2022
CAPITAL IMPROVEMENTS PLAN
DRAFT July 15, 2021

TABLE OF CONTENTS

INTRODUCTION AND OVERVIEW

INTRODUCTION

The District's Capital Improvements Plan (CIP) is updated each year prior to development of the annual budget. The CIP contributes to District planning and budgeting in the following ways:

- Identifies capital projects that are needed to keep the District's assets in good working order and meet capacity needs.
- Analyzes and describes projects in detail in individual business cases, including needs, alternatives, costs and timeframes for planning, design and construction.
- Identifies potential large spending requirements for future years and incorporates them into financial planning as needed.
- Estimates costs for a six-year time period using the best information available.
- Arranges project timelines to balance urgency, resources and coordination requirements.
- Prepares a financing plan to balance use of debt, financial resiliency and impacts on service charges.
- Proposes an annual capital budget for the succeeding year.

For projects toward the end of the six-year time frame, costs and schedules are generally less developed. Details of projects in the first one to three years are more precisely known. Many of the early period projects are underway, and their costs have been committed to by contract. Annual CIP updates allow the District to have more precise spending and work plans in the short term and prepare for potential large work and financial issues over the longer term.

Information on specific projects in the CIP can be found in the project summaries in Appendix A. These project summaries describe the scope, need, cost and schedule for each project. More detailed descriptions of each project are included in business cases.

A brief discussion of recently completed projects can be found in Appendix B, along with the status of maintenance retainers for recently completed or soon-to-be-completed projects. Appendix C includes a discussion about risk management for some of the projects in the District's conveyance system. This appendix is intended to provide additional information regarding the relative priority of the various projects in the conveyance system.

OVERVIEW AND HIGHLIGHTS

Capital expenditures for 2022 focus on the rehabilitation of existing assets at the treatment plant and in the conveyance system to extend their useful life. Some of the major construction activities and equipment purchases in 2022 include the following:

- Rehabilitating the HVAC system in the Gravity Belt Thickening Building.
- Continuing work on replacement of the District's maintenance, financial and human resources systems.
- Rehabilitating the Northeast Interceptor (Truax Extension) along U.S. Highway 151 between Pumping Station 13 and Lien Road.

- Installing a relief sewer for the West Intercepting System along University Avenue between Marshall Court and University Bay Drive in the City of Madison.
- Rehabilitating Pumping Station 4 in the City of Madison.
- Rehabilitating Pumping Station 13 and Pumping Station 14 in the City of Madison.

Smaller construction projects in 2022 include the following:

- Repairing and restoring the Badfish Creek effluent channel near Grass Lake in the Town of Dunn.
- Grouting pipe joints on the Northeast Interceptor from Pumping Station 10 to State Highway 30.
- Pavement rehabilitation and process tank coating and repair at the treatment plant.

In addition to construction, many projects will be under design in 2022. At the treatment plant, the design of repairs to the air piping in the East Primary Influent Channel and to the flow splitter structure at the Headworks Building will begin. Design work is also expected to start on the testing of a new low- dissolved oxygen process for the secondary treatment system.

For the interceptor system, design will begin for the first phase of capacity improvements to the Waunakee Extension of the Northeast Interceptor and for the rehabilitation of the Southeast Interceptor in the Village of McFarland. Design work is also expected to begin in the second half of 2022 for the final two phases of the Lower Badger Mill Creek Interceptor extension between County Highway PD and Midtown Road.

Related to the Lower Badger Mill Creek Interceptor extension, the design of downstream capacity improvements will be ongoing in 2022 at Pumping Station 17 and for the second phase of the Pumping Station 17 Relief Force Main. These improvements must be in place prior to diverting flow north of Midtown Road to the new interceptor.

Significant planning work will also continue in 2022. The 2020 Energy Management Master Plan, to be completed in the fall of 2021, is expected to recommend significant improvements to the District's energy-producing infrastructure and to the way that biosolids are processed and handled in the future. Facility planning in 2022 will investigate options for upgrading cogeneration facilities if the District wishes to keep producing energy with its biogas and for producing biogas of pipeline grade quality for distribution and sale. With regards to the biosolids program, the District is evaluating transitioning from a liquid biosolid that is land applied to a cake, or dried product. This transition would be expected to take upwards of 10 years to complete and would involve several intermediate testing and planning steps. Work in 2022 will focus on testing different technologies for development of a cake product and initial study to see if a market exists for such a product.

Other planning work in 2022 involves completion of the Collection System Facilities Plan Update. This document will be used to guide and prioritize the selection of conveyance system projects for future CIPs. A new planning project in 2022 concerns the use of District properties. Many of the District's long-range goals and initiatives will require more assets and possibly more space. Examples include additional land for biosolids processing and possible tertiary treatment for chlorides and/or phosphorus. A space needs study of all District properties will be performed in 2022 and 2023 to provide a plan for how the District should best utilize its existing assets and what future assets may be required.

A contractor prepares to weld together components outside the Headworks Building as part of the modifications to the influent force mains to this facility.

CONFORMANCE WITH ADOPTED PLANS AND PROGRAMS

The 2022 CIP assumes that capital projects will be in conformance with the recommendations of the District's 2009 50-year Master Plan regarding centralized treatment. The plan recommends that the District continue to treat all wastewater from its service area at the Nine Springs Wastewater Treatment Plant and to return a portion of the effluent to Badger Mill Creek. As such, none of the projects in the CIP assume that a satellite treatment facility will be located anywhere in the District's service area in the foreseeable future.

While the 50-year Master Plan provides long-term guidance, shorter-term planning is required to assess the condition and capacity of the District's systems and assets. The District relies upon facility planning efforts, its asset management program and other planning efforts to help direct annual updates to its CIP. The following planning efforts provide the most significant guidance to the District's annual capital improvements planning.

Collection System Facilities Plan

Last updated in 2011, the Collection System Facilities Plan provides a list of recommended capital improvements to the District's collection system. The Capital Area Regional Planning Commission updated its 2009 evaluation of the District's collection system capacity in 2017 and 2018. This update will in turn allow the District to update its Collection System Facilities Plan, currently scheduled for completion in 2022.

Solids Handling Facilities Plan

This Solids Handling Facilities Plan formed the basis for work constructed during the Eleventh Addition to the plant. This addition, completed in 2014, provided a comprehensive update to the treatment plant's solids handling processes. This work should allow the plant to meet solids loadings for the next 20 years. As such, solids handling is not a primary focus of the 2022 CIP.

Liquid Processing Facilities Plan

While the Solids Handling Facilities Plan investigated the plant's solids streams and processes, the Liquid Processing Facilities Plan reviewed the plant's liquid streams and processes. This facilities plan was substantially completed in 2017 and included multiple projects that will address the plant's liquid processing needs. It is assumed that the 17 projects identified in the facilities plan will be combined into separate bid packages that will be constructed in multiple phases over the next 10 to 15 years. The first phase of projects was bid in 2019 and will be completed in the second half of 2021. Subsequent capital improvement plans will identify the timing and phasing of the remaining projects based on project need, staff workload and the District's financial situation.

Energy Management Master Plan

Brown and Caldwell and Strand Associates performed an energy study in 2014. This plan builds on that study by taking a comprehensive look at how the District is currently using energy and creating a roadmap for how to manage energy in the future. The study, conducted by Carollo Engineers, places an emphasis on how to select projects and optimize energy use as critical pieces of equipment are replaced in the coming years, such as the gas-driven electrical generators and the associated hot water system. It is expected that projects related to heat and power improvements, biosolids processing and miscellaneous energy enhancements will be recommended for further study and facilities planning when the report is finalized in the fall of 2021.

Asset Management Program

The CIP is informed by the District's asset management program. Asset management contributes to capital planning by evaluating the condition and criticality of District assets, implementing proper maintenance processes to extend asset life and providing data on asset repair and replacement needs. The District's program began in 2011, received an updated framework in 2016, and received an updated plant asset management plan in 2019. Next steps in the program include further improving maintenance practices, improving asset data and implementing a new computerized maintenance management system to provide better information for planning.

2022 CAPITAL PROJECTS BUDGET OVERVIEW & SUMMARY

This section discusses the District's 2022 capital budget. The capital budget sets spending limits on a per-project basis and total annual spending basis. Spending on individual projects is limited to the authorized total project cost. Individual project spending can and does vary by year, as long as the total cost is not exceeded over the life of the project. Spending on all capital projects combined in the budget year is limited to the total amount authorized. The annual total budget limit is set for the current year only. Future year spending totals in the CIP are estimates.

The tables in this section list proposed total project cost authorizations, annual expenditures by project and loan proceeds. Financial matters, including fund balances and use of debt, are discussed in the section on capital finance.

TOTAL PROJECT COSTS SUMMARY

Table CIP-1A lists total project costs. In accordance with Commission policy ATT-2 on development of the capital budget, each year the Chief Engineer and Director is required to submit to the Commission a list of total project costs for all previously approved projects and for all projects new to the proposed budget. This table also includes total costs for those projects that are included in the six-year Capital Improvements Plan. For each project the total project cost of the current budget year is compared to that of the preceding year. A similar table will be provided as part of the annual capital budget.

Table CIP-1B provides a breakdown of total project costs for projects that were authorized in previous capital improvements plans but were subsequently combined, or bundled, into a single consolidated project for bidding and construction purposes. This table is provided for informational purposes per Commission policy, although only the total cost of the consolidated project is used for cost control purposes.

ANNUAL BUDGETS AND EXPENDITURES SUMMARY

Table CIP-2 lists annual expenditures by project. Table CIP-3 shows total annual budgets for 2020-2022, with actual and estimated spending for 2020 and 2021, respectively. For 2020, actual expenditures were $25.5 million, well below the budgeted amount of $44.1 million. The primary reasons for this were that the Pumping Station 13 and 14 Rehabilitation and West Interceptor – Shorewood Relief projects did not start in 2020 as assumed in the 2020 Capital Budget. Small delays to both projects caused the expenditures for construction to be deferred to 2021 and 2022.

Expenditures for 2021 are estimated to be $28.1 million. This is below the budgeted value of $39.9 million by $11.7 million. Expenditures for 2021 are lower than anticipated due to more spending on the Liquid Processing Improvements (Phase 1) project in 2020 than projected. Also, the construction bid for the West Interceptor – Shorewood Relief (Phase 1) project was significantly less than the amount included in the budget.

LOAN REVENUES SUMMARY

Table CIP-4 provides a summary of loan revenues by project(s). Preceding year values are actual disbursements received from the State of Wisconsin's Clean Water Fund for projects under construction or recently completed. Current year and subsequent year values are estimates based on the District's financing needs.

As shown in the table, the District received $24.4 million in loan proceeds from the Clean Water Fund in 2020. Similar levels of borrowing are estimated for 2021 and 2022. Additional discussion of debt is included in the capital finance section.

TABLE CIP-1A | Total Project Cost Authorizations

Subprojects shown in separate table as noted		Has Subprojects	Authorization in 2021 Plan	Proposed Authorization in 2022 Plan	Change in Authorization	
TREATMENT PLANT			**$90,721,000**	**$202,857,000**	**$112,136,000**	**124%**
A01	East Primary Influent Channel Air Piping Replacement			793,000		n/a
A02	Lagoon Dikes Improvements		2,109,000	2,046,000	(63,000)	-3%
A03	Flow Splitter Improvements			2,252,000		n/a
A04	Maintenance, Financial and HR Systems		4,373,000	5,660,000	1,287,000	29%
A05	Plant HVAC Improvements		838,000	4,367,000	3,529,000	421%
A06.1	Low Disssolved Oxygen (Partial Plant)		2,791,000	3,171,000	380,000	14%
A06.2	Low Dissolved Oxygen (Full Plant)		24,246,000	18,015,000	(6,231,000)	-26%
A07	West Blower Replacements		11,151,000	12,540,000	1,389,000	12%
A08.1	Heat and Power Improvements			40,405,000		n/a
A08.2	Biosolids Processing			57,755,000		n/a
A08.3	Miscellaneous Energy Projects			7,154,000		n/a
A09	Shop One Interior Renovations			105,000		n/a
A10	East and West Blower Switchgear		2,624,000	2,623,000	(1,000)	0%
A11	15 kV Electrical Service Replacement		3,093,000	3,098,000	5,000	0%
A12	Headworks Screening		4,109,000	4,246,000	137,000	3%
A13	Septage Receiving Modifications		3,502,000	3,832,000	330,000	9%
A14	Grit Processing Improvements			2,393,000		n/a
A15	Metrogro Applicators & Equipment		4,148,000	4,405,000	257,000	6%
A16	Annual Process Tank Coating and Repair		1,076,000	1,306,000	230,000	21%
A17	Annual Pavement Improvements		408,000	420,000	12,000	3%
A18	Minor Capital Improvements		726,000	746,000	20,000	3%
A19	Miscellaneous Treatment Plant Projects		562,000	560,000	(2,000)	0%
N/A	Badfish Creek Effluent Force Main Standpipe		175,000	175,000	-	0%
	Clarifier Stress Testing		130,000	130,000	-	0%
	Energy Management Master Plan		624,000	624,000	-	0%
	Engine Generator and Blower Control Panel Replacements		677,000	677,000	-	0%
	Final Clarifier 4, 5 and 6 Effluent Launder Trough Replacement		310,000	310,000	-	0%
	Headworks Flow Metering		2,291,000	2,291,000	-	0%
	Liquid Processing Improvements- Phase 1	*	16,818,000	16,818,000	-	0%
	Operations Building First Floor Remodel		2,050,000	2,050,000	-	0%
	Resource Recovery Facility		899,000	899,000	-	0%
	Shop One Site Improvements		200,000	200,000	-	0%
	2019 Treatment Plant Piping Improvements Project	*	791,000	791,000	-	0%

TABLE CIP-1A | Total Project Cost Authorizations (cont.)

Subprojects shown in separate table as noted		Has Subprojects	Authorization in 2021 Plan	Proposed Authorization in 2022 Plan	Change in Authorization	
INTERCEPTORS			**$73,867,000**	**$75,697,000**	**$1,830,000**	**2%**
B01	Northeast Interceptor Joint Grouting MH10-101 to MH10-106		309,000	307,000	(2,000)	-1%
B02.1	West Interceptor- Shorewood Relief (Phase 1)		7,906,000	4,915,000	(2,991,000)	-38%
B02.2	West Interceptor- Shorewood Relief (Phase 2)		2,429,000	1,756,000	(673,000)	-28%
B02.3	West Interceptor- Shorewood Relief (Phase 3)		4,311,000	4,679,000	368,000	9%
B03	NEI- Truax Extension Rehab (lining project)		5,991,000	6,025,000	34,000	1%
B04	NEI- Waunakee Extension Capacity Improvements (Phase 1)		7,133,000	7,948,000	815,000	11%
B05	NEI- FEI to SEI Rehab (lining project)		2,070,000	2,129,000	59,000	3%
B06	Lower Badger Mill Creek Interceptor- Phase 5		4,289,000	1,196,000	(3,093,000)	-72%
B07	Lower Badger Mill Creek Interceptor- Phase 6			3,082,000		n/a
B08	SEI Rehab- PS 9 to SEI-Dutch Mill Extension			1,796,000		n/a
B09	PS 6 to PS 10 Connector		7,097,000	7,100,000	3,000	0%
B10	NSVI Capacity Improvements- Phase 1		13,250,000	13,251,000	1,000	0%
B11	West Interceptor Rehab- Babcock Hall to Dayton Street			1,249,000		n/a
B12	District Flow Monitoring Stations			1,182,000		n/a
N/A	NEI- Truax Extension Relief		9,646,000	9,646,000	-	0%
	Northeast Interceptor Joint Grouting MH10-112 to MH10-106		304,000	304,000	-	0%
	NSVI Improvements-McKee Road to Dunn's Marsh		4,754,000	4,754,000	-	0%
	NSVI-Morse Pond Extension		2,300,000	2,300,000	-	0%
	Interceptor Rehabilitation- 2020	*	2,078,000	2,078,000	-	0%
PUMPING STATIONS AND FORCE MAINS			**$37,063,000**	**$50,011,000**	**$12,948,000**	**35%**
C01	Grass Lake Dike Stabilization		864,000	890,000	26,000	3%
C02	PS 4 Rehabilitaiton		5,328,000	5,481,000	153,000	3%
C03	PS 17 Rehabilitation		5,232,000	5,224,000	(8,000)	0%
C04	PS 17 Force Main Relief- Phase 2		4,276,000	4,961,000	685,000	16%
C05	PS 16 Force Main Rehabilitation		1,652,000	1,652,000	-	0%
C06	Emergency Power Generation at District Pumping Stations			8,429,000		n/a
C07	Miscellaneous Collection System Improvements		451,000	580,000	129,000	29%
C08	Force Main Condition Assessment			3,534,000		n/a
N/A	Automated Power Transfer at Pump Stations 10 and 11		268,000	268,000	-	0%
	PS 13 & PS 14 Rehabilitation	*	10,755,000	10,755,000	-	0%
	PS 17 Force Main Relief- Phase 1		3,490,000	3,490,000	-	0%
	PS 7 Improvements		4,247,000	4,247,000	-	0%
	PS 7 Force Main Emergency Repair		500,000	500,000	-	0%
CAPITAL BUDGET EXPENSES			**$2,954,000**	**$20,245,000**	**$17,291,000**	**585%**
D01	Capital Budget Expenses		334,000	334,000	-	0%
D02	Collection System Facilities Plan Update		206,000	206,000	-	0%
D03	Badger Mill Creek Phosphorus Compliance		1,499,000	19,345,000	17,846,000	1191%
D04[1]	Plan for District Properties		915,000	360,000	(555,000)	-61%
Grand Total			$204,605,000	$348,810,000	$144,205,000	70%

1 Project D04 was titled "Campus Space Master Plan" in the 2021 CIP

TABLE CIP-1B | ESTIMATED TOTAL SUBPROJECT COSTS FOR BUNDLED PROJECTS

Spending limits are at the bundled project level. Subproject amounts are estimates for information only.

	2021	Estimated 2022	Increase	
2019 Treatment Plant Piping Improvements Project	**$ 791,000**	**$791,000**	**-**	**0%**
Hot Water Piping Improvements	212,000	212,000	-	0%
W1 Piping Improvements	579,000	579,000	-	0%
Interceptor Rehabilitation - 2020	**$2,078,000**	**$2,078,000**	**-**	**0%**
NEI Relief Sewer and E. Johnson Street Relief Sewer Rehab	470,000	470,000	-	0%
West Interceptor- Spring Street Relief (lining project)	1,608,000	1,608,000	-	0%
Liquid Processing Improvements - Phase 1	**$16,818,000**	**$16,818,000**	**-**	**0%**
54 Inch Primary Influent Rehabilitation	870,000	662,000	(208,000)	-24%
East Blower Controls	424,000	727,000	303,000	71%
East-West Plant Flow Metering	167,000	1,848,000	1,681,000	1007%
Plant Peak Capacity Improvements	5,663,000	4,695,000	(968,000)	-17%
Plant Unit Substation Improvements	3,374,000	3,940,000	566,000	17%
Primary Tanks 1 and 2 Rehabilitation	490,000	1,055,000	565,000	115%
Process Control System Upgrade- Phase Two	1,634,000	1,112,000	(522,000)	-32%
UV Disinfection System Replacement	4,196,000	2,779,000	(1,417,000)	-34%
PS 13 & PS 14 Rehabilitation	**$10,755,000**	**$10,755,000**	**-**	**0%**
PS 13 Rehabilitation	5,480,000	5,480,000	-	0%
PS 14 Rehabilitation	5,275,000	5,275,000	-	0%

Amanda Wegner, communications and public affairs manager, and Eric Hjellen, project engineer, discuss the the Pumping Station 17 force main project at the construction site. The project is part of a larger, multi-year effort to serve the far west side of the District's service area.

