



Montecito Sanitary District & Montecito Water
District
Enhanced Recycled Water Feasibility Analysis

Technical Memorandum 5
COST FOR REHABILITATION AND
30-YEAR OPERATIONS

FINAL DRAFT | November 2022





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Lisa J. Arroyo,
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California Civil C-57518

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Abbreviations

AACE International	Association for the Advancement of Cost Engineering
ADA	Automatic Dialer Alarm
ASR	alkali-silica reaction
ATS	automatic transfer switch
CCB	chlorine contact basin
CIP	capital improvement plan
CMMS	Computerized Maintenance Management System
DAFT	dissolved air floatation thickener
I&C	instrumentation and control
IPS	Influent Pump Station
K	thousand
LED	light-emitting diode
M	million
MCC	motor control center
MBR	membrane bioreactor
MSD	Montecito Sanitation District
MWD	Montecito Water District
O&M	Operational and Maintenance
Project	Enhanced Recycled Water Feasibility Analysis
RAS	return activated sludge
SCADA	supervisory control and data acquisition
TM	technical memorandum
TWAS	thickened waste activated sludge
VFD	variable frequency drive
WAS	waste activated sludge
WWTP	wastewater treatment plant

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Technical Memorandum 5

COST FOR REHABILITATION AND 30-YEAR OPERATIONS

5.1 Introduction and Purpose

This technical memorandum (TM) uses results from the Condition Assessment (TM3) and Performance and Capacity Evaluation (TM4) to develop a prioritized capital improvement plan (CIP) and operating costs for Montecito Sanitary District (MSD) over the next 30 years.

5.2 Background

This work supports the larger Enhanced Recycled Water Feasibility Analysis (Project), a joint effort by MSD and Montecito Water District (MWD). The Project analyzes four potential approaches to maximize water reuse from the MSD Wastewater Treatment Plant (WWTP), including local non-potable reuse, local potable water reuse, and regional potable water reuse projects (one in Carpinteria and one in Santa Barbara).

To effectively analyze several Project options which include treated effluent from the MSD WWTP, Carollo performed a condition assessment (TM3) and a capacity and performance evaluation (TM4) to understand the state of the assets at MSD. Using the results from TM3 and TM4, combined with anticipated replacements based on end of useful life projections, an asset renewal prioritization plan was developed, and operational costs were estimated for the WWTP over a 30-year planning horizon.

5.3 Capital Improvement Planning

Using condition assessment scores and estimated useful life projections, a 30-year CIP was developed. Projects were assigned a capital planning group which defines the initial planning period for implementation. The five (5) capital planning groups are presented in Table 5.1 below.

Table 5-1 Capital Planning Groups

Planning Group	Timeframe (years)	Description
Urgent	0 to 2	Assets recommended for immediate action for replacement or rehabilitation or to address safety related deficiencies.
Priority	3 to 5	Assets recommended for CIP planning and replacement or rehabilitation within 3-5 years.
Short-Term	6 to 10	Assets recommended for CIP planning and implementation within the 6 to 10-year timeframe.
Mid-Term	11 to 20	Assets recommended for CIP planning and implementation within the 11 to 20-year timeframe.
Long-Term	20+	Assets recommended for CIP planning and implementation within the 20+ year timeframe.

5.3.1 Condition Based Prioritization

Assets were prioritized based on their condition assessment scores from the on-site condition assessment performed in November 2022 (TM3). Condition scores were used as a basis to determine the planning group timeline for asset renewal as shown in Table 5.2 below. Assets which have redundancy or are not critical for WWTP operations had their planning group timeline extended. Conversely, planning group timelines were shortened for assets that were deteriorating more quickly than expected or if they pose a risk to WWTP operations if they failed.

Table 5-2 Assignment of Capital Planning Groups by Condition

Planning Group	Condition Assessment Score
Urgent	5
Priority	4
Short-Term	3
Med-Term	2
Long-Term	1

Figure 5.1 shows the condition assessment results by planning group, distributed by the number of major assets assessed (not replacement cost). As illustrated, 26 percent or 15 assets are assigned to the urgent planning group with recommended renewal action to be performed within the next 0-2 years; 15 percent or 9 assets should be addressed in the following 3–5-year timeframe; with the remaining assets requiring rehabilitation or replacement beyond 5 years.

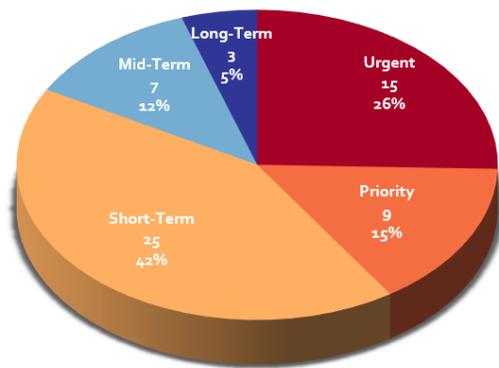


Figure 5.1 Capital Planning Groups by Condition Assessment

As noted in TM3, MSD electrical and instrumentation and control systems have the highest concentration of assets in very poor condition. These systems comprise most of the urgent capital planning group assets. MSD is already in the planning stages to replace many of the assets identified in the urgent planning category in 2022.

The on-site field condition assessment comprised of major assets and did not include ancillary assets such as valves, headers or manifolds, electrical feeders and conduits, pipelines, etc. It is recommended that MSD consider including replacement of ancillary assets in conjunction with major assets to ensure proper operation. Additionally, many of these ancillary assets are aging and past their useful life.

5.3.2 Renewal Strategy

The goal of the renewal strategy is to balance short term infrastructure and operational needs with long term capital investment based on the pending decision regarding the future of MSD's wastewater, whether it will be treated at a different facility or continue to be treated at MSD's WWTP. If a decision is made to have MSD wastewater treated at another facility, it is anticipated that MSD will remain operational for approximately 10 more years.

