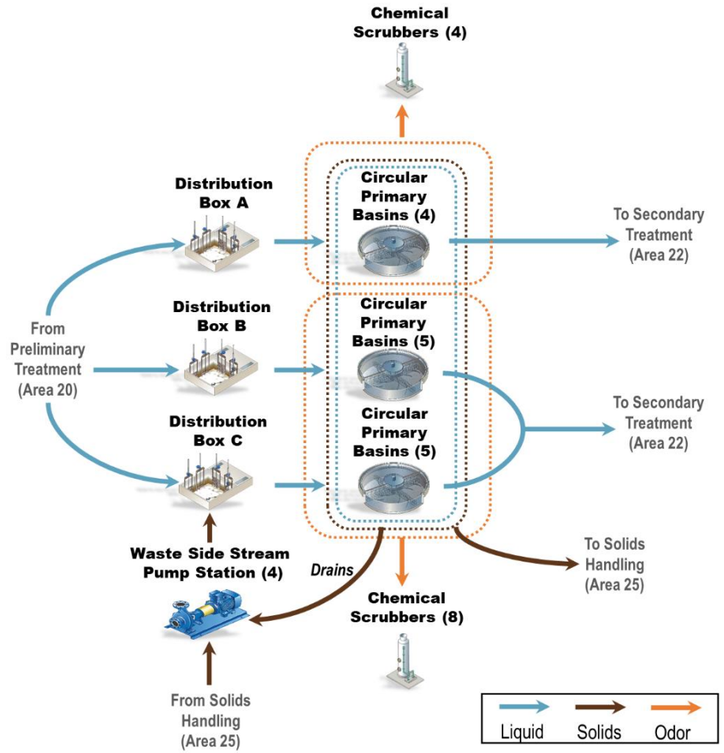
Types of Project Legend:

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

Acronym Key:
CIP=Capital Improvement Program; FY=Fiscal Year; GWRS=Groundwater Replenishment System; HW=Headworks; MSP=Main Sewage Pump; N/A= Not Applicable; PM=Preventative Maintenance; TL=Trunkline; 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; 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	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	2
Structural																				
General	4	4	3	3	4	3	3	3	3	3	2	2	2	2	3	3	3	2	3	1
Dome	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-
Mechanical																				
Piping	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	-	2	3	2
Internal Mechanism	5	5	3	3	5	3	3	3	3	4	5	3	4	4	-	-	-	-	-	-
Fans & Pumps	3		3		3		3		3		3		3		3	3	3	2	-	4
HVAC & Ventilation	2		2		2		2		2		2		2		-	-	-	-	-	-
Gates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
Electrical																				
Process – Motor, MCC, VFD	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	-	3
Instrumentation																				
PLC, Flow Meters	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	2	-	3

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	
Primary Basin	4
Sludge/ Scum Collectors	4
Sludge/ Scum Pump	8
Supply Fan	6
B-Side	
Primary Basin	5
Sludge/ Scum Collectors	5
Sludge/ Scum Pump	10
Supply Fan	7

Major Assets	Quantities
C Side	
Primary Basin	5
Sludge/ Scum Collectors	5
Sludge/ Scum Pump	10
Supply Fan	8
North Scrubber Complex	
Chemical Scrubber	7
Biofilter	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	2
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 Primary Basins –** Due to its age, basins have corroded internal mechanism issues, and Basin D, E, H, I, and N are not currently operational. With wet weather officially begins in October 15th, at least two basins need to be back in service, bringing the total available to 11 basins. With existing A-Side basins being demolished and replaced with new basins, B/ C side of basins need to be stay reliable for 10 years to support P2-98A construction.	• Basins D, E, H, and I are down for repair through P2-98B B & C Side Interim Repair. Basin N is down due to the imbalance of the sweep arm. Basin N is scheduled to be assessed by OEM of internal mechanism to identify addition scope needed to put the basin back in service. • MP-692 P2 Primary Basin N Repairs is in place to cover additional items beyond P2-98B scope. • P2-98A and P2-133 are in place to provide long term solutions to all A, B, & C side of primary clarifiers.
• Reliability of Waste Sidestream Pump Station C – Waste sidestream pumps and their associate equipment show accelerated corrosion issue due to the drains from the South Scrubber Complex. The South Scrubber Complex uses bleach for their scrubbers and the bleach pumps are oversized and do not have good turndown ratio. Excessive bleach goes to the drains that go to the WSSPS-C. The materials are not compatible with bleach, resulting accelerated corrosion.	• MP-420 Plant No. 2 South Scrubber Complex Bleach Pump is in place to replace oversized bleach pump with smaller sized pump with better turndown capacity. This will reduce excess bleach that flows to the WSSPS-C. • Two failed pumps (5HP and 35HP) are sent out for root cause failure analysis and will be replaced with improved design. • X-054 WSSPS-C Rehabilitation at Plant No. 2 is in place to address corroded equipment caused by replacing equipment with upgraded material.

Current and Future Projects

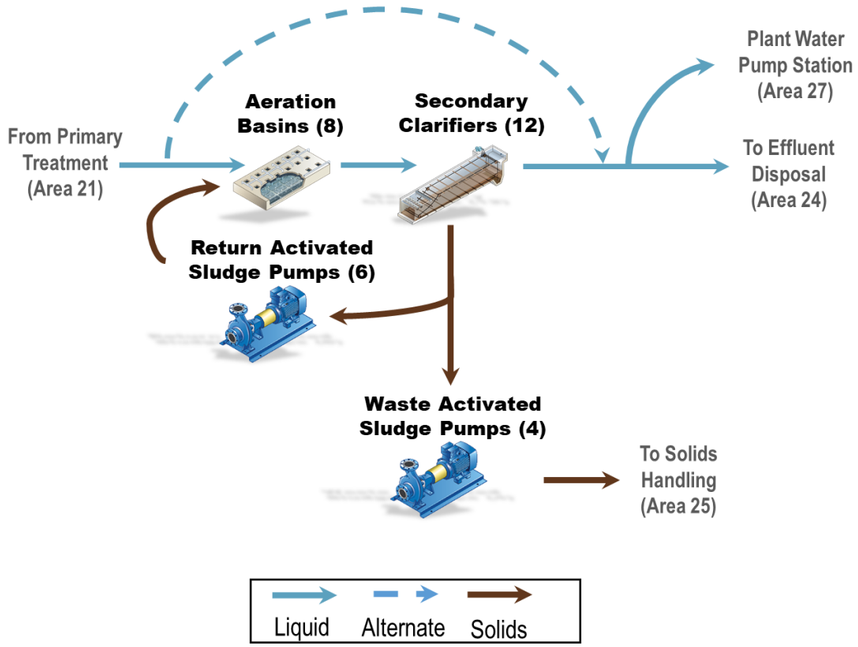
Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	A Side Primary Basins	• Demolish and replace four existing A-Side Primary Basins. • Demolish and replace the South Scrubber Complex.															
P2-98B	B/C Side Primary Clarifiers Interim Repair at Plant No. 2	B & C Side Primary Basins	• Repair the structural steel mechanism members of 12 primary basins. • Interim repairs to make basins reliable for 10 years during P2-98A construction.															
P2-133	B/C Side Primary Clarifiers Rehabilitation at Plant No. 2	B & C Side Primary Basins	• Long term repairs to extend remaining useful life of B & C side basins to 40 years or greater.															
PRN-00306	Plant No. 2 Primary Clarifier D & E Repairs	Primary Basin D & E	• Interim repairs for Primary Basin D & E to extend the lifecycle by 8-10 years. Added to P2-98B scope.															
MP-692	Plant No. 2 Primary Clarifier N Repairs	Primary Basin N	• Identify and repair items not covered in P2-98B scope to make the basin operable for next 10 years.															
MP-420	Plant No. 2 South Scrubber Complex Bleach Pump	South Scrubber Complex	• Replace existing bleach pumps with higher turndown capable pump to reduce excess bleach usage.															
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:
CIP=Capital Improvement Program; FY=Fiscal Year; HP=Horsepower; OEM=Original Equipment Manufacturer; 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	3	3	3	3	3	3	2	2	3	3
Clarifier/DAFT Moving Mechanism	-	-	5	-	-	-	-	2	-	-	-
Channel Air Blower	-	-	-	-	-	4	-	-	-	-	-
Control Gate	-	3	4	3	-	-	-	-	-	2	-
LOX Facility	-	-	-	-	-	-	3	-	-	-	-
HVAC & Ventilation	2	-	-	-	3	3	-	-	-	-	-
Crane	3	-	-	-	-	-	-	-	-	-	-
Electrical											
MCC & VFD	4	3	3	-	4	4	-	3	3	3	3
Instrumentation											
PLC & 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

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 • Missing flapper gates on the area drains inlets to the basins	• PRN-00573 (MP-513) project will replace the PEPS VFDS • Condition assessment will be performed to determine the condition
• **Aeration Basins–** Cracks and concrete spalling on aeration basins deck • Aerator motor corrosion and vibration	• P2-118 filled the cracks on west side, and the remaining work will be included in P2-123 contract • Maintenance have been rebuilding the gearbox, the motor base, and replacing the motor • X-050 will overall rehab. the aeration basins
• **Clarifiers–** Broken clarifier mechanism need to be repaired or replaced • Corroded Inlet gates need to be replaced • Broken Area lights	• MP-248 will replace D, L, G, J, C, F), and the remaining six will be replaced by another MP • MP-638 Will replace all the 36 inlet gates • P2-123 will replace all the lights
• **RAS/WAS Pump Stations** – Obsolete VFDs • Corroded RAS piping	• PRN-00573 (MP-513) will replace the RAS and WAS VFDs • P2-123 will replace the RAS piping
• **Oxygen Facility -** LOX Tank A out of service due to leaking flange	• Operation is working on a contract to repair the LOX tank

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY 20/21	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
MP-248	Plant No. 2 Secondary Clarifiers D, G, L, J, F, C Repairs	Secondary clarifiers	• Replace the six clarifiers moving mechanisms.																
PRN-00457	Activated Sludge Plant Clarifier Inlet Gate Replacement at Plant No. 2	Secondary clarifiers	• Replace all the 36 inlet gates with stainless steel gates.																
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 primary basins will be demolished and be directed to PEPS.																
P2-123	Return Activated Sludge Piping Replacement at Plant No. 2	RSS pump stations and secondary clarifiers	• Replace RAS piping, area lights and fix the concrete cracks and spalling on east aeration basin decks.																
PRN -00573 (MP-513)	Plant No. 1, Plant No. 2, Collections VFD Drives Replacement	PEPS, RSS pump stations	• Replace PEPS, RAS and WAS VFDs																
X-50	Activated Sludge Aeration Basin Rehab. 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.																
PRN-00572	Plant No. 2 AS Plant Clarifiers Rehabilitation - Phase 2	Secondary clarifiers	• Replace Clarifiers A, B, E, G, H, L moving mechanism.																

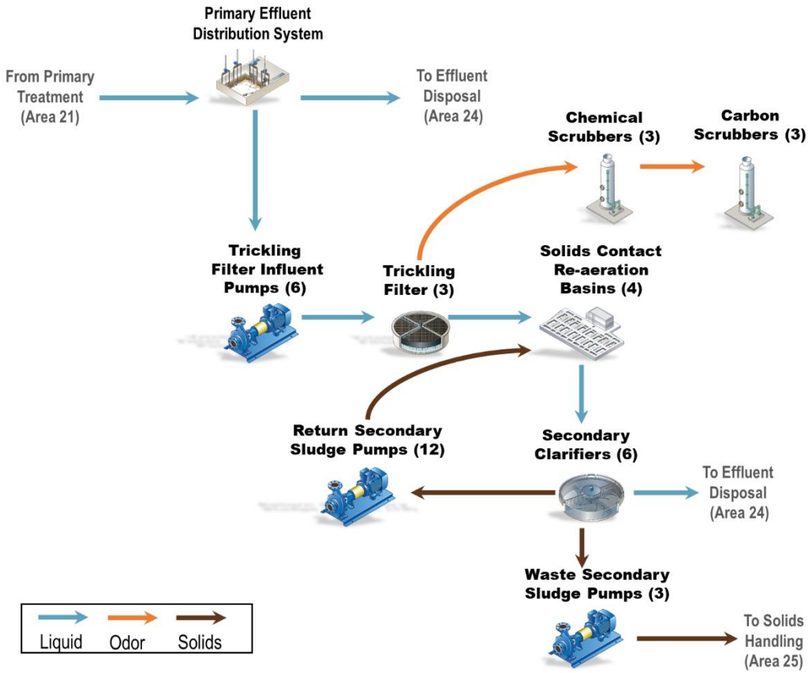
Types of Project Legend:

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

Acronym Key:
AS= Activated sludge; CIP=Capital Improvement Program; FY= Fiscal Year;
GWRS=Groundwater Replenishment System; LOX=Liquid Oxygen; 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

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	4	-	-	2	2	2	2	2	-	2	3
TF Rotary Distributor	-	2	-	-	-	-	-		-	-	-
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	2
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
RSS PS B	
Buildings	1
RSS Pumps	4

Major Assets	Quantities
RSS PS C & Electrical Room	
Buildings	1
RSS Pumps	4
Distribution Center J	
Building	1
Odor Control Facility	
Foul Air Fans	3
Chemical scrubbers	3
Carbon Units	3

Major Assets	Quantities
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

Key Issues

Key Issues	Actions and Recommendations
• **TFPS –** Pumps seal water failure due to the seal tube corrosion	• PRN-00493 (MP-551) removed the C2 pump to the manufacture authorized pump shop to do inspection and evaluation. All six pumps will be repaired with parts replaced with better corrosion resistant materials. There pumps will be refurbished by the end of 2019.
• **Snail control –** Signs of snail shell accumulation at process area and excessive wearing on RSS and WSS pipes.	• Changed from 25% percent caustic injection to 50%. • PS18-10 did the evaluation and recommended to change the injection the original design of flooding. Operation is doing the testing of flooding. • Performed condition assessment of various pipes and replaced the bad pipes.
• **Clarifiers–** Clarifier E out of service since December 2018 due to the damage of the moving mechanism.	• PRN-00503 (MP-622) performed the condition assessment by the equipment manufacture Ovivo and will repair the mechanism. Clarifier E will return to service by in December 2019.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY 20/21	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
MP-339	Plant No. 2 Trickling Filter Fan Support Modifications	Trickling filter fans	• Raise the fan motor base, allowing for the use of shorter belts.																
PRN-00493 (MP-551)	Plant No. 2 Trickling Filter Seal Tube Evaluation and Repair	TFPS pumps	• Identify the cause, replace parts and repair all the six pumps.																
PRN-00503 (MP-622)	Plant No. 2 TFSC Clarifier E Damage Evaluation and Repair	Clarifier E	• Identify the cause of the damage, replace the damaged parts, make modification to bring Clarifier E back to service.																
J-117B	Outfall Low Flow Pump Station	DCJ, TFSC effluent	• New PWPS to draw flow from TFSC secondary effluent • Provide 2nd feed to DCJ from Central Generation and load shed for non-critical loads.																
P2-122	Headworks Modifications at Plant No. 2 for GWRS Final Expansion	TFSC influent and effluent	• TFSC to treat the reclaimable stream.																
J-36-2	GWRS Final Expansion Coordination	TFSC effluent	• New diversion structure and weir box to divert the TFSC effluent to OCWD equalization tanks and pump station at Plant No. 2.																
X-031	Plant No. 2 TF/SC Rehabilitation	TFSC facility	• Overall rehab. TF/SC. • Replace the TF media.																

Types of Project Legend:

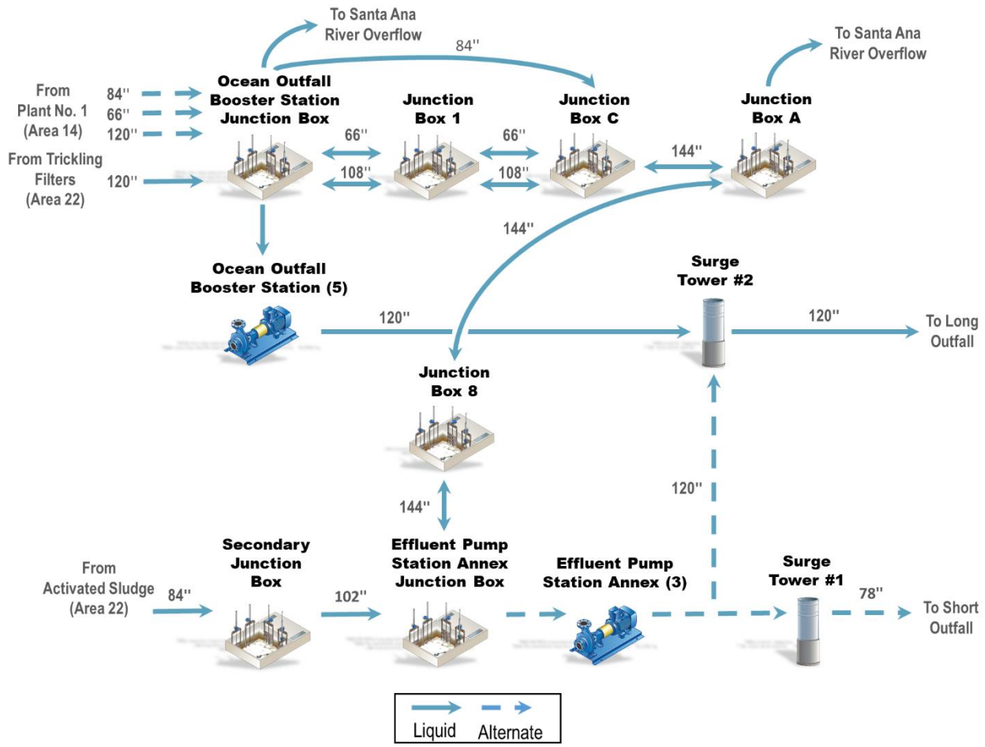
CIP - Planning **CIP – Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP=Capital Improvement Program; DCJ=Distribution Center J; FY=Fiscal Year;
GWRS =Groundwater Replenishment System; MCC=Motor Control Center; ML=Mixed Liquor;
OCWD= Orange County Water District; PLC= Programmable Logic Controller;
PWPS = Plant Water Pump Station; RSS=Return Secondary Sludge; SC=Secondary Clarifier; TF= Trickling Filter;
TFPS= Trickling Filter Pump Station; TFSC= Trickling Filter Secondary Clarifier; VFD=Variable Frequency Drive;
WSS=Waste Secondary Sludge