TABLE CIP-2 | 2020-2022 EXPENDITURES BY PROJECT

District policy limits 2022 spending to the all-projects grand total shown
Individual project spending is not limited by year, but is limited by total project cost authorization

		2020 Actual	2021 Estimated	2022 Anticipated
TREATMENT PLANT		**$14,135,000**	**$9,262,000**	**$4,813,000**
A01	East Primary Influent Channel Air Piping Replacement	-	-	77,000
A02	Lagoon Dikes Improvements	3,000	397,000	752,000
A03	Flow Splitter Improvements	-	-	141,000
A04	Maintenance, Financial and HR Systems	1,000	75,000	501,000
A05	Plant HVAC Improvements	27,000	245,000	1,251,000
A06.1	Low Disssolved Oxygen (Partial Plant)	-	-	62,000
A07	West Blower Replacements	-	-	283,000
A08.1	Heat and Power Improvements	-	-	711,000
A08.2	Biosolids Processing	-	-	206,000
A08.3	Miscellaneous Energy Projects	-	-	191,000
A09	Shop One Interior Renovations	-	-	52,000
A11	15 kV Electrical Service Replacement	-	-	108,000
A12	Headworks Screening	-	-	10,000
A13	Septage Receiving Modifications	-	-	-
A15	Metrogro Applicators & Equipment	4,000	811,000	-
A16	Annual Process Tank Coating and Repair	-	-	202,000
A17	Annual Pavement Improvements	-	63,000	65,000
A18	Minor Capital Improvements	12,000	112,000	115,000
A19	Miscellaneous Treatment Plant Projects	-	100,000	87,000
N/A	2019 Treatment Plant Piping Improvements Project	447,000	-	-
	Badfish Creek Effluent Force Main Standpipe	-	-	-
	Clarifier Stress Testing	-	-	-
	Energy Management Master Plan	416,000	208,000	-
	Engine Generator and Blower Control Panel Replacements	39,000	632,000	-
	Final Clarifier 4, 5 and 6 Effluent Launder Trough Replacement	5,000	305,000	-
	Headworks Flow Metering	1,481,000	700,000	-
	Liquid Processing Improvements- Phase 1	10,897,000	4,136,000	-
	Operations Building First Floor Remodel	542,000	1,478,000	-
	Resource Recovery Facility	243,000	-	-
	Shop One Site Improvements	18,000	-	-
INTERCEPTORS		**$7,788,000**	**$8,180,000**	**$8,997,000**
B01	NEI Joint Grouting MH10-101 to MH10-106	-	65,000	242,000
B02.1	West Interceptor- Shorewood Relief (Phase 1)	429,000	4,326,000	-
B02.2	West Interceptor- Shorewood Relief (Phase 2)	-	-	1,756,000
B03	NEI- Truax Extension Rehab (lining project)	-	30,000	5,995,000
B04	NEI- Waunakee Extension Capacity Improvements (Phase 1)	-	10,000	577,000
B05	NEI- FEI to SEI Rehab (lining project)	-	-	-
B06	Lower Badger Mill Creek Interceptor- Phase 5	-	-	93,000
B07	Lower Badger Mill Creek Interceptor- Phase 6	-	-	113,000
B08	SEI Rehab- PS 9 to SEI-Dutch Mill Extension	-	-	77,000
B09	PS 6 to PS 10 Connector	-	-	144,000
N/A	Interceptor Rehabilitation- 2020	1,016,000	12,000	-
	NEI- Truax Extension Relief	4,966,000	32,000	-
	NEI- Joint Grouting MH10-112 to MH10-106	190,000	18,000	-
	NSVI Improvements-McKee Road to Dunn's Marsh	1,088,000	3,637,000	-
	NSVI-Morse Pond Extension	100,000	50,000	-

TABLE CIP-2 | 2020-2022 EXPENDITURES BY PROJECT (CONT.)

		2020 Actual	2021 Estimated	2022 Anticipated
PUMPING STATIONS AND FORCE MAINS		**$3,542,000**	**$10,297,000**	**$6,841,000**
C01	Grass Lake Dike Stabilization	30,000	400,000	345,000
C02	PS 4 Rehabilitaiton	2,000	320,000	1,669,000
C03	PS 17 Rehabilitation	-	20,000	402,000
C04	PS 17 Force Main Relief- Phase 2	-	90,000	288,000
C05	PS 16 Force Main Rehabilitation	-	15,000	67,000
C06	Emergency Power Generation at District Pumping Stations	-	-	5,000
C07	Miscellaneous Collection System Improvements	17,000	-	90,000
N/A	Automated Power Transfer at Pump Stations 10 and 11	159,000	84,000	-
	PS 13 & PS 14 Rehabilitation	544,000	5,963,000	3,976,000
	PS 17 Force Main Relief- Phase 1	437,000	2,905,000	-
	PS 7 Improvements	2,353,000	-	-
	PS 7 Force Main Emergency Repair	-	500,000	-
CAPITAL BUDGET EXPENSES		**$75,000**	**$408,000**	**$475,000**
D01	Capital Budget Expenses	-	52,000	52,000
D02	Collection System Facilities Plan Update	-	56,000	40,000
D03	Badger Mill Creek Phosphorus Compliance	8,000	300,000	206,000
D04	Plan for District Properties	-	-	177,000
N/A	Plant Asset Management Plan Implementation	67,000	-	-
Grand Total		$25,539,000	$28,147,000	$21,126,000

TABLE CIP-3 | ANNUAL BUDGET AND EXPENDITURES

	Adopted Capital Budget		2022 Proposed CIP
	2020	**2021**	**2022**
Budgets	$44,133,000	$39,869,000	$21,126,000
Expenditures (Actual 2020; Estimated 2021)	25,539,000	28,147,000	
Underspending	*$18,594,000*	*$11,722,000*	

TABLE CIP-4 | CLEAN WATER FUND LOAN PROCEEDS

	2020 Actual	2021 Estimated	2022 Anticipated
2019 Treatment Plant Piping Project	-	439,000	-
LPI- Phase 1/PS 7 Improvements/Headworks Flow Metering	14,551,000	8,691,000	-
NEI- Truax Extension Rehab	-	-	$5,964,000
NEI-Truax Ext Relief/SWI-Haywood Ext Replacement	9,583,000	31,000	-
Operations Building First Floor Remodel	-	2,029,000	-
Plant HVAC Improvements	-	-	1,493,000
PS 10 FM Rehab/West Interceptor- PS 5 to Gammon Ext	218,000	-	-
PS 13 & PS 14 Rehab	-	6,712,000	3,936,000
PS 4 Rehabilitation	-	-	1,950,000
West Int.- Spring Street Relief Rehab	-	748,000	-
West Interceptor- Shorewood Relief (Phase 1)	-	4,374,000	-
Lagoon Dikes Improvements	-	-	1,014,000
NSVI- McKee Road to Dunn's Marsh	-	-	4,707,000
Grand Total	$24,351,000	$23,025,000	$19,065,000

2022 PROJECT FUNDING

As discussed in the capital finance section, capital projects are funded by a mix of Clean Water Fund loan proceeds and cash reserves. Financing decisions are made on a per-project basis, considering eligibility and project size, in addition to overall financing strategy. For 2022, the following notable projects will be financed with cash reserves:

- Maintenance, Financial and HR Systems ($501,000)
- Biosolids Processing ($206,000)
- Miscellaneous Energy Projects ($191,000)
- Northeast Interceptor Joint Grouting MH10-101 to MH10-106 ($242,000)
- Design of Lower Badger Mill Creek Interceptor ($206,000)
- Grass Lake Dike Stabilization ($345,000)
- Various Capital Budget Expenses ($475,000)

Cash reserves will also be used to pay for planning and/or design work for various projects, including the flow splitter improvements ($141,000) ; planning for the heat and power improvements project ($711,000); design of the capacity improvements for the Northeast Interceptor – Waunakee Extension ($577,000); and design of Pumping Station 17 Rehabilitation and Pumping Station 17 Force Main Relief – Phase 2 ($690,000). These planning and design costs will initially be paid from cash reserves and may later be reimbursed through loans from the Clean Water Fund in subsequent years if/when construction commences.

The Grass Lake Dike project will provide effective repairs to restore and maintain the integrity of the dike.

SIX-YEAR CAPITAL PROJECTS SUMMARY

This section discusses planned projects for the six years of the CIP. Financing issues for the six-year period are discussed in the capital finance section.

The District's CIP includes projections for projects that are either underway and will continue into 2022, or for those new projects that will begin within the six-year planning horizon. These projects have been identified by District staff to address a variety of needs such as hydraulic capacity, condition or new regulatory requirements. Costs and schedules for these projects are continually updated as the scopes become better defined and as priorities and funding strategies change over time.

Table CIP-5 is included to show the anticipated annual inflation-adjusted costs that are expected for each project. These tables show approximately $210 million worth of expenditures over the six-year period from 2022 to 2027.

Table CIP-6 presents the anticipated schedule for each project by phase within the six-year planning window. For each project, the predominant phase of the project is shown for a given year. Where two phases of a project are likely to occur in the same year, both phases are indicated.

TABLE CIP-5 | SIX-YEAR SPENDING FORECAST

Project Number	Project Title	2022	2023	2024	2025	2026	2027
Treatment Plant		**$4,813,000**	**$6,522,000**	**$14,858,000**	**$17,119,000**	**$22,746,000**	**$26,615,000**
A01	East Primary Influent Channel Air Piping Replacement	77,000	716,000	-	-	-	-
A02	Lagoon Dikes Improvements	752,000	446,000	448,000	-	-	-
A03	Flow Splitter Improvements	141,000	1,040,000	1,071,000	-	-	-
A04	Maintenance, Financial and HR Systems	501,000	864,000	1,603,000	1,797,000	820,000	-
A05	Plant HVAC Improvements	1,251,000	-	1,197,000	917,000	730,000	-
A06.1	Low Disssolved Oxygen (Partial Plant)	62,000	63,000	2,557,000	183,000	289,000	-
A06.2	Low Dissolved Oxygen (Full Plant)	-	-	-	-	464,000	1,110,000
A07	West Blower Replacements	283,000	292,000	2,650,000	6,050,000	214,000	3,051,000
A08.1	Heat and Power Improvements	711,000	732,000	1,655,000	1,705,000	14,879,000	14,394,000
A08.2	Biosolids Processing	206,000	318,000	-	-	-	-
A08.3	Miscellaneous Energy Projects	191,000	313,000	-	208,000	371,000	5,588,000
A09	Shop One Interior Renovations	52,000	53,000	-	-	-	-
A10	East and West Blower Switchgear	-	5,000	219,000	1,182,000	1,217,000	-
A11	15 kV Electrical Service Replacement	108,000	117,000	120,000	1,356,000	1,397,000	-
A12	Headworks Screening	10,000	191,000	2,087,000	1,958,000	-	-
A13	Septage Receiving Modifications	-	11,000	11,000	315,000	1,722,000	1,773,000
A14	Grit Processing Improvements	-	-	-	-	-	155,000
A15	Metrogro Applicators & Equipment	-	881,000	743,000	934,000	116,000	-
A16	Annual Process Tank Coating and Repair	202,000	208,000	214,000	221,000	227,000	234,000
A17	Annual Pavement Improvements	65,000	67,000	69,000	71,000	73,000	75,000
A18	Minor Capital Improvements	115,000	119,000	122,000	126,000	130,000	134,000
A19	Miscellaneous Treatment Plant Projects	87,000	89,000	92,000	95,000	97,000	100,000
Interceptors		**$8,997,000**	**$10,324,000**	**$13,336,000**	**$5,059,000**	**$8,417,000**	**$12,508,000**
B01	NEI Joint Grouting MH10-101 to MH10-106	242,000	-	-	-	-	-
B02.2	West Interceptor- Shorewood Relief (Phase 2)	1,756,000	-	-	-	-	-
B02.3	West Interceptor- Shorewood Relief (Phase 3)	-	4,679,000	-	-	-	-
B03	NEI- Truax Extension Rehab (lining project)	5,995,000	-	-	-	-	-
B04	NEI- Waunakee Extension Capacity Improvements (Phase 1)	577,000	2,334,000	5,027,000	-	-	-
B05	NEI- FEI to SEI Rehab (lining project)	-	49,000	2,081,000	-	-	-
B06	Lower Badger Mill Creek Interceptor- Phase 5	93,000	1,103,000	-	-	-	-
B07	Lower Badger Mill Creek Interceptor- Phase 6	113,000	117,000	2,852,000	-	-	-
B08	SEI Rehab- PS 9 to SEI-Dutch Mill Extension	77,000	1,719,000	-	-	-	-
B09	PS 6 to PS 10 Connector	144,000	324,000	3,267,000	3,365,000		
B10	NSVI Capacity Improvements- Phase 1	-	-	104,000	416,000	429,000	6,060,000
B11	West Interceptor Rehab- Babcock Hall to Dayton Street	-	-	5,000	1,244,000	-	-
B12	District Flow Monitoring Stations	-	-	-	34,000	1,148,000	-
N/A	Collection System Projects 2025	-	-	-	-	-	-
	Collection System Projects 2026	-	-	-	-	4,637,000	-
	Collection System Projects 2027	-	-	-	-	-	4,179,000
	Lining Projects 2025	-	-	-	-	-	-
	Lining Projects 2026	-	-	-	-	2,203,000	-
	Lining Projects 2027	-	-	-	-	-	2,269,000

TABLE CIP-5 | SIX-YEAR SPENDING FORECAST (CONT.)

Project Number	Project Title	2022	2023	2024	2025	2026	2027
Pumping Stations and Force Mains		**$6,841,000**	**$12,107,000**	**$3,195,000**	**$5,380,000**	**$5,793,000**	**$5,520,000**
C01	Grass Lake Dike Stabilization	345,000	-	-	-	-	-
C02	PS 4 Rehabilitaiton	1,669,000	3,490,000	-	-	-	-
C03	PS 17 Rehabilitation	402,000	2,366,000	2,437,000	-	-	-
C04	PS 17 Force Main Relief- Phase 2	288,000	4,583,000	-	-	-	-
C05	PS 16 Force Main Rehabilitation	67,000	1,570,000	-	-	-	-
C06	Emergency Power Generation at District Pumping Stations	5,000	5,000	117,000	1,552,000	1,850,000	1,459,000
C07	Miscellaneous Collection System Improvements	90,000	92,000	95,000	98,000	101,000	104,000
C08	Force Main Condition Assessment	-	-	546,000	563,000	580,000	597,000
N/A	PS 13 Rehabilitation	2,029,000	-	-	-	-	-
	PS 14 Rehabilitation	1,947,000	-	-	-	-	-
	Pump Station Projects 2025	-	-	-	3,167,000	-	-
	Pump Station Projects 2026	-	-	-	-	3,262,000	
	Pump Station Projects 2027	-	-	-	-	-	3,360,000
Capital Budget Expenses		**$475,000**	**$501,000**	**$1,147,000**	**$5,684,000**	**$5,854,000**	**$6,030,000**
D01	Capital Budget Expenses	52,000	53,000	55,000	56,000	58,000	60,000
D02	Collection System Facilities Plan Update	40,000	-	-	-	-	-
D03	Badger Mill Creek Phosphorus Compliance	206,000	265,000	1,093,000	5,628,000	5,796,000	5,970,000
D04	Plan for District Properties	177,000	182,000	-	-	-	-
Grand Total		**$21,126,000**	**$29,454,000**	**$32,536,000**	**$33,242,000**	**$42,810,000**	**$50,673,000**

TABLE CIP-6 | SIX YEAR CAPITAL PROJECTS PHASES

C = Construction | D = Design | D/C = Design and Construction | E = Equipment Purchase | P = Planning
P/D = Planning and Design | S = Study | S/T = Study and Testing | T = Testing | A = Annual

Project Number	Project Title	2022	2023	2024	2025	2026	2027
Treatment Plant							
A01	East Primary Influent Channel Air Piping Replacement	D	C	-	-	-	-
A02	Lagoon Dikes Improvements	D/C	C	C	-	-	-
A03	Flow Splitter Improvements	D	C	C	-	-	-
A04	Maintenance, Financial and HR Systems	C	C	C	C	C	-
A05	Plant HVAC Improvements	C	-	D/C	D/C	D/C	-
A06.1	Low Disssolved Oxygen (Partial Plant)	P/D	D	C	T	T	-
A06.2	Low Dissolved Oxygen (Full Plant)	-	-	-	-	D	D
A07	West Blower Replacements	P/D	D	C	C	D	C
A08.1	Heat and Power Improvements	P	P	D	D	C	C
A08.2	Biosolids Processing	S	S	-	-	-	-
A08.3	Miscellaneous Energy Projects	C	D/C	-	C	P/D	-
A09	Shop One Interior Renovations	S	P/D	-	-	-	-
A10	East and West Blower Switchgear	-	P	D	C	C	-
A11	15 kV Electrical Service Replacement	P	D	D	C	C	-
A12	Headworks Screening	P	P/D	D/C	C	-	-
A13	Septage Receiving Modifications	-	-	P	P/D	C	C
A14	Grit Processing Improvements	-	-	-	-	-	D
A15	Metrogro Applicators & Equipment	-	E	E	E	E	-
A16	Annual Process Tank Coating and Repair	A	A	A	A	A	A
A17	Annual Pavement Improvements	A	A	A	A	A	A
A18	Minor Capital Improvements	A	A	A	A	A	A
A19	Miscellaneous Treatment Plant Projects	A	A	A	A	A	A

TABLE CIP-6 | SIX YEAR CAPITAL PROJECTS PHASES (CONT.)