Using the CIP planning group timelines will allow MSD to budget the necessary capital dollars for each asset rehabilitation, repair, or replacement project. Projects falling within the urgent through short-term planning groups are recommended to be implemented regardless of the future wastewater treatment location to minimize risk to MSD's operations and maintain permit compliance. Longer-term projects would be implemented if MSD remains operational long-term, and CIP projects would be confirmed by MSD management through detailed asset investigations, coordination with future capacity expansion or reuse projects, and priority-based scheduling of projects.

5.3.3 Cost Estimating Methodology

Cost estimates were aggregated from information provided by discipline leads that participated in the field assessment, MSD staff, and the engineer's opinion of probable cost. Asset replacement costs are planning level or "Order-of-Magnitude" estimates (Class 5 estimates) per the Association for the Advancement of Cost Engineering (AACE International) and should not be considered pre-design cost estimates.

A Class 5 estimate is made without detailed engineering data and the expected accuracy range is within +100 percent to -50 percent. This means that bids can be expected to fall within a range of 100 percent over the estimate to 50 percent under the estimate. While they have a wide range of accuracy, they are typically used to quickly determine overall project feasibility or to screen several alternatives.

As noted above, detailed asset investigation should be performed and other ancillary assets such as piping, valves, feeders, etc. should be reviewed and considered when implementing each CIP project. MSD should also consider grouping similar or smaller projects together to take advantage of cost savings that typically occur due to economy of scale of larger projects.

Replacement and rehabilitation costs were developed in today's dollars (2022) and include direct costs (equipment, material, and labor) and allowances for indirect costs as shown in Table 5.3 and discussed in more detail below. For assets where no direct cost information was identified, previous studies and projects were used to estimate a reasonable direct replacement cost for equipment, material, and labor. Projected inflation over the next 30 years was not considered as part of the cost estimate.

Estimated costs were further categorized between assets MSD staff plan to replace or rehabilitate themselves (insource) and assets MSD would hire a consultant and/or contractor to

perform the work (outsource). Insource work only considered direct costs associated with materials, as most of the equipment and labor would be provided by MSD staff. Work to be outsourced would include direct and indirect costs as explained in the following section.

Planning Level Cost Markups

Cost markups were applied to work to be outsourced to account for indirect costs. Indirect costs are components of the estimate that are subject to much more variability and subjectivity than direct costs. The markups represent a percentage of direct cost total (equipment, material, and labor) as shown in Table 5.3 below. Note again that these are Class 5 planning level estimates, which have an expected accuracy range of -50 to +100 percent. A brief description of the cost markup categories is outlined as follows:

- **General Conditions:** accounts for the general conditions and general requirements of the contract specifications and typically includes items such as contractor's field overhead costs, mobilization, demobilization, temporary facilities, testing and start-up.
- **Estimating Contingency:** this is the amount added to account for design elements that are not well defined yet. It also accounts for minor design changes but does not include changes in scope or unforeseeable major events such as strikes or earthquakes. As the design matures and the project is better defined, the contingency is typically reduced.
- **Contractor Overhead and Profit:** refers to the general contractor's overhead, an amount allocated to each project to cover the cost of his main office operations, administration of subcontracts, etc. and the contractor's profit.
- **Engineering, Administrative and Legal:** these costs are sometimes referred to as "soft costs" and cover the owner's expenses for engineering fees, construction management and inspection, legal fees, and owner's internal administrative expenses, bid advertisement, etc.

Table 5-3 Allowances by Category

Item	Estimated Cost	Estimated Cost of "A"
Direct Cost	"A"	100 %
Sales Tax	8 % of 1/2 "A"	4 %
Estimating Contingency ⁽¹⁾	3 %	31%
General Conditions ⁽¹⁾	12 %	16%
Contractor Overhead and Profit ⁽¹⁾	12%	18%
Bonds and Insurance ⁽¹⁾	2.5%	4%
Construction Cost Total	"B"	174%
Engineering, Legal and Administrative	20% of "B"	35%
Owner's Reserve for Change Orders	5% of "B"	9%
Project Cost Total	"C"	217%

Notes:

- (1) The construction cost elements are applied sequentially, e.g., the sales tax is calculated and added on to the equipment cost, then the estimating contingency is 30 percent of the sum of the equipment cost and sales tax.

Commented [LA1]: I updated the table to align with TM8. I did not go through and recalculate costs because MSD provided many of the costs that they wanted to use (noted in the revised table) and the difference between my original mark-ups and this table is 17%.

5.4 CIP Project Recommendations

A preliminary list of asset replacements was developed for the next 30 years. It was developed based on the results from TM3, TM4, and anticipated replacements based on end of useful life

projections over the 30-year planning period. It is based on in-kind or like replacement or rehabilitation. No alternatives analysis was performed.

5.4.1 Recommended Additional Evaluation

In November 2021, a Phase 1 Field Evaluation was conducted at MSD WWTP. This evaluation was a visual, non-invasive, and non-destructive condition assessment of the major assets. TM3 identified additional follow-up evaluations that would provide in-depth assessments to better identify condition or cause of degradation needed to fully evaluate certain assets. These follow-up evaluations are described in more detail below. Please note that costs for the additional evaluation are engineering effort costs and do not include the cost of potential repairs. Any repairs identified as a result of the evaluation would need to be added to the list of CIP projects.

- **Petrographic Testing of Concrete.** It is recommended that MSD perform petrographic testing of the concrete at the aeration basins and clarifiers due to the extensive cracking observed during the condition assessment. Petrographic testing analyzes concrete core samples under a microscope to find the cause of distress or deterioration of concrete. Petrographic testing is used to determine whether alkali-silica reaction (ASR) between the contaminants and the concrete matrix has occurred. The main effect of ASR is extensive cracking in the concrete. ASR is an initial chemical reaction and occurs when the aggregates used in the concrete contain high content of reactive silica materials. The high silica content reacts with alkali hydroxide in the cement, and this creates internal volumetric expansive stresses. These stresses can induce enough pressure to damage the concrete which is typically visible as excessive cracking. There is no cure for ASR; however, there are some remedial actions to prolong the life of the structures if ASR is observed. The long-term solution would be to replace the concrete structure if ASR is determined to be the cause of the cracking and deterioration.
- **Seismic Evaluation.** It is recommended that MSD perform seismic evaluations on several structures. During the condition assessment, potential seismic deficiencies were noted in the Digester Blower and Administration and Control Buildings. In addition, the Aeration Basin and Secondary Clarifier structures appeared to have overstressed beams that should be evaluated.