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	4	1	2	2	2	4	2	1	2	1	2	-	-
Structural													
Structures, Buildings	4	1	2	2	2	2	2	1	2	1	2	1	1
Mechanical													
Pumps, Fans	3	-	-	-	-	2	2	-	-	-	-	-	-
Gates	2	1	2	2	2	3	-	-	-	-	-	-	-
Valves	2	-	-	-	-	2	-	-	2	-	-	-	-
Pipes	3	1	2	2	2	4	-	1	2	1	1	-	-
Manhole Covers	-	-	-	-	-	-	-	-	-	-	-	?	?
Monel Parts	-	-	-	-	-	-	-	-	-	-	-	?	?
Ballast	-	-	-	-	-	-	-	-	-	-	-	?	?
Electrical													
Process – Motor, MCC, VFD	5	-	-	-	-	4	2	2	2	2	-	-	-
Instrumentation													
PLC, Flow Meters	5	-	-	-	-	3	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:

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;
? = Unknown RUL;
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
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 EPSA Pumps –** With J-117B rehabilitating OOBS pumps, up to 2 OOBS pumps may be down during the construction, which is scheduled to begin in April of 2021. By then, EPSA system needs to stay reliable to compensate outfall capacity loss from OOBS being down. There are currently 3 ongoing projects to improve EPSA reliability, which are VFD cells refurbishment, motor cooling improvement, and EPSA discharge line assessment and repair	• EPSA motors cooling issue has been approved by Clearinghouse (PRN-00519) by modifying the motor cooling with additional internal fans. This effort will be executed by the Small Capital Delivery group. • VFD cells refurbishment and control modernization approved by the Board. Plan is to complete the refurbishment and perform control upgrades by summer of 2020. • Issued a Purchase Order to perform a confined space entry assessment for EPSA discharge pipelines. Once the internal condition is known, repair plan will be developed.
• **OOBS & EPSA Overflow pipe and wing wall assessment –** J-117A Interplant Effluent Pipeline Rehabilitation assessed OOBS overflow structure pipe segments and its concrete wing wall. The assessment identified separation of the pipe joints and deterioration of the wing wall	• PS17-10 Emergency Overflow Weirs, Wing Wall Structural and Geotechnical Investigations is in place to investigate the root causes of the issues and provide recommendations to protect these structures. This study will feed into a FE project for execution.
• **Long Ocean Outfall Assessment –** With long outfall pipe approaching 50 years in service, need an extensive assessment to understand maintenance required to extend the useful life. The permit with the California State Lands Commission was renewed for 25 years effective August 28, 2017, and the permit requires to maintain the outfall to use its land.	• PS18-09 Ocean Outfall Condition Assessment and Scoping Study is in place to determine the condition of ocean outfall and provide recommendations to extend its useful life. • X-053 is created to execute rehabilitation efforts per recommendations from PS18-09. May need to assume similar condition to that of the 78” Outfall to address its condition.
• **Corrosion issues –** Due to its corrosive environment, there are various areas that began to show signs of coating failure. There are areas, such as EPSA discharge line, that need to be assessed and Surge Tower welding joint between lower concrete and upper steel shell	• Continue to work with coating team to address visible coating failures. PRN-00480 will repair the OOBS pipeline thermal expansion supports, and PRN-00566 will repair the external coating for OOBS & EPSA pipes • Coordinate with condition assessment team to develop work plans for welding joint and EPSA underground discharge assessment.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	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
PS17-10	Emergency Overflow Weirs, Wing Wall Structural and Geotechnical Investigations	OOBS & JB-A	• Perform a geotechnical and structural assessment of piping and respective wing wall structures.															
PS18-09	Ocean Outfall Condition Assessment	120” Ocean Outfall	• Determine condition of Ocean Outfall and provide recommendations.															
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.															
X-053	Long Ocean Outfall Rehabilitation	120” Ocean Outfall	• Rehabilitate long ocean outfall per PS18-09 recommendations.															
PRN-00480	OOBS 120-in Pipe Plinths Repair	OOBS	• Conduct repairs on the pipe support by encapsulating with pitch.															
PRN-00566	EPSA Pipe Coating	EPSA	• Conduct a repair painting job on areas identified with corrosion to prevent further deterioration.															
PRN-00499	EPSA VFD Modernization	EPSA	• VFD power cell refurbishment and control modernization.															
PRN-00519	EPSA Motor Cooling	EPSA	• Modify motor cooling system to provide adequate cooling to the motor at a lower speed.															
N/A	Outfall External Inspection	120” Ocean Outfall	• Ocean outfall external inspection every 2.5 years per lease agreement with the California State Lands Commission.															
N/A	Outfall Structural Integrity Report	120” Ocean Outfall	• Ocean outfall structural integrity report every 5 years per the NPDES Permit.															

Types of Project Legend:

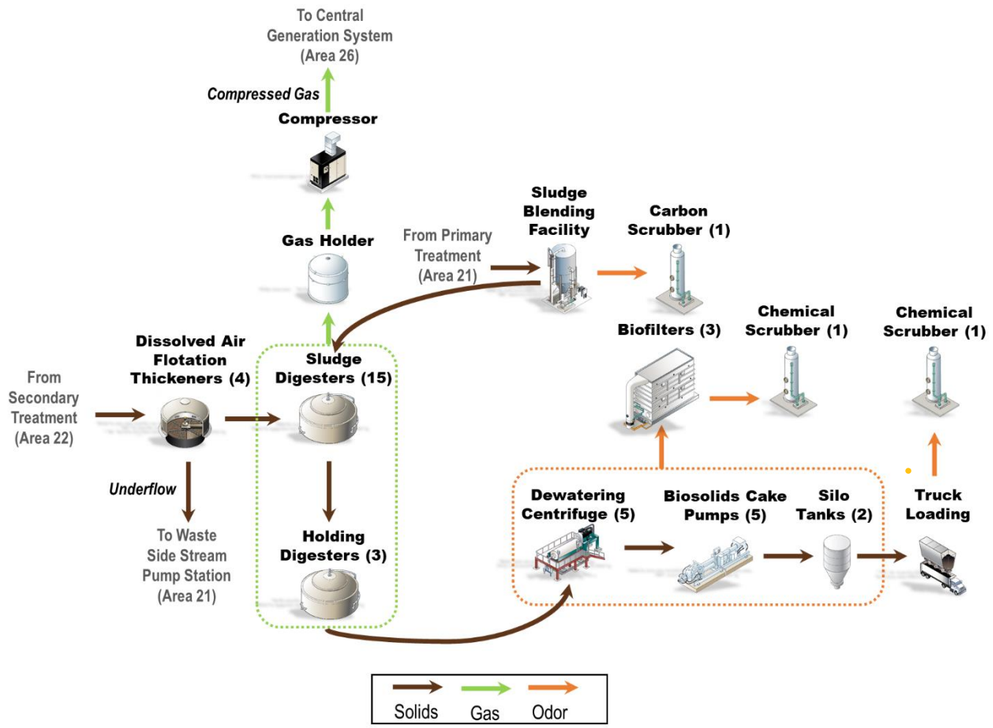
CIP - Planning **CIP – Design** **CIP - Construction** **Maintenance Project**

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; 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	3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3	3	3	2
Digester Dome	3	3	3	3	3	3	2	2	3	3	3	3	3	2	2	2	2	2	-
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	3	3	3	3	3	3	2	2	-	3	3	3	3	3	3	3	3	3	-
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&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 Digester I&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 process as planned by the Biosolids Master Plan.	• Digester replacement food waste related projects. • Digester cleaning and repairs by Maintenance projects that need to be done while digester out of service after cleaning. • P2-91-1 to rehabilitate existing digesters
• **Digester Replacement** – Building new digester complex as recommended by Biosolids Master Plan to replace the existing 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.

Current and Future Projects

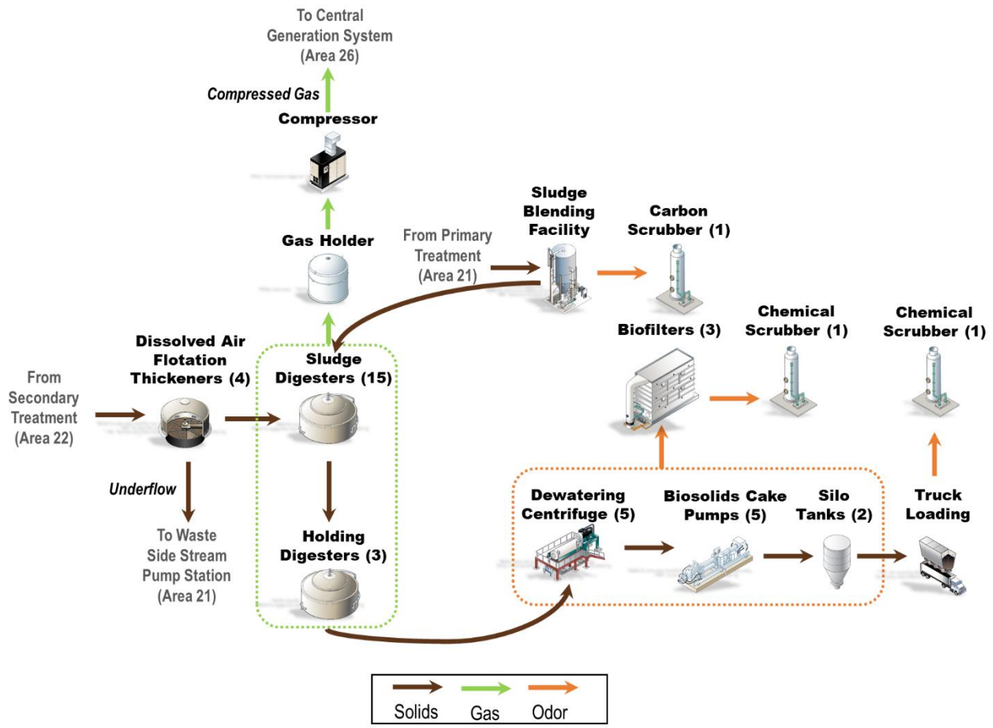
Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
P2-124	Interim Food Waste Receiving Facility	Plant No. 2 Digesters, gas treatment facilities and Central Generation	• Receive 150 wet ton per day of source separated and processed organic food waste to digesters for Co-digestion.																
P2-125	Perimeter Screening at Plant No. 2 (on hold)	Plant No. 2 perimeter walls and plants	• Add additional plants to perimeter wall areas.																
P2-126	Plant No. 2 Warehouse Relocation	Plant No. 2 Warehouse	• Relocate existing warehouse.																
P2-127	Plant No. 2 Collections Yard Relocation	Plant No. 2 Collections Yard	• Relocate existing Collections Yard.																
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, R, R, S as the new mesophilic digesters.																
N/A	Digester Cleaning	Plant No. 2 Digesters	• Continue the digester cleaning. Digester O and I to be cleaned in 2020.																
N/A	Digester repairs after cleaning	Plant No. 2 digesters	• Repairs that need to be done while digester out of service.																
P2-91-1	Plant No. 2 Digesters Rehabilitations	Plant No. 2 Digesters	• Rehabilitate the digesters to keep them operable until the TPAD process in operation.																
MP-690	Digester G and S Valve replacement	Digester G and S	• Replace penetration valves and other miscellaneous repairs identified by condition assessment after digester cleaning.																
MP-688	Digester F and G Walkway Bridge repair	Digester F and G	• Repair walkway bridge between Digester F and G as recommended by condition assessment after Digester F cleaning.																
PRN-00571	Digester O Repairs	Digester O	• Replace valves and minor repairs from condition assessment after cleaning																

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

Acronym Key:
CIP=Capital Improvement Program; FY=Fiscal Year; 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	Gas Handling	Gas Holder	Truck Loading
Civil								
Effluent Piping	2	4	1	1	1	-	3	1
Structural								
Structure	2	-	1	1	1	-	3	1
Building	1	3	1	-	-	4	-	-
Mechanical								
Pump	2	-	1	1	1	-	-	-
Fan	-	-	-	1	2	-	-	-
Boiler & Heat Exchanger	-	5	-	-	-	-	-	-
Centrifuge	-	-	1	-	-	-	-	-
Polymer System	-	-	1	-	-	-	-	-
Biofilter	-	-	-	1	-	-	-	-
Chemical System	-	-	-	1	1	-	-	-
Gas Compressor	-	-	-	-	-	4	-	-
Gas Dryer	-	-	-	-	-	2	-	-
Gas Flare	-	-	-	-	-	4	-	-
Screw Conveyor	-	-	-	-	-	-	-	4
Sliding Frame	-	-	-	-	-	-	-	4
Piping & Valve	3	3	1	1	1	3	3	2
Electrical								
MCC & VFD	2	2	1	1	1	4	-	3
Instrumentation								
PLC & Flow Meter	2	2	1	1	1	4	-	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

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

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

Major Assets	Quantities
Truck Loading Bay Odor Control	
2-stage Chemical Scrubbers	2
Gas Handling	
Gas Compressors	3
Gas Dryer	1
Gas Flares	3

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

Key Issues

Key Issues	Actions and Recommendations
• **Boilers and Heat Exchangers –** Boiler tube leaking; boiler heat exchangers wearing out; no steam bypass outlet during boilers PM and AQMD required testing; boiler corrosion issues	• MP-271 – P2 Boiler Heat Exchangers Replacement • PRN-00455 (MP-624) – P2 Boiler Re-tubing • PRN-00456 (MP-547) – P2 Boiler Steam By-pass • Maintenance Activities – Chemical system improvements
• **Gas Handling System –** Gas compressor system lived its life and need replacement	• J-124 – Digester Gas Facilities rehabilitation • Gas compressors repair and overhaul by Maintenance
• **Truck Loading –** Auger No. 6 and No.3 out of service due to age and wearing from higher solids content from centrifuge dewatered cake; difficult to lubricate the screw conveyors because of access issues.	• PRN-00513 (MP-585) – P2 Truck Loading Screw Conveyors Replacement (lubrication extension will be included in the new screw conveyor system)

Current and Future Projects

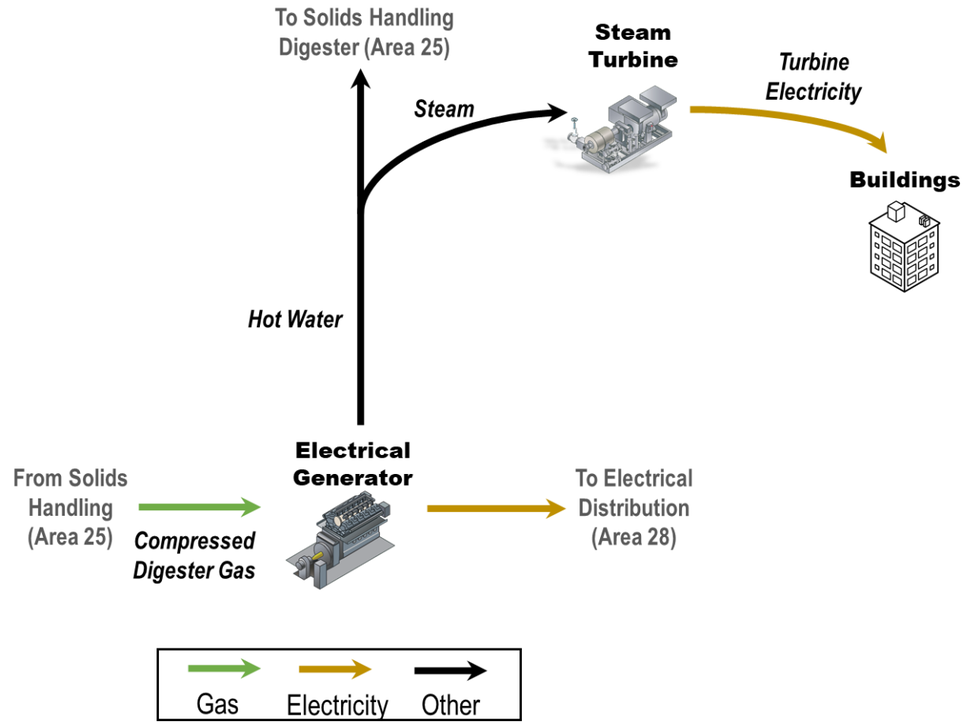
Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, flare and holder system	• Replace the entire gas handling system including the gas compressor building.																
MP-271	Plant No. 2 Boiler Heat Exchanger Replacement	Plant No. 2 Boiler system	• Replace two heat exchangers.																
PRN-00456 (MP-547)	Plant No. 2 Boiler Steam By-pass	Plant No. 2 Boiler system	• Add steam by-pass to release the steam to the atmosphere at boiler bldg. room level.																
PRN-00455 (MP-624)	Plant No. 2 Boiler Re-tubing	Plant No. 2 Boiler system	• Re-tube both boilers.																
N/A	Plant No. 2 Boiler Chemical system Improvements	Plant No. 2 Boiler system	• Modifying the existing chemical injection system for better corrosion control.																
PRN-00513 (MP-585)	Plant No. 2 Truck Loading Screw Conveyor Replacement	Plant No. 2 Truck Loading Station	• Replace all twelve screw conveyors, and lubrication extension will be included in the new screw conveyor system.																
N/A	Gas Compressor Overhaul	Plant No. 2 Gas compressor facility	• Overhaul all gas compressors.																

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; N/A=Not Applicable; PM=Preventative Maintenance

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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1
Mechanical																								
General	4	4	4	4	4	5	5	2	3	3	3	3	3	4	4	4	5	5	5	5	5	-	-	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	3	3	3	3	3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																								
General	4	4	4	4	4	5	-	-	-	-	-	-	-	-	-	3	3	3	3	3	5	5	-	-
Switchgear	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Instrumentation																								
General	5	5	5	5	5	4	4	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 Cylinder)	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 Reliability –** Monies shall be spent to address aging components and systems required to operate the 5 Central Generation Engines.	• Overhaul engines (ongoing) • Replace obsolete systems (i.e., Battery Backup, Switch Gear, etc.)
• **Engine Lube Oil System –** The Lube Oil Centrifuges are no longer operational	• Install new instrumentation and controls onto the existing 2 units.
• **Steam Turbine System Rehabilitation –** The Steam Turbine has degraded and is in need of rehabilitation.	• Overhaul the Steam Turbine and Steam Condenser.
• **Plant Water Piping –** The plant water (i.e., Cooling Water) piping has degraded and is in need of replacement.	• Replace all plant water piping in the basement of Central Generation.
• **Emission Control System –** The Housings on the Oxidizer Catalysts are failing prematurely.	• Analyze and design new Catalyst Housings.
• **Instrument Air Compressors –** The instrument air compressors are no longer working.	• Replace the entire Instrument Air System, installing new compressors and appurtenances.