Project Number	Project Title	2022	2023	2024	2025	2026	2027
Interceptors							
B01	NEI Joint Grouting MH10-101 to MH10-106	C	-	-	-	-	-
B02.2	West Interceptor- Shorewood Relief (Phase 2)	C	-	-	-	-	-
B02.3	West Interceptor- Shorewood Relief (Phase 3)	-	C	-	-	-	-
B03	NEI- Truax Extension Rehab (lining project)	C	-	-	-	-	-
B04	NEI- Waunakee Extension Capacity Improvements (Phase 1)	D	C	C	-	-	-
B05	NEI- FEI to SEI Rehab (lining project)	-	D	C	-	-	-
B06	Lower Badger Mill Creek Interceptor- Phase 5	P/D	C	-	-	-	-
B07	Lower Badger Mill Creek Interceptor- Phase 6	P/D	D	C	-	-	-
B08	SEI Rehab- PS 9 to SEI-Dutch Mill Extension	D	C	-	-	-	-
B09	PS 6 to PS 10 Connector	S	D	C	C	-	-
B10	NSVI Capacity Improvements- Phase 1	-	-	P	D	D	C
B11	West Interceptor Rehab- Babcock Hall to Dayton Street	-	-	D	C	-	-
B12	District Flow Monitoring Stations	-	-	-	-	C	-
N/A	Collection System Projects 2025	-	-	-	-	-	-
	Collection System Projects 2026	-	-	-	-	C	-
	Collection System Projects 2027	-	-	-	-	-	C
	Lining Projects 2025	-	-	-	-	-	-
	Lining Projects 2026	-	-	-	-	C	-
	Lining Projects 2027	-	-	-	-	-	C
Pumping Stations and Force Mains							
C01	Grass Lake Dike Stabilization	C	-	-	-	-	-
C02	PS 4 Rehabilitaiton	D/C	C	-	-	-	-
C03	PS 17 Rehabilitation	D	C	C	-	-	-
C04	PS 17 Force Main Relief- Phase 2	D	C	-	-	-	-
C05	PS 16 Force Main Rehabilitation	D	C	-	-	-	-
C06	Emergency Power Generation at District Pumping Stations	-	-	A	A	A	A
C07	Miscellaneous Collection System Improvements	A	A	A	A	A	A
C08	Force Main Condition Assessment	-	-	A	A	A	A
N/A	PS 13 Rehabilitation	C	-	-	-	-	-
	PS 14 Rehabilitation	C	-	-	-	-	-
	Pump Station Projects 2025	-	-	-	C	-	-
	Pump Station Projects 2026	-	-	-	-	C	-
	Pump Station Projects 2027	-	-	-	-	-	C
Capital Budget Expenses							
D01	Capital Budget Expenses	A	A	A	A	A	A
D02	Collection System Facilities Plan Update	P	-	-	-	-	-
D03	Badger Mill Creek Phosphorus Compliance	T	P	P/D	C	C	C
D04	Plan for District Properties	P	P	-	-	-	-

PROJECT SUMMARIES AND BUSINESS CASES

Summary descriptions for each of the proposed projects are included in Appendix A. Projects are categorized as Nine Springs Wastewater Treatment Plant projects, interceptor projects or pumping station and force main projects. Projects are identified using an alphanumeric identifier. Project identification for Nine Springs Wastewater Treatment Plant projects begin with the letter A; those for interceptor projects begin with the letter B; those for pumping station and force main projects begin with the letter C; and those for capital budget expenses begin with the letter D.

Additional project information for most projects is contained in comprehensive business cases. Since some projects are closely connected or contingent upon other projects, more than one project may be included in a single business case. Note that some business cases, and hence associated costs, are more developed than others. Where costs have not been fully developed, amounts have been included as placeholders or allowances to identify the need. As with all projects, these costs will be modified as project scopes are refined, and better estimates become available. It should be noted that projects that have entered the construction phase are not included in the project summaries in Appendix A and do not have an updated business case.

The remainder of this section provides a brief summary of the most notable projects that are included in each category in the 2022 CIP.

TREATMENT PLANT

With the completion of the Liquid Processing Improvements – Phase 1 project in the second half of 2021, focus will now shift to some of the remaining projects from the 2016 Liquid Processing Facilities Plan. Replacement of the west blowers will begin in 2022. The project is being split into two phases, with construction of the first phase scheduled for 2024-2025 and the second phase occurring in 2027. In addition to replacing all three blowers, this project will also interconnect the air piping in the west and east plants to provide redundancy.

Another project from the 2016 Liquid Processing Facilities Plan that will begin in 2022 is the introduction of a low-dissolved oxygen process to secondary treatment. The facilities plan recommended a process called nitrite shunt that would use less energy and lower nutrients. While bench-scale testing of the nitrite shunt process did not yield satisfactory results, it did suggest that using low-dissolved oxygen for secondary treatment could have significant energy savings. The low-dissolved oxygen process will be implemented at full scale in one of the four treatment plants in 2024. If successful, the process would be expanded to all plants in 2028-2029.

Other significant projects in the treatment plant category were generated from the 2020 Energy Management Master Plan and 2020 Biosolids Management Study. The most critical project involves replacing the aging assets that are associated with the production of energy using biogas. These include the gas-driven engine generators and the hot water system. Follow-up work will investigate whether the District should upgrade its cogeneration facilities using the latest technology or sell its biogas for regional distribution. Facility planning, design and construction of these improvements is anticipated within the six-year planning window of the 2022 CIP.

Wastewater sampling and analysis keeps the District in compliance with regulatory monitoring requirements.

The Biosolids Management Study and 2020 Energy Management Master Plan also evaluated having the District transition from producing a liquid biosolid to a cake product. The early years of the 2022 CIP include funds to research and test technologies for making an acceptable cake product and to assess the market demand for this product. Detailed design and construction of the facilities to make this product are beyond the planning timeline of the 2022 CIP. In the interim, the production, handling and distribution of liquid biosolids will remain essential to the biosolids program, and the plan includes the purchase of three new applicators over the next six years to support this effort.

INTERCEPTORS

The addition of system capacity is a major theme in the interceptor category. Due to new growth throughout the collection system, the following capacity improvements are planned:

- West Interceptor – Shorewood Relief. New relief and replacement sewers will be constructed in the City of Madison and the Village of Shorewood between Whitney Way and Walnut Street in three separate phases between 2021 and 2023 to serve new lands in the City of Middleton and Town of Westport.
- Northeast Interceptor – Waunakee Extension (Phase 1). Approximately 9,000 feet of sewer will be installed in 2023 and 2024 to serve future development in the Villages of Waunakee and Dane and the Town of Westport.
- Lower Badger Mill Creek Interceptor (Phases 5 & 6). These are the final phases of the interceptor, to be installed in 2023 and 2024. At completion, all existing wastewater flows north of Midtown Road will be diverted to Pumping Station 17 in the City of Verona.
- Nine Springs Valley Interceptor Capacity Improvements (Phase 1). This is the first phase of major capacity improvements that are needed to this intercepting system between Pumping Station 11 and Pumping Station 12. It is expected that construction will be divided into at least four phases over a 15-year to 20-year period, with the first phase scheduled for construction in 2027 and 2028.

The 2022 CIP also contains several rehabilitation projects to District interceptors. The most notable project includes the lining of the Northeast Interceptor – Truax Extension between Pumping Station 13 and Lien Road. A relief sewer was installed roughly parallel to this interceptor in 2019-2020. With its recent completion, flow can be diverted to the new relief sewer, allowing a new liner to be installed in the original sewer.

PUMPING STATIONS AND FORCE MAINS

The District has been systematically rehabilitating its pumping stations over the last 20 years as part of its capital improvements program. These rehabilitations have generally included full replacement of the major mechanical, electrical, control and HVAC systems. The 2022 CIP includes rehabilitation projects at Pumping Station 13 (2022), Pumping Station 4 (2022-2023) and Pumping Station 17 (2023-2024). The plan does not include any other major rehabilitation projects in the six-year planning window.

This category also includes completion of a relief force main for Pumping Station 17 in 2023. The Phase 1 work was coordinated with a City of Verona public works project completed in the summer of 2021. When complete, the force main will have the capacity needed to serve flows in the upper portions of the Lower Badger Mill Creek basin, which are scheduled to be diverted to Pumping Station 17 in 2024.

New projects in this category have been included to address continuity of pumping station operations and force main condition. Only two District pumping stations currently have standby generators that can ensure that the stations continue to operate during a loss of electrical power. Generators will also be installed at Pumping Stations 13 and 14 as part of the construction that is in progress. The 2022 CIP outlines a plan to install standby generators at most of the remaining District stations between 2025 and 2030. The plan also includes an annual allowance, starting in 2024, to perform annual inspections of the District's higher-risk force mains.

CAPITAL PROJECTS BUDGET EXPENSES

The final category of expenditures in Table CIP-4 are capital budget expenses (letter D). These expenses typically include expenses related to planning and studies assessed against the capital fund that would be difficult to capitalize to a specific asset.

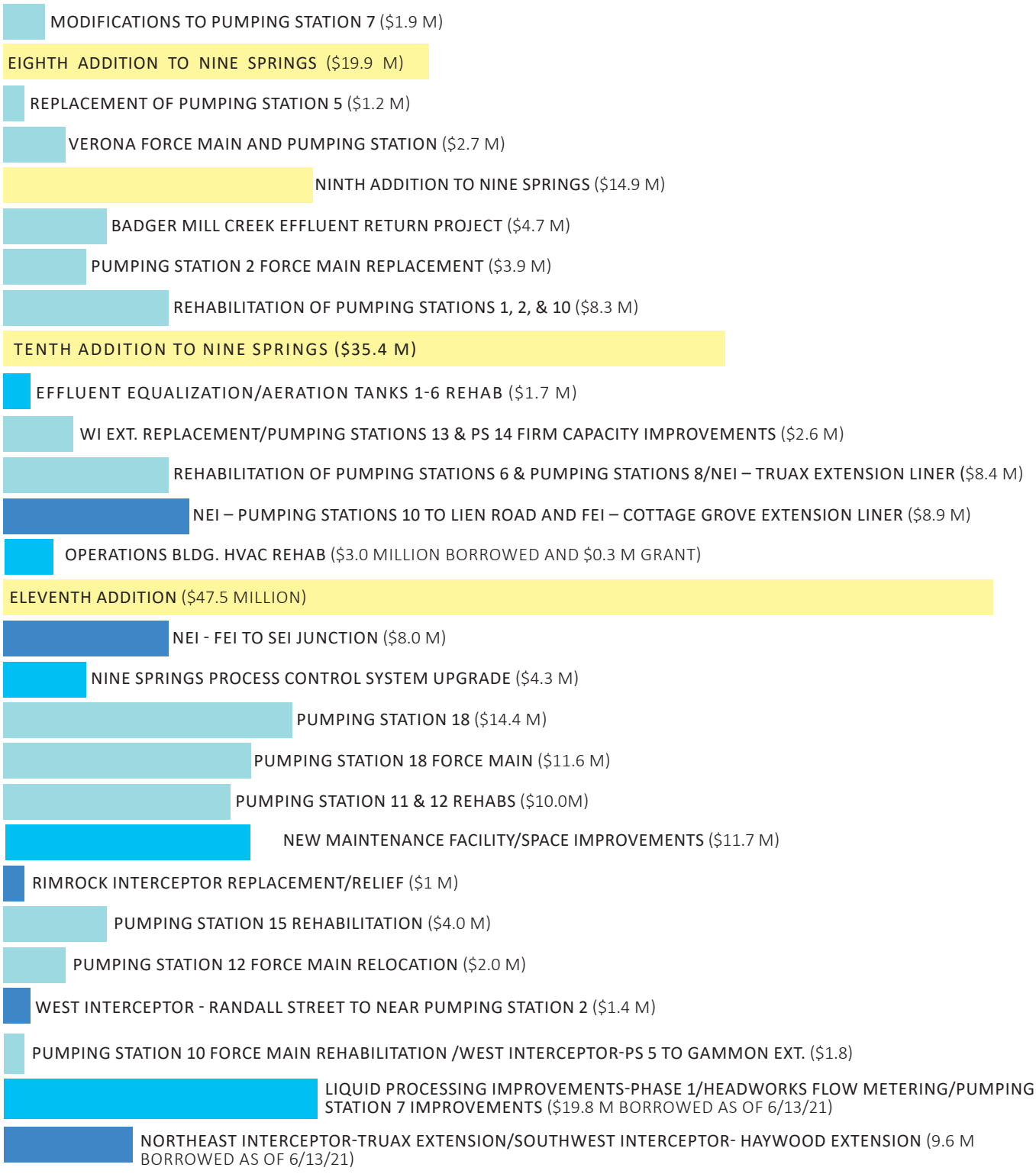
The largest anticipated expenses in this category over the next six years pertain to the work necessary to comply with the new phosphorus requirements for District effluent that is discharged to Badger Mill Creek. These new requirements were included in the District's discharge permit that was reissued in May of 2020 and call for full compliance in 2028. The plan calls for pilot testing and evaluation of appropriate technologies to reduce phosphorus to acceptable levels in 2022 and 2023. After selection of the final alternative, design is expected to commence in 2024, followed by construction from 2025 through 2027. At this point in the project, the costs included in the plan are conservative and should not necessarily be considered the lowest-cost option. Since the work is in the early stages and no final alternative has been selected, all project costs will be expensed rather than assigned to a future asset. It is likely that this project will move to a different category as the project matures and appropriate alternatives are identified and selected.

Other items in this category include an annual allowance for general planning expenses for use in developing the Capital Improvements Plan, completion of the Collection System Facilities Plan Update in 2022, and a space needs study for all District-owned properties.

The District discharges its treated wastewater into Badfish Creek and Badger Mill Creek, shown here.

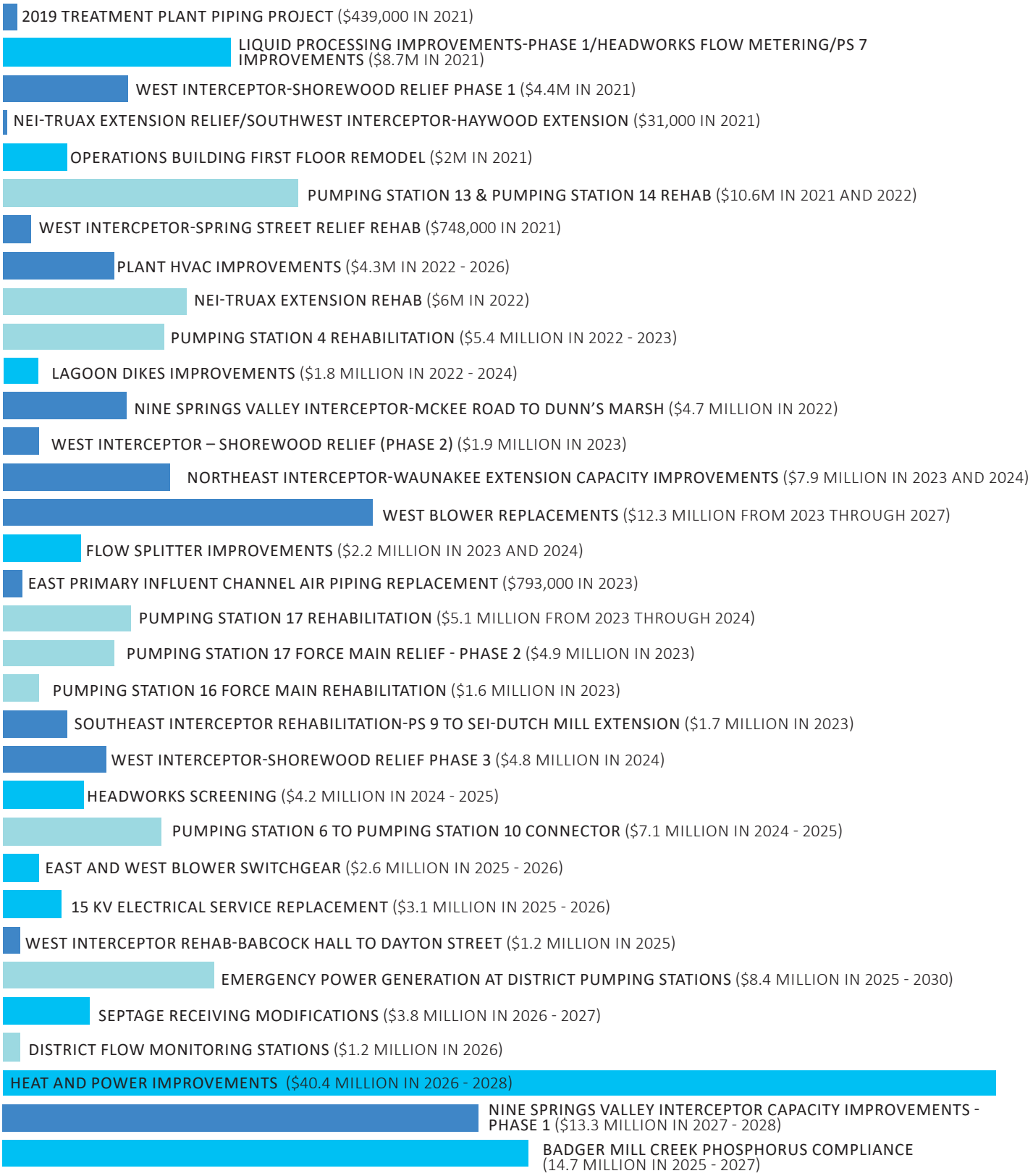
Wisconsin Clean Water Fund Loan Program

Although the District can, and may, fund future projects with general obligation bonds, continued use of the Wisconsin Clean Water Fund loan program is anticipated for most of the larger projects in the plan. As of June 13, 2021, the District has borrowed $264.9 million from this program for the following projects:



Wisconsin Clean Water Fund Loan Program - Anticipated Debt

The District also anticipates that it will require funding for many future projects, with funding for many of them coming from Clean Water Fund loans. The projects listed below are expected to qualify for a reduced interest rate from the Clean Water Fund over the 20-year life of the loan. This reduced interest rate has averaged less than 2% in the past year. Use of the loan program helps to ensure that adequate capital reserves are on hand to address any unforeseen capital costs.



CAPITAL FINANCE

INTRODUCTION

The previous sections described the annual capital budget and the six-year project plan, including project costs and schedules. This section addresses how this work is to be financed.

The District finances its capital improvements program through a combination of cash and borrowing. Borrowing is done through the state's Clean Water Fund loan program, which provides attractive interest rates in support of the state's wastewater infrastructure.

The financing plan seeks to maintain financial resiliency, limit use of debt, and control needed increases in service charges. These goals are in tension and must be balanced under overall Commission direction.

Financing under this Capital Improvements Plan differs from the 2021 plan in two respects. This plan proposes larger service charge increases than the 2021 plan. It also proposes greater use of debt. Both changes are driven by the higher-than-anticipated costs of certain projects, primarily the costs of implementing the Energy Management Master Plan.

POLICY CONTROLS

District capital financing is controlled by several Commission policies (available at www.madsewer.org/About-Us/Commission). These include:

- Outcomes Policy O – 2C "Charges for service are justified, adequate, equitable and predictable;"
- Executive limitations Policy EL – 2C, regarding financial planning/budgeting;
- EL – 2D (5) regarding adequacy of available funds;
- EL – 2G regarding adequacy of rates to fund capital improvements; and
- Commission policy book attached policy ATT-2, specifically the sections on:
- Capital projects budget and debt service budget;
- Debt financing;
- Fund reserves;
- Fund structure; and
- Strategic financial planning.