Table 5.4 summarizes the asset replacements by renewal timeline. It provides the major asset name, condition score, process area, recommended action, driver, recommended scope, project pathway, and estimated cost contingent on whether the project execution would be insourced, outsourced, or a combination of the two.

The “driver” category is intended to identify asset replacements that are safety related (Safety), those that could affect MSD meeting its National Pollutant Discharge Elimination System permit requirements (Permit), replacements that would benefit recycled water (Recycled Water), and assets that can be eliminated if MSD implements membrane bioreactor (MBR) treatment technology.

The “project pathway” category is intended to quantify the necessity of the recommended replacement based on pending selection of a Project Alternative as follows:

- **Applies to All Alternatives.** This indicates that regardless of the alternative selected, this asset should be replaced. This could be due to timing or the function it serves at the WWTP.

- Applies to MSD NPR or DPR. This indicates that if the alternative Project selected is either NPR or DPR at MSD, this asset will need to be replaced; however, if an offsite alternative Project is selected (Carpinteria IPR or Santa Barbara DPR), replacement of this asset is not necessary.
- May apply to Carp and SB. This indicates that asset replacement may be required if the alternative Project selected is either Carpinteria IPR or Santa Barbara DPR.
- Will not be replaced. This indicates that MSD is eliminating the need for that asset through construction of an upcoming project.

Assets identified by MSD for replacement in 2022 are shown at the top of the table with MSD's scope of work and estimated costs per their CIP funding form 2021-2023. Figure 5.2 follows Table 5.4 and illustrates the list of asset replacements by process area and planning group.

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Table 5-4 30-Year CIP Strategy

Item No.	Asset Name	Condition Score	Process Area	Recommended Action	Driver	Recommended Scope	Project Pathway	Delivery Method	Estimated Cost
MSD Scheduled Replacement for 2022									
1	IPS Ventilation	Poor	IPS	Replace ⁽²⁾	Permit Compliance	In-kind replacement of air ducting from aeration basin blower manifold to IPS. It is recommended that MSD consider rerouting foul air, especially if MSD will continue to operate long-term. Foul air from the wet well is currently routed to the intake of the aeration blowers, which contributes to accelerated wear for the blowers, air distribution system and diffusers. More air changes per hour would be desirable to reduce H ₂ S levels and corrosion in the wet well room. This work will be performed as part of the electrical project.	Applies to All Alternatives	Outsource	\$58,000 ⁽³⁾
2	WAS Pump and Motor	Moderate	RAS/WAS System	Replace ⁽²⁾	Permit Compliance	In-kind replacement of WAS pump and motor and base piping.	Applies to All Alternatives	Insource	\$15,000 ⁽³⁾
3	RAS Dry Well Sump Pump	Very Poor	RAS/WAS System	Replace ⁽²⁾	Permit Compliance	In-kind replacement of RAS dry well sump pump and control panel.	Applies to All Alternatives	Insource	\$40,000 ⁽³⁾
4	Secondary Clarifier Skimmer Troughs	Poor	Secondary Treatment	Replace ⁽²⁾	Permit Compliance	In-kind replacement of skimmer troughs.	Applies to All Alternatives	Combination Insource / Outsource	\$140,000 ⁽³⁾
5	Digester Blowers	Good	Thickening, Digestion and Dewatering	Replace	Permit Compliance	In-kind replacement of digester blowers. Work completed in 2021-2022	Applies to All Alternatives	Completed	\$0
6	SCADA Upgrade	Moderate	I&C	Replace ⁽²⁾	Permit Compliance	Upgrade SCADA System. Incorporate new processes and alarms for MSD's treatment plant processes and lift stations into the existing backbone SCADA system. SCADA upgrades would eliminate the need to replace the annunciator panel.	Applies to All Alternatives	Outsourced	\$125,000 ⁽³⁾
7	Aeration Basin Blowers and Motors	Moderate	Secondary Treatment	Replace ⁽¹⁾	Permit Compliance	Electrical Rehabilitation Project. MSD work includes replacing motors with units suitable for use with VFDs, replace blowers and incorporate dissolved oxygen control. Consider replacing valves associated with each asset as part of this project.	Applies to All Alternatives	Outsourced	Included below
8	Distribution Panels by MCC2	Very Poor	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
9	MCC No. 1	Very Poor	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
10	Old ATS	Very Poor	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
11	Old Control and ADA Alarm Panel	Very Poor	I&C	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
12	Service and Metering Cabinet	Very Poor	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
13	Distribution Panels	Very Poor	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
14	IPS VFDs	Good	IPS	Replace ⁽¹⁾	Permit Compliance	VFDs are past their useful life and will be replaced as part of the rehabilitation project.	Applies to All Alternatives	Outsourced	Included below
15	Newer ATS	Good	Electrical	Replace ⁽¹⁾	Permit Compliance & Safety	Electrical Rehabilitation Project.	Applies to All Alternatives	Outsourced	Included below
Electrical Rehabilitation Project Cost									\$1,680,000 ⁽⁴⁾
Subtotal									\$2,058,000