Current and Future Projects

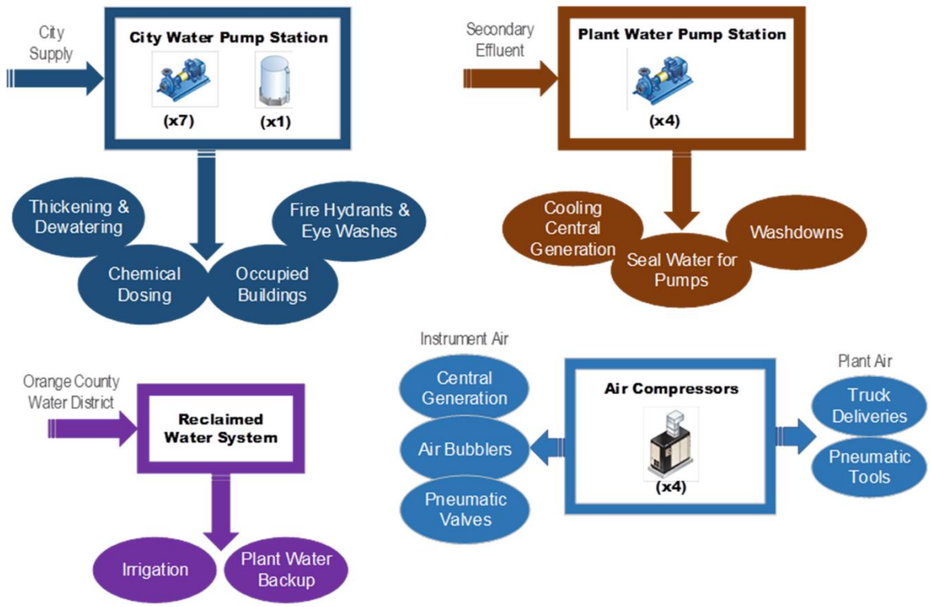
Project No.	Project Title	Impacted Facilities	Description of Work	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
P2-119	Central Generation Rehabilitation	Central Generation Facility Wide	• Rehabilitation of Gas Engine Support Systems.															
FE18-06	Instrument Air Compressor Replacement	Instrument Air Compressor System, Urea Injection System	• Install 2 new Instrument Air Compressors.															
MP-105 PRN-00262	Steam Turbine Rehabilitation	Steam Turbine Generator	• Rehabilitation of the Steam Turbine.															
MP-118 PRN-00211	Engine Lube Oil System Controls Upgrade	Engine Generator	• Install new instrumentation and controls onto the existing units.															
MP-227	Starting Air Compressor System Rehabilitation	Starting Air Compressor System	• Rehabilitation of the Air Compressors.															
MP-231 PRN-00427	Engine Emission Control Redesign	OXI/SCR Catalyst	• Analyze and design new Catalyst Housings.															
MP-257 PRN-00394	Steam Condenser Rehabilitation	Steam Condenser	• Replace the Steam Condenser Tube Bundle.															
MP-275 PRN-00297	Engine Overhauls	Engine Generator	• Overhaul the engines as needed (ongoing).															
MP-305 PRN-00314	Ventilation Supply Fan Rehabilitation	HVAC	• Replace one fan and rehabilitation the fan support structures.															
MP-358 PRN-00322	Lube Oil Filter Catwalk	Engine Generator	• Install Lube Oil Filter catwalks for maintenance purposes.															
MP-484	Steam Boiler Level Control Upgrade	Heat Recovery Boiler	• Install new technology for improved Boiler level control.															
MP-546	Plant Water Pipe Rehabilitation	Plant Water Piping	• Replace existing plant water piping with new.															
MP-608	Engine Ignition and Controls Upgrade	Engine Generator	• Replace the existing engine ignition, controls, and fuel system.															

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

Acronym Key:
CIP=Capital Improvement Program; FY=Fiscal Year; HVAC=Heating, Ventilation, and Air Conditioning; OXI=Oxidizer; RUL=Remaining Useful Life; 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	-
Structural				
Pump Station	3	3	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	4
Ventilation System	2	2	-	-
Electrical				
MCC	1	1	-	-
VFD	3	3	-	-
Instrumentation				
PLC, Flowmeter	1	1	-	1

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 severe corrosion issues.	• Current plan is to run to fail and repair the lines as they fail. In addition, if opportunity arises through future CIP or FE projects within areas where known air system deficiencies exist, we will address them at that time.

Current and Future Projects

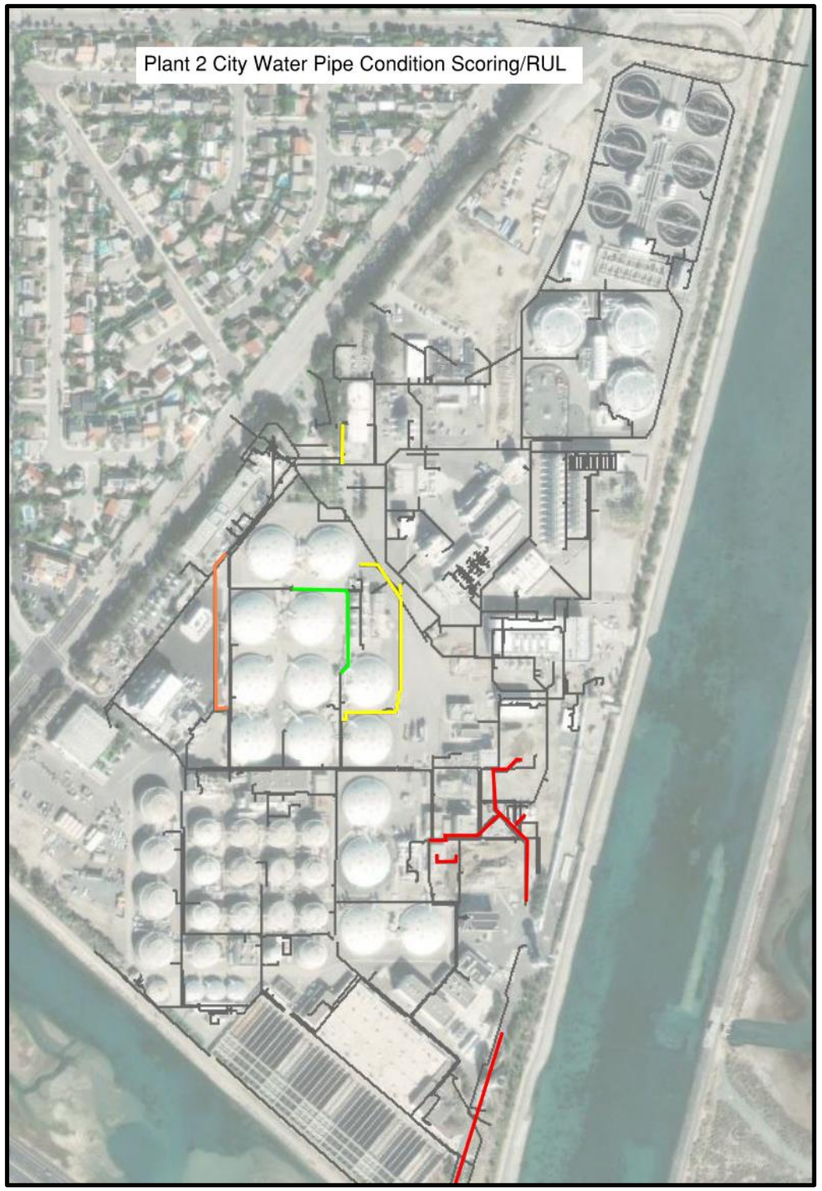
Project No.	Project Title	Impacted Facilities	Description of Work	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24	FY24/25	FY25/26	FY26/27	FY27/28	FY28/29	FY29/30	FY30/31	FY31/32	FY32/33	FY33/34
FE18-14	Plant Water Pipeline Rehabilitation	Piping in tunnels	• 1600 feet of piping in the tunnels.															
FE18-06	Instrument Air Compressors at Central Generation	Central Generation	• Replace Instrument Air compressors at Central Generation.															
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/C Side Primary Clarifiers Rehab	Primary Clarifiers	• Replace City water piping near project.															
P2-98A	Primary Treatment Rehab	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	• Rehab of City Water Pump Station.															
X-037	Plant No. 2 Plant Water Pump Station Demolition	Plant Water Pump Station	• Demo Plant Water Pump Station.															
FE-XX1	Relocation of Air Compressor Central Generation to Ocean Outfall Booster Station	Central Generation and OOBS	• Relocate existing 100HP Air Compressor.															
FE-XX2	Repair Reclaimed Pipe Leaks	Piping in tunnels	• Repair and re-route portions of reclaimed water line near Primary Clarifiers and Bar Screen.															

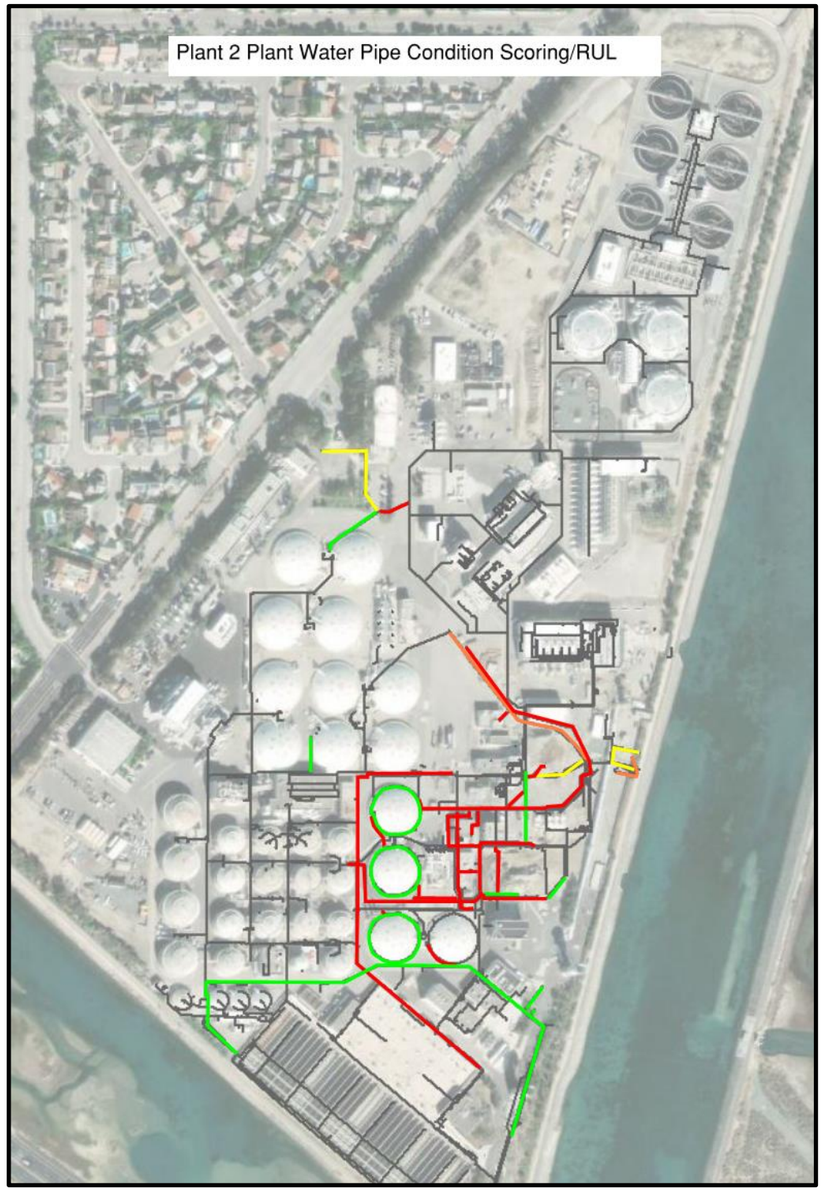
Types of Project Legend:
CIP - Planning **CIP – Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP=Capital Improvement Program; FY=Fiscal Year; HP=Horsepower; OOBS= Ocean Outfall Booster Station

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

Remaining Useful Life of Utility Infrastructure





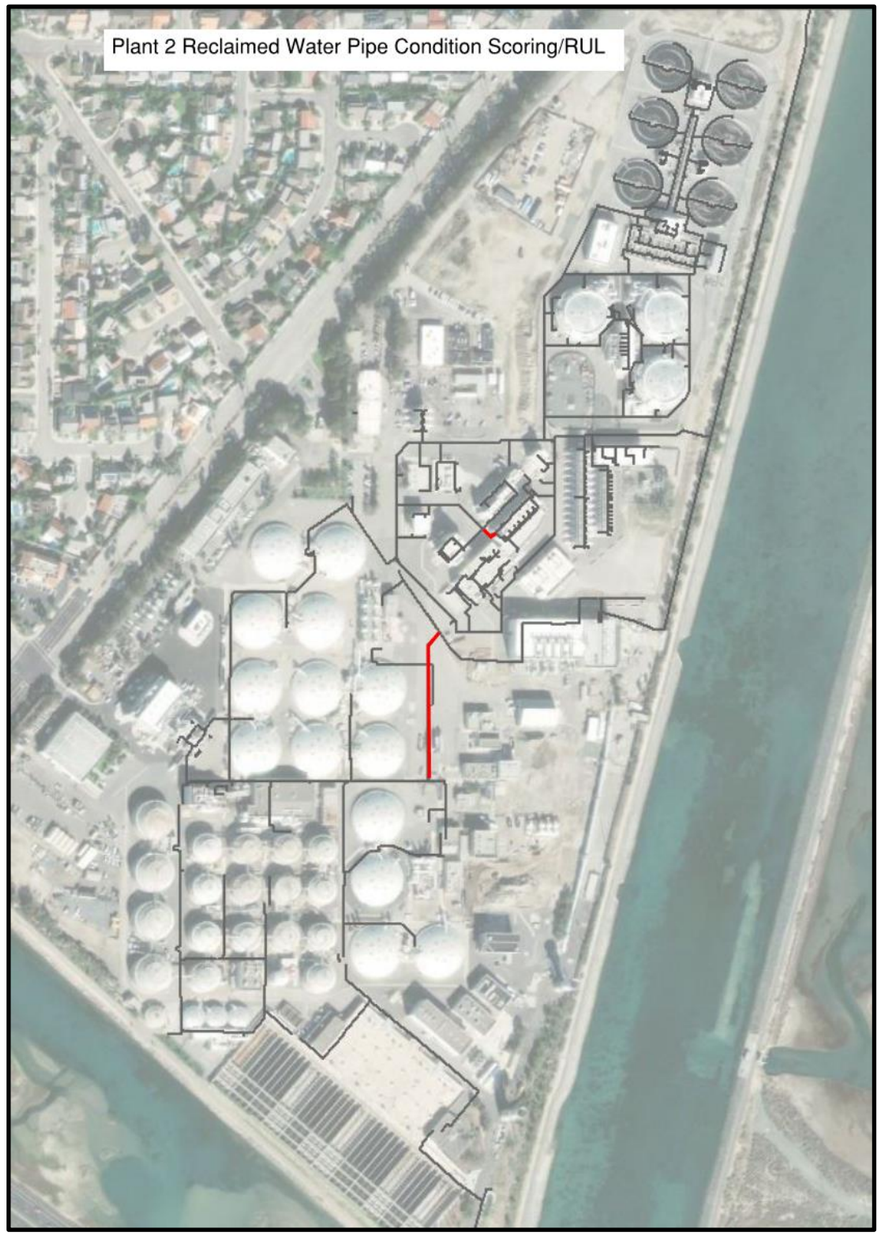
RUL Legend:

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



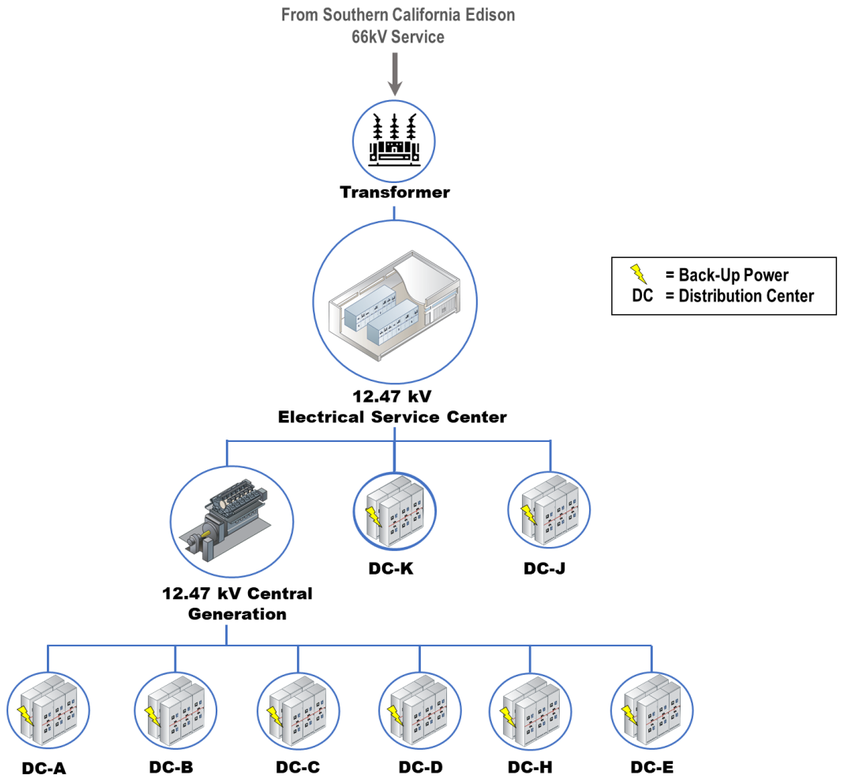
RUL Legend:

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
Uninterruptible Power Supply (UPS)	27

Acronym Key:
CENGEN=Central Generation;
DC=Distribution Center;
kV=Kilovolt;
PB=Power Building;
RUL=Remaining Useful Life;
VDC=Volts of Direct Current;
UPS=Uninterruptible Power Supply