This CIP is consistent with the above policies.

FINANCING TOOLS

Commission and staff members work together to develop guidance during strategic financial planning discussions.

The District's capital program is financed with three tools:

- Disbursements from the state's Clean Water Fund loan program.
- Cash from District connection charges (charged for extension of service to new areas).
- Cash from District service charges (paid quarterly by municipalities).

Clean Water Fund loan interest rates are lower than commercial loans because of a state interest rate subsidy. Rates in the past two years have been at or under 2%. Clean Water Fund loans have a 20-year term.

Clean Water Fund loan proceeds are deposited in the capital projects fund. Loan proceeds are often received a year or more after spending begins on a project. This is because initial planning and design expenses are not eligible for reimbursement until a construction contract for the project has been bid and awarded. These delays are one reason to maintain an adequate balance in the capital projects fund.

Principal and interest payments are made from a separate debt service fund. Money for these payments comes from District service charges, transferred from the operating fund to the debt service fund. Clean Water Fund program terms require the District to maintain a certain minimum balance in the debt service fund.

The District receives and treats approximately 41 million gallons of wastewater daily at the Nine Springs Wastewater Treatment Plant.

Connection charge revenue is paid by municipalities (or directly by developers) on a one-time basis when service is made available to new areas. Connection charges are based on the cost of the conveyance facilities serving a given area and a proportion of the costs of assets at the Nine Springs Wastewater Treatment Plant. Connection charges are meant to recover the infrastructure costs of expanding the system and providing capacity. Ongoing repair and replacement of the system are supported by service charges. Connection charges are deposited directly in the capital projects fund.

Connection charge revenue varies significantly by year depending on the pace and location of development in the region. In preparing the capital financing plan, staff estimate future connection charges based on historical patterns, known rate changes and best judgement about economic conditions. The unpredictability of connection charge revenue is a second reason to maintain an adequate balance in the capital projects fund. (Estimated connection charges in this CIP reflect the phase-in of higher treatment plant connection charge rates, authorized by the Commission in 2017.)

Connection charge revenues contribute roughly half of the cash financing for the capital program. The other half is from service charges. (Service charges also cover all debt service payments.) Service charge revenues are initially deposited in the operating fund and then transferred to the capital projects fund as part of the District's annual budget.

Use of Clean Water Fund loans remains the largest financing tool for the capital program, financing approximately 70% to 80% of capital expenditures in this Capital Improvements Plan.

CAPITAL FINANCING PLAN

The financing plan covers the CIP planning period, 2022–2027. In addition to borrowing levels, the plan proposes annual transfers from the operating fund to the capital projects fund and to the debt service fund. These amounts are anticipated. However, the transfer amounts for the first year of the plan will be fixed in the District's annual budget in the fall. Borrowing amounts will vary from anticipated, reflecting changes in project costs, loan eligibility and staff decisions to not borrow for smaller projects when feasible.

Capital Projects Fund Balance

The capital projects fund balance is an important factor in the capital financing plan. The balance provides resiliency against fluctuations in connection charge revenues and against delays in loan proceeds. It also covers the costs of the planning and design phases of loan-funded projects until loan proceeds are received. Furthermore, the balance allows the District to take on unplanned capital expenditures, like emergency repairs. To provide this resiliency, the balance must grow with the size of the capital program. The District seeks to maintain a capital projects fund balance at least as large as annual cash spending, averaged over several years.

To achieve needed balances, the plan increases the amount transferred from the operating fund to the capital projects fund, over the course of the six-year plan. As shown in Table CIP-7, the reserve target increases from $6 million to over $12 million over the period, reflecting increased expenditures. To meet this target, the plan increases transfers from $3.5 million in 2022 to just over $8 million by the end of the period.

TABLE CIP-7 | CAPITAL PROJECTS FUND CASH FLOW SUMMARY

Millions of Dollars	2022	2023	2024	2025	2026	2027
Opening Balance	**$5,574,000**	**$10,670,000**	**$11,787,000**	**$13,774,000**	**$17,627,000**	**$17,649,000**
Revenues						
Clean Water Fund Loans	19,065,000	21,958,000	22,684,000	24,590,000	29,091,000	36,065,000
Connection Charges	3,600,000	4,000,000	4,400,000	4,825,000	5,225,000	5,375,000
Interest Revenues	56,000	107,000	118,000	138,000	176,000	176,000
Transfers From Operating Fund	3,501,000	4,506,000	7,321,000	7,542,000	8,340,000	8,161,000
Total Revenues	*$26,222,000*	*$30,571,000*	*$34,523,000*	*$37,095,000*	*$42,832,000*	*$49,777,000*
Expenditures						
Treatment Plant	4,813,000	6,522,000	14,858,000	17,119,000	22,746,000	26,615,000
Interceptors	8,997,000	10,324,000	13,336,000	5,059,000	8,417,000	12,508,000
Pumping Stations and Force Mains	6,841,000	12,107,000	3,195,000	5,380,000	5,793,000	5,520,000
Capital Budget Expenses	475,000	501,000	1,147,000	5,684,000	5,854,000	6,030,000
Total Expenditures	*$21,126,000*	*$ 29,454,000*	*$32,536,000*	*$33,242,000*	*$42,810,000*	*$50,673,000*
Closing Balance	**$10,670,000**	**$11,787,000**	**$13,774,000**	**$17,627,000**	**$17,649,000**	**$16,753,000**
Reserve Target	*6,133,000*	*7,015,000*	*9,930,000*	*11,708,000*	*12,008,000*	*12,850,000*
Closing Balance Net of Reserve	*$4,537,000*	*$4,772,000*	*$3,844,000*	*$5,919,000*	*$5,641,000*	*$3,903,000*

Debt Service Fund Balance

Payments for principal and interest obligations come from the debt service fund. As with the capital projects fund, the balance provides resiliency against financial fluctuations.

However, where the capital projects fund's balance is useful mainly for year-to-year variations, the debt service fund's balance is for longer-term variations. In particular, the fund balance provides resiliency against potential large capital costs three or more years in the future. "Large" means costs on the order of $25 million or more, like those for major new regulatory requirements. The debt service fund balance allows the District to take on new debt for such requirements without having to immediately make large increases in service charge revenue. The District tries to increase the balance when such a potential requirement begins to seem likely.

In addition, the Clean Water Fund loan program requires the District to have sufficient funds on hand to pay debt service requirements for the following calendar year. This minimum requirement assures ability to pay but provides no resiliency against potential future projects.

The current financing plan accounts for currently known potential large costs, notably the Energy Management Master Plan, phosphorous requirements for the Lower Badger Mill Creek and potential changes to the District's biosolids program. As shown in Table CIP-8, the Clean Water Fund reserve requirement increases from $18 million to $23 million over the period. Transfers from the operating fund to the debt service fund increase from $16 million to $22 million. The balance net of the reserve requirement declines from $12 million in 2023 to $8 million in 2027. This reflects the use of the debt service fund balance for the additional anticipated costs of implementing the Energy Management Master Plan.

(Note: The debt service fund balances are adequate to pay the required principal and interest payments on existing and anticipated Clean Water Fund loans. The planned balance at the end of 2022 meets the District's policy requirement to maintain a balance sufficient to avoid levying a property tax to satisfy its debt service obligations.)

TABLE CIP-8 | DEBT SERVICE FUND CASH FLOW SUMMARY

Millions of Dollars	2022	2023	2024	2025	2026	2027
Opening Balance	**$28,914,000**	**$28,831,000**	**$28,433,000**	**$28,949,000**	**$29,870,000**	**$30,404,000**
Revenues						
Transfer from Operating Fund	16,297,000	17,276,000	16,489,000	18,339,000	19,727,000	22,156,000
Interest Earnings	289,000	288,000	284,000	289,000	299,000	304,000
Total Revenues	*16,586,000*	*17,564,000*	*16,773,000*	*18,628,000*	*20,026,000*	*22,460,000*
Debt Service Payments	16,669,000	17,962,000	16,257,000	17,707,000	19,492,000	21,616,000
Closing Balance	**$10,670,000**	**$11,787,000**	**$13,774,000**	**$17,627,000**	**$17,649,000**	**$16,753,000**
Reserve Requirement	*17,962,000*	*16,257,000*	*17,707,000*	*19,492,000*	*21,616,000*	*23,059,000*
Closing Balance Net of Reserve	*$10,869,000*	*$12,176,000*	*$11,242,000*	*$10,378,000*	*$8,788,000*	*$8,189,000*

Borrowing

Borrowing allows the District to smooth its revenue needs over time. Rather than significantly increase service charges to accommodate large new capital projects, borrowing spreads the costs over the term of the loan. The price of this smoothing is the interest payments required.

As shown in Table CIP-9, total outstanding principal would rise from $153 million to $214 million over the planning period. The District does not have a self-imposed debt limit. Debt levels are instead planned in conjunction with the other goals of managing service charge increases and maintaining financial resiliency. Furthermore, the District's ability to obtain future Clean Water Fund program loans is not limited by current debt levels.

TABLE CIP-9 | USE OF DEBT IN CAPITAL PROGRAM

Millions of Dollars	2022	2023	2024	2025	2026	2027
Percent of Capital Expenditures Financed with Debt (3 year moving average)	94%	82%	78%	73%	71%	71%
End of Year Outstanding Principal Obligations	$153,203,000	$160,661,000	$170,625,000	$181,171,000	$194,756,000	$213,631,000
Interest Paid	$3,419,000	$3,462,000	$3,537,000	$3,663,000	$3,986,000	$4,426,000

American white pelicans make a stop at the District Wildlife Observation area during the spring migration.

The District does have one external limit on debt. State statute limits District debt to 5% of the equalized property valuation of the District. Currently, that valuation is approximately $52 billion. The District's debt limit is 5% of that, or approximately $2.6 billion. Forecast debt level in 2027 is $214 million or 8% of the statutory limit.

A reason to limit debt is to limit annual interest payments. Under the plan, payments would rise from $3.4 million to $4.4 million. If, hypothetically, the District had no debt, service charge revenue would be lowered by the amount of interest payments. On a percentage basis, interest payments are about 7% of all service charge revenue in 2022 and would decline to about 6% in 2027. The declining percentage reflects the overall growth in the District's expenditures over the period.

Also, over the planning period, the percentage of capital expenditures financed with debt will be 94% in 2022, declining to 71% in 2027. (Percentages are three-year moving averages, to smooth annual variation that results from loan and spending timing differences.) It should be noted that the District cannot borrow 100% of its capital expenses, because of Clean Water Fund program eligibility limits. For example, projects to expand the collection system are generally not eligible for a program loan.

Service Charges

Supporting the financing plan will require additional transfers from the operating fund and thus increases in service charge revenues. Table CIP-10 shows the amount transferred from the operating fund to each of the other funds per year. The total amount transferred rises from $20 million to $30 million over the period. The rate of increase is stable, being between $1.8 million and $2.3 million per year. However, the mix of transfers varies to meet fund balance needs each year. For example, annual transfers to the debt service fund stay flat through 2024, while annual transfers to the capital projects fund rise from $3.5 million to $3.7 million in 2024.

Table CIP-9 also shows a forecast of service charge needs for the operating budget, the non-capital side of District spending. Although the operating budget is not planned on a multi-year basis, the overall trend in growth is relatively stable. It is driven by inflationary factors and anticipated increases in staffing levels. The amounts shown reflect an assumed steady growth rate that is slightly higher than recent years to err on the side of caution in forecasting.

Adding planned capital program transfers to that trend, forecast year-over-year increases in total District service charges reach 9.8% from 2022 to 2023, and decline to 8.9% from 2026 to 2027. The declining percentage reflects the fact that total District revenues increase over time.

TABLE CIP-10 | SERVICE CHARGES SUPPORT FOR THE CAPITAL PROGRAM

	2022	2023	2024	2025	2026	2027
Transfer to Capital Projects Fund	$3,501,000	$4,506,000	$7,321,000	$7,542,000	$8,340,000	$8,161,000
Transfer to Debt Service Fund	16,297,000	17,276,000	16,489,000	18,339,000	19,727,000	22,156,000
Total Support for Capital Program	*19,798,000*	*21,782,000*	*23,810,000*	*25,881,000*	*28,067,000*	*30,317,000*
Increase from Prior Year	*1,760,000*	*1,984,000*	*2,028,000*	*2,071,000*	*2,186,000*	*2,250,000*
Operating Budget Service Charge Needs (trend)	29,875,000	32,563,000	35,494,000	38,689,000	42,171,000	45,966,000
Total Service Charge Increase from Prior Year	*$4,227,000*	*$4,673,000*	*$5,959,000*	*$5,265,000*	*$5,668,000*	*$6,045,000*
Total Percentage Increase from Prior Year	*9.7%*	*9.8%*	*9.5%*	*9.2%*	*9.1%*	*8.9%*

APPENDIX A: PROJECT SUMMARIES

In this section, you will find project summaries. These summaries are intended to give a broad overview of the project, including general location, scope of work, history, schedule and a summary of cost. Total project costs are adjusted for inflation on an annual basis, unless otherwise noted.

Please note that project summaries are provided only for those projects that are anticipated to occur within the planning horizon of this document (2022-2027).

TABLE OF CONTENTS - PROJECT SUMMARIES

CIP ID#
A01

East Primary Influent Channel Air Piping Replacement

START DATE:
2022

COMPLETION DATE:
2023

PROJECT TYPE	Plant Improvements – Primary Treatment
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project will replace the air piping in the influent channels to the primary tanks on the east side of the treatment plant. Several air leaks were discovered in the air piping in April of 2021, and it has been determined that the system can no longer be repaired cost effectively. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	The air piping in the influent channels to the primary tanks supplies pressurized air to the wastewater so that the solids remain suspended until they reach the primary settling basins. Without the proper amount of air in these channels the solids will settle over time, reducing the channel capacity and increasing maintenance costs to clear the settled material. The air piping in the primary influent channels on the west side of the plant was recently replaced as part of the Liquid Processing Improvements (Phase 1) in 2020. The piping for the east plant is older than that on the west side prior to its replacement. It requires replacement at this time to ensure that the primary treatment process continues to operate effectively.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$77,000	$793,000

CIP ID#
A02

Lagoon Dikes Improvements

START DATE:
2020

COMPLETION DATE:
2024

PROJECT TYPE	Plant Improvements – Lagoon Management
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of this project is to conduct a geotechnical study of the dikes in the District lagoons and implement measures to stabilize them, especially in periods of high-water levels. The entire project will be conducted in several phases between 2020 and 2024, and any recommended repairs will be prioritized and implemented as needed. It is anticipated that the geotechnical study will be funded through cash reserves, while any necessary improvements will be funded through a loan from the Clean Water Fund.
BACKGROUND	The District's lagoons, located east of Moorland Road, were used to store biosolids until the early 1980s, at which time application on agricultural lands commenced. Some of the biosolids in the lagoons were found to have levels of polychlorinated biphenyls, or PCBs. The District worked with the EPA to clean up the lagoons in the late 1990s through addition of soil, a fabric cover and a new dike. The lagoons now provide wildlife habitat and recreational opportunities for the public and also act as storage reservoirs for excess plant inflow. During the extreme rainfall event in August of 2018, the water level in Nine Springs Creek reached historic levels, causing a leak which allowed water from the creek to move into the lagoon area. To protect the integrity of the dikes and prevent any migration of contaminated biosolids to the environment, it is desired to fully evaluate the dikes and repair any defective sections.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$752,000	$2,046,000

CIP ID#
A03

Flow Splitter Improvements

START DATE:
2022

COMPLETION DATE:
2024

PROJECT TYPE	Plant Improvements – Headworks
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project will rehabilitate, modify or possibly replace the existing flow splitter structure which is located immediately downstream of the grit removal tanks at the Headworks Building. The structure's concrete and metal components have deteriorated significantly since the structure was put into operation as part of the Tenth Addition, likely due to the high levels of hydrogen sulfide and turbulent flow in this structure. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	The flow splitter structure was built in 2005 as part of the Tenth Addition and allows for the controlled distribution of flow to the west and east plants. Flow from the grit removal basins enters the splitter structure from the west. The flow rises within the structure and spills over weirs that empty into five channels that connect to discharge pipes to the west and east sides of the plant. Flow to each side of the plant can be controlled by the placement of stop logs in the effluent channels. Corrosion of the structure has made it difficult to remove the stop logs in recent years. A thorough video inspection of the structure in February of 2021 revealed that the concrete walls that support the effluent channels are also in very poor condition. It is desired to rehabilitate or rebuild the damaged sections of concrete before the steel reinforcing is further compromised and leads to failure of the structure.