Item No.	Asset Name	Condition Score	Process Area	Recommended Action	Driver	Recommended Scope	Project Pathway	Delivery Method	Estimated Cost
Urgent (Next 0-2 Years)									
16	Influent Wet Well, Gate and Channels	Poor	IPS	Repair/ Rehabilitation	Permit Compliance & Safety	Replace influent gate and stop plates. Perform concrete repair on channels, side of frame and grating supports. There is a lot of corrosion, and this area should be monitored carefully until repaired due to safety concerns. Install or rehabilitate floor coating to protect concrete.	Applies to All Alternatives	Outsource	\$141,000
17	Influent Grinders	Poor	IPS	Replace	Permit Compliance	Replace motor on Grinder 1, as it was not replaced with Grinder 1 in 2021. Replace Grinder 2 as it is past its useful life and corroded. Replace every 5-7 years.	Applies to All Alternatives	Insource	\$40,000
18	IPS Intermediate Level	Poor	IPS	Repair/ Rehabilitation	Permit Compliance	Pump baseplates and anchorage appear to be insufficient and should be monitored until they are replaced. Perform concrete repair, replace corroded piping and hatches, and replace/rehabilitate concrete coating to protect it from the corrosive environment.	Applies to All Alternatives	Combination Insource & Outsource	\$65,000
								Subtotal	\$246,000
Priority (Next 3-5 Years)									
19	Aeration Basins and Secondary Clarifiers	Moderate to Poor	Secondary Treatment	Additional Assessment		Perform petrographic testing of concrete to rule out cracking due to ASR.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$10,000
20	Aeration Basins and Secondary Clarifiers	Moderate to Poor	Secondary Treatment	Additional Assessment		Perform seismic evaluation to identify deficiencies in structural components such as overstressed beams.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$40,000
21	Digester Blower Building	Moderate	Thickening, Digestion and Dewatering	Additional Assessment		Perform seismic analysis building to verify the capacity of the wall-to-room diaphragm connection and any other seismic deficiencies.	Applies to All Alternatives	Outsource	\$20,000
22	Control and Administration Building	Moderate	Administration	Additional Assessment		Perform seismic analysis of building.	Applies to All Alternatives	Outsource	\$20,000
23	Ocean Outfall	Poor	Piping	Additional Assessment		Perform assessment to determine condition of the outfall. This will help to correlate condition to age and better plan for the timing and extent of repairs/rehabilitation.	Applies to All Alternatives	Outsource	\$15,000
24	CCB Flash Mixers	Moderate	Disinfection	Replace	Permit Compliance	Replace flash mixers, supports and anchors. Continue to monitor corrosion.	Applies to All Alternatives	Insource	\$105,000 ³
25	Storage Canopy	Poor	Structural	Replace		Replace canopy due to corrosion, coating failure, seismic concerns, and impact damage.	Applies to All Alternatives	Outsource	\$120,000
26	Lighting	Very Poor	Electrical	Replace	Safety	Replace lighting with LED lighting.	Applies to All Alternatives	Insource	\$25,000 ³
27	Secondary Clarifiers (Mechanical)	Moderate	Secondary Treatment	Replace	Permit Compliance	Replace drives, chains and scrapers. Drives are past their useful life, so monitor closely for deterioration. Chains and scrapers are expected to be at the end of their useful life in approximately 10 years.	Applies to All Alternatives	Outsource	\$290,000
								Subtotal	\$645,000

Item No.	Asset Name	Condition Score	Process Area	Recommended Action	Driver	Recommended Scope	Project Pathway	Delivery Method	Estimated Cost
Short-Term (Next 6-10 Years)									
28	Influent Grinders	Poor	IPS	Replace	Permit Compliance	Replace Grinders every 5-7 years as needed due to corrosion.	Applies to All Alternatives	Insource	\$50,000
29	Belt Filter Press	Good	Thickening, Digestion and Dewatering	Replace		Replace belts every 6-7 years as needed due to typical wear.	Applies to All Alternatives	Insource	\$5,000 ³
30	IPS Pump Room (Basement)	Moderate	IPS	Repair/Rehabilitate	Permit Compliance	Repair concrete as needed in basement pump room. Install or rehabilitate coating to protect concrete from corrosive environment.	Applies to All Alternatives	Outsource	\$40,000
31	Froth Sprayer Pumps & Motors	Moderate	IPS	Replace		It is anticipated that the froth sprayer pumps and motors will not be replaced. The plan water pumps would be able to be plumbed into the froth sprayers. Minor cost for modifications	Will not be replaced	Insource	\$5,000 ³
32	Influent Meter Vault, Sump Pump and Flow Meter	Moderate	IPS	Replace	Permit Compliance	Monitor pump and flow meter condition and replace when condition deteriorates.	Applies to MSD NPR or DPR. May apply to Carp and SB	Insource	\$30,000 ³
33	Aeration Basins (Structure)	Moderate to Poor	Secondary Treatment	Repair	Permit Compliance	Repair cracks with epoxy or polyurethane resin injection system. Repair damaged concrete (exposed aggregates and embedded items) with structural repair material. Repairs to entire structure (struts, walkways, walls, etc.). Perform recommended repairs per the Petrographic Testing and Seismic Evaluation. This estimate is a "place holder" cost and assumes that ASR is not detected in the concrete structures.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$220,000
34	Secondary Clarifiers (Structures & Gates)	Moderate to Poor	Secondary Treatment	Repair/ Replace	MBR	Repair damaged concrete with structural repair material. Replace failed coating system. Replace corroded gates. Perform recommended repairs per the Petrographic Testing and Seismic Evaluation. This estimate is a "place holder" cost and assumes that ASR is not detected in the concrete structures.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$400,000
35	CCB	Moderate	Disinfection	Rehabilitation	Permit Compliance	Repair cracks in concrete and replace liner.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$90,000
36	Sodium Bisulfite Storage Facility	Moderate	Disinfection	Replace	Permit Compliance	Replace tank and mechanical components. Repair concrete and replace concrete coating. An alternative is to have chemical supplier install tank but chemicals must be purchased from supplier. Evaluate cost/benefit to owning tank vs supplier owned tank prior to replacing tank. Cost assumes chemical supplier will install new tank.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$61,250 ³
37	Chemical Storage Canopy	Moderate	Disinfection	Replace	Permit Compliance	Recommend replacement of canopy with storage facility/tanks. Monitor condition until replaced.	Applies to All Alternatives	Outsource	\$120,000
38	RAS/WAS Dry Well	Moderate	RAS/WAS System	Replace	Permit Compliance	Replace steel tube supports for the cover beams. Replace concrete pads, metal skid and anchors for the pumps.	Applies to MSD NPR or DPR	Outsource	\$80,000
39	RAS/WAS VFDs	Good	RAS/WAS System	Replace	Permit Compliance	Replace at end of useful life.	Applies to MSD NPR or DPR	Outsource	\$43,750 ³