Major Assets Remaining Useful Life

Asset Type	Service Center	CENGEN	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	4	2	3	3	4	4	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 Level Indicator Switches	-	-	-	-	-	-	-	-	2	-	2	1	1	3	3	4
12.47kV Feeders	4	4	1	1	4	4	3	3	2	2	2	1	1	1	1	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	-	-	3	-	-	-	-	-	2	-	2	1	3	3	3	4
Transfer Switches	-	-	-	-	-	-	-	-	-	-	-	-	4	3	3	4
Generators	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Tier V – UPS																
UPSs Individual	-	5	-	5	5	-	4	-	4	-	4	-	-	4	-	-
UPSs Regional	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
Tier VI – 125 VDC and 24 VDC Battery Systems																
125VDC Chargers	5	5	5	5	-	-	-	4	-	4	4	1	4	4	-	-
125VDC Batteries	5	5	5	5	-	-	-	4	-	4	4	1	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	• PS16-02 & Plant No. 2-124 (Plant No. 2-124 will start ~January 2002): ○ New 66kV Switchyard; Additional 66kV Line; Additional Transformer with automatic Load tap changes
• Aging Battery Chargers and Batteries	• MP-233: 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: Testing aging Medium Voltage Cabling to perform Condition Assessment and develop plan for preventive maintenance.
• Plant No. 2 Cabling: 480V (Headworks) failing cables ○ Areas where there are no direct Back Up Standby Generation: ○ Gas Compressor (4.16kV Motors), PEPs & Trickling Filter Pumps	• PRN-00401/MP-509 address repairs. ○ J-124 will address Gas Compressors ○ Revisit policy to address Back Up Generation for PEPs and Trickling Filter Pumps

Acronym Key:
kV=Kilovolt; PEPS=Primary Effluent Pump Station; 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 19/20	FY 20/21	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
MP-233	Plant No. 2 and P1 Battery System Upgrade	Plant No. 2 Power Distribution	• Replace old batteries and chargers.															
MP-320	Plant No. 2 Medium Voltage Cable PM Services	Plant No. 2 Power Distribution	• Medium Voltage Cables Condition Assessment and Testing.															
P2-107	SCADA System and Network Upgraders	Plant No. 2 Power Distribution	• Process Data Network, SCADA System Expansion, Load Management and Load Shedding.															
J-117B	Outfall Low Flow Pump Station	Plant No. 2 Outfall Booster Station	• Rehabilitation of Mechanical, electrical and Civil Systems at the Ocean Outfall Booster Station at Plant No. 2 that includes 12.47 kV switchgear replacement, VFD motors, and feeder cable replacement.															
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	Plant No. 2 A-Side Primary Clarifiers	• Demolish and replace four (4) existing A-side Primary Clarifiers, Replace Scrubber Complex, demolish Power Building A and associated electrical equipment, install new Distribution Center F, including 12.47 kV switchgear, transformers, and 480V switchgear.															
J-124	Digester Gas facilities Rehabilitation	Plant No. 2 – Gas compressors and flares	• Project will rehabilitate the low and high pressure gas facilities at Plant No. 1 and Plant No. 2 to meet current and future OCSD needs such as Air Quality Management District and NFPA regulations, and future projected gas production.															
J-98	Electrical Power Distribution System Improvements	Plant No. 2 Power Distribution System	• Provide electrical distribution system improvements at Plant No. 1 and No. 2, as recommended by the J-25-4 project study, which are needed based on equipment condition and age, insufficient equipment ratings, grounding safety, non-compliance with the National Electrical Code requirements, and electrical configuration reliability.															
P2-128	Temperature-Phased Anaerobic Digester at Plant No. 2	Plant No. 2 – Solids Handling	• Project will replace the mesophilic anaerobic digesters at Plant No. 2 with new digesters in a TPAD configuration. This project will add new electrical power building with 12 kV switchgear, 480V switchgears, oil-filled transformers located outside of the building, VFDs, transfer switches, and cables/conduits.															
P2-134	Substation Replacement at Plant No. 2	Plant No. 2 Power Distribution	• This project will add a second 66-kV incoming distribution line to OCSD Plant No. 2 and construct a new 66-kV to 12.47-kV substation. The new substation will include two incoming 66-kV lines and two 66-kV to 12.47-kV transformer.															
J-121	UPS System Upgrade	Plant No. 2 UPS System	• Provide a regional UPS in the northern portion of Plant No. 2 and provide UPS power distribution and power distribution units to feed UPS loads from the regional UPSs installed by this project and existing regional UPSs.															
P2-133	Plant No. 2-133 B/C-Side Clarifiers Rehabilitation at Plant No. 1	Plant No. 2 Primary Clarifiers, Mechanical and Electrical Systems	• Extensively rehabilitate the C-Side primary clarifiers at Plant No. 2. The work is expected to include demolition of Power Building 80, including backup generator and installation of new electrical systems.															

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

Acronym Key:
CIP=Capital Improvements Program; FY=Fiscal Year; kV=Kilovolt; NFPA= National Fire Protection Association; OCSD=Orange County Sanitation District; 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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5.2.3 Collection System Pump Station Asset Management Summaries

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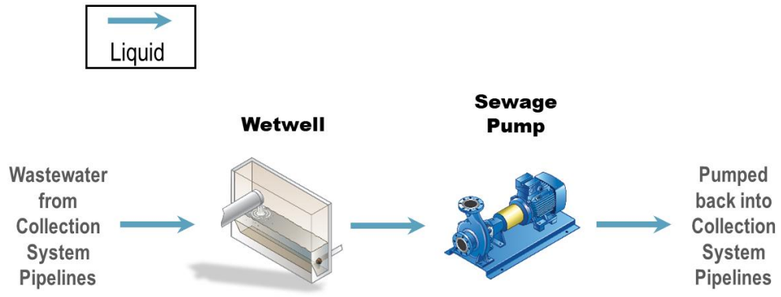
ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

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
Total	**17**	**62**	**27**	**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
Civil - Piping															
Force Mains	3	3	4	2	3	3	4	1	4	4	1	4	3	3	3
Structural															
Pump Station	3	4	3	4	1	3	3	3	3	1	2	3	3	2	4
Wet Well	4	4	4	1	2	3	3	4	3	4	4	4	4	3	3
Mechanical															
Pumps	3	3	4	1	2	3	3	3	3	4	2	4	5	3	5
Valves	4	3	4	1	3	5	3	4	5	5	5	5	5	3	4
Ventilation System	3	3	4	5	5	4	3	4	3	3	3	3	4	3	2
Emergency Generator	--	--	3	1	--	3	--	--	--	2	2	3	--	2	--
Electrical															
Motor Control Center	1	2	4	1	1	3	4	3	4	2	2	2	5	2	3
Variable Frequency Drive	2	3	5	1	3	--	--	2	3	4	3	4	5	2	--
Motors	3	3	4	1	2	3	2	4	2	2	2	3	4	3	3
Transformer	2	2	4	1	1	3	2	3	4	1	2	2	4	2	3
Instrumentation															
Programmable Logic Controller	3	1	4	2	1	1	1	4	1	1	1	1	2	2	1
Flowmeter	3	3	4	2	1	3	4	2	--	3	2	3	4	3	3

Asset RUL Legend:

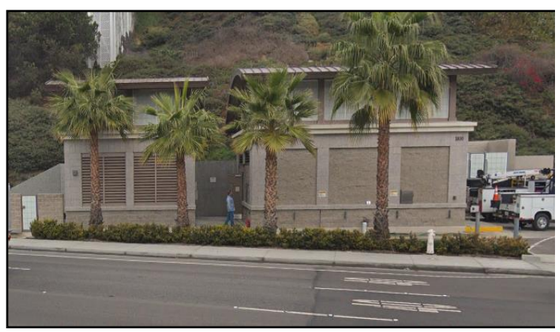
- RUL < 5 years
- RUL 5-10 years
- RUL 11-15 years
- RUL 16-20 years
- RUL > 20 years

Acronym Key:
RUL=Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Key Issues	Actions and Recommendations
• **Safety –** Currently four of OCSD'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 on-going issue.	• A planning study has been established to review and interpret electrical code and establish OCSD design standards to address this issue. Practicing on-going 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.	• Siting analysis has identified an area farther away from the active flood control channel to which Edinger pump station may be moved. Also, the County of Orange is planning to increase the capacity of the channel to accommodate future planned flows. A planning study 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.	• OCSD crews respond to alarms that indicate increased levels of methane gas. An internal effort has been defined to place flow monitors in the system to collect necessary data prior to establishing a planning study to determine the cause of the gas accumulation and possible mitigation measures.
• **Corrosion** – Corrosion is an on-going problem in this very harsh environment. In places were 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 on-going 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 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.	• OCSD continues to improve planned maintenance processes and inter-agency coordination that allow crews to minimize impacts to the community during necessary maintenance operations. A future capital project has been established to construct a redundant force main to serve MacArthur pump station.

Acronym Key:
OCSD=Orange County Sanitation District



Rocky Point Pump Station

Main Street Pump Station

College Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
General – Projects that affect more than one pump station																			
5-68	Newport Beach Pump Station Odor Control Improvements	Multiple Pump Stations in Newport Beach Area	• Installation of venting equipment; phased implementation of chemical use																
FE19-01	Portable Generator Connectors at Pump Stations	Multiple Pump Stations	• Installation of standard portable generator connectors																
MP-304	Pump Station Deragger Unit Install	Multiple Pump Stations	• Installation of Deragger units at multiple pump stations																
MP-393	Pump Station On-Call Electrical PM Services	All Pump Stations	• Various electrical PM services including testing of equipment																
MP-429	Portable Emergency Generator Set Purchase	Multiple Facilities	• Purchase of portable generators and associated equipment																
MP-474	Pacific Coast Highway Force Main Manual Air Release Valve PM	Newport Force Main System	• Venting of force mains on Pacific Coast Highway																
MP-503	Critical Breaker Replacement Procurement	Multiple Pump Stations	• Procurement of critical breakers																
MP-529	Dry Well Concrete Crack Repair	Multiple Pump Stations	• Groundwater intrusion remediation																
MP-542	Pump Station Bypass Parts Procurement	Multiple Pump Stations	• Purchase pump station bypass parts																
PS00005	Newport Beach Methane Gas Reduction Study	Newport Beach Force Main System	• Comprehensive study of methane gas reduction alternatives	**On Hold - Internal Effort**															
PS15-08	Collections Capacity Evaluation Study	All Pump Stations	• Collection system master plan and model update																
PS18-06	Go/No-Go Lights and Signage Study	All Pump Stations	• Standardize hazardous gas warning systems																
XPS0009	A Street and 15th Street Pump Station and Force Main Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
15th Street Pump Station																			
MP-658	15th Street Pump Station Force Main Valve Replacement	Pump Station Force Main Isolation Valves	• Replace isolation valves																
X-022	15th Street Pump Station and Force Main Project	Entire Pump Station	• Comprehensive rehabilitation of pump station and force mains																
A Street Pump Station																			
X-041	A Street Pump Station and Force Main Project	Entire Pump Station	• Comprehensive rehabilitation of pump station and force mains																
Bay Bridge Pump Station																			
5-67A	Bay Bridge Pump Station Force Main Replacement	Pump Station Force Main	• Comprehensive rehabilitation of pump station and force mains																
5-67B	Bay Bridge Pump Station Replacement	Entire Pump Station	• Comprehensive rehabilitation of pump station and force mains																
MP-681	Bay Bridge Pump Station Valve Replacement Project	Pump Station Isolation Valves	• Replacement of pump suction and discharge valves																
Bitter Point Pump Station																			
XPS0004	Bitter Point Pump Station Rehabilitation Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																
College Pump Station																			
MP-482	College Pump Station Vapex Improvements	Pump Station Vapex Unit and Wet Well	• Modifications to Vapex Unit																
X-026	College Avenue Force Main Rehabilitation Project	Pump Station Force Main	• Comprehensive rehabilitation of force mains																

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
Crystal Cove Pump Station																			
PS00004	Crystal Cove Pump Station Settlement Evaluation	Crystal Cove Pump Station site	• Study to determine how to mitigate site settlement																
5-66	Crystal Cove Pump Station Upgrade and Rehabilitation Project	Entire Pump Station	• Comprehensive rehabilitation of pump station																
Edinger Pump Station																			
11-33	Edinger Pump Station Rehabilitation Project	Entire Pump Station	• Comprehensive relocation of pump station																
MP-444	Edinger Pump Station UPS Repairs	Pump Station UPS	• Replacement of pump station UPS																
MP-495	Edinger Pump Station Stair Repairs	Pump Station Stairs	• Paint metal stairs in the pump room																
PS15-02	Edinger Pump Station Rehabilitation Study	Entire Pump Station	• Determine extent of pump station replacement or rehabilitation																
Lido Pump Station																			
FE15-10	East Lido Force Main Rehabilitation Project	Pump Station East Force Main	• Rehabilitation of east force main																
MP-442	Lido Pump Station Bathroom Drainpipe Replacement	Pump Station Bathroom and Wet Well	• Replacement of drain line from the bathroom to the wet well																
MP-618	Lido Pump Station Camlock Receptacle Panel Installation	Pump Station Electrical Equipment	• Installation of standard portable generator connector																
X-023	Lido Pump Station Rehabilitation Project	Entire Pump Station	• Comprehensive rehabilitation of pump station																
XPS0017	Lido Pump Station Rehabilitation Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
MacArthur Pump Station																			
7-63	MacArthur Pump Station Rehabilitation Project	Entire Pump Station	• Comprehensive rehabilitation of pump station																
7-68	MacArthur Force Main Improvements	Pump Station Force Main	• Installation of second force main and rehabilitation of existing force main																
MP-427	MacArthur Pump Station Force Main Valve Replacement	Pump Station Force Main	• Replacement of force main isolation valve																
Main Street Pump Station																			
7-64	Main Street Pump Station Rehabilitation Project	Entire Pump Station	• Comprehensive rehabilitation of pump station																
MP-559	Main Street Pump Station Valve Replacement	Pump Station Isolation Valves	• Pump And force main isolation valve replacement																
XPS0048	Main Street Pump Station Rehabilitation Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																
Rocky Point Pump Station																			
MP-508	Rocky Point Pump Station Wet Well Liner Repair	Pump Station Wet Well	• Repair wet well liner																
XPS0005	Rocky Point Pump Station Rehabilitation Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																

Project No.	Project Title	Impacted Facilities	Description of Work	FY 19/20	FY 20/21	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
Slater Pump Station																			
11-34	Slater Pump Station Rehabilitation Project	Entire Pump Station	• Comprehensive rehabilitation of pump station																
FE16-14	Slater Pump Station Valve Replacement	Pump Station Pump Isolation Valves	• Replacement of pump isolation valves																
MP-207	Slater Pump Station Link Seal Repair	Pump Station Dry Well Wall	• Replace leaking link seal																
XPS0044	Slater Pump Station Rehabilitation Study	Entire Pump Station	• Comprehensive study of pump station condition and capacity																
Seal Beach Pump Station																			
3-67	Seal Beach Pump Station Replacement	Entire Pump Station	• Reconstruction of pump station																
PRN-00550	Seal Beach Pump Station – Fan No. 3 Relocation	Fan No. 3	• Relocate the fan to the outside of the building for better maintenance access																
N/A	Seal Beach Valve Replacement Project	Pump and force main isolation valves	• Replace 17 gate valves of various sizes																
Westside Pump Station																			
3-62	Westminster Boulevard Force Main Replacement	Seal Beach PS Force Main	• Replacement of the force mains																
Yorba Linda Pump Station																			
2-73	Yorba Linda Pump Station Abandonment Project	Entire Pump Station and Force Main	• Abandonment of pump station and force main																

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
UPS=Uninterruptible Power Supply

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5.2.4 Collection System Pipeline Asset Management Summaries

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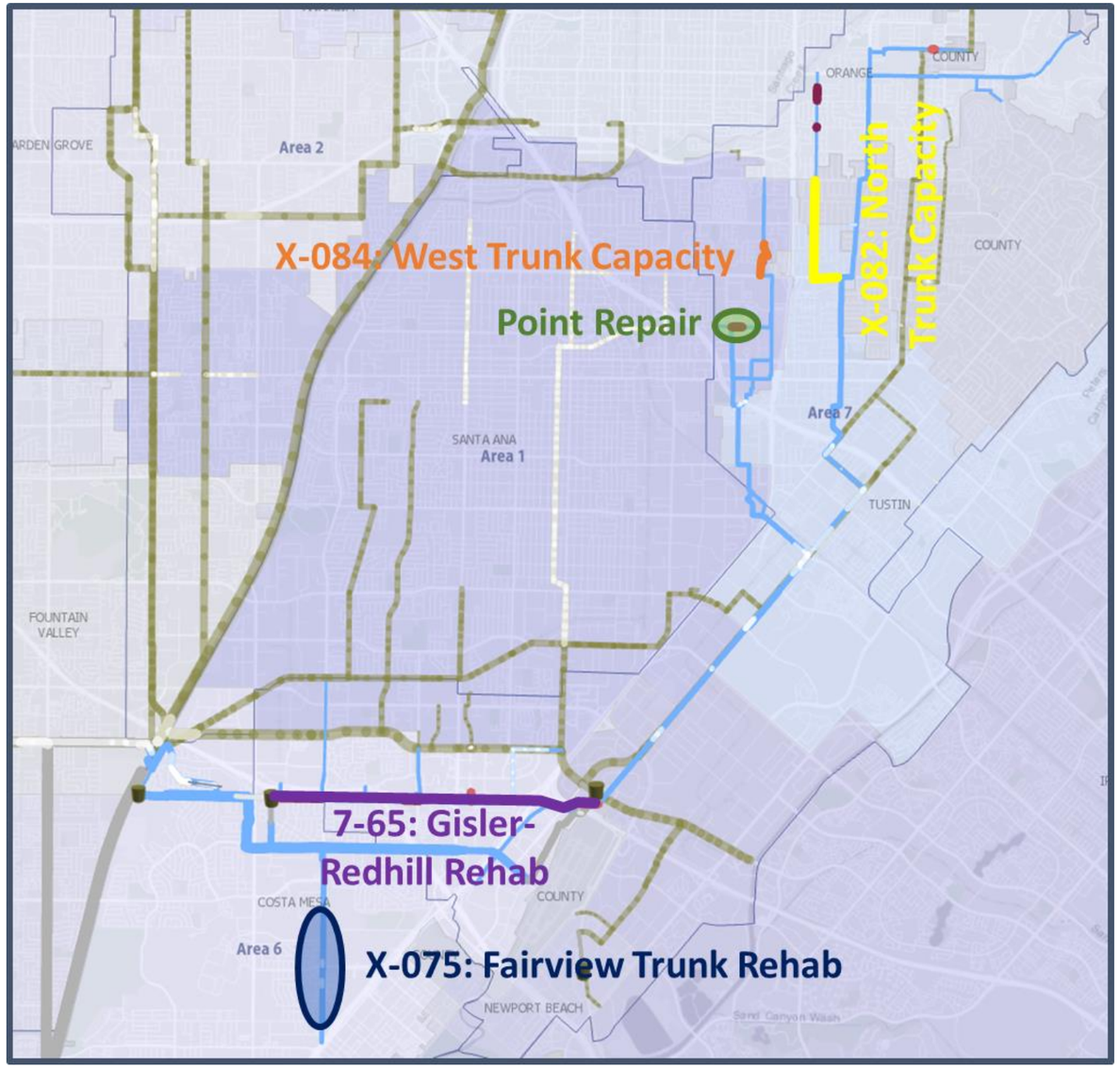
ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNK

System Overview



Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	18.8	339	52	4	3
21” - 27” Ø	9.7	162	33	-	-
≥ 30” Ø	6.1	79	44	5	1
Reinforced Concrete					
≤ 48” Ø	0.3	4	26	-	-
51” - 66” Ø	0.9	12	28	-	-
≥ 72” Ø	3.7	35	25	-	-
Ductile Iron					
42” Ø	0.5	2	28	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

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

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

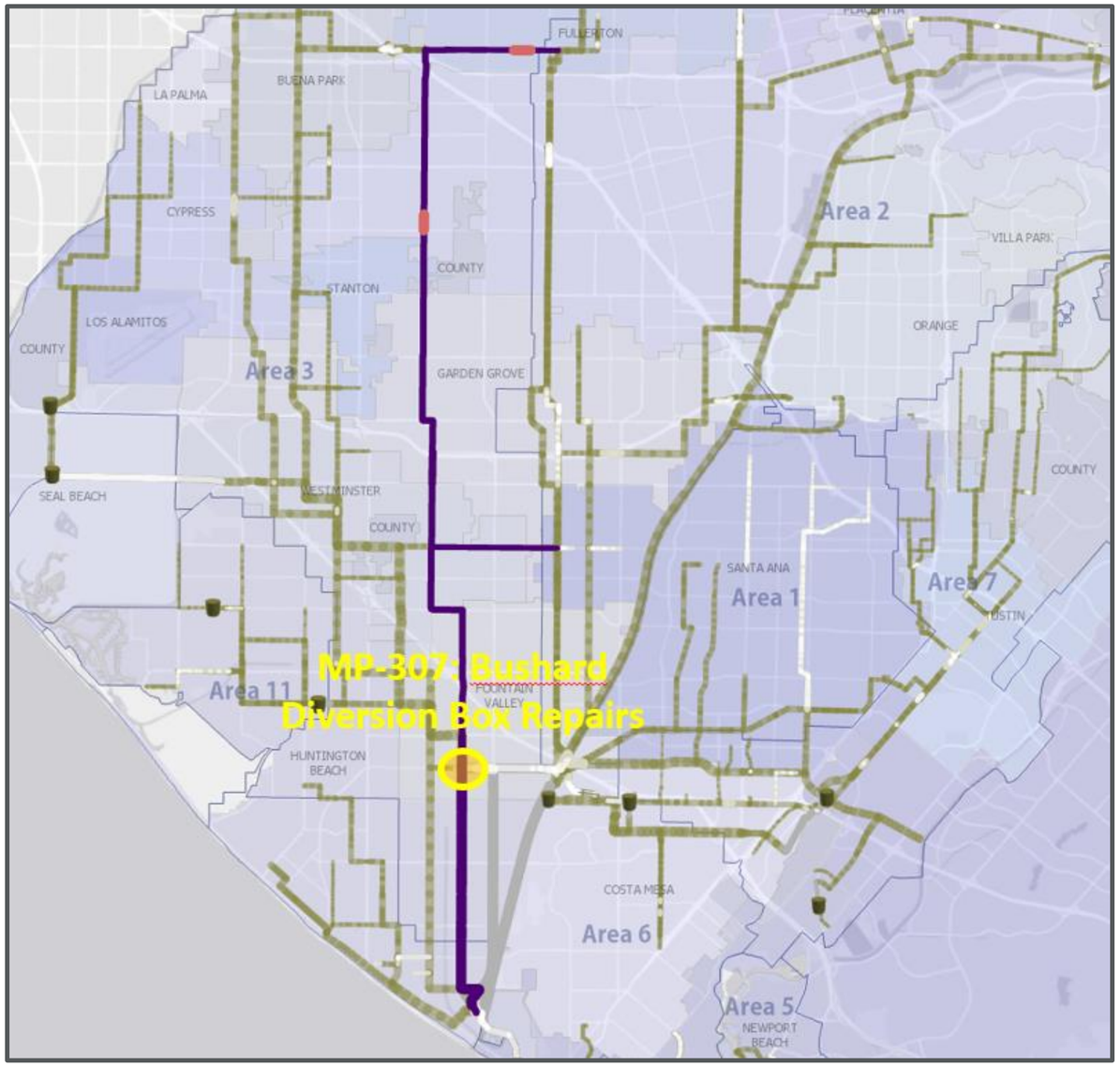
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
7-65	Gisler-Redhill Interceptor Rehabilitation Project	• Rehabilitation of sewer facilities in the city of Costa Mesa.																
X-082	North Trunk Improvement Project	• Upsizing of pipe segments to increase capacity in the city of Tustin.																
X-075	Fairview Trunk Sewer Rehabilitation Project	• Rehabilitation of sewer facilities in the city of Costa Mesa.																
X-084	Tustin Ave Sewer Relief Project	• 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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

System Overview



Structural Grade Defect Legend:

- **Grade 5**
- **Grade 4**

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	0.03	3	54	-	-
21” - 27” Ø	5.1	73	54	-	2
≥ 30” Ø	3.6	26	44	-	1
Reinforced Concrete					
≤ 48” Ø	2.4	14	55	-	-
51” - 66” Ø	0.3	8	55	-	-
≥ 72” Ø	4.5	32	19	-	-
Fiberglass					
36” - 48” Ø	4.7	27	8	-	-
Unreinforced Concrete					
42” - 48” Ø	1.0	10	22	-	-
HDPE					
22” Ø	0.06	2	21	-	-

Acronym Key:
HDPE=High-Density Polyethylene Resin;
NASSCO=National Association of Sewer Service Companies

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 is underway to determine a course of action regarding potential modifications to the Bushard Diversion Box. This study will also incorporate box rehabilitation beyond the scope of the more immediate repairs being performed as part of MP-307.
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.

Current and Future Projects

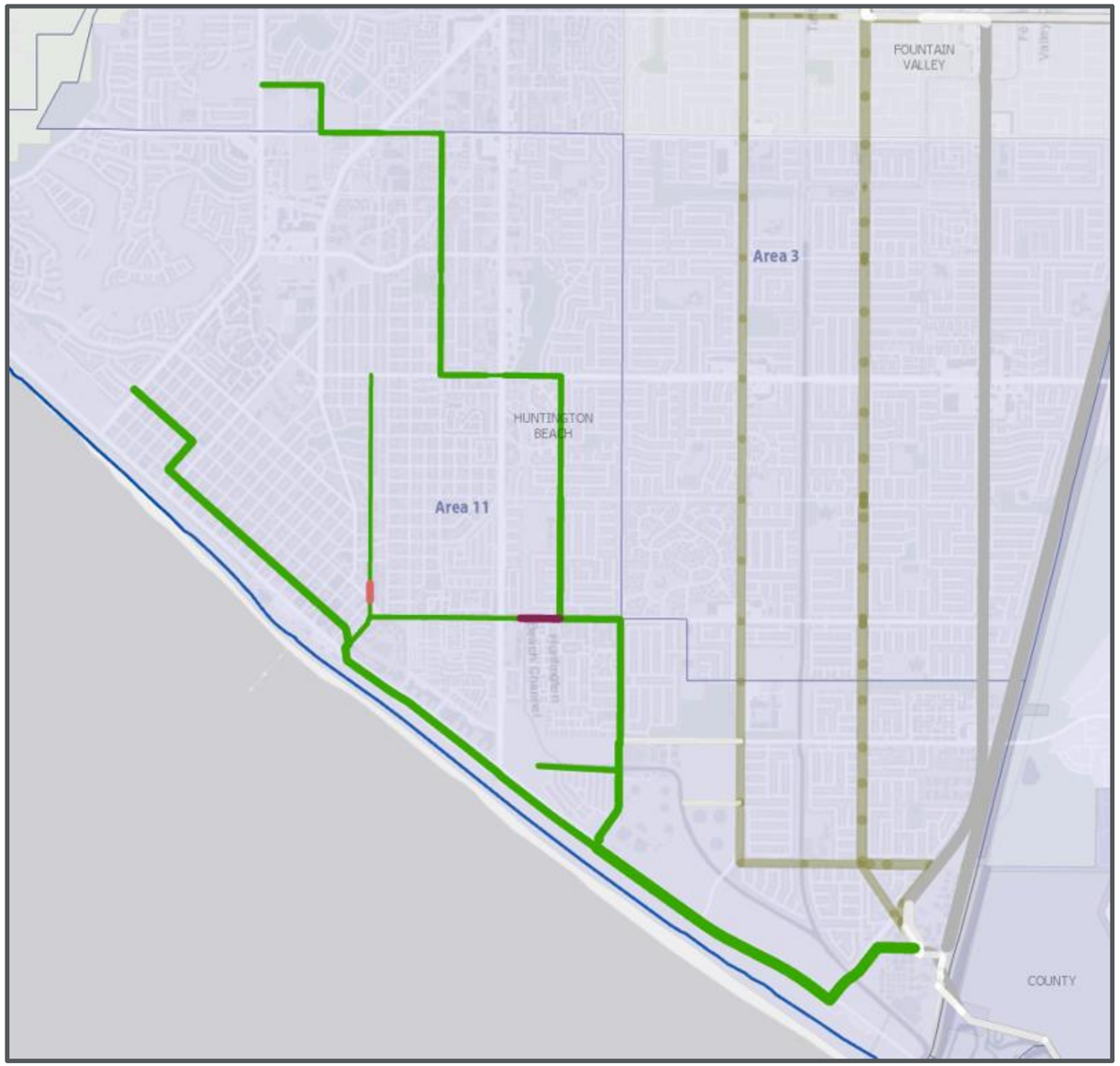
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
MP-307	Bushard Diversion Box Repairs	• Repair of structural assets and replacement of electrical and instrumentation and control components.																
PS18-02	Bushard Diversion Structure Rehabilitation Study	• Study to determine the scope of necessary modifications that will reinstate and improve operation of the structure.																

Types of Project Legend:
CIP - Planning | CIP – Design | CIP - Construction | Maintenance Project

Acronym Key:
CCTV=Closed-Circuit Television; CIP=Capital Improvement Project; FY=Fiscal Year; OCSD=Orange County Sanitation District

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

System Overview



Structural Grade Defect Legend:

- Grade 5
- Grade 4

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	2.1	32	60	1	1
21” - 27” Ø	2.6	34	57	-	-
≥ 30” Ø	1.8	24	60	-	-
Reinforced Concrete					
≤ 48” Ø	0.5	5	60	-	-
51” - 66” Ø	2.8	38	34	-	-
≥ 72” Ø	1.6	11	38	-	-
Polyvinyl Chloride					
54” Ø	0.05	2	38	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

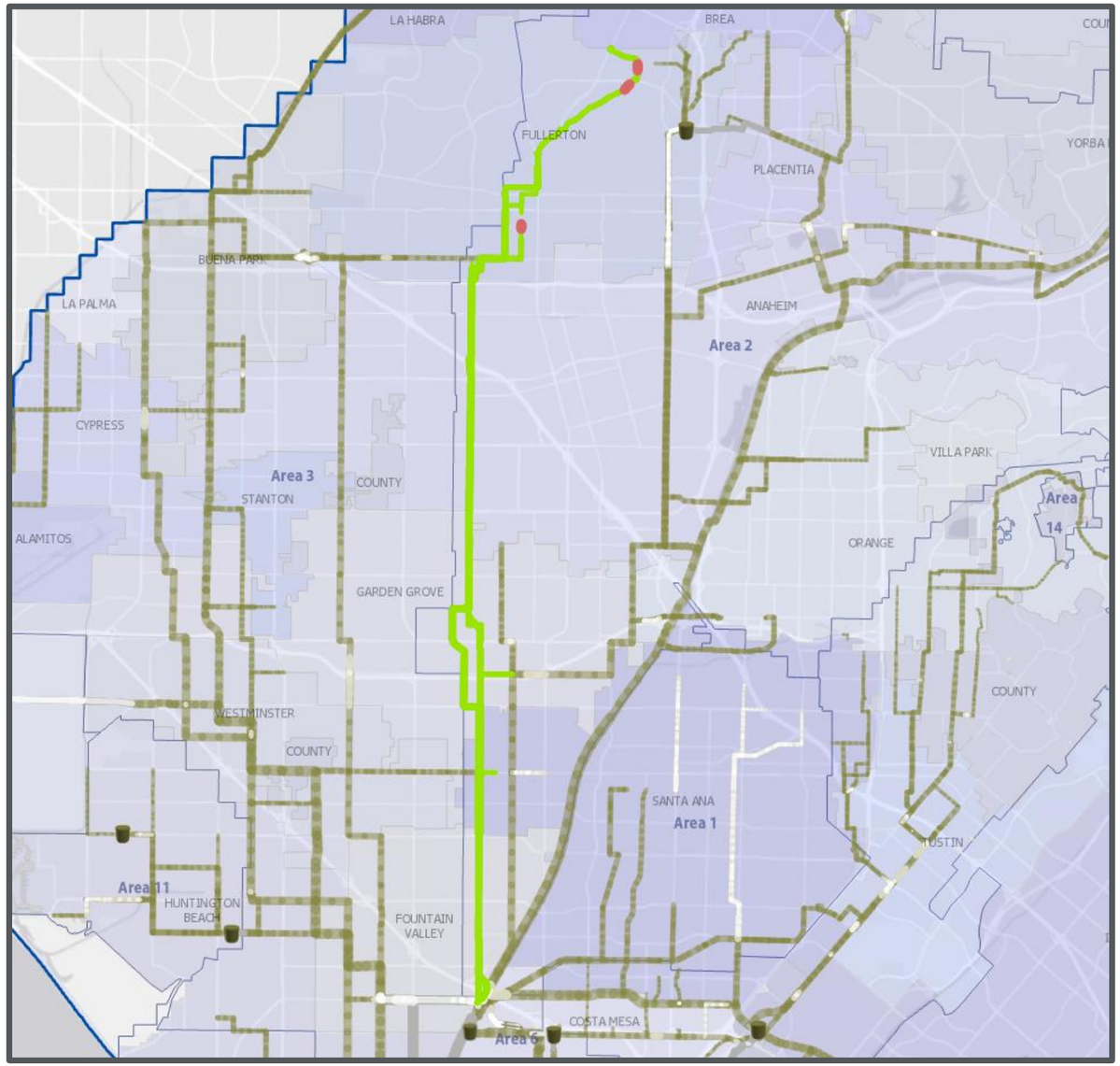
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

System Overview



Structural Grade Defect Legend:

- **Grade 5**
- **Grade 4**

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	4.4	76	56	-	3
21” - 27” Ø	3.9	52	37	-	-
≥ 30” Ø	12.1	154	47	-	-
Reinforced Concrete					
≤ 48” Ø	7.0	69	33	-	-
51” - 66” Ø	7.0	75	31	-	-
≥ 72” Ø	-	-	-	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

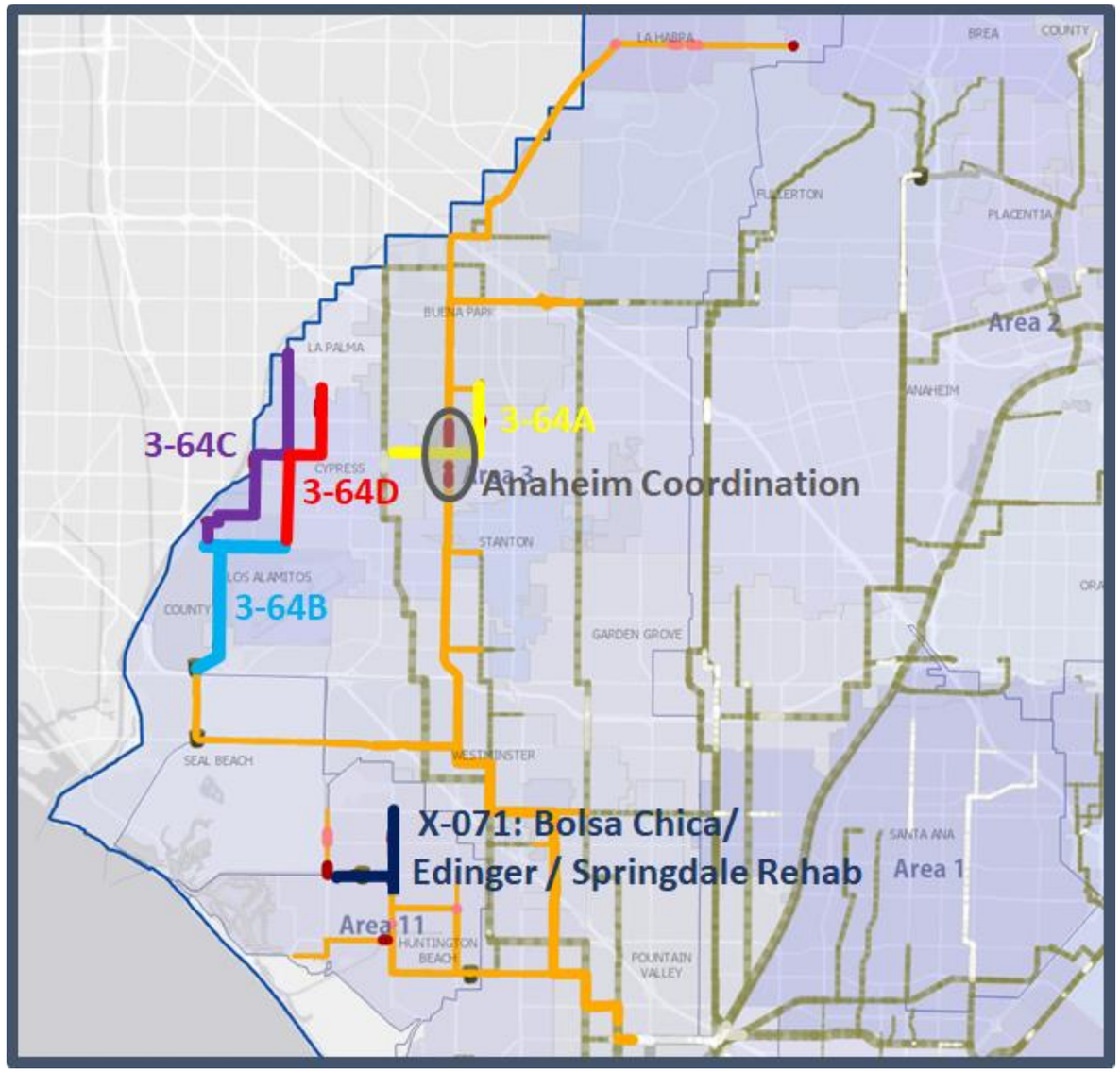
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