FINANCIAL ANALYSIS

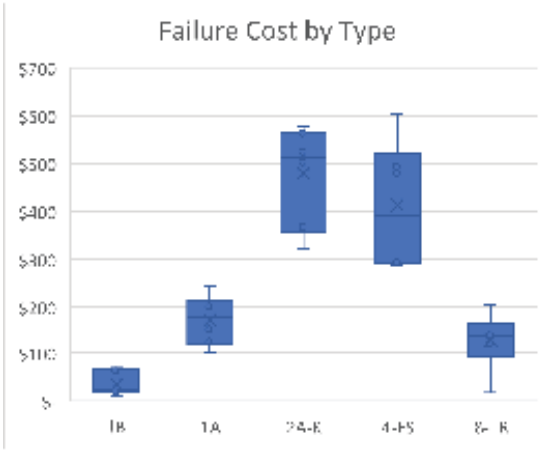
2022 EXPENDITURE ($2022)	TOTAL COST
$141,000	$2,252,000

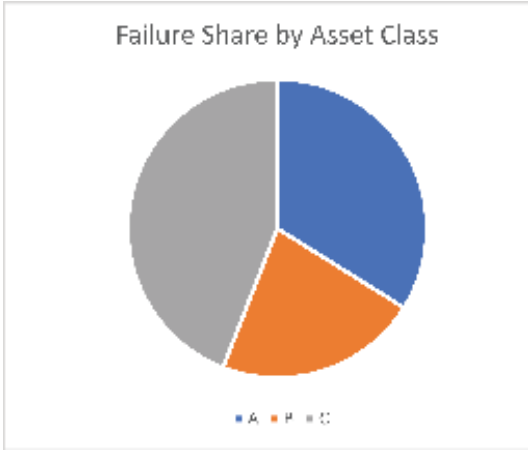
CIP ID#
A04

Maintenance, Financial and HR Systems

START DATE:
2020

COMPLETION DATE:
2026





PROJECT TYPE	Plant Improvements – Computerized Maintenance Management System (CMMS)
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of this project is to replace the District's existing CMMS and to address needs in the related financial and human resources systems. Each system will operate independently, but their functions and design must be closely integrated. The cost of this project will be funded through reserves in the capital fund.
BACKGROUND	The District installed its initial CMMS in 1997 for a cost of approximately $1.0 million (roughly $1.9 million in 2020 dollars). The company that developed the system eventually was purchased by Oracle. While the system has generally served the District well since 1997, Oracle is now planning to upgrade its system to a new version that is more complex and targets large users with different needs than the District. As such, the District has a need to obtain a new CMMS and financial system that better supports the District's approach to asset management and reliability centered maintenance. The project will also identify processes within the Human Resources department that need to be incorporated in the new financial system or in a new dedicated system.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$501,000	$5,660,000

CIP ID#
A05

Plant HVAC Improvements

START DATE:
2022

COMPLETION DATE:
2026

PROJECT TYPE	Plant Improvements – HVAC
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of this project is to upgrade and replace aging HVAC systems in various buildings at the treatment plant. HVAC systems need to be in good working order so that they meet applicable building codes, provide a safe environment for staff and protect equipment from damage caused by changing environmental conditions. Due to the harsh environments that these systems treat, they have deteriorated beyond reasonable repair and need to be replaced. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	This project will address HVAC deficiencies throughout the treatment plant. Many systems installed prior to the Eleventh Addition to the treatment plant are not working as designed or are not functioning at all. These systems do not meet applicable code requirements and pose a health risk to workers. A consultant performed a comprehensive study of existing systems in 2020 and compiled a prioritized list of the most deficient systems. In the second phase of this project, the most pressing improvements will be designed by a consultant and will be constructed in several phases through the year 2026.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$1,251,000	$4,367,000

CIP ID#
A06.1

Low Dissolved Oxygen (Partial Plant)

START DATE:
2018

COMPLETION DATE:
2025

PROJECT TYPE	Plant Improvements – Aeration System
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purposes of this project are to replace aging assets associated with the secondary treatment system and to test the use of low dissolved oxygen (DO) at full scale on a portion of the biological nutrient removal process. The test results will be used to determine if the low DO process changes can be implemented to the entire secondary treatment process. It is anticipated that costs associated with implementing and testing the low DO process changes will be funded through capital fund reserves.
BACKGROUND	The existing activated sludge facilities operate an enhanced biological phosphorus removal process. Many of the aeration supply and control equipment assets are in need of replacement due to age, condition or obsolescence. As part of the 2016 Liquid Processing Facilities Plan, changes to the existing processes were evaluated as part of asset replacement, including a process called nitrite shunt that could result in more effective nutrient removal while using less energy and potentially positioning the District for future total nitrogen regulations. While bench-scale testing of the nitrite shunt process did not yield satisfactory results, it did identify low DO as a promising alternative that could remove the necessary nutrients with less energy.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$62,000	$3,171,000

CIP ID#
A06.2

Low Dissolved Oxygen (Full Plant)

START DATE:
2026

COMPLETION DATE:
2029

PROJECT TYPE	Plant Improvements – Aeration System
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project involves implementation of a low-dissolved oxygen (DO) biological nutrient removal process on a plant-wide basis. This project assumes successful bench scale and pilot testing of the process in prior years (see related project ID A06.1). It is anticipated that costs associated with the project will be funded through the Clean Water Fund.
BACKGROUND	The existing activated sludge facilities operate an enhanced biological phosphorus removal process. Many of the aeration supply and control equipment assets are in need of replacement due to age, condition or obsolescence. As part of the 2016 Liquid Processing Facilities Plan, changes to the existing processes were evaluated as part of asset replacement, including a process called nitrite shunt that could result in more effective nutrient removal while using less energy and potentially positioning the District for future total nitrogen regulations. While bench-scale testing of the nitrite shunt process remove the necessary nutrients with less energy. The low DO improvements will be implemented in all plants of the biological nutrient removal process if the initial testing, currently scheduled for 2025-26, is successful.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$18,015,000

CIP ID#
A07

West Blower Replacements

START DATE:
2022

COMPLETION DATE:
2027

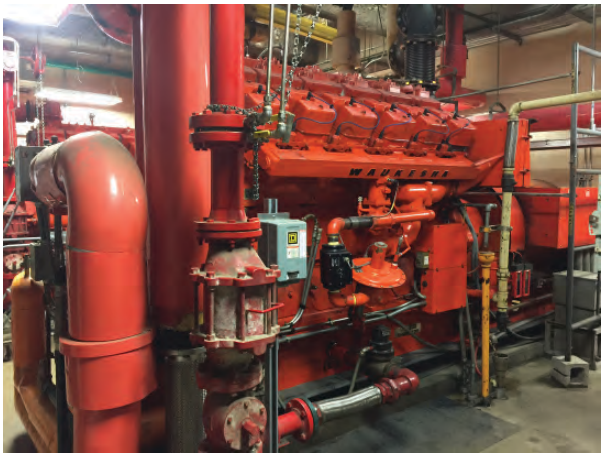
PROJECT TYPE	Plant Improvements – Activated Sludge Process
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project includes a series of improvements to the activated sludge process that will improve energy efficiency and system reliability and also relieve existing maintenance issues. This project was included in the 2016 Liquid Processing Facilities Plan. It is anticipated that the project will be funded through the Clean Water Fund.
BACKGROUND	The treatment plant's east and west blower complexes supply air to the east and west plants, respectively. Currently, they are separate systems that are not optimized with regards to energy use. This project includes provisions to connect the east and west blower systems to allow for more efficient use of the existing blowers and to provide improved redundancy. The project also allows for the phased replacement of all three west blowers so that the system operates more efficiently.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$283,000	$12,540,000

CIP ID#
A08.1

Heat and Power Improvements



START DATE:
2022

COMPLETION DATE:
2028

PROJECT TYPE	Energy-Related Projects – Use Reduction/Generation
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of this project is to identify and replace aging assets associated with the District's energy-producing infrastructure and to optimize the use of energy going forward. These improvements will position the District to use its biogas to generate electricity on site at greater efficiency or to produce a biogas of pipeline quality that can be sold to others. This project was evaluated as part of the 2020 Energy Management Master Plan. Additional facility planning and design phases are expected to precede construction. It is anticipated that all project costs will be financed through a loan from the Clean Water Fund.
BACKGROUND	An energy study was conducted in 2014 by Strand and Brown and Caldwell to provide a roadmap for how the District might achieve energy independence. Areas of focus included ways to reduce energy usage, improve utilization of digester gas and produce more energy. The 2020 master planning study expands on all these areas and examines the most energy-efficient way to handle and dispose of biosolids. It is anticipated that the master plan will lead to three major projects going forward: (1) Heat and Power Improvements; (2) Biosolids Processing; and (3) Miscellaneous Energy Projects. Carollo Engineers began work on the master plan in February of 2020, and a final report is anticipated in the fall of 2021 with the final recommendations.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$711,000	$40,405,000

CIP ID#
A08.2

Biosolids Processing

START DATE:
2022

COMPLETION DATE:
2035

PROJECT TYPE	Plant Improvements – Biosolids End Use
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project lays out a pathway for the District to transition from producing a liquid biosolid that is land applied to a cake product. The 2020 Biosolids Management Plan recommended that the District switch to a cake product based on several challenges with the liquid program, including incompatibility of application methods with agricultural conservation practices, concerns over emerging contaminants, fewer agricultural fields available for application, and shortened seasons for application due to climate change. Initial years of this project will be spent on researching and testing various technologies to produce an acceptable cake product and to ensure that an adequate market exists for such a product. Facility planning for any future assets is not anticipated before 2030. Initial research and testing will be paid for from cash reserves in the capital projects fund, while any future facilities will be funded with a loan from the Clean Water Fund.
BACKGROUND	The 2020 Biosolids Management Plan contained a comprehensive study of the District's existing biosolids program and its needs for the future using a triple bottom-line analysis. Based on this analysis, the preferred alternative is to move to production of a Class B cake product over time, with the eventual goal to produce a Class A cake. The recommended alternative was studied in conjunction with the 2020 Energy Management Master Plan to ensure that it was an energy efficient process.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$206,000	$57,755,000

CIP ID#
A08.3

Miscellaneous Energy Projects

START DATE:
2022

COMPLETION DATE:
2031

PROJECT TYPE	Energy-Related Projects – Use Reduction/Generation
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	These are projects that are recommended by the 2020 Energy Management Master Plan to reduce or optimize energy use. Due to their smaller scope and cost as compared to the cogeneration and biosolids projects in the master plan, many of these projects can be implemented in the near term and will be done so on an annual basis over the next 10 years. These projects will likely be funded through a mixture of cash reserves and loans, dependent on the cost in a given year.
BACKGROUND	An energy study was conducted in 2014 by Strand and Brown and Caldwell to provide a roadmap for how the District might achieve energy independence. Areas of focus included ways to reduce energy usage, improve utilization of digester gas and produce more energy. The 2020 master planning study expands on all these areas and examines the most energy-efficient way to handle and dispose of biosolids. It is anticipated that the master plan will lead to three major projects going forward: (1). Heat and Power Improvements; (2) Biosolids Processing; and (3) Miscellaneous Energy Projects. Carollo Engineers began work on the master plan in February of 2020, and a final report is anticipated in the fall of 2021 with the final recommendations.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$191,000	$7,154,000

CIP ID#
A09

Shop One Interior Renovations

START DATE:
2022

COMPLETION DATE:
2023

PROJECT TYPE	Plant Improvements
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project renovates and reconfigures the interior spaces of the Shop One Building to help the District promote the One Water concept. Initial stages of the project will focus on identifying projects to engage the public and other stakeholders. A space needs analysis and development of a conceptual building improvements plan will follow the project identification work. It is anticipated that the early planning for the project will be funded through reserves from the capital projects budget.
BACKGROUND	For many decades, the Shop One Building was used to support the District's maintenance staff. With the construction of a new Maintenance Facility in 2016, the Shop One Building began its transition to a location for public outreach and education. Creation of a large public meeting space was completed in 2017. Roofing was replaced and acoustical improvements to the large meeting room were added in 2019. Large, unfinished portions of the Shop One Building remain to be renovated in response to future needs. The project work included in the Capital Improvements Plan at this time includes a study of these future needs and a conceptual plan to move forward with further improvements.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$52,000	$105,000

CIP ID#
A10

East and West Blower Switchgear

START DATE:
2023

COMPLETION DATE:
2026

PROJECT TYPE	Plant Improvements- Activated Sludge Process
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of this project is to replace the switchgear that powers the blower motors in the East Blower Building and the West Blower Building. The equipment in these buildings has exceeded its expected service life of 30 years and needs replacement in conjunction with the blower systems at these facilities. It is expected that the project will be funded with a loan from the Clean Water Fund.
BACKGROUND	The switchgear equipment for the East Blower Building was installed in 1963 and powers four blower motors. The switchgear equipment for the West Blower Building was installed in 1985 and currently powers three blower motors. While this equipment is regularly inspected and well maintained, it has exceeded its expected service life and should be replaced as part of the blower system improvements that are anticipated in future phases of the liquid processing projects. Failure to replace this equipment in a timely manner increases the risk of arc-fault events and the likelihood of permit violations due to interruptions in the secondary treatment process.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$2,623,000

CIP ID#
A11

15 kV Electrical Service Replacement

START DATE:
2022

COMPLETION DATE:
2026

PROJECT TYPE	Plant Improvements – Electrical Distribution
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project proposes to replace the outdoor service switchgear, transformers and busway system for the incoming electrical service to the treatment plant. This system is responsible for transforming the incoming voltage from 15,000 volts to 5,000 volts so that it can be utilized by plant equipment. It is anticipated that any future equipment replacement will be funded through a loan from the Clean Water Fund. Initial investigation and assessments of equipment condition will be paid for through capital fund reserves.
BACKGROUND	This equipment was installed in 1984-85 and is located outside, just north of the Effluent Building. The equipment steps down the incoming voltage to 5,000 volts for use by large equipment such as the effluent pumps and the blowers for the aeration system. Industry standards estimate a service life of 40 to 50 years for this equipment. Based on the lower bound of this estimate, the District is planning for the equipment to be replaced in 2025. An inspection of the equipment was conducted by an electrical engineering company in the fall of 2020. While the equipment was determined to be in good operating condition overall, it is beginning to show signs of deterioration and should be replaced in the next 5 to 10 years.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$108,000	$3,098,000

CIP ID#
A12

Headworks Screening

START DATE:
2022

COMPLETION DATE:
2025

PROJECT TYPE	Plant Improvements – Screening at Headworks Facility
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project includes the replacement of the fine screening equipment and related screening handling system at the Headworks Facility. One possible solution is to replace the existing band screens with new step screens and wash presses to dewater the captured material. This project was included in the 2016 Liquid Processing Facilities Plan. It is anticipated that the project will be funded through the Clean Water Fund.
BACKGROUND	Three fine screening units were installed at the Headworks Facility as part of the Tenth Addition to the treatment plant. The screens have openings of one-quarter inch and are designed to remove rags and other large material from the raw wastewater to keep it out of the biosolids and to protect downstream process equipment. Several problems have been experienced with the existing screening system, particularly with the processing of the material that is captured on the screens. The existing screening handling system requires frequent operator attention to keep it running. Further, the equipment for the screening handling system is prone to plugging and wear and tear, and it is difficult to obtain replacement parts in a cost-effective and timely manner.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$10,000	$4,246,000

CIP ID#
A13

Septage Receiving Modifications

START DATE:
2023

COMPLETION DATE:
2027

PROJECT TYPE	Plant Improvements – Septage Receiving
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project will correct problems encountered with operation of the existing septage receiving facility. Work will include reconfiguration of the existing facility to allow improved traffic flow, better screening equipment upstream of the Headworks Facility and implementation of more security and tracking measures to reduce the potential for unauthorized discharges. This project was included in the 2016 Liquid Processing Facilities Plan. It is anticipated that project costs will be funded through the Clean Water Fund.
BACKGROUND	The septage receiving facility was constructed as part of the Tenth Addition to the treatment plant and has experienced a number of operational difficulties since it was placed into operation. Trucks discharging at the facility have to back up to empty their contents, resulting in congestion during periods of heavy traffic and icy and unsafe conditions in winter. Further, sand and grit accumulate in the discharge trough, which requires manual cleaning by District staff on a frequent basis. Improvements will allow for one-way traffic for haulers and an improved screening system to keep unwanted material out of the screening channel.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$3,832,000

CIP ID#
A14

Grit Processing Improvements

START DATE:
2027

COMPLETION DATE:
2028

PROJECT TYPE	Plant Improvements – Grit Handling
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project will improve the performance of the grit handling equipment in the Headworks Facility. It is expected that several pieces of equipment will be replaced due to age and wear, including grit pumps, concentrators, classifiers and appurtenances. It is anticipated that project costs will be funded through the Clean Water Fund program.
BACKGROUND	The existing grit system was installed as part of the Tenth Addition to the Nine Springs Treatment Plant in 2005. The system consists of three vortex grit basins, six recessed impeller grit pumps and three grit concentrators/classifiers located on the mezzanine level of the Headworks Facility. This system was evaluated as part of the 2016 Liquid Processing Facilities Plan. While the equipment works reasonably well and requires little operator attention, it is now reaching the end of its useful life and will require replacement in the next five to ten years, especially the grit concentrators.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$2,393,000

CIP ID#
A15

Metrogro Applicators & Equipment

START DATE:
2015

COMPLETION DATE:
2026

PROJECT TYPE	Metrogro Applicators and Equipment
LOCATION	Metrogro Program
DESCRIPTION	This line item is included in the Capital Improvements Plan to fund the replacement of three biosolids applicators, three tankers and three low-disturbance toolbars. It is anticipated that these replacements will be funded through reserves from the capital fund.
BACKGROUND	While the District's recently completed biosolids management plan recommends that the District transition from a liquid biosolid to a cake product, that transition will take years to complete if pursued. It is probable that a cake product could not be produced on a consistent basis until 2035. In the interim Metrogro will remain the backbone of the biosolids reuse program. The District's standard is to replace an applicator when it reaches 10,000 hours of service. Using that standard, three applicators will require replacement between 2023 and 2026. Acquisition of new equipment will also allow for enhanced GPS capability and low disturbance soil injection. These features are lacking in the older equipment.

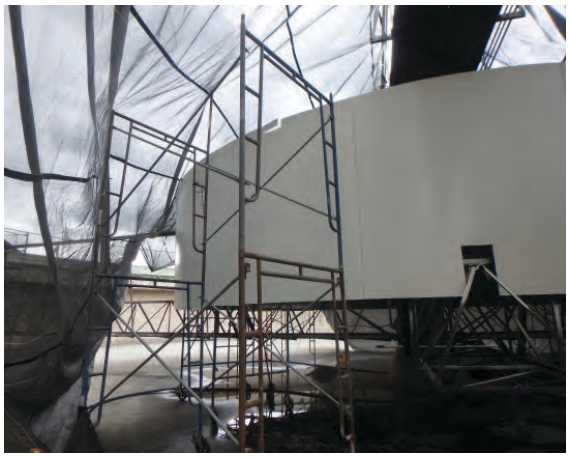
FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$4,405,000

CIP ID#

A16, A17, A18

Miscellaneous Capital Improvements



START DATE:
ONGOING

COMPLETION DATE:
ONGOING

PROJECT TYPE	Plant Improvements – Miscellaneous Capital Improvements
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This summary covers three areas: 1. Annual Process Tank Coating and Repair (A16) 2. Annual Pavement Improvements (A17) 3. Minor Capital Improvements (A18)
BACKGROUND	The District annually includes funds in its capital budget for coating of process tanks and resurfacing of roads. These funds are used to protectively coat the tanks and restore paved areas of the plant where necessary. In addition, other minor capital improvements are routinely necessary, and funds have been included to address these improvements on an as-needed basis.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$382,000	ONGOING

CIP ID#
A19

Miscellaneous Treatment Plant Improvements

START DATE:
ONGOING

COMPLETION DATE:
ONGOING

PROJECT TYPE	Variable
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	The purpose of these projects is to make modifications or minor improvements to capital assets at the treatment plant on an annual basis to ensure that they remain in good working condition and to ensure the safety of the District's workers. These projects will be funded through reserves in the capital fund.
BACKGROUND	As the District's assets at the treatment plant continue to age and process complexity increases, operations staff have noted a need to make a number of minor improvements to assets to ensure they remain in good working order. In many cases, the projects are relatively small in scope, yet they are too large and time consuming to be addressed by the District's maintenance staff. The intent of this item in the capital budget is to provide an annual allowance for the identification and completion of these smaller improvement projects at the treatment plant. The projects will be administered through the Operations Department or Engineering Department and completed by a contractor in accordance with the District's procurement code.