Item No.	Asset Name	Condition Score	Process Area	Recommended Action	Driver	Recommended Scope	Project Pathway	Delivery Method	Estimated Cost
40	TWAS Pumps and Motors	Moderate	Thickening, Digestion and Dewatering	Replace		Frequent replacement of wear plates and internals are needed and believed to be due to grit and debris. Perform a cost/benefit analysis to determine if cost to continue to repair current rotary lobe pumps is the best alternative, versus replacing with new progressive cavity pump or grit removal. Continue maintaining pumps as needed. Cost estimate assumes replacement of wear plates, not pumps.	Applies to MSD NPR or DPR	Insource	\$20,000 ³
41	MCC No. 3 (Digester Blower Room)	Very Poor	Thickening, Digestion and Dewatering	Replace	Permit Compliance	Replace MCC. Past its useful life and obsolete. Staff reported no issues. Monitor and replace sooner if needed.	Applies to MSD NPR or DPR	Outsource	\$150,000
42	Control & Administration Building	Moderate	Administration	Repair	Safety	Repair building per seismic evaluation recommendations. This is a placeholder value. Reevaluate after seismic evaluation is performed and deficiencies are known.	Applies to All Alternatives	Outsource	\$150,000
43	Digester Blower Motors	Good	Thickening, Digestion and Dewatering	Replace	Permit Compliance	Replace digester motors. These were not replaced when the blowers were replaced.	Applies to MSD NPR or DPR	Insource	\$20,000
44	Digester Blower Building	Moderate	Thickening, Digestion and Dewatering	Repair	Safety	Repair building per seismic evaluation recommendations. This is a placeholder value. Reevaluate after seismic evaluation is performed and deficiencies are known.	Applies to MSD NPR or DPR	Outsource	\$100,000
45	Air Diffuser System	Poor	Secondary Treatment	Replace	Recycled Water	Continue to maintain system until a decision is made on future of plant. If secondary process remains as-is for the long-term, consider the following changes: re-route exhaust of foul air from IPS wet well so that it no longer goes to aeration blowers and diffusers; replace air distribution header and drop legs and evaluate the ability to use fewer than 7 drop legs (i.e., 2 or 3 may be sufficient); replace diffusers with fixed type diffusers that provide full coverage along the floor (not along one side only). The current flexible tube diffusers are not as efficient as other fixed tube, disc, or panel designs.	Applies to MSD NPR or DPR	Outsource	\$720,000
46	Sodium Hypochlorite Storage Facility	Poor	Disinfection	Repair/ Replace	Permit Compliance	Replace tank and all mechanical components. Repair concrete and replace concrete coating. An alternative is to have chemical supplier install tank but chemicals must be purchased from supplier. Evaluate cost/benefit to owning tank vs supplier owned tank prior to replacing tank. Cost assumes chemical supplier will install new tank.	Applies to MSD NPR or DPR	Outsource	\$61,250 ³
Subtotal									\$2,439,250
Mid-Term (Next 11-20 Years)									
47	Influent Grinders	Poor	IPS	Replace	Permit Compliance	Replace Grinders every 5-7 Years as needed due to corrosion.	Applies to MSD NPR or DPR	Insource	\$50,000
48	IPS Pumps and Motors	Good	IPS	Replace	Permit Compliance	Replace pumps and motors. Consider replacement of pump suction and discharge valves with project.	Applies to MSD NPR or DPR. May apply to Carp and SB	Insource	\$80,000 ³
49	Influent Dry Well Sump Pump	Good	IPS	Replace	Permit Compliance	Replace pump and motor.	Applies to All Alternatives	Insource	\$2,000 ³
50	Plant Water Pumps and Motors	Good	IPS	Replace		Replace pumps and motors and install new equipment baseplates. Monitor pump anchorage and equipment baseplates until replaced, especially if there is a change such as a seismic event or pump vibration. Consider replacing valves (isolation, suction, gate, check and drain) with project.	Applies to MSD NPR or DPR	Insource	\$30,000 ³
51	IPS Control Panel	Good	IPS	Replace	Permit Compliance	In-kind replacement due to end of useful life.	Applies to All Alternatives	Outsource	\$110,000

52	Back-Up Generator	Good	IPS	Replace	Permit Compliance	Prior to replacement, evaluate sizing. Monitor closely when generator nears its end of useful life, as this is the only form of redundancy for the WWTP during a power outage.	Applies to MSD NPR or DPR. May apply to Carp and SB	Outsource	\$100,000 ³
53	Emergency Distribution Panel	Good	IPS	Replace	Permit Compliance	Recommend replacement with back-up generator. While in good condition, this panel is the only form of redundancy for the WWTP during a power outage.	Applies to All Alternatives	Outsource	\$30,000
54	MCC No. 4	Good	IPS	Replace	Permit Compliance	Replace at end of useful life. This MCC may be able to be eliminated once IPS the new IPS control panel is installed (MCC No. 1)	Will not be replaced		\$0
55	CCB Sample Pumps	Good	Disinfection	Replace	Permit Compliance	Replace at end of useful life.	Applies to MSD NPR or DPR	Insource	\$5,000 ³
56	RAS/WAS Wet Well Pump	Moderate	RAS/WAS System	Replace	Permit Compliance	Replace pump, motor, and replace skid, concrete pad and anchors.	Applies to MSD NPR or DPR	Insource	\$40,000
57	RAS Pumps and Motors	Good	RAS/WAS System	Replace	Permit Compliance	Replace due to end of useful life.	Applies to MSD NPR or DPR	Insource	\$100,000 ³
58	Aerobic Digester	Good	Thickening, Digestion and Dewatering	Replace		Replace at end of useful life.	Applies to MSD NPR or DPR	Outsource	\$200,000 ³
59	Belt Filter Press	Good	Thickening, Digestion and Dewatering	Replace		Replace belt filter press due to end of useful life.	Applies to MSD NPR or DPR	Outsource	\$400,000
60	Ocean Outfall	Poor	Piping	Repair	Permit Compliance	Repair unsupported span of pipe, replace tide-flex valves and perform internal repairs/rehabilitation per outfall condition assessment. This is a placeholder cost and must be reevaluated after the outfall condition assessment is complete.	Applies to MSD NPR or DPR	Outsource	\$350,000
61	MCC No. 2	Good	Electrical	Replace	Permit Compliance	MCC2 is located outside and is well maintained. It is past its useful life but performing well. Monitor performance and replace sooner if needed.	Applies to MSD NPR or DPR	Outsource	\$150,000
62	MCC2 Control Panel	Good	I&C	Replace	Permit Compliance	MCC2 control panel is past its useful life. Monitor and replace sooner if needed.	Applies to MSD NPR or DPR	Outsource	\$100,000
56	RAS/WAS Wet Well Pump	Moderate	RAS/WAS System	Replace	Permit Compliance	Replace pump, motor, and replace skid, concrete pad and anchors.	Applies to MSD NPR or DPR	Insource	\$40,000
57	RAS Pumps and Motors	Good	RAS/WAS System	Replace	Permit Compliance	Replace due to end of useful life.	Applies to MSD NPR or DPR	Insource	\$100,000 ³