System Overview



Structural Grade Defect Legend:

- Grade 5
- Grade 4

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	9.0	127	51	21	7
21” - 27” Ø	20.5	299	45	9	4
≥ 30” Ø	17.0	215	38	14	1
Reinforced Concrete					
≤ 48” Ø	3.0	37	32	-	-
51” - 66” Ø	6.8	57	45	-	-
≥ 72” Ø	9.4	66	44	-	-
Polyvinyl Chloride					
18” Ø	1.2	12	15	-	-
Fiberglass					
30” Ø	0.04	1	23	-	-
Ductile Iron					
20” Ø	0.02	1	60	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Anaheim Coordination** – The city of Anaheim owns and operates various small diameter pipelines and diversions throughout the northern central area of the trunk.	• Coordinate with the City of Anaheim pertaining to operation and maintenance of these pipelines and diversions.
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

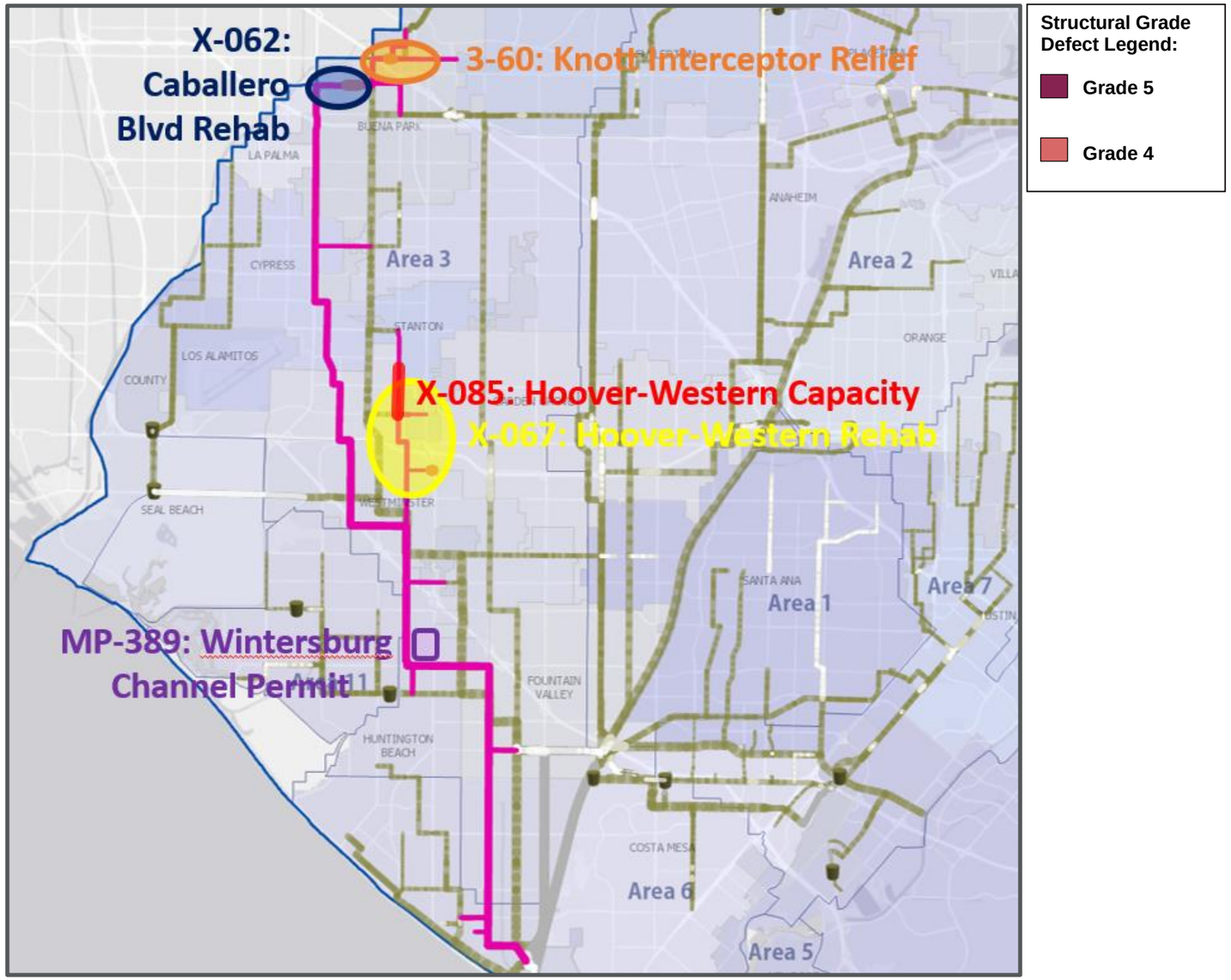
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
3-64A	Orange Western Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the cities of Cypress, Anaheim, and Buena Park.																
3-64B	Los Alamitos Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the cities of Seal Beach, Los Alamitos, and the community of Rossmoor.																
3-64C	Cypress Trunk Sewer Rehabilitation - West	• Upsize and rehabilitate sewer facilities in the cities of Cypress and La Palma.																
3-64D	Cypress Trunk Sewer Rehabilitation - East	• Rehabilitate sewer facilities in the cities of Cypress and La Palma.																
X-071	Bolsa Chica / Edinger / Springdale 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; CIP=Capital Improvement Program; FY=Fiscal Year; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

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 NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	2.9	50	60	-	1
21” - 27” Ø	6.9	87	58	-	-
≥ 30” Ø	2.4	5	57	-	2
Reinforced Concrete					
≤ 48” Ø	2.9	20	61	-	-
51” - 66” Ø	6.6	35	61	-	-
≥ 72” Ø	9.8	46	65	-	-
Ductile Iron					
12” Ø	0.03	2	60	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

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

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

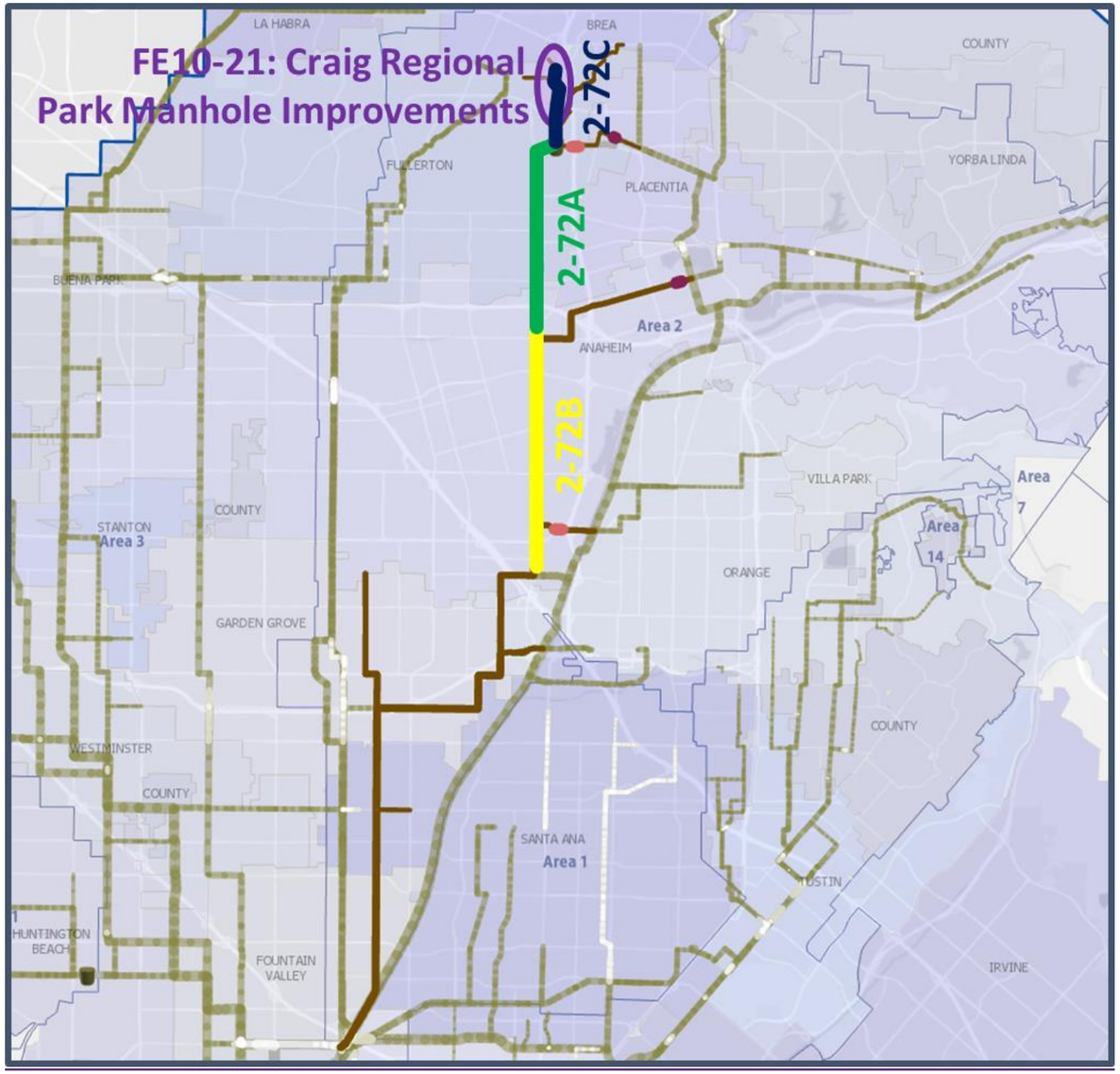
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
MP-389	Wintersburg Channel Permit	• Easement coordination to improve existing manhole access.																
3-60	Knott Interceptor Relief	• Rehabilitation of sewer facilities in the city of Buena Park.																
X-062	Caballero Blvd. Trunk Sewer Rehabilitation	• Rehabilitation of sewer facilities in the city of Buena Park.																
X-067	Western Ave. / Hoover St. Trunk Sewer Rehabilitation	• Rehabilitation of sewer facilities in the city of Westminster.																
X-085	Hoover-Western Sub-Trunk Improvement Project	• Upsizing of sewer segments to increase capacity.																

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

System Overview



Structural Grade Defect Legend:

- **Grade 5**
- **Grade 4**

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	2.7	57	56	1	1
21” - 27” Ø	2.7	39	59	1	-
≥ 30” Ø	10.5	140	49	-	1
Reinforced Concrete					
≤ 48” Ø	4.6	30	61	-	-
51” - 66” Ø	3.8	19	57	-	-
≥ 72” Ø	-	-	-	-	-
Polyvinyl Chloride					
24” Ø	0.01	1	25	-	-
Fiberglass					
30” Ø	0.03	1	2	-	-
Ductile Iron					
20” Ø	1.3	24	30	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

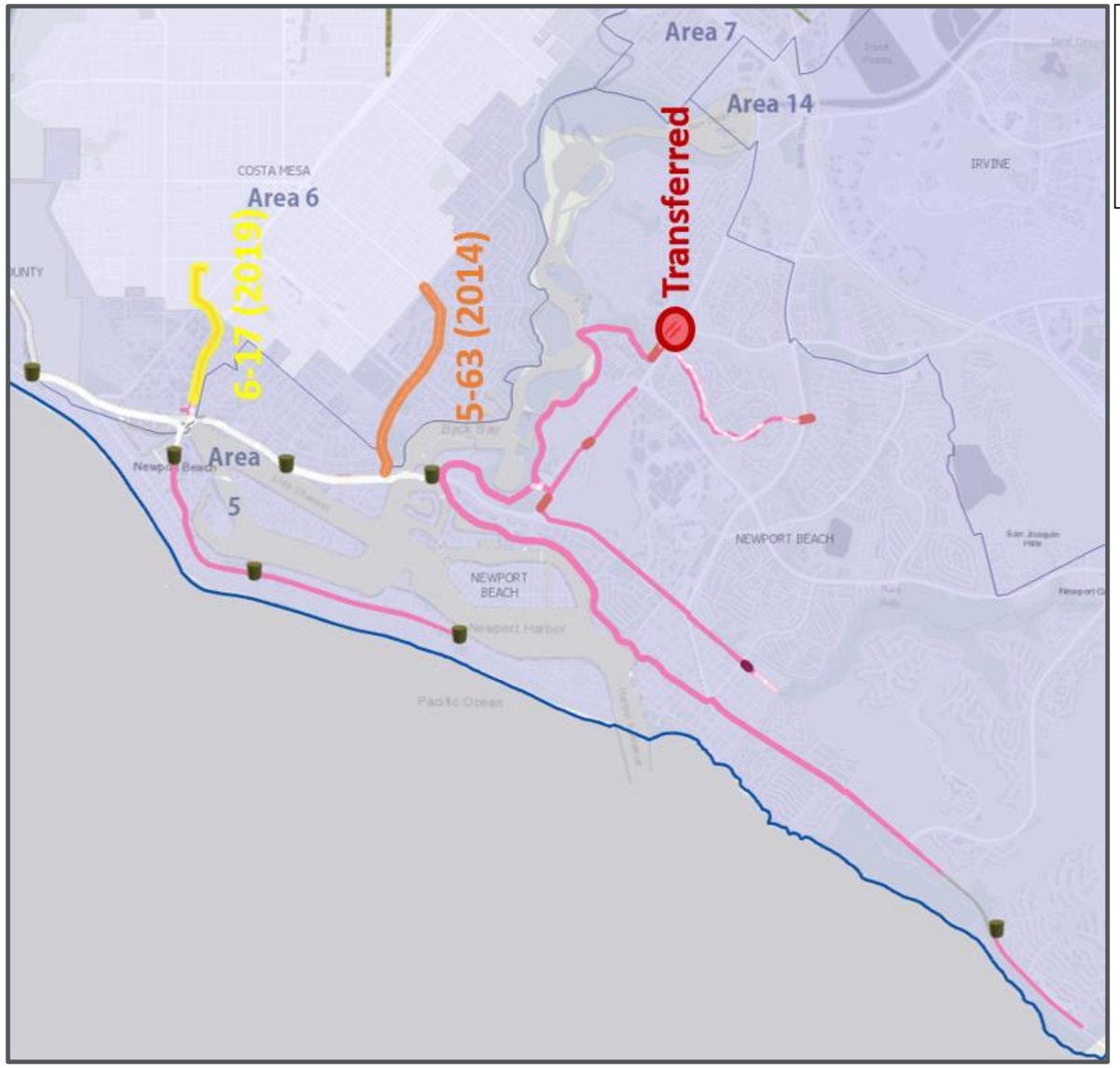
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
2-72B & 2-72C	Newhope Placentia Trunk Sewer Replacement	• Upsizing of segments of sewer to increase capacity.																
FE10-21	Craig Regional Park Manhole Improvements	• Manhole access improvements throughout Craig Regional.																

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

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 NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	6.1	122	44	1	3
21” - 27” Ø	4.5	99	35	-	-
≥ 30” Ø	3.8	75	32	-	1
Ductile & Cast Iron					
8” - 30” Ø	3.0	44	27	-	1
Polyvinyl Chloride					
12” - 36” Ø	2.6	37	19	-	-
Cured-in-Place					
24” Ø	1.1	13	21	-	-
HDPE					
20” Ø	0.6	12	27	-	1

Acronym Key:
HDPE=High-Density Polyethylene Resin;
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Tuberculation** – Some portions of the existing metal pipes have tuberculation which poses a risk. Several of these segments have been lined; however, some work remains to complete these repairs.	• Review condition of unlined metal pipes and rehabilitate pipes subject to tuberculation as needed.
• **Local Sewers –** A portion of gravity collection system that was local service was transferred to Newport Beach.	• None.
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

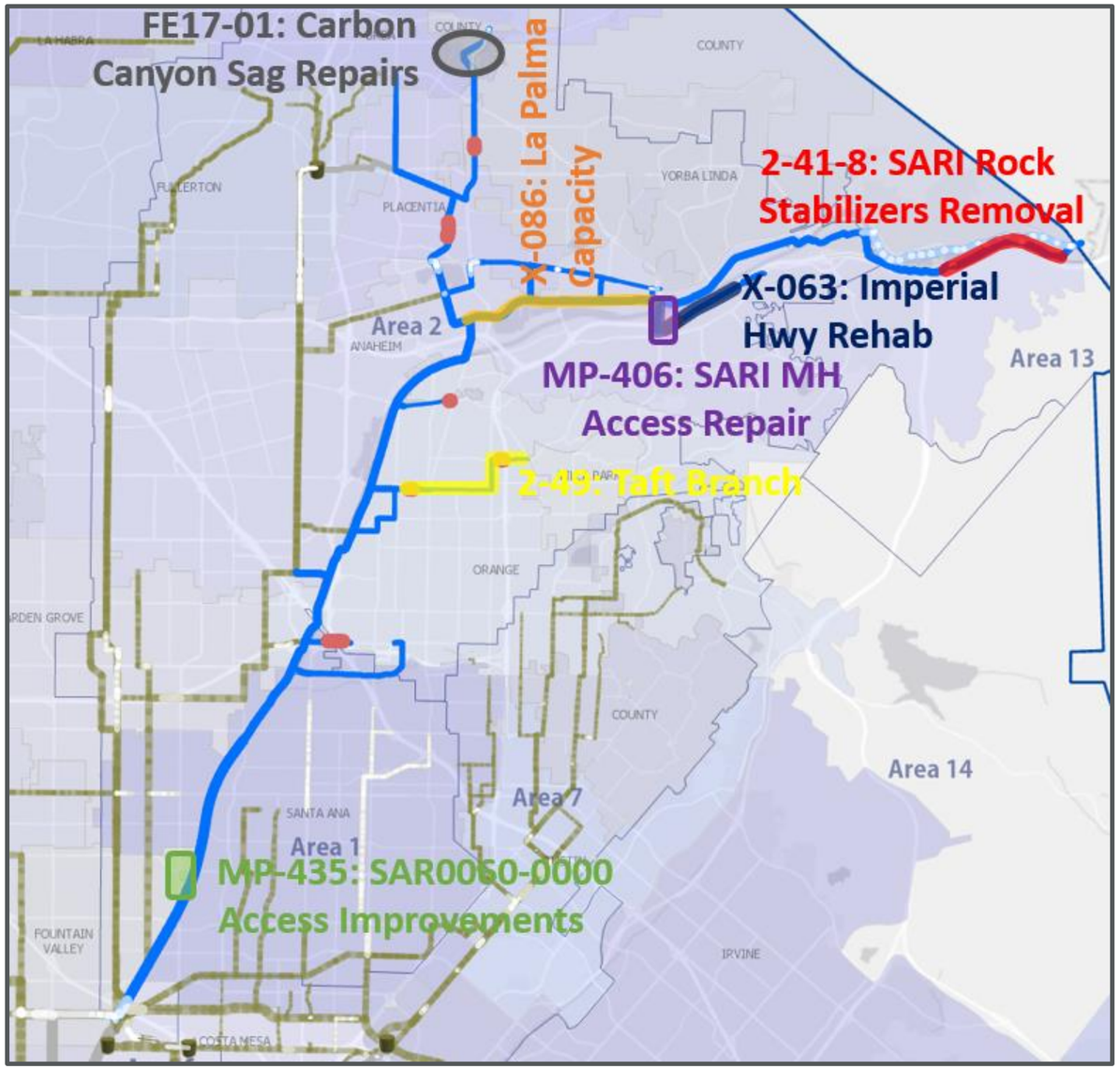
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