FINANCIAL ANALYSIS

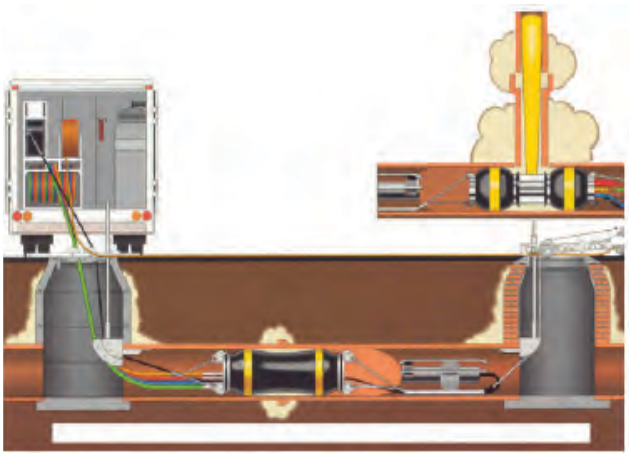
2022 EXPENDITURE ($2022)	TOTAL COST
$ 87,000	ONGOING

CIP ID#
B01

Northeast Interceptor Joint Grouting MH10-101 to MH10-106

START DATE:
2021

COMPLETION DATE:
2022



PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Northeast Interceptor State Highway 30 to Pump Station 10, City of Madison
DESCRIPTION	The purpose of this project is to identify joints in the Northeast Interceptor upstream of Pumping Station 10 that have excessive rates of infiltration and to seal these joints by injecting them with grout. Staff intends to fund this project through reserves from the capital fund.
BACKGROUND	The Northeast Interceptor from Pumping Station 10 to Lien Road was installed in 1964. In 2010, a relief sewer was added from Pumping Station 10 to Nakoosa Trail, and a replacement sewer was installed from Nakoosa Trail to Lien Road, thereby allowing a portion of the 1964 sewer to be abandoned. During construction of the relief sewer in 2010, it was discovered that numerous joints in the 1964 sewer that remained in service were leaking. In approximately five locations, the water is flowing into the sewer at a rate that is estimated to be five gallons per minute or more. This project proposes to test all joints in the 1964 sewer with pressurized air and fill them with grout to mitigate the intrusion of clear water into the public sewerage system. Approximately 2,600 feet of the 1964 sewer was rehabilitated immediately upstream of this project in 2020. The remaining 2,500 feet between Highway 30 and Pump Station 10 will be completed as part of this project.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$242,000	$307,000

CIP ID#
B02

West Interceptor – Shorewood Relief (Phases 1, 2 & 3)

START DATE:
2018

COMPLETION DATE:
2023

PROJECT TYPE	Capacity Improvement – Conveyance System
LOCATION	West Interceptor Relief Sewer University Avenue, Walnut Street to Whitney Way, City of Madison and Village of Shorewood
DESCRIPTION	This project will provide additional capacity to the West Interceptor System in order to convey projected flows from the west side of the District's service area. The improvements consist of the installation of 11,500 feet of replacement and/or relief sewer that will be installed roughly parallel to the District's existing sewer that runs along the University Avenue corridor between Walnut Street and Whitney Way. Due to the size and complexity of this project, it is proposed that construction will occur in three phases, with construction beginning in 2021 and ending in 2023. It is anticipated that each phase of this project will be financed through the Clean Water Fund program.
BACKGROUND	Expected growth in the District's Pumping Station 15 service area, including the Bishops Bay development in the City of Middleton and the Town of Westport, has created a need for the District to add additional capacity to its West Intercepting System. In its 2009 report entitled, "MMSD Collection System Evaluation," the Capital Area Regional Planning Commission identified several sections of the West Interceptor within the proposed project limits that required capacity relief prior to 2010 based on population forecasts. The District's 2011 Collection System Facilities Plan Update included a detailed analysis of the system between Walnut Street and Whitney Way and determined that additional capacity should be provided in or around 2020.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
PHASE 1 – $0	PHASE 1 – $4,915,000
PHASE 2 – $1,756,000	PHASE 2 – $1,756,000
PHASE 3 – $0	PHASE 3 – $4,679,000

CIP ID#
B03

NEI – Truax Extension Rehab (Lining Project)

START DATE:
2021

COMPLETION DATE:
2022

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Northeast Interceptor – Truax Extension USH 51 Corridor, Rieder Road to Lien Road, City of Madison
DESCRIPTION	This project will correct condition defects in the Northeast Interceptor between Lien Road and the end of the Pumping Station 13 Force Main at Rieder Road. Approximately 11,000 feet of existing 48-inch concrete pipe will be rehabilitated through the installation of a new cured-in-place liner within the existing pipe. This project will be undertaken shortly after the NEI-Truax Extension relief sewer is completed. It is anticipated that this project will be financed through a Clean Water Fund loan.
BACKGROUND	This section of the Northeast Interceptor was installed in 1969 and suffers from internal corrosion due to the presence of elevated levels of hydrogen sulfide in the wastewater. Approximately one-half of the Northeast Interceptor System between Pumping Station 18 and Pumping Station 14 has either been rehabilitated or replaced due to corrosion. Corrosion of the pipe reduces the capacity by increasing surface roughness and may eventually cause the pipe to fail. Installation of a cured-in-place liner can extend the service life of the interceptor if installed before the corrosion progresses too far.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$5,995,000	$6,025,000

CIP ID#
B04

NEI – Waunakee Extension Capacity Improvements (Phase 1)

START DATE:
2021

COMPLETION DATE:
2024

PROJECT TYPE	Capacity Relief – Conveyance System
LOCATION	Northeast Interceptor – Waunakee Extension Yahara River to Village of Waunakee, Town of Westport and Village of Waunakee
DESCRIPTION	This project will provide additional capacity to the Northeast Interceptor system in order to convey projected flows from the villages of Dane and Waunakee and the Town of Westport. The improvements consist of the installation of approximately 18,600 feet of new sewer that will be installed parallel to the District's existing sewer that extends from the Yahara River to the Village of Waunakee. At this time, it is proposed that construction will occur in two phases, with construction of the first phase tentatively scheduled for 2023-24. It is anticipated that this project will be financed through the Clean Water Fund program.
BACKGROUND	Continued high growth rates in the Village of Waunakee and Town of Westport are expected to create a need for the District to add capacity to the Waunakee Extension of the Northeast Interceptor. The Capital Area Regional Planning Commission (CARPC) is projecting that capacity will be reached in several segments of the Waunakee Extension by or about 2022, based on population forecasts. Periodic flow monitoring performed by District staff as part of the billing program validates these projections. This project could be postponed if development patterns in the service area change.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$577,000	$ 7,948,000

CIP ID#
B05

NEI - FEI to SEI Rehab (Lining Project)

START DATE:
2023

COMPLETION DATE:
2024

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Northeast Interceptor Femrite Drive/Copps Avenue to Progress Road, City of Monona and City of Madison
DESCRIPTION	This project will correct condition defects in the Northeast Interceptor between its junction with the Far East Interceptor and its junction with the Southeast Interceptor. Approximately 3,300 feet of existing 48-inch concrete pipe will be rehabilitated through the installation of a new cured-in-place liner within the existing pipe. It is anticipated that financing of the project will be through a loan from the Clean Water Fund.
BACKGROUND	This section of the Northeast Interceptor was installed in 1964 and suffers from internal corrosion due to the presence of elevated levels of hydrogen sulfide in the wastewater. Approximately 2,250 feet of the Northeast Interceptor between the Far East and Southeast interceptors was abandoned in 2013 and replaced with a new sewer due to the condition of the pipe. This project will rehabilitate and extend the service lives of the remaining sewer segments that were not replaced in the 2013 project.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$2,129,000

CIP ID#
B06 & B07

Lower Badger Mill Creek Interceptor – Phases 5 and 6

START DATE:
2022

COMPLETION DATE:
2024

PROJECT TYPE	New Capacity – Conveyance System
LOCATION	Lower Badger Mill Creek Interceptor CTH PD to Midtown Road, Town of Verona & City of Madison
DESCRIPTION	This project will extend the District's Lower Badger Mill Creek Interceptor from Highway PD to Midtown Road to provide service for new development and relieve the City of Madison's existing pumping station at Midtown Road. Construction will occur in two phases in order to accommodate proposed development in the basin. This project will be funded through capital fund reserves. Project costs will be recovered from connection charges from new users upon connection to the interceptor improvements.
BACKGROUND	District policy allows for the construction of District interceptors only when that interceptor shall serve at least two municipalities. Sanitary sewer service options for the Lower Badger Mill Creek drainage basin were studied by District staff in 2005. At that time, it was decided that a regional interceptor sewer would be constructed in several phases as development needs dictated in order to serve the cities of Verona and Madison and the towns of Verona and Middleton. Phases one through four of the interceptor were constructed between 2006 and 2018. Phase five will extend the sewer approximately 3,000 feet to the north to Shady Oak Lane in 2023. The sewer is scheduled to be completed in 2024 when it is extended 5,500 feet to Midtown Road.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
PHASE 5 – $93,000 PHASE 6 – $113,000	PHASE 5 – $1,196,000 PHASE 6 – $3,082,000

CIP ID#
B08

SEI Rehab – PS 9 to SEI-Dutch Mill Extension

START DATE:
2022

COMPLETION DATE:
2023

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Southeast Interceptor Along U.S. Highway 51 from Pumping Station 9 to U.S. Highway 12/18, Village of McFarland
DESCRIPTION	This project will correct condition defects in the Southeast Interceptor between the District's Pumping Station 9 in the Village of McFarland and U.S. Highway 12/18. Numerous cracks and missing pipe material in the asbestos cement sewer will be rehabilitated through the insertion of a cured-in-place lining. New force main valves and a flow meter will also be installed at Pumping Station 9 as part of the work. It is anticipated that this project will be financed through the Clean Water Fund program.
BACKGROUND	This section of the Southeast Interceptor was constructed in 1961 and consists of approximately 8,300 lineal feet of 12-inch and 15-inch asbestos cement pipe. A routine inspection by closed-circuit television in 2014 revealed numerous defects, including surface corrosion, cracks and missing pipe material. The Wisconsin Department of Transportation (WDOT) is planning to make improvements to U.S. Highway 51 from I-39/90 to U.S. Highway 12/18 in 2023. Since the Southeast Interceptor is parallel to U.S. Highway 51 and within the highway right-of-way for a significant distance, it is desired to rehabilitate the sewer in advance of the highway project.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$77,000	$1,796,000

CIP ID#
B09

Pump Station 6 to Pump Station 10 Connector

START DATE:
2022

COMPLETION DATE:
2025

PROJECT TYPE	System Redundancy – Conveyance System
LOCATION	Pumping Station 6 402 Walter Street, City of Madison Pumping Station 10 110 Regas Road, City of Madison
DESCRIPTION	This project proposes to construct a gravity sewer to connect the East Interceptor upstream of Pumping Station 6 to the Northeast Interceptor upstream of Pumping Station 10. The primary purpose of this interconnection is to provide system redundancy and flexibility during high flows and other emergency events. Since this emergency diversion relies on gravity and not electrical energy, it satisfies all the guidance requirements set forth in the District's Administrative Guideline #11 for Operational Continuity During Loss of Grid Power. It is expected that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	The District's collection system consists of 18 pumping stations and 32 miles of raw wastewater force mains. A loss of electrical power at any of these pumping stations or a pipe failure in any of the force mains threatens the ability of the collection system to safely and efficiently convey raw wastewater to the treatment plant. Diversion sewers such as the one proposed for this project allow for the emergency transfer of flow between pump stations during emergency situations, and they have been used very effectively in other areas of the collection system. The Pumping Station 6 to Pumping Station 10 connector was studied and recommended in both the 2002 Collection System Facilities Plan and the 2009 Collection System Facilities Plan Update.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$144,000	$7,100,000

CIP ID#
B10

NSVI Capacity Improvements – Phase 1

START DATE:
2024

COMPLETION DATE:
2028

PROJECT TYPE	Additional Capacity – Conveyance System
LOCATION	Nine Springs Valley Interceptor (NSVI) Lewis Springs E-Way from Pumping Station 11 to Syene Road, City of Fitchburg
DESCRIPTION	This project will provide additional capacity to the Nine Springs Valley Intercepting System between the District's Pumping Station 11 and Syene Road. It is expected that approximately 8,700 feet of relief or replacement sewer will be installed along the Lewis Springs E-Way in order to serve new development in the southwest and western portions of the District's service area. This project will be funded through a loan from the Clean Water Fund.
BACKGROUND	The Nine Springs Valley Intercepting System between Pumping Station 11 and Pumping Station 12 was constructed in 1965 and includes 33,000 feet of sewer, ranging in diameter from 30 inches to 54 inches. The Interceptor's service area includes some of the fastest growing lands in Dane County and Wisconsin. Population and wastewater forecasts performed by the Capital Area Regional Planning Commission indicate that most of the NSVI system and approximately 3,600 feet of sewer upstream of Pumping Station 12 will require additional capacity between 2025 and 2040. A capacity improvement project is currently underway for the NSVI between McKee Road and Dunn's Marsh. This project is the first phase of a multi-phase project that will address capacity needs in the remainder of the NSVI system.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$13,251,000

CIP ID#
B11

West Interceptor Rehab – Babcock Hall to Dayton Street

START DATE:
2024

COMPLETION DATE:
2025

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	West Interceptor Along Babcock Drive, University Avenue and N. Randall Avenue, City of Madison
DESCRIPTION	The purpose of this project is to rehabilitate a portion of the West Interceptor which is located on the University of Wisconsin campus. The sections to be rehabilitated have been in service for over 100 years and are suffering from internal corrosion. Inserting a cured-in-place liner in the existing sewer will extend its service life 50 years or more. It is anticipated that this project will be financed through the Clean Water Fund program.
BACKGROUND	These sections of the West Interceptor are the oldest assets in the District's collection system. The 24-inch cast iron sewer was originally constructed by the City of Madison in 1916 and then transferred to the District in 1933. Like other sewers of similar age and construction materials, this sewer suffers from tuberculation, or the buildup of deposits on the inside walls of the pipe. These deposits reduce the capacity of the sewer over time and may compromise the structural integrity of the pipe if left unchecked. Rehabilitating the pipe with a new liner is a cost-effective way to address these problems.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$1,249.000

CIP ID#
B12

District Flow Monitoring Stations

START DATE:
2025

COMPLETION DATE:
2026

PROJECT TYPE	Inflow & Infiltration – Conveyance System
LOCATION	Various
DESCRIPTION	This project supports the District's inflow and infiltration monitoring program through the installation of flow monitoring stations. These monitoring stations will be installed at strategic locations in the collection system to provide accurate flow measurements from District customers. It is anticipated that this project will be funded through the Clean Water Fund program.
BACKGROUND	Customer community meetings held in 2019 identified inflow and infiltration (I/I) reduction as a top priority for the District. With that in mind, the District hired a consultant in 2020 to develop an I/I reduction plan. One of the recommendations from that plan is to use the District's hydraulic model of its collection system to identify areas of excessive I/I. The construction of long-term monitoring sites in the collection system is needed to properly calibrate the model and validate it's results. The installation of monitoring sites that are well constructed, provide accurate data and are safe for District staff will ensure the integrity of the flow data and the I/I reduction program.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$1,181,000

CIP ID#
C01

Grass Lake Dike Stabilization

START DATE:
2018

COMPLETION DATE:
2022

PROJECT TYPE	System Rehabilitation – Effluent Conveyance System
LOCATION	Badfish Creek and Grass Lake Badfish Creek, Schneider Road to Rutland Dunn Town Line Road, Town of Dunn
DESCRIPTION	The purpose of this project is to evaluate and implement corrective measures to stabilize the Grass Lake dike to prevent sloughing of the shoreline soil. It is anticipated that these measures will include a combination of repair methods, including rebuilding sections of the dike and redirecting the channel and enhancing habitat by inserting vegetation into the channel at strategic locations. Funding of the improvements will be via capital fund reserves.
BACKGROUND	The Grass Lake dike roads were built to provide a barrier between the District's effluent in Badfish Creek and Grass Lake. Repairs have been made in the past to prevent subsurface flow from the effluent channel from passing into Grass Lake and also to prevent animals from tunneling through the dike. Despite the repairs made by the District's Facilities Maintenance Department over the years, these problems are recurring, and a more permanent solution is needed. Cardo Inc. was retained in September 2018 to provide an assessment of the problem, recommend solutions and prepare a design for improvements. The preliminary assessment and final design have been substantially completed. Construction is scheduled for 2021-22, pending acquisition of the necessary permits.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$345,000	$890,000

CIP ID#
C02

PS 4 Rehabilitation

START DATE:
2020

COMPLETION DATE:
2023

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Pumping Station 4 620 John Nolen Drive, City of Madison
DESCRIPTION	This project provides for a major rehabilitation of Pumping Station 4. Improvements to the station are expected to include the following: replacement of all three pumps due to age and lack of adequate capacity; provision of variable frequency drives to improve operational performance; improvements to the power system to achieve greater redundancy, including provision of an on-site generator; replacement of aging electrical and control equipment; and a new HVAC system. It is anticipated that this program will be funded through a Clean Water Fund loan.
BACKGROUND	Pumping Station 4 was placed into service in 1967 and pumps flow directly to the Nine Springs Wastewater Treatment Plant through a parallel force main system with Pumping Stations 2 and 3. Most of the equipment in the station has not been replaced or upgraded since the station was started up in 1967. As a result, it is recommended that the major electrical equipment and associated controls be replaced to ensure that the station operates reliably. In addition, it is recommended that the pumping units be replaced and optimized so that the station works in concert with the pumps from Pumping Stations 2 and 3.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$1,669,000	$5,481,000

CIP ID#
C03

PS 17 Rehabilitation

START DATE:
2021

COMPLETION DATE:
2024

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Pumping Station 17 407 Bruce Street, City of Verona
DESCRIPTION	This project will rehabilitate many systems at Pumping Station 17 in advance of a significant increase in flows to the station, which is expected to occur in 2024. The rehabilitation will include improvements to the following: new pumps and associated piping; electrical improvements to support the new pumping equipment; a new standby generator; replacement of HVAC equipment; and replacement and automation of station valves. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	At this time Pumping Station 17 serves only areas within the City of Verona. Additional flow from the City of Madison, and possibly the Town of Verona, will drain to Pumping Station 17 in or about 2024 when the final phase of the Lower Badger Mill Creek Interceptor is constructed up to Midtown Road and the City of Madison abandons its pumping station in this location. A capacity upgrade will be needed for Pumping Station 17 when this occurs. In addition, it is expected that significant upgrades to the station piping and the electrical and HVAC systems will be needed with the new pumping equipment.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$402,000	$5,224,000

CIP ID#
C04

PS 17 Force Main Relief – Phase 2

START DATE:
2021

COMPLETION DATE:
2023

PROJECT TYPE	Capacity Improvement – Conveyance System
LOCATION	Pumping Station 17 Force Main Badger Mill Creek, Bruce Street to Maple Grove Drive, City of Verona and Town of Verona
DESCRIPTION	This project will add a relief force main to the existing 16-inch force main and will provide additional capacity for wastewater that is pumped from Pumping Station 17 in the City of Verona. Approximately 6,850 feet of force main will be installed in the first phase of construction and 8,700 feet in the second phase. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	Additional flow will drain to Pumping Station 17 in or about 2024 when the final phase of the Lower Badger Mill Creek Interceptor is constructed up to Midtown Road and the City of Madison abandons its pumping station in this location. Capacity relief will be needed for the force main system when this occurs. Relief for the force main system has been separated into two construction phases. The District is constructing phase one of the relief force main in conjunction with a City of Verona utility project in 2020 and 2021 to reduce costs and inconvenience to the general public. Phase two of the project will occur in or about 2023, just prior to completion of the final phase of the Lower Badger Mill Creek Interceptor Project.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$288,000	$4,961,000