Long Term (20+ Years)									
63	Influent Grinders	Poor	IPS	Replace	Permit Compliance	Replace Grinders every 5-7 Years as needed due to corrosion.	Applies to MSD NPR or DPR	Insource	\$50,000
65	Rotary Micro Screen	Excellent	Thickening, Digestion & Dewatering	Replace		The rotary drum thickener and feed pump were replaced in 2020. Replace at end of useful life.	Applies to MSD NPR or DPR	Insource	\$60,000 ³
66	DAFT	Excellent	Thickening, Digestion & Dewatering	Rehabilitate		Continue to monitor for rust on stainless steel supporting piping. Cost estimate is based on overhaul components of DAFT (pumps and piping), not replacement.	Applies to MSD NPR or DPR	Insource	\$100,000 ³
67	Polymer Mix Area	Excellent	Thickening, Digestion & Dewatering	Replace		Assumed to be in excellent condition due to its age (installed in 2018). Replace at end of useful life.	Applies to MSD NPR or DPR	Insource	\$20,000 ³
68	WAS Pump and Motor	Moderate	RAS/WAS System	Replace	Permit	In-kind replacement of WAS pump and motor and base piping. The pump and motor were purchased in a previous budget year and will be installed by MSD staff. No anticipated cost in 2022.	Applies to MSD NPR or DPR	Insource	\$10,000 ³
69	RAS Dry Well Sump Pump	Very Poor	RAS/WAS System	Replace	Permit Compliance	In-kind replacement of RAS dry well sump pump and control panel. The pump and control panel have been purchased and will be installed by a local contractor. No anticipated cost in 2022.	Applies to MSD NPR or DPR	Insource	\$40,000 ³
70	Secondary Clarifier Skimmer Troughs	Poor	Secondary Treatment	Replace	Permit Compliance	In-kind replacement of skimmer troughs.	Applies to MSD NPR or DPR	Combination Insource/ Outsource	\$140,000 ⁽³⁾
71	Digester Blowers	Good	Thickening, Digestion & Dewatering	Replace	Permit Compliance	In-kind replacement of digester blowers.	Applies to MSD NPR or DPR	Insource	\$40,000 ³
72	Aeration Basin Blowers and Motors	Moderate	Secondary Treatment	Replace	Permit Compliance	Electrical Rehabilitation Project. MSD work includes replacing motors with units suitable for use with VFDs, replace blowers and incorporate dissolved oxygen control. Consider replacing valves associated with each asset as part of this project.	Applies to MSD NPR or DPR	Insource	\$100,000 ³
	ATS Replacement	Good	Electrical	Replace	Permit Compliance	Replace due to end of useful life	Applies to MSD NPR or DPR	Outsource	\$35,000 ³
Subtotal									\$595,000
Total									\$7,730,250

Notes:

Abbreviations: IPS - Influent Pump Station; RAS - return activated sludge; WAS - waste activated sludge; SCADA - supervisory control and data acquisition; I&C - instrumentation and control, MCC - motor control center; ATS - automatic transfer switch; ADA- Automatic Dialer Alarm; CCB - chlorine contact basin; LED - light-emitting diode; TWAS - thickened waste activated sludge; DAFT - dissolved air floatation thickener.

- (1) Scheduled for replacement as part of 2022 Electrical Project.
- (2) Scheduled for replacement in 2022 by MSD.
- (3) Estimated cost provided by MSD.
- (4) Estimated cost for electrical rehabilitation project in 2022.