System Overview



Structural Grade Defect Legend:

- Grade 5
- Grade 4

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	5.0	114	55	-	2
21” - 27” Ø	11.6	187	44	-	4
≥ 30” Ø	6.0	85	34	-	3
Reinforced Concrete					
42” Ø	1.5	19	34	-	-
Fiberglass					
54” Ø	0.3	2	10	-	-
HDPE					
12” - 30” Ø	0.7	3	9	-	-
Ductile Iron					
24” - 48” Ø	0.4	5	27	-	-
Steel					
24” - 48” Ø	0.03	2	9	-	-

Acronym Key:
HDPE=High-Density Polyethylene Resin; MH=Manhole;
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

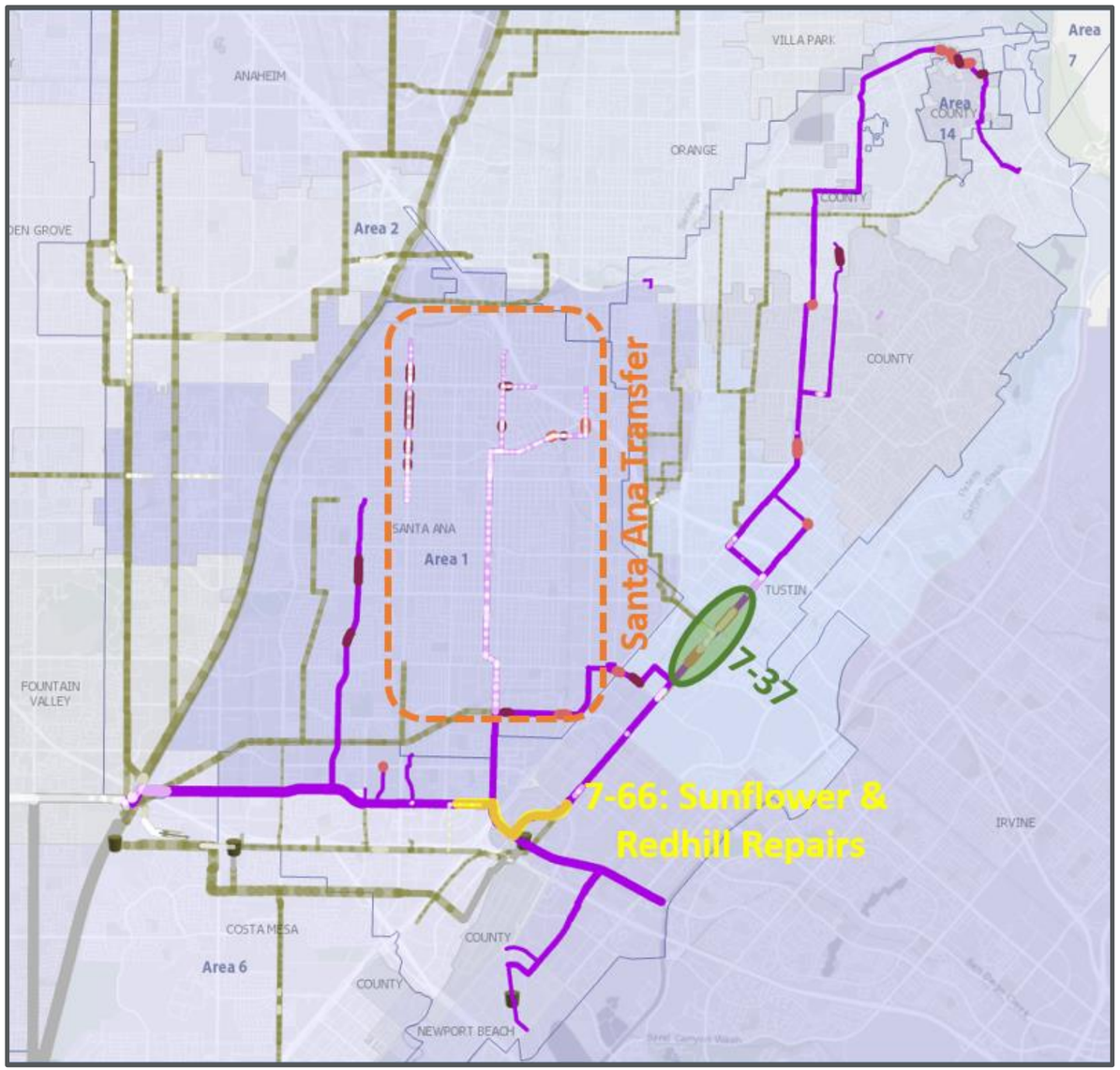
Project No.	Project Title	Description of Work	FY19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
MP-406	SARI Manhole Access Repair	• Improvements for manholes with limited vehicle access.																
MP-435	SAR0060-0000 Access Improvements	• Coordination with OCFCD to improve vehicle access to manholes.																
2-41-8	SARI Rock Stabilizers Removal	• Removal of rip rap and restoration of access roads.																
2-49	Taft Branch Improvements	• Upsizing of sewer segments to increase capacity.																
X-063	Imperial Hwy / 91 Freeway Trunk Sewer Rehabilitation	• Rehabilitation of sewer facilities in the city of Anaheim.																
X-086	Santa Ana River Sewer Relief Project	• Upsizing of sewer segments to increase capacity.																

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; PVC=Polyvinyl chloride; OCFCD=Orange County Flood Control District; OCSD=Orange County Sanitation District

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 NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	7.06	142	43	1	4
21” - 27” Ø	13.6	207	48	7	4
≥ 30” Ø	4.4	55	44	-	1
Reinforced Concrete					
≤ 48” Ø	1.6	15	40	-	-
51” - 66” Ø	3.1	32	40	-	-
≥ 72” Ø	4.1	27	33	-	-
Ductile Iron					
20” Ø	0.5	11	20	1	1
Polyvinyl Chloride					
30” Ø	0.02	2	13	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Point Repairs** – There are two isolated pipe segments with significant defects.	• Evaluate the extent of the necessary repairs in these locations.
• **Sewer Transfer** – Approximately 7.8 miles of gravity sewer were transferred to the City of Santa Ana.	• None.
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

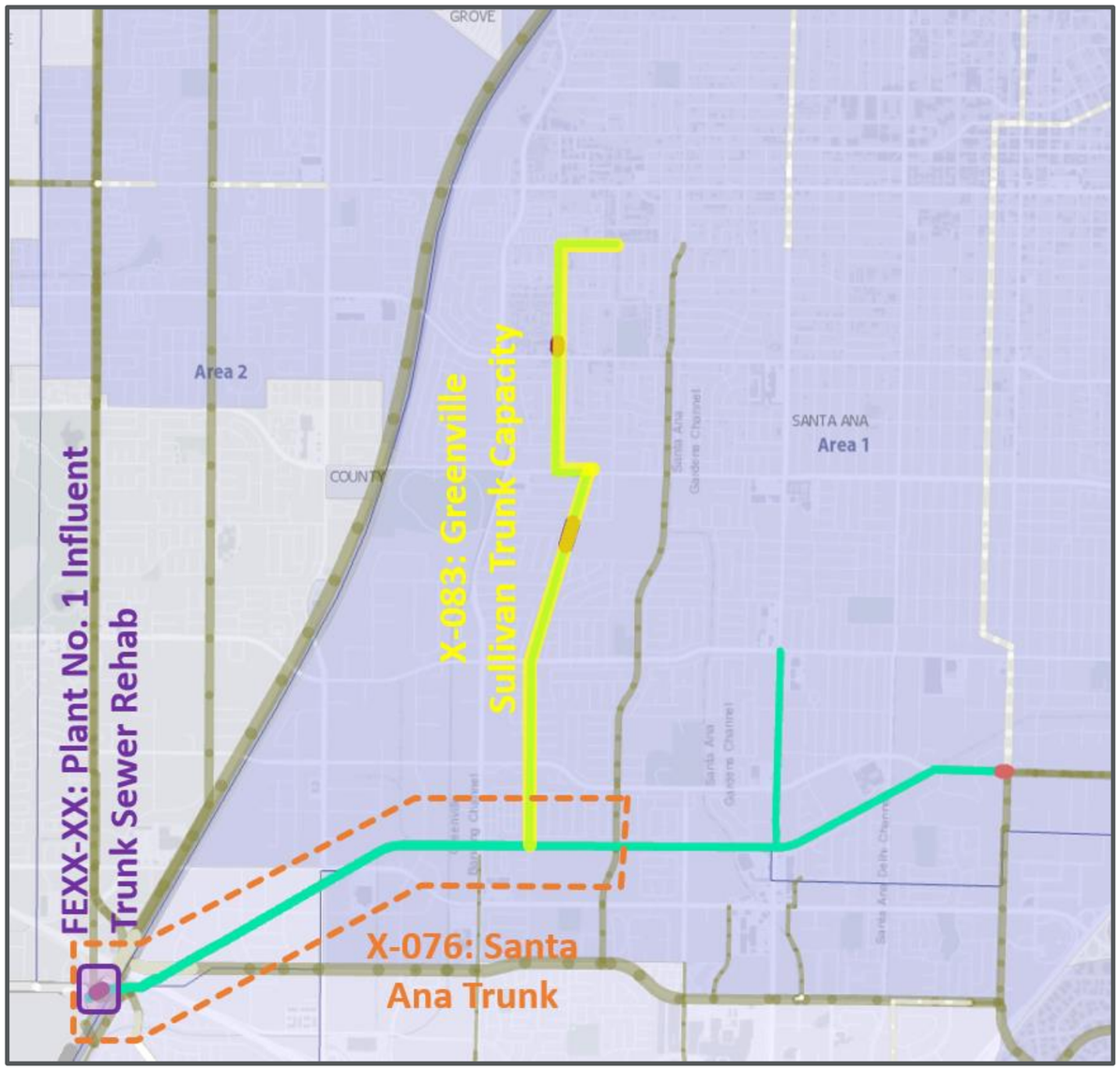
Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35
7-66	Sunflower and Red Hill Interceptor Repairs	• Rehabilitation of sewer facilities in the cities of Santa Ana and Costa Mesa.																

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

System Overview



Structural Grade Defect Legend:

- Grade 5
- Grade 4

Major Assets and Condition Information

Asset Type	Total Length (miles)	# of Pipes	Average Age (years)	# of NASSCO Structural 5	# of NASSCO Structural 4
Vitrified Clay					
≤ 18” Ø	0.03	3	62	-	-
21” - 27” Ø	3.4	46	66	3	-
≥ 30” Ø	1.7	23	64	-	1
Reinforced Concrete					
≤ 48” Ø	3.3	39	49	-	-
51” - 66” Ø	0.08	2	55	-	-
≥ 72” Ø	-	-	-	-	-

Acronym Key:
NASSCO=National Association of Sewer Service Companies

Santa Ana Trunk Sewer

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Unlined Reinforced Concrete Pipelines** – The lower portions of the Santa Ana trunk are unlined reinforced concrete pipe that has been routinely evaluated and is currently in acceptable condition. These segments are more prone to corrosion related issues than typical pipe materials utilized within the collection system.	• Continue frequent monitoring of the pipeline condition to provide routine updates from which the scheduling of a future rehabilitation project (X-076) can be determined.
• **Sewer Transfer** – Approximately 7.8 miles of gravity sewer were transferred to the City of Santa Ana.	• None.
• **Condition Assessment of Gravity Pipelines** - Many factors impact the accuracy of the coding system used to identify the type and severity of condition issues within the collection system. Video quality, operator experience, and field conditions often make correct and consistent coding of defects difficult. For this reason, defects that have been identified may not illicit an immediate response.	• OCSD staff reviews condition reports on a regular basis and if necessary, marks the defect for monitoring or repair.
• **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.	• Develop and execute a Planning Study to identify alternative methods for inspection of siphons and large diameter pipelines.
• **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.	• Develop and complete CIPs identified by the Collections Capacity Evaluation Study to address capacity issues. Monitor potential spill locations associated with capacity deficiencies not identified as near-term CIPs.
• **T-lock** – The T-Lock PVC sheet lining system use to line manholes and concrete structures throughout the collection system will be discontinued.	• OCSD staff will investigate alternative liner technologies and methods to repair existing lined structures.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 19/20	FY 20/21	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
FEXX-XX (PRN-00223)	Plant No.1 Influent Trunk Sewer Rehabilitation	• Rehabilitation of influent trunk line.																
X-076	Santa Ana Trunk Sewer Rehab	• Rehabilitation of sewer facilities in the cities of Santa Ana and Costa Mesa.																
X-083	Greenville Sullivan Trunk Capacity	• Upsizing of sewer segments to increase capacity.																

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; OCSD=Orange County Sanitation District; PVC=Polyvinyl chloride

CHAPTER 6 PROGRAM MONITORING AND IMPROVEMENTS

6.1 Program Monitoring

OCSD is continually evaluating AM Program progress and realized benefits. To support the evaluation, OCSD is in the early stages (first year) of developing metrics for monitoring. The metrics will be included in subsequent AMP versions.

6.2 AM Program Improvement Opportunities

Several improvement opportunities are defined in **Table 6.1** as part of the AM Program continuous improvement process. Reasonable timeframes are defined for implementing these improvements. Future AMP updates will summarize the implementation progress.

Table 6.1. AM Program Improvement Opportunities

Improvement Opportunity	Description	Timeframe (Years)	Success Measures
Performance Management Framework and Metrics	Establish metrics, processes, and organizational roles for tracking and trending the AM program performance and progress towards meeting the GM's intent.	1-2	• Defined metrics • Documented reporting processes
Remaining Useful Life	Continue to monitor and update the condition of assets and remaining useful life estimates for major assets.	Ongoing	• RUL estimate defined for each major asset
Risk Assessment	Expand existing risk assessment process and update likelihood and consequence of failure criteria. Score each major asset using the criteria.	2-5	• Risk score for each major asset
Integrated Use of Maximo	Transition asset hierarchy and inventory, replacement costs, risk scores, and RUL estimates to Maximo to make it the system of record.	2-5	• Maximo used as system of record • Elimination of Asset Engineer asset registry spreadsheets
Life Cycle Costing	Continue refining processes to track asset-level life cycle cost data.	2-5	• Documented processes for conducting life cycle cost analyses • Formalized templates • Staff trained on processes and templates

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CHAPTER 7 BUDGETARY CONSIDERATIONS

The AMP focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations. OCSD has been striving to more accurately identify 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 being evaluated and updated on an on-going basis as new information becomes available.

7.1 Capital Improvement Expenditures

Fiscal Year 2019-2020 Budget Update, adopted on June 26, 2019, includes updates to the 20-year CIP outlay. **Figure 7.1** shows the 20-year CIP outlay which includes current and projected future Capital Improvement Program projects. Fiscal Year 2019-2020 CIP outlay is further divided into process categories shown in **Figure 7.2**.