CIP ID#
C05

PS 16 Force Main Rehabilitation

START DATE:
2021

COMPLETION DATE:
2023

PROJECT TYPE	System Rehabilitation – Conveyance System
LOCATION	Pumping Station 16 Force Main North Gammon Road (Colony Drive to Mineral Point Road), City of Madison
DESCRIPTION	The purpose of this project is to correct condition defects in the Pumping Station 16 force main on North Gammon Road between Colony Drive and Mineral Point Road. Approximately 400 feet of interceptor sewer downstream of the interceptor will also be rehabilitated as part of this project. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	The Pumping Station 16 Force Main was installed in 1979-80 on Gammon Road from Pumping Station 16 in the City of Middleton to just north of Mineral Point Road in the City of Madison. The system consists of approximately 6,900 feet of 36-inch diameter ductile iron pressure sewer and 2,900 feet of 30-inch diameter ductile iron sewer that is not pressurized. The majority of the pressurized sewer is fully submerged at all times and is believed to be in good condition. Approximately 1,600 feet of the non-pressurized sewer is not fully submerged with wastewater and thus is showing evidence of corrosion via inspection by closed circuit television. A thorough evaluation of the pipe will be done in the summer of 2021 to verify the need for rehabilitation. The project proposes to either rehabilitate the corroded force main sections with a cured-in-place liner or to replace those sections with new pipe.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$67,000	$1,652,000

CIP ID#
C06

Emergency Power Generation at District Pumping Stations

START DATE:
2022

COMPLETION DATE:
2030

PROJECT TYPE	System Reliability – Conveyance System
LOCATION	Various Pumping Stations
DESCRIPTION	This project will improve the District's ability to sustain its collection system operations in the event of a local or regional power outage. Improvements will include the addition of on-site diesel generators for emergency use and associated switching equipment that will be installed at District pumping stations which currently lack such standby facilities. It is anticipated that this project will be funded through a loan from the Clean Water Fund.
BACKGROUND	District Administrative Guideline #11 provides guidance on how to sustain operations during a loss of power from the electrical grid. More specifically, the guideline specifies a desired level of service such that wastewater collection and treatment can continue to operate at peak design capacity for at least 72 hours after a loss of power. Applying this standard to District pumping stations, one method of achieving this level of service is by providing standby generators at each station. District staff have prioritized each pumping station's needs for standby generation and have developed an implementation schedule that begins in 2025 and runs through 2030.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$5,000	$8,429,000

CIP ID#
C07

Miscellaneous Collection System Improvements

START DATE:
ONGOING

COMPLETION DATE:
ONGOING

PROJECT TYPE	Variable
LOCATION	Conveyance System
DESCRIPTION	The purpose of these projects is to make modifications or minor improvements to capital assets in the collection system on an annual basis to ensure that they remain in good working condition and enhance the safety of the District's workers. These projects will be funded through reserves in the capital fund.
BACKGROUND	As the District's assets in the collection system age, operations staff members have noted a need to make a number of minor improvements to ensure that they remain in good working order. In many cases, the projects are relatively small in scope, yet they are too large and time consuming to be addressed by the District's maintenance staff. The intent of this item in the capital budget is to provide an annual allowance for the identification and completion of these smaller improvement projects. The projects will be administered through the Operations Department or Engineering Department and completed by a contractor in accordance with the District's procurement code.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$90,000	ONGOING

CIP ID#
C08

Force Main Condition Assessment

START DATE:
2024

COMPLETION DATE:
2029

PROJECT TYPE	Conveyance System – Force Main Condition Assessment
LOCATION	Various
DESCRIPTION	The purpose of this project is to provide support for annual inspection of the District's force mains. These assets are extremely difficult to inspect by traditional methods as they are difficult to access under pressure and cannot be taken out of service for long periods of time. Technology has been developed that can address these challenges, but the inspections require careful planning and can be costly to perform. It is expected that these annual inspections will be paid for from cash reserves in the capital projects fund.
BACKGROUND	Black & Veatch developed a Force Main Condition Assessment Plan for the District in 2017. The primary goals of this work were to develop a plan for the District to use to evaluate the condition of its force mains and to recommend when and how the condition assessments should be performed. The Collection System Facilities Plan Update will make further recommendations on the timing and location of projects when it is completed in 2022. In the interim, an annual placeholder is being included in the six-year Capital Improvements Plan beginning in 2024.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$0	$3,534,000

CIP ID#
D01

Capital Budget Expenses

START DATE:
ONGOING

COMPLETION DATE:
ONGOING

PROJECT TYPE	Capital Budget Expenses
LOCATION	District-wide
DESCRIPTION	These are general capital budget expenses. More specifically, they are annual funds used for smaller planning, study and related expenses that are required to update and implement the Capital Improvements Plan (CIP).
BACKGROUND	Development of the District's Capital Improvements Plan and capital budget requires almost continual study and planning. Often, internal resources are not available to conduct studies or planning in desirable time frames, and external resources are necessary. This budget item provides funds to cover expenditures for smaller studies or planning efforts.

FINANCIAL ANALYSIS

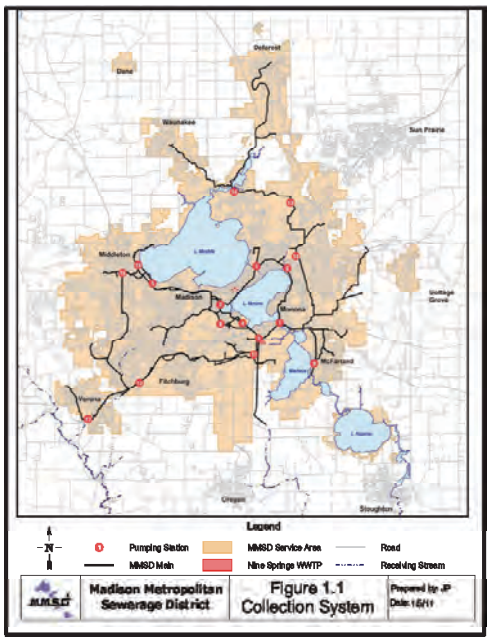
2022 EXPENDITURE ($2022)	TOTAL COST
$52,000	ONGOING

CIP ID#
D02

Collection System Facilities Plan Update

START DATE:
2018

COMPLETION DATE:
2022



PROJECT TYPE	Capital Budget Expenses
LOCATION	Collection System
DESCRIPTION	The District's Collection System Facilities Plan is a key planning document that is periodically updated based on projections from the Capital Area Regional Planning Commission. Funding for this study will be through reserves from the capital fund.
BACKGROUND	The purpose of the collection system facilities plan is to update and revise the previous plan conducted in 2011. As with the original 2002 plan, the 2011 update reviewed and assessed the adequacy and condition of the District's collection system to identify and recommend future collection system projects. Since plan adoption, the District has completed many of the recommended projects. Following the Capital Area Regional Planning Commission's update of the District's collection system evaluation in 2018, it will be time to review those projects remaining on the list and identify additional future projects that may be required to sustain and/or enhance the integrity of the District's collection system. In the past, the facility plans have been completed solely with District staff at considerable levels of time and effort. An engineering consultant will be retained to complete a portion of this update, with particular attention given to work on control of inflow and infiltration on private property.

FINANCIAL ANALYSIS

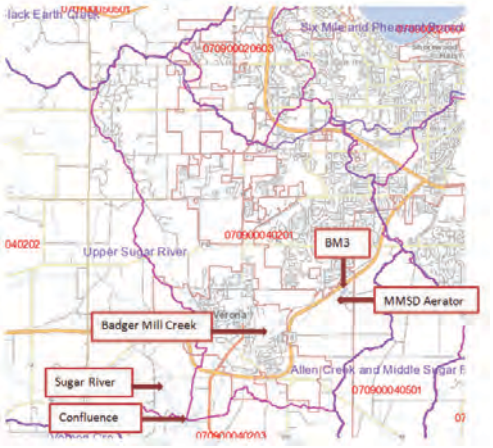
2022 EXPENDITURE ($2022)	TOTAL COST
$40,000	$206,000

CIP ID#
D03

Badger Mill Creek Phosphorus Compliance

START DATE:
2019

COMPLETION DATE:
2028



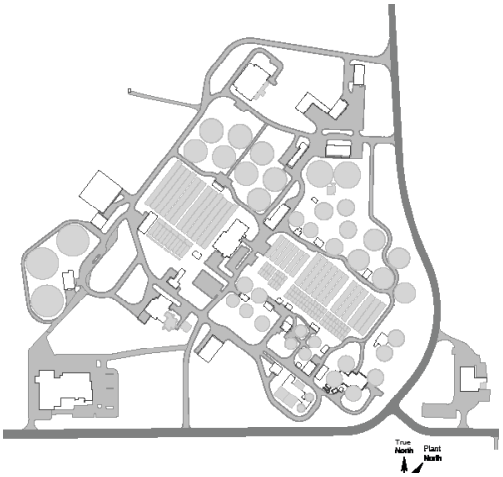
PROJECT TYPE	Effluent
LOCATION	Badger Mill Creek Town of Verona and City of Verona
DESCRIPTION	The purpose of this project is to allow for evaluation, plan development and implementation of a solution to address new phosphorus water quality criterion for Badger Mill Creek. New water quality standards for this waterway are part of the District's Wisconsin Pollution Discharge Elimination System (WPDES) permit that was issued in April 2020. The District began preliminary planning for the new standards in 2019, assuming a nine-year compliance schedule. It is anticipated that early planning work related to this effort will be funded through reserves from the capital fund.
BACKGROUND	Badger Mill Creek is an effluent-dominated stream located in the Town of Verona and City of Verona. The District returns approximately 3.6 million gallons per day of treated effluent to this waterway to offset groundwater that is pumped out of the Sugar River basin and sent to the Nine Springs Wastewater Treatment Plant as wastewater for treatment. The District's new WPDES permit requires a phosphorus water quality criterion for Badger Mill Creek, which is significantly less than the existing standard. The District has developed six preliminary options to comply with this new criterion: (1) diversion of flow to Badfish Creek; (2) water quality trading; (3) site-specific phosphorus criterion for Badger Mill Creek; (4) variance to current water quality criterion; (5) watershed adaptive management; and (6) treatment. Preliminary work will involve the evaluation of these options and pilot testing options that appear viable.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$206,000	$19,345,000

CIP ID#
D04

Plan for District Properties



START DATE:
2022

COMPLETION DATE:
2023

PROJECT TYPE	Plant Improvements – Space Needs
LOCATION	Nine Springs Wastewater Treatment Plant
DESCRIPTION	This project was referred to as the Campus Space Master Plan in previous capital improvements plans. The primary purposes of this project are to perform an inventory of all available land and buildings owned by the District, identify those lands and buildings with the greatest needs, propose reconfiguration options and prepare an annual plan for recommended changes. Plant security will be an integral part of the evaluation to ensure that the campus is secure and safe for all staff and visitors. It is likely that this project will include the implementation of some security enhancements in the near term. It is anticipated that this project will be funded through capital fund reserves.
BACKGROUND	Traditionally, the District has planned for future space needs in conjunction with major plant additions that were driven by permit compliance and/or capacity needs. The District has many large projects in its six-year Capital Improvements Plan that will require additional space and coordination. These projects include the following: liquids processing improvement projects, Energy Management Master Plan, Biosolids Management Plan, Shop One site improvements and renovations, a new septage receiving facility and a potential resource recovery facility. All these projects should be evaluated together to effectively plan the future layout of the plant grounds.

FINANCIAL ANALYSIS

2022 EXPENDITURE ($2022)	TOTAL COST
$177,000	$360,000

APPENDIX B: COMPLETED PROJECTS AND RETAINERS

2020 PROJECT COMPLETIONS

SHOP ONE SITE IMPROVEMENTS

A portion of Shop One was converted into a large meeting room when the new Maintenance Facility was constructed in 2016. The room functioned as a meeting room for District staff and tour groups but had limitations due to the poor sound quality. In order to use this space for increased uses such as educational programming and to promote the One Water concept, improvements were needed. This project improved the lighting and acoustical properties of this space so that it can be better utilized. The work was done using a design-build process and was completed in early 2020 at a total cost of $200,000, with funding from capital reserves.

2019 TREATMENT PLANT PIPING IMPROVEMENTS PROJECT

This project involved the replacement of both potable water and hot water piping networks at the treatment plant. Both piping networks were installed in the 1960s and have suffered numerous breaks and leaks over the years. Replacement of the pipes was necessary to ensure that they can reliably support the treatment processes. Work began in December of 2019 by 1901 Inc. (mechanical contractors) and was substantially completed in May of 2020. The total project cost of $460,000 will be funded through the Clean Water Fund program.

AUTOMATED POWER TRANSFER AT PUMPING STATIONS 10 AND 11

Work under this project includes the addition of a third electrical power feed at the District's Pumping Station 10 and Pumping Station 11. The installed equipment included an automated transfer switch that monitors the status of each incoming power feed to the station and switches the feed as necessary to maintain reliable power. Madison Gas & Electric Company will own and operate this equipment for the District. Work on this project began in 2019 and was completed in the second half of 2020. The total project cost of $250,000 was paid for out of cash reserves in the capital fund.

2021 PROJECT COMPLETIONS/ANTICIPATED COMPLETIONS

Final Completion or Substantial Completion in 2021:

PUMPING STATION 7 IMPROVEMENTS

Pumping Station 7 (PS 7) was constructed in 1948. Prior to the construction of Pumping Station 18 (PS 18) in 2015, PS 7 conveyed approximately 40% of the daily flow to the District's treatment plant. While PS 18 lessened the criticality of PS 7 to a degree, improvements were still needed at PS 7 to replace aging equipment and to optimize how the stations interact with each other. Improvements constructed as part of this project include the replacement of existing controllers and the control system, replacement of electrical switchgear and HVAC system, separation of the control room space from the garage and screen room, installation of an odor

control system and pump and valve replacements. Work on the project by C.D. Smith began in August of 2019 and reached final completion in January of 2021. The total project cost of $4.1 million will be funded through a loan from the Clean Water Fund program.

INTERCEPTOR REHABILITATION – 2020

This project involved the rehabilitation of existing sewers on two District interceptor systems in 2020. Approximately 4,500 feet of the Spring Street Relief Sewer on the West Interceptor was rehabilitated with a cured-in-place liner as part of the project, starting at the intersection of Spring Street and North Randall Street and terminating at West Washington Avenue near Brittingham Park. This 24-inch diameter cast iron sewer was installed in 1940 and has heavy mineral deposits, or tuberculation, along its entire length. These deposits decrease capacity and weaken the structural integrity of the pipe if not addressed. In addition, approximately 300 feet of the Northeast Interceptor Relief Sewer and East Johnson Street Relief Sewer was rehabilitated as part of this project. These sewers are located at the intersection of North First Street and East Johnson Street in the City of Madison. Work on this project was completed in the fall of 2020, with final project closeout occurring in February of 2021. The total project cost of $1.0 million will be funded with a loan from the Clean Water Fund program.

NORTHEAST INTERCEPTOR JOINT GROUTING MH10-112 TO MH10-106

Evidence of excessive inflow and infiltration (I/I) has been observed in the original Northeast Interceptor sewer immediately upstream of Pumping Station 10 for approximately 5,100 feet. This 48-inch diameter concrete sewer was installed in 1964 in an area with a high groundwater table. It is estimated that I/I rates may be as high as five gallons per minute in some areas. In this project, each joint along the sewer was air tested and injected with grout for 2,600 feet to reduce the I/I to an acceptable rate. The remaining 2,500 feet of 48-inch sewer will be rehabilitated in a similar manner in 2021 and 2022. Work on this project was performed in the second half of 2020, with final closeout of the project occurring in June of 2021. The total project cost of $193,000 will be paid for from cash reserves in the capital projects fund.

ANTICIPATED COMPLETIONS IN 2021

NORTHEAST INTERCEPTOR – TRUAX EXTENSION RELIEF

The Truax Extension to the Northeast Interceptor was constructed in 1969. The existing sewer within the project limits consists of approximately 11,000 feet of 48-inch diameter reinforced concrete pipe. Like many other sections of the Northeast Interceptor, this section of sewer is badly corroded due to hydrogen sulfide attack. In addition, population and flow forecasts by the Capital Area Regional Planning Commission indicate that additional capacity is needed in this section of the Northeast Interceptor within the next five to ten years to serve rapidly growing areas in the villages of Waunakee and DeForest. This project provides for the installation of a relief sewer to increase system capacity and will serve as a future bypass line when the existing sewer is rehabilitated in 2022. Speedway Sand & Gravel began work on the project in July of 2019 and substantially completed the work in October of 2020. It is expected that final closeout of the project will occur in July of 2021. The estimated total project cost of $8.5 million will be funded with a loan from the Clean Water Fund program.

LIQUID PROCESSING IMPROVEMENTS – PHASE 1

With the startup of new Pumping Station 18 in 2015 and capacity upgrades to Pumping Station 11 occurring shortly thereafter, there was the potential for the hydraulic capacity of the Nine Springs Treatment Plant to be exceeded. Facility planning began in 2016 for hydraulic upgrades to the treatment plant and to identify any related improvements to the liquid processes. A facilities plan was completed in August of 2017 that recommended a series of improvements to be implemented in three phases over a period of roughly 10 years. The first phase of these

improvements consists of enhancements to peak flow management at the plant, replacement of the ultraviolet light disinfection system, replacement of an electrical substation building and upgrades to the process control system. C.D. Smith began work on the improvements in the spring of 2020 and substantial completion is expected in June of 2021. The estimated total project cost of $16.8 million will be funded with a loan from the Clean Water Fund.

HEADWORKS FLOW METERING

The District's flow metering facilities were installed in 2005 as part of the Tenth Addition improvements. These facilities consist of a venturi meter on each of the five influent force mains that convey flow to the treatment plant. Accurate readings of these meters are essential for service charge billing and for proper operation of plant processes. Shortly after these facilities were started up, it was discovered that the flow meters were installed at an elevation which was too high relative to the water surface at the downstream fine screening units. In order to ensure that the flow meters read accurately, it was necessary to artificially raise the water surface upstream of the screens. This has caused the screens to run excessively and bypass rags and other solids. The purpose of this project is to lower each of the five venturi meters such that the fine screening units can be operated as originally intended with a lower upstream water elevation. Staab Construction began work on the project in June of 2020, and it is expected that the work will be substantially completed in the fall of 2021. The estimated total project cost of $2.3 million will be funded with a loan from the Clean Water Fund program.