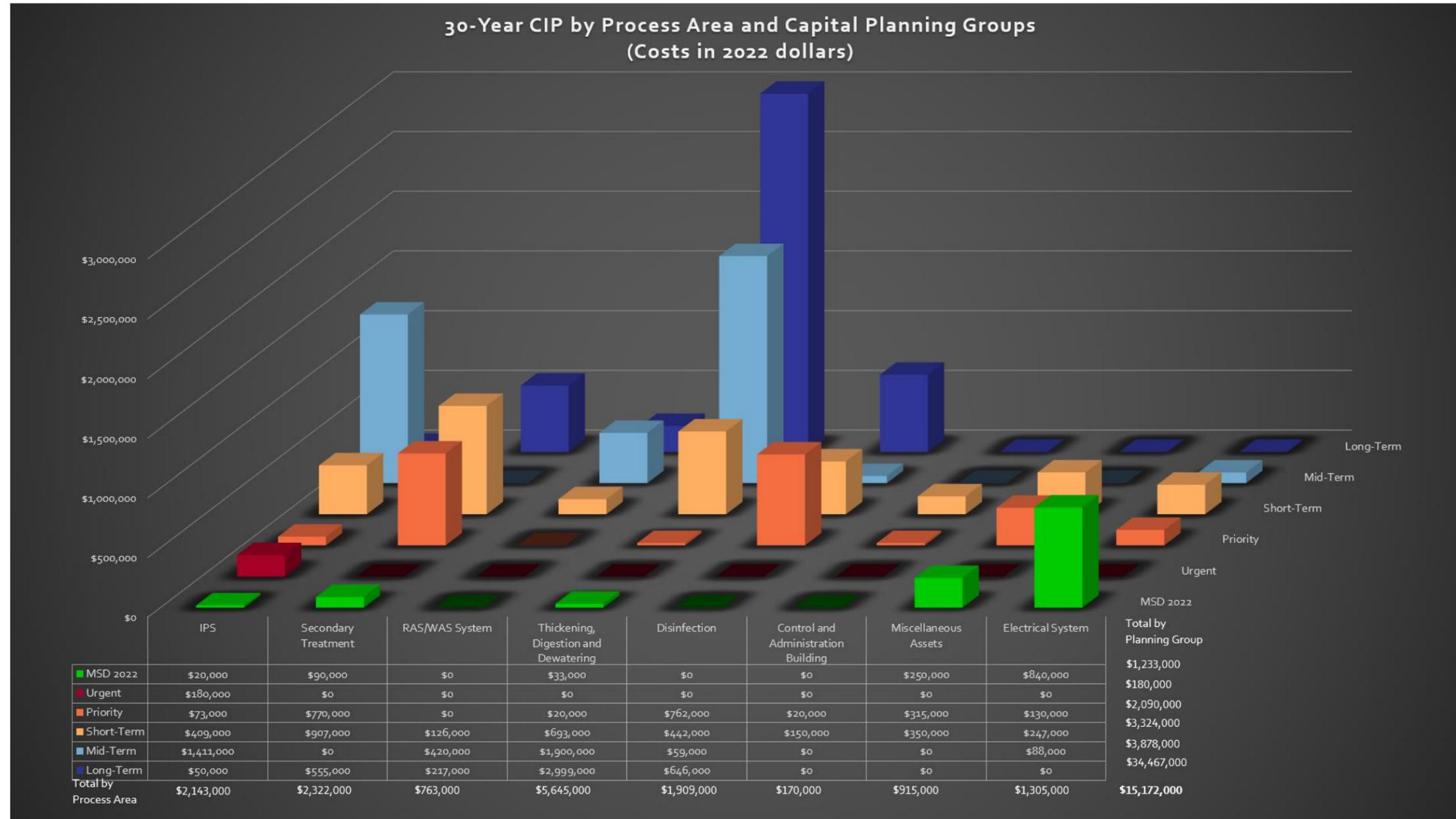


Figure 5.2 30-Year CIP by Process Area and Capital Planning Groups

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5.5 Operational Costs

MSD provided their Operational and Maintenance (O&M) expenditures for Wastewater Treatment for the previous three fiscal years. Table 5-5 summarizes operational expenses for Treatment by fiscal year.

Table 5-5. Summary of Treatment Operational Expenditures

Expense Category	Fiscal Year 2019-20	Fiscal Year 2020-21	Fiscal Year 2021-22
Salaries and Benefits	\$1,254,226	\$1,172,050	\$1,043,215
Chemicals	\$205,091	\$165,496	\$178,430
Electricity	\$121,519	\$129,714	\$116,794
Covid-19 Expenses	\$135,499	\$135,499	\$34,847
Other	\$368,460	\$354,826	\$413,999
Total	\$2,084,795	\$1,957,585	\$1,787,285

The following observations were made regarding the operational expenses:

- **Salaries and Benefits:** A decrease of over \$200,000 was observed over the past three fiscal years. Most of the decrease was observed in regular salaries (\$100,000) and Calpers contribution (\$72,000). This was largely attributed to staff retirements and is expected return to Fiscal Year 2019-20 levels.
- **Chemicals:** Chemical expenditures decreased significantly and is attributed to Covid-19. These costs are expected to return to post Covid-19 levels.
- **Electricity:** Similar to chemicals, electricity expenditures were reduced during the Covid-19 pandemic. These costs are expected to return to post Covid-19 levels.
- **Covid-19 Expenses:** This was a new category used to additional expenses incurred by MSD during the pandemic such as portable bathrooms.
- **Other Expenses:** This category represents all of the other treatment expenditures as one lump sum. In general, it has remained relatively consistent with some outlier expenses that may be contributed to special projects and the Covid-19 pandemic.

5.6 The following categories were reviewed with the following recommendations:

Other Considerations

The following items were discussed with MSD and should be considered as appropriate:

5.6.1 Electrical System

- **Load Analysis.** If there is a future expansion, it is recommended to perform a load analysis. It appears the service size has increased one time in the past, but if MSD wants to increase the nominal capacity of the plant, an electrical load analysis would be beneficial.

- **Arc-Flash Study.** The arc flash labels are old and not code compliant. It is recommended to do a new arc-flash study that could be part of the upcoming electrical project.
- **Ungrounded Electrical System.** There was a discussion to add variable frequency drives (VFDs) to the blower pumps, but it was not recommended due to ungrounded electrical system. It is recommended to do an electrical study and find solutions to add VFDs for the blowers; however, updating the system to a grounded system is recommended.

5.6.2 Electrical Project (2022)

During the November 2021 condition assessment, MSD staff reviewed the major elements of the upcoming electrical project. Prior to bidding the electrical project, it is recommended that MSD review and update the project plans and specifications to address potential safety hazards, bring the documents up to industry standards, provide additional details for constructability, contractor pricing, and ability to operate the WWTP during construction.

5.6.3 Computerized Maintenance Management System (CMMS)

MSD has a “skeleton” CMMS for the WWTP asset inventory and maintenance history; however, it does not appear that it has been used regularly since 2016. There does not appear to be any type of CMMS for the collection system, but some data may be stored in the geographic information system.