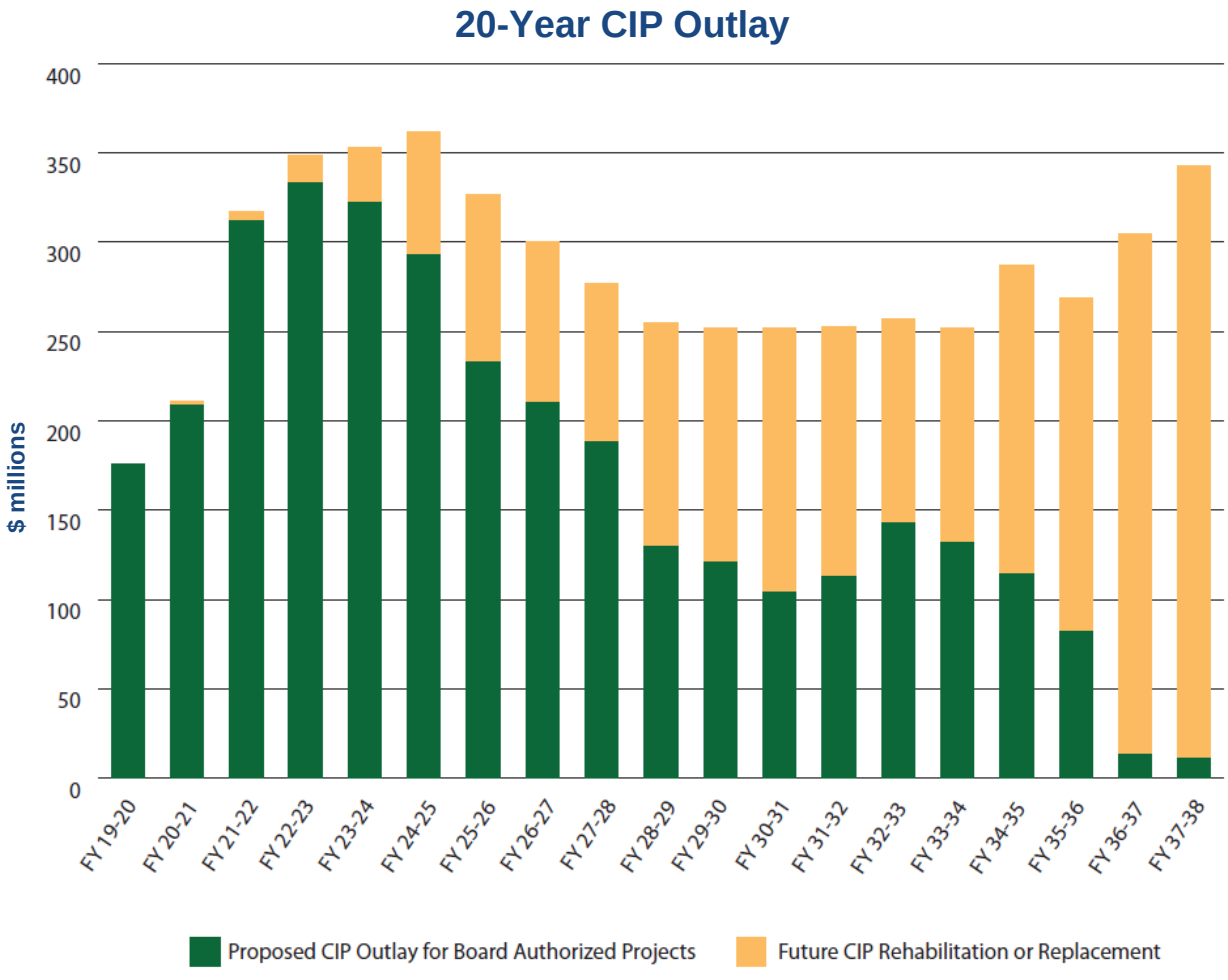

Figure 7.1. 20-Year CIP Outlay

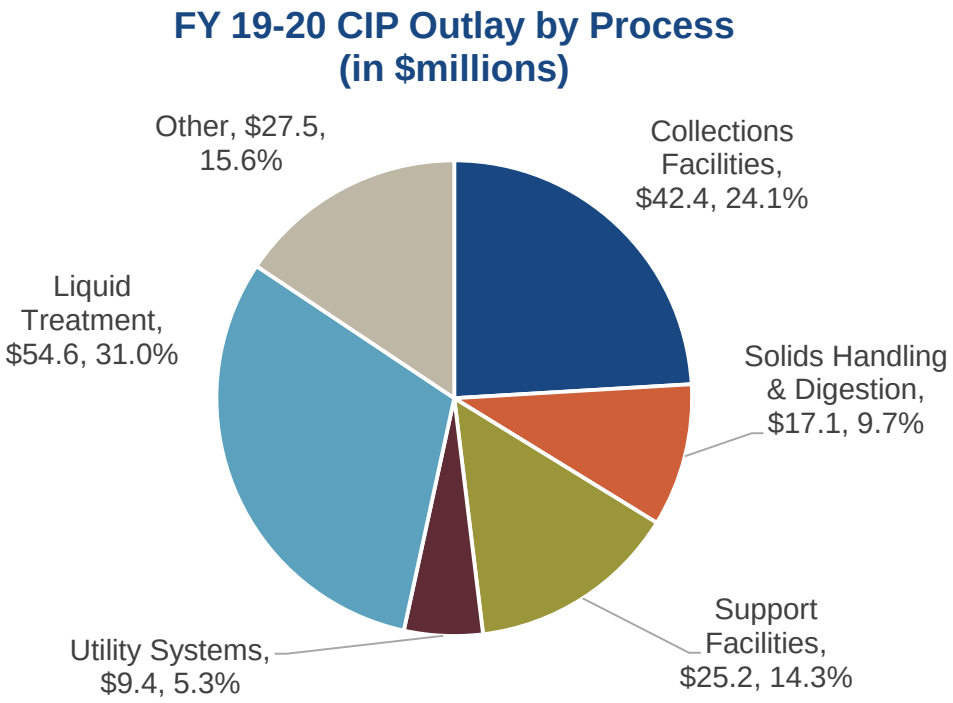

Figure 7.2 CIP Outlay by Process

7.2 Maintenance Expenditures

7.2.1 Five-Year Historical Maintenance Expenditures

Figure 7.3 and **Figure 7.4** 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).
- These costs represent the operations and maintenance costs of fixed assets, including operationally funded repair/replacement projects.

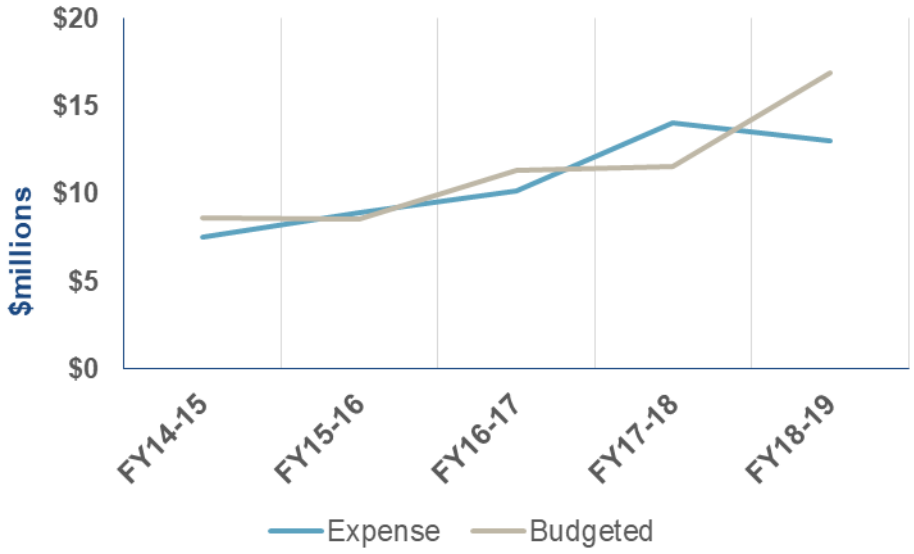

Figure 7.3. Five-Year Historical Maintenance Costs for Treatment Plants

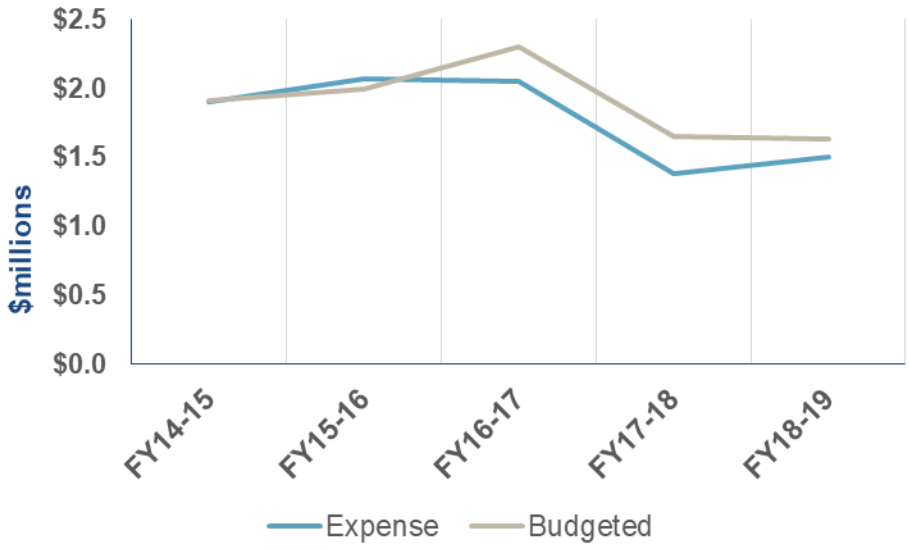

Figure 7.4. Five-Year Historical Maintenance Costs for Collection System

7.2.2 Three-Year Look-Ahead Maintenance Expenditures

Table 7.1 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, and Collection System), and then sorted by the project start fiscal year and estimated cost (highest to lowest). The list encompasses projects identified thus far. It is likely FY20-21 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 7.1. Planned Operational-Funded Maintenance Projects in Fiscal Years 2019/20 through 2021/22

#	Project Title	Location	Cost Type	FY19-20	FY20-21	FY21-22	Three-Year Total Cost
PRN-00159	Bushard Diversion Structure Repair	CS	Project	$365,000	$365,000	$0	$730,000
PRN-00250	Yorba Linda Pump Station - Leaking WYE Needs Replacement	CS	Project	$60,000	$0	$0	$60,000
PRN-00302	Slater, Lido, And Seal Beach Pump Station Deragger Unit Install	CS	Project	$47,000	$0	$0	$47,000
PRN-00376	Warner Avenue Vault - Structural Design	CS	Project	$10,000	$0	$0	$10,000
PRN-00377	Warner Avenue Vault - Structural Repair	CS	Project	$20,000	$0	$0	$20,000
PRN-00393	Pump Station Dry Well Concrete Crack Evaluation At A Street, 15th Street, and Bitter Point Pump Stations	CS	Project	$0	$0	$0	$0
PRN-00448	Main Street Pump Station Manual Check Valve And Plug Valve Replacement-MP 559	CS	Project	$80,000	$0	$0	$80,000
PRN-00463	College Pump Station Vapex Modifications	CS	Project	$30,000	$0	$0	$30,000
PRN-00550	Seal Beach PS - Fan No. 3 Relocation	CS	Project	$30,500	$0	$0	$30,500
	Seal Beach Valve Replacement	CS	Project	$0	$100,000	$0	$100,000
PRN-00435	Pipe Coatings And Sump Pump In Effluent-Junction-Box Valve Vault	P1 & P2	Project	$0	$0	$0	$0
PRN-00537	P2 And P1 Office Space For Heavy Mechanics Group	P1 & P2	Project	$0	$0	$0	$0
PRN-00252	Garfield Traffic Spike Barrier	P1	Project	$11,000	$0	$0	$11,000

#	Project Title	Location	Cost Type	FY19-20	FY20-21	FY21-22	Three-Year Total Cost
PRN-00263	AS1 Blower Building Generator Tank Repair (MP-122)	P1	Project	$15,000	$0	$0	$15,000
PRN-00332	Lab Second Floor Repair/Replace Flooring	P1	Project	$0	$0	$0	$0
PRN-00333	Plant 1 Primary Clarifiers 16-31 Restroom	P1	Project	$5,000	$0	$0	$5,000
PRN-00375	P1 AS-2 Blower Silencer Piping Repairs (MP-405)	P1	Project	$31,798	$0	$0	$31,798
PRN-00385	P1-37 Primary Rectangular Basin Rehab (MP-462)	P1	Project	$400,000	$400,000	$400,000	$1,200,000
PRN-00398	P1 Power Building 3A Protective Relay Replacement	P1	Project	$60,000	$0	$0	$60,000
PRN-00402	P1 AS Clarifier Lighting Replacement	P1	Project	$71,060	$0	$0	$71,060
PRN-00460	P1 Primary #3 Repairs	P1	Project	$65,375	$0	$0	$65,375
PRN-00478	P1 AS2 Clarifier #31 Catwalk - Coatings	P1	Project	$66,570	$0	$0	$66,570
PRN-00489	P1 Barscreen #6 Driveshaft Replacement	P1	Project	$68,487	$0	$0	$68,487
PRN-00491	Repair Storm Drains Throughout Plant 1 (MP 584)	P1	Project	$0	$0	$40,000	$40,000
PRN-00500	P1 CenGen Elevator Hydraulic Jack Replacement	P1	Project	$265,230	$0	$0	$265,230
PRN-00507	Work Platforms Over The Pipes - Plant 1 Truck Loading Roof	P1	Project	$6,000	$0	$0	$6,000
PRN-00509	P1 Primary Basin #4 Temp Repairs	P1	Project	$139,664	$0	$0	$139,664
PRN-00516	PEPS Pump #1 Mechanical Repair	P1	Project	$80,000	$0	$0	$80,000
PRN-00517	PB-7 Generator Radiator Repair	P1	Project	$100,000	$0	$0	$100,000
PRN-00522	Coating - P1 Effluent Junction Box (EJB) Piping Coating Repairs (CTO-0018)	P1	Project	$0	$120,000	$0	$120,000

#	Project Title	Location	Cost Type	FY19-20	FY20-21	FY21-22	Three-Year Total Cost
PRN-00526	P1 Emergency Generator Breaker Spares	P1	Project	$170,000	$0	$0	$170,000
PRN-00569	Emergency Generator Protection Relays Upgrade	P1	Project	$150,000	$150,000	$0	$300,000
PRN-00569	P1 Emergency Generator Relay Upgrade	P1	Project	$0	$190,000	$0	$190,000
	P1 Gas Compressor Overhaul (1 / Yr)	P1	Annual	$100,000	$100,000	$100,000	$300,000
	P1 Centrifuge Overhaul (4K Hr) (3/Yr)	P1	Annual	$1,000,000	$1,000,000	$1,000,000	$3,000,000
	P1 CenGen Overhaul (1 / Yr)	P1	Annual	$0	$1,800,000	$1,800,000	$3,600,000
	P1 Primary Basin Torque Limiter	P1	Annual	$0	$500,000	$0	$500,000
	P1 Secondary Clarifier (AS1) Collectors And Torque Limiters	P1	Annual	$0	$2,000,000	$2,000,000	$4,000,000
	P1 Holding Digester Annual Cleaning	P1	Annual	$0	$300,000	$300,000	$600,000
	P1 Digester Cleaning - 5 Year	P1	Annual	$820,000	$0	$0	$820,000
PRN-00258	Dual Heat Exchanger Replacement		Project	$192,815	$0	$0	$192,815
PRN-00207	Plant 2 Clarifier N Steel Support Cage Repairs	P2	Project	$8,200	$0	$0	$8,200
PRN-00215	P2 AS2 Secondary Clarifier Gate Replacement (MP#252)	P2	Project	$75,000	$75,000	$0	$150,000
PRN-00241	P2 Cen-Gen Exhaust Recovery Boiler #2 Repair (MP-266)	P2	Project	$200,000	$0	$0	$200,000
PRN-00262	P2 CenGen Steam Turbine Rehabilitation	P2	Project	$189,528	$0	$0	$189,528
PRN-00306	P2 Primary Clarifier E & D Repairs	P2	Project	$275,000	$0	$0	$275,000
PRN-00331	P2 Dewatering Building Plant Water Pipe Repair (MP-385)	P2	Project	$54,000	$0	$0	$54,000

#	Project Title	Location	Cost Type	FY19-20	FY20-21	FY21-22	Three-Year Total Cost
PRN-00340	P2 TF 'A' Refurbishment	P2	Project	$98,478	$0	$0	$98,478
PRN-00374	Plant 2 South Scrubber Complex Bleach Pump Turndown	P2	Project	$86,000	$0	$0	$86,000
PRN-00394	P2 CenGen Steam Turbine Condenser Repair	P2	Project	$232,100	$0	$0	$232,100
PRN-00398	P2 Power Building 'C' Protective Relay Replacement	P2	Project	$60,000	$0	$0	$60,000
PRN-00409	P2 Headworks Low Voltage Cable Assessment	P2	Project	$397,500	$397,500	$0	$795,000
PRN-00428	P2 Trickling Filter Fan Support Fan Modifications Pilot	P2	Project	$10,000	$0	$0	$10,000
PRN-00441	MP-592 P2 CenGen Engine #3 Exhaust System Repair	P2	Project	$50,000	$0	$0	$50,000
PRN-00451	P2 Secondary Clarifier Repairs (MP-248)	P2	Project	$1,524,000	$1,524,000	$0	$3,048,000
PRN-00457	P2 AS Plant Inlet Gate Replacement	P2	Project	$662,000	$0	$0	$662,000
PRN-00493	P2 TF Pump Overhaul / Seal Tube Evaluation	P2	Project	$631,000	$0	$0	$631,000
PRN-00499	P2 EPSA VFD Upgrades	P2	Project	$218,842	$218,842	$0	$437,684
PRN-00503	P2 TF Clarifier 'E' Damage Evaluation & Repair	P2	Project	$190,280	$0	$0	$190,280
PRN-00512	Plant No. 2 Steam Pipe Repairs	P2	Project	$0	$25,000	$0	$25,000
PRN-00513	P2 Truck Loading Auger Replacement	P2	Project	$913,400	$0	$0	$913,400
PRN-00521	P2 Aeration Basins Mixers Coating Repairs (CTO-0028)	P2	Project	$0	$0	$0	$0
PRN-00529	P2 MSP Motor Overhaul	P2	Project	$0	$462,000	$0	$462,000
PRN-00530	Plant No. 2 Digester Facilities Rehabilitation	P2	Project	$50,000	$0	$0	$50,000

#	Project Title	Location	Cost Type	FY19-20	FY20-21	FY21-22	Three-Year Total Cost
PRN-00530	P2 Digester F Repair	P2	Project	$150,000	$0	$0	$150,000
PRN-00557	P2 Digester S Concrete Crack Repair	P2	Project	$10,000	$0	$0	$10,000
PRN-00561	AI-041 P2 MSP Vibration Monitoring System Modernization	P2	Project	$0	$277,000	$0	$277,000
PRN-00565	Plant 2 EPSA Building City Water Line Repair	P2	Project	$15,000	$0	$0	$15,000
PRN-00566	EPSA Piping Coating	P2	Project	$50,000	$0	$0	$50,000
PRN-00570	Primary Treatment Rehabilitation at P2 B/C Side Primary Clarifiers	P2	Project	$462,000	$0	$0	$462,000
	P2 Cake Transfer Pumps Overhaul	P2	Project	$0	$275,000	$0	$275,000
	P2 Secondary Clarifier Repairs (Phase II)	P2	Project	$50,000	$50,000	$0	$100,000
	P2 Centrifuge Damage Repair And Spare Part Purchase	P2	Project	$0	$0	$3,000,000	$3,000,000
	P2 Gas Compressor Overhaul (1 / Yr)	P2	Annual	$100,000	$100,000	$100,000	$300,000
	P2 Centrifuge Overhaul (4K Hr) (3/Yr)	P2	Annual	$1,000,000	$1,000,000	$1,000,000	$3,000,000
	P2 CenGen Overhaul (1 / Yr)	P2	Annual	$0	$2,200,000	$2,200,000	$4,400,000
	P2 AS Plant High Rate Mix Pumps Corrosion Repairs	P2	Annual	$0	$500,000	$0	$500,000
	P2 Cathodic Protection/Ground Rod Replacement	P2	Annual	$0	$0	$0	$0
	P2 Holding Digester Annual Cleaning	P2	Annual	$0	$500,000	$500,000	$1,000,000
	P2 Digester Cleaning - 5 Year	P2	Annual	$1,664,640	$0	$0	$1,664,640

Acronym Key:
AS=Activated Sludge, AS1=Activated Sludge Plant No. 1; AS2=Activated Sludge Plant No. 2; CenGen=Central Generation; CS = Collection System; EPSA=Effluent Pump Station Annex; MP=Maintenance Project; MSP=Main Sewage Pump; P1=Plant No. 1, P2=Plant No. 2; PEPS=Primary Effluent Pump Station; PS=Pump Station; TF=Trickling Filter; VFD=Variable Frequency Drive; Yr=Year

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