ENERGY MANAGEMENT MASTER PLAN

Brown and Caldwell and Strand Associates performed an energy study in 2014 with the goal of outlining a strategy for the District to achieve energy independence. These strategies included ways to reduce energy usage, improve the utilization of digester gas and produce more energy. One major area not addressed in the 2014 study pertained to biosolids handling and distribution. With the recent issues with aging biogas powered engines, the addition of air permit requirements and new opportunities for biogas upgrading and sale, updating the energy plan was deemed a sensible next step to determine the best use of energy infrastructure. This master planning effort is taking a comprehensive look at how the District is currently using energy and is creating a roadmap for how to manage energy in the future. The study is emphasizing how to optimize energy use as critical pieces of equipment are replaced in the coming years, such as the gas-driven electrical generators and the associated hot water system. It is expected that projects related to heat and power improvements, biosolids processing and miscellaneous energy enhancements will be recommended for further study and facilities planning. Carollo Engineers, Inc. began work on the master plan in February of 2020 and is expected to deliver its final report in the fall of 2021. The anticipated total project cost of $624,000 is being paid for from reserves in the capital fund.

FINAL CLARIFIERS 4, 5 AND 6 EFFLUENT LAUNDER TROUGH REPLACEMENT

In the fall of 2017 District staff discovered numerous holes in the effluent launder troughs of Final Clarifier 6. It is believed that these holes are due to corrosion of the steel. Similar holes were found in the launder trough of Final Clarifier 5 in the spring of 2018. If the corrosion progresses too far, it could result in mixed liquor combining with the effluent and lead to decreased treatment performance. The corrosion could also compromise the safety of District personnel who need to stand on the troughs to maintain the clarifiers. This project will replace the effluent launder troughs on final Clarifiers 4, 5 and 6. The new launder troughs will be installed by Sabel Mechanical, LLC in the second half of 2021. The estimated total project cost of $310,000 will be paid for from reserves in the capital projects fund.

OPERATIONS BUILDING FIRST FLOOR REMODEL

A space needs study performed by Bray Architects in 2013 identified a need for improvements to the operators' control room in the Operations Building. In particular, a need for personal storage and a more efficient working space were identified. Further study and improvements were not conducted at

that time, however. Since 2013, several members of the Ecosystems Services Department have moved into offices in the laboratory, and the operations supervisor and lead operators share a small office. These changes have led to concerns over worker safety, the safety of the general public during facility tours and overall unsanitary conditions in these work areas. This project includes remodeling a portion of the laboratory and the operators' control room to provide a safer and more efficient use of space for staff who work in this area. Kenneth F. Sullivan Co. began work on the project in September of 2020, and it is anticipated that substantial completion will occur in the fall of 2021. The total estimated project cost of $2.1 million will be paid for through a loan from the Clean Water Fund.

OPERATIONS BUILDING 800 MECHANICAL ROOM (MINOR CAPITAL IMPROVEMENTS 2020)

The District's mechanical room contains an electric chiller that uses a refrigerant to cool interior spaces within the Operations Building. An inspection of this room by the Department of Safety and Professional Services in April of 2020 noted that several aspects of the chiller operation needed to be brought up to the proper standards. Required improvements included installation of a leak detection and alarm system for the refrigerant, ventilation modifications and provision of warning signs to alert personnel of the associated dangers with the system. The District retained Design Services to prepare plans and specifications for the necessary improvements in August of 2020, and the work was awarded to Kenneth F. Sullivan Co. in November of 2020. Substantial completion of the work is expected in July of 2021. The estimated total project cost of $100,000 will be paid for from cash reserves as part of the minor capital improvements line item in the 2020 capital budget.

ENGINE GENERATOR CONTROL PANEL REPLACEMENTS

The gas-driven engines and generators were installed in 1991 as part of the Sludge Gas Utilization Facilities for the Sixth Addition. The control panels for the generators use relays for control of the engines and have not been significantly modified since they were first installed. The panels also have high-voltage cabling in them that requires special safety equipment and expertise for staff to work in them. The purpose of this project is to replace the relay-based panels with modern programmable logic controllers (PLC) and to reconfigure the panels to eliminate the electric hazard for routine maintenance. An advertisement for construction bids was conducted in June of 2021. It is expected that the work will be awarded and substantially completed by the end of 2021. The estimated total project cost of $677,000 will be paid for from cash reserves in the capital projects fund.

NINE SPRINGS VALLEY INTERCEPTOR – MCKEE ROAD TO DUNN'S MARSH

This portion of the Nine Springs Valley Interceptor was installed in 1965 and consisted of reinforced concrete pipe ranging in diameter from 30 inches to 42 inches, except for a 1,170 foot stretch that was replaced in 2000. Due to its proximity with the end of the Pumping Station 12 Force main, significant corrosion has occurred in portions of this section. In addition, upstream flows have increased at a rapid pace due to development, and updated population forecasts suggest that capacity in much of this section will be reached in the next ten years. For these reasons, a new replacement sewer was installed along the recreational trail between McKee Road and Dunn's Marsh. R.G. Huston, Inc. began work on the project in December of 2020, and it is expected that work will be substantially complete in the summer of 2021. The estimated total project cost of $4.8 million will be funded through a loan from the Clean Water Fund.

PUMPING STATION 17 FORCE MAIN RELIEF – PHASE 1

Pumping Station 17 currently serves only lands within the City of Verona, and it and its force main are nearing capacity. In addition, the completion of the Lower Badger Mill Creek Interceptor between County Highway PD and Midtown Road is scheduled for 2023-24. When this occurs, the City of Madison's Midtown Pumping Station will be abandoned, and the flow to this station will be redirected to

Pumping Station 17. In advance of this diversion, a relief force main for Pumping Station 17 is needed to provide the required future capacity. The relief force main project was broken into two phases so that construction of the first phase would be coincident with a City of Verona project in the same corridor. Installation of the force main by Minger Construction Co., Inc. began in November of 2020 and will be substantially completed in the second half of 2021. The estimated total project cost of $3.5 million will be paid for from cash reserves in the capital projects fund.

NSVI-MORSE POND EXTENSION

This project included the construction of approximately 3,200 feet of new sanitary sewer from the existing Nine Springs Valley Interceptor (Midtown Extension) to the southwest corner of Highway PD and Highway M. The new sewer is located along Raymond Road and will provide service for lands in the City of Madison and lands south of Highway PD in the City of Verona. The sewer construction was coordinated with the reconstruction of Highway M from Cross Country Road in the City of Verona to Flagstone Drive in the City of Madison. Construction began in October 2017 and was substantially completed in September 2018. It is expected that final payment of the District's share of the project will be made in 2021. The total project cost of $2.2 million was financed through reserves from the capital fund.

RETAINERS

The District often includes maintenance or performance retainers within its contracts. The retainers are typically released to the contractor at the end of one year (in some cases contracts include longer performance periods) following completion of the contract and assuming satisfactory performance. The following are retainers that the District has released within the past year or those that are presently being withheld.

PUMPING STATION 11 AND 12 REHABILITATION

The District withheld a $20,000 three-year special maintenance retainer upon final project closeout. A total of $10,000 was for satisfactory performance of the pumps and motors and $10,000 was for satisfactory performance of the adjustable frequency drives. The $20,000 retainer was released to J.F. Ahern in February of 2020.

PUMPING STATION 15 REHABILITATION

The District withheld a $27,500 three-year special maintenance retainer upon project acceptance in March of 2018 as follows: (1) $10,000 to be paid to contractor and pump/motor supplier after three years of satisfactory performance; (2) $10,000 to be paid to contractor and supplier of variable frequency drives after three years of satisfactory performance; and (3) $7,500 to be paid to contractor after three years for landscape maintenance warranty, with payments to the contractor of $2,500 per year for each year's successful warranty work for the landscaping. The total retained amount of $7,500 for the landscaping work will not be paid due to unsatisfactory performance. The remaining $20,000 retained amount was scheduled for payment in March of 2021 but is still being withheld by the District pending the submission of final lien waivers from the project subcontractors.

The NSVI-Morse Pond Extension consists of approximately 3,200 feer of new sanitary sewer.

NSVI-MORSE POND EXTENSION

The District's interceptor was constructed under a contract that is being administered by the Wisconsin Department of Transportation. The District will withhold a maintenance retainer upon final project closeout in accordance with the Wisconsin Department of Transportation's contracting provisions.

PUMPING STATION 10 FORCE MAIN REHABILITATION

The District withheld a $10,000 one-year maintenance retainer upon final project closeout. The retainer was released to Murphy Pipeline Contractors, Inc. in February of 2020.

WEST INTERCEPTOR REHAB – PUMPING STATION 5 TO GAMMON EXTENSION

The District withheld a $10,000 one-year maintenance retainer upon final acceptance in September 2019. The retainer was released to Visu-Sewer, Inc. in September of 2020.

SOUTHEAST INTERCEPTOR REHABILITATION UPSTREAM OF PUMPING STATION 9

The District withheld a $10,000 one-year maintenance retainer upon final project closeout. The retainer was released to Visu-Sewer, Inc. in September of 2020.

SOUTHWEST INTERCEPTOR – HAYWOOD DRIVE REPLACEMENT

The District withheld a $20,000 retainer upon acceptance of the project in November of 2019, as follows: (1) a $10,000 maintenance retainer to correct any defective work for a period of one year after project acceptance and (2) an additional $10,000 retainer to grout two sanitary structures to address infiltration and inflow issues. The $10,000 retainer for the manhole grouting will be released to Maddrell Excavating, LLC upon successful execution of the grouting for a period of up to one year following project acceptance. The full retained amount remains to be paid due to warranty issues with inflow and infiltration.

BADFISH CREEK EFFLUENT FORCE MAIN STANDPIPE

The District withheld a $3,000 one-year maintenance retainer upon acceptance of the project in July of 2019. The retainer was released to Maddrell Excavating, LLC in August of 2020.

PUMPING STATION 7 IMPROVEMENTS

The District withheld maintenance retainers upon acceptance of the project on January 4, 2021 as follows: (1) a $10,000 retainer to correct any work which is found to be defective for the one-year period following project acceptance and (2) a $5,000 retainer to be withheld for a three-year period after project acceptance to be split equally between the pump/motor assembly and the variable frequency drives. All retainers will be paid to the contractor and/or supplier pending satisfactory performance in the previously mentioned amounts and time frames.

The District's collection system consists of 18 pumping stations and 32 miles of raw wastewater force main.

NORTHEAST INTERCEPTOR – TRUAX EXTENSION RELIEF

The District will withhold a $25,000 one-year maintenance retainer upon completion of the project. The retainer will be released to Speedway Sand & Gravel, Inc. one year after project closeout, pending satisfactory performance.

LIQUID PROCESSING IMPROVEMENTS – PHASE 1

The District will withhold a $10,000 one-year maintenance retainer upon final completion and acceptance of the work. The retainer will be released to C.D. Smith, Inc. one year after project acceptance, pending satisfactory performance. Additionally, a sum of $35,000 will be withheld until October 30, 2021, to ensure that any performance deficiencies exhibited by the UV disinfection system are rectified to the District's satisfaction.

2020 INTERCEPTOR REHABILITATION

The District withheld a $10,000 one-year maintenance retainer upon closeout of the project on February 11, 2021. The retainer will be released to Visu-Sewer, Inc. one year after project closeout, pending satisfactory performance.

The average age of the District's infrastructure continues to increase, which will require more construction planning and investment in the years ahead.

NORTHEAST INTERCEPTOR JOINT GROUTING MH10-112 TO MH10-106

The District withheld a $5,000 one-year maintenance retainer upon final completion and acceptance of the work on June 10, 2021. The District also withheld an additional $5,000 one-year maintenance retainer as a guarantee that the contractor shall provide post-grouting digital video of pipe sections that were tested, sealed and verified. The retained amounts shall be released to Michaels Corporation one year after project acceptance, pending satisfactory performance.

OPERATIONS BUILDING FIRST FLOOR REMODEL

The District will withhold a $10,000 one-year maintenance retainer upon final completion and acceptance of the work. The retainer will be released to Kenneth F. Sullivan Co. one year after project acceptance, pending satisfactory performance.

HEADWORKS FLOW METERING

The District will withhold a $10,000 one-year maintenance retainer upon final completion and acceptance of the work. The retainer will be released to Staab Construction Corporation one year after project acceptance, pending satisfactory performance.

NSVI – MCKEE ROAD TO DUNN'S MARSH

The District will withhold a $25,000 one-year maintenance retainer upon final completion and acceptance of the work. The retainer will be released to R.G. Huston Co., Inc. one year after project acceptance, pending satisfactory performance.

APPENDIX C: RISK MANAGEMENT AND PROJECT SELECTION

One of the purposes of the District's asset management program is to assess the risk related to specific critical assets. This process is ongoing and the tools to assess risk will become more sophisticated as the asset management program matures. An interim process to rate the level of risk is included in this section. The interim process, while less systematic than the final resulting system, provides similar end results and presents relative levels of risk for the projects selected.

INTERCEPTORS AND FORCE MAINS:

Risk is a combination of the consequences of asset failure and the probability that the asset will fail. It is typically scored as the product of the two scores:

Risk = (Consequence of Failure) x (Probability of Failure)

Another factor that enters into the analysis is mitigation. Mitigation methods may reduce the level of risk. One such method of reducing failure for interceptors is to install a lining within them. Redundant facilities and/or flow diversion options provide additional means of mitigating risk.

The pages following the pumping station discussion list the interceptor and force main projects included in this Capital Improvements Plan, brief information about each project and relative risk among the projects. This is then summarized in Table C-1 and shown graphically on Chart C-1. Projects that are proposing new assets are not scored since they do not have existing condition scores.

As can be seen from the chart, projects in the reddish upper-right area are of higher risk than those in the green lower-left area. Please note that relative risk is only one factor in determining when a project is scheduled. Other factors include, but are not limited to, cost, other resource availability, coordination with other construction and asset history.

PUMPING STATIONS:

The first edition of the District's Collection System Facilities Plan was completed in 2002. This plan used a rating process to identify the most critical pumping stations for refurbishment purposes. The rating sheet from this process has been used since to schedule pumping station rehabilitation projects and to help develop the scope of services for those projects.

The rating sheet was updated as part of the 2011 Collection System Facilities Plan update and was updated again in May 2020 to reflect recently completed projects such as the Pumping Station 7 Improvements Project and updated flow projections by the Capital Area Regional Planning Commission. The rating sheet, referenced as Table 5.1 from the 2011 Collections System Facilities Plan update, is included in most of the pumping station rehabilitation business cases throughout this Capital Improvements Plan, but has also been included at the end of this section for reference.

The rating system uses five rating criteria and a criticality rating factor to develop an overall score for the pumping station. The five factors include: (1) maximum and firm capacities, (2) power system redundancy, (3) mechanical systems, (4) electrical systems and (5) a category called structural integrity, which is a general category that includes a number of factors related to the pumping facility, structural condition being one of them. Each category is scored on a scale ranging from 1 (excellent condition) to 5 (very poor condition). The weighting factor is a scale from 1 to 2 and assesses the level of "criticality" of the pumping station in the District's system. It is the average of scores provided by several of the District's staff members. The score is based upon factors such as flow to the pumping station, location within the system, potential redundancy measures and how quickly the site might overflow or backup.

As noted in the table, the higher the score, the higher the priority. It should be noted that **Table 5.1** reflects the outcome of rehabilitation projects that were recently completed at Pumping Stations 7, 11, 12 and 15. As a result, these three stations have low overall scores since their needs were just addressed. The five highest ranking pumping stations currently include Pumping Station 13 (20.80), Pumping Station 14 (17.25), Pumping Stations 4 and 17 (15.53) and Pumping Station 2 (12.68).

The District is addressing the highest rated stations in the 2022 Capital Improvements Plan as follows: (1) The District is rehabilitating Pumping Station 13 and Pumping Station 14 in 2020 and 2021; (2) The District is planning to rehabilitate Pumping Station 4 in 2022 and 2023; and (3) The District is planning to upgrade capacity and rehabilitate many other systems at Pumping Station 17 in 2023 in response to growth needs in the Lower Badger Mill Creek service area.

Pumping stations (also called lift stations) are used to move wastewater to higher elevations in order to allow transport by gravity flow.

INTERCEPTOR AND FORCE MAIN PROJECTS AND ASSOCIATED RELATIVE RISK

The information below includes the main reason for each project, risk scores (consequence of failure times condition, or probability of failure), and informative details related to the project. The projects show up in related cells of the risk chart as well. Please note that the risk assessment for pumping stations is summarized in Table 5.1 and is not discussed in this section, except for smaller, specific projects.

B01 – Northeast Interceptor (NEI) Joint Grouting MH10-101 to MH10-106

Main driver for project:	Condition (I/I at pipe joints).
Consequence of failure 2 of 5	Large flows in sewer but it is part of a parallel system. Parallel sewer could handle all dry weather flows if needed.
Condition 3 of 5	Pipe is structurally sound overall but I/I is excessive at joints. Sewer located in an area with high groundwater table.
Comment:	This is second phase of joint grouting on NEI upstream of Pumping Station 10. The first phase was completed in 2020.
Risk score	6

B02 – West Interceptor – Shorewood Relief (not on chart)
Construction to occur in three separate phases/years beginning in 2021 and ending in 2023

Main driver for project:	Capacity relief.
Risk of not doing:	Portions of sewer at benchmark capacity since 2000. Peak flows estimated at 115% to 120% of available capacity in some stretches. Minor sewer overflow in this system in July of 2016 and August of 2018 during high-flow events.
Comment:	Growth in upstream basins has been slower than projected but need is still pressing.
Risk score	N/A, nonexistent facility

B03 – NEI-Truax Extension Rehab (lining)

Main driver for project:	Condition (significant corrosion).
Consequence of failure 3 of 5	Large sewer that crosses major highway. Serves large portions of northeast Madison and Westport plus all of Waunakee, DeForest, Dane and Windsor. Part of a parallel sewer system after completion of NEI-Truax Extension Relief Sewer in 2020 .
Condition 4 of 5	Significant corrosion.
Comment:	Continuation of rehab projects on Northeast Interceptor system.
Other information:	Rehab project will utilize NEI-Truax Extension Relief Sewer as a bypass sewer during lining operations, thereby saving on bypassing costs
Risk score	12

B04 – NEI-Waunakee Extension Capacity Improvements – Phase 1 (not on chart)
Planning in 2021; design in 2022, Construction in 2023-2024

Main driver for project:	Capacity – high growth area.
Risk of not doing:	Main interceptor from Waunakee and Dane, mainly in relatively open and low-lying areas adjacent to Six Mile Creek. Nearing benchmark capacity.
Comment:	Waunakee is one of our higher growth areas.
Risk score	N/A, nonexistent facility

B05 – NEI-FEI to SEI Rehab (lining project)

Main driver for project:	Condition
Consequence of failure 3 of 5	Large sewer which crosses major highway. Concern is that it may corrode to point it can't be lined. Relief