It is recommended that MSD consider its approach for asset management. At a minimum, MSD should consider investing in a CMMS for its horizontal and vertical assets. Vertical assets are typically above ground assets and generally consist of assets found at water and wastewater facilities, whereas horizontal assets include the various pipelines, manholes, and cleanouts that make up MSD’s collection system. A CMMS would allow staff to track maintenance history, and assist with planning and decision making for future capital improving program replacement or rehabilitation of assets.

5.7 Annual Capital Funding

As of the start of Fiscal Year 2022-23, MSD has a balance of approximately \$7.4 million (M) in its CIP account to fund future collection, treatment, and facilities projects. Annually, the District adds approximately \$1.2 M from rate revenue into the CIP account to fund its capital improvement projects. Currently, MSD anticipates allocating between \$750,000 and \$1M from that portion of the CIP funds for WWTP projects as “pay as you go” funding. Using this information, Figure 5.3 shows how each CIP project could be constructed based on MSD current funding levels.

MSD is planning a rate study in the next year to assess the adequacy of its rates and funding for operational and CIP goals. The expected capital funding requirements in Figure 5.3 will be useful during the rate study to identify any deficiencies in the District’s 30-year capital improvement funding requirements and where rate adjustments or supplemental funding sources (bonds, loans, grants) will be needed to supplement the current “pay as you go” CIP funding strategy.

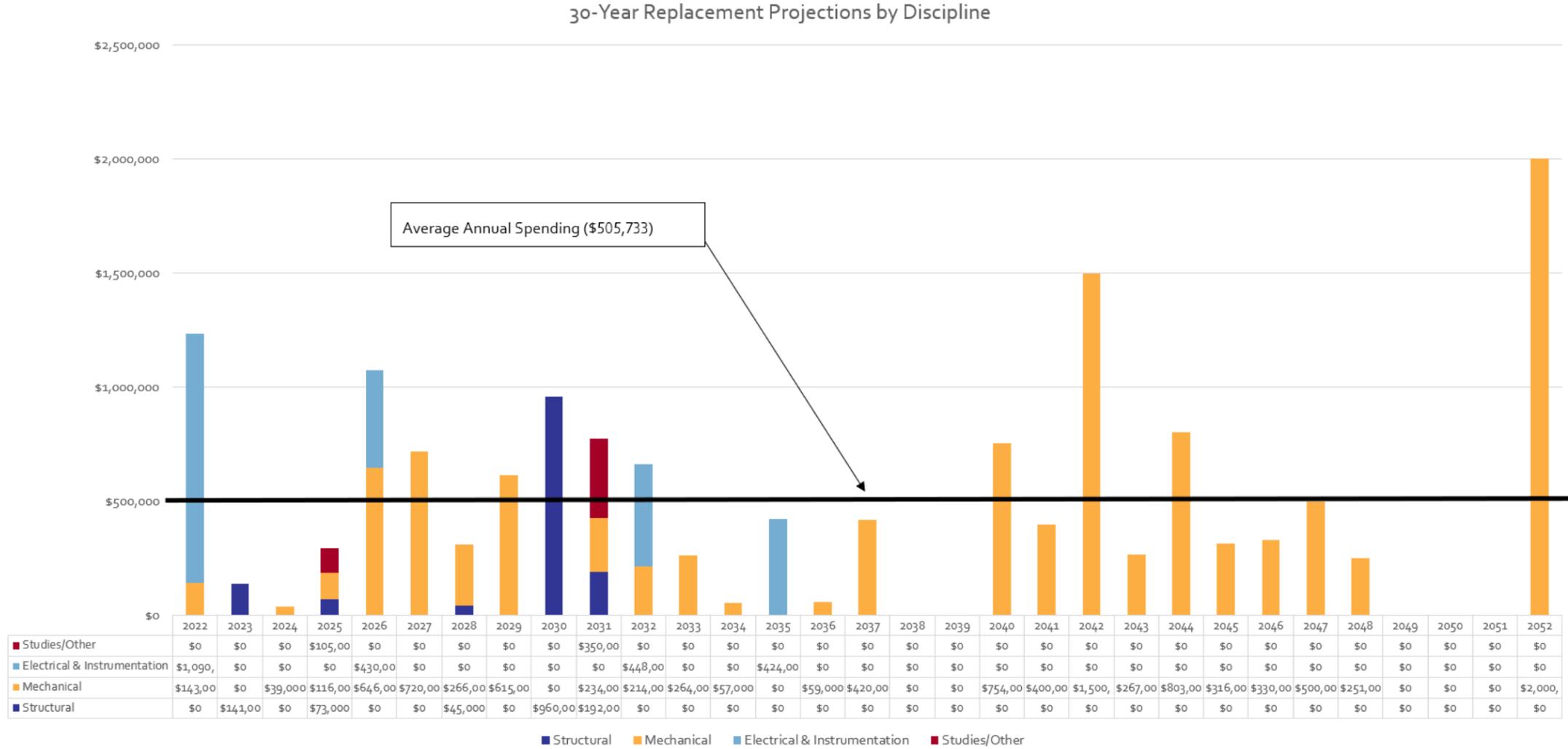


Figure 5.3 30-Year Replacement Projections

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5.8 Conclusion

This TM presents the 30-year CIP and Operational costs for MSD. It is estimated that MSD will need to implement approximately \$7.7M of capital improvements over the next 30 years to maintain current treatment and operations at the plant, of which, approximately \$3M will occur within the next 10 years. Several additional studies are recommended to further evaluate the aeration basins, clarifiers, select buildings and the ocean outfall. Pending the results, the capital cost could increase.

It is recommended that MSD determine the outcome of its wastewater, whether it will be treated at another regional facility or continue to be treated at MSD, prior to undergoing the additional assessments. If it is determined that MSD effluent will be treated at another facility, MSD will need to implement the necessary capital improvements to maintain treatment and operations for the next 10 years until such time the legal, permitting, and logistical challenges are overcome.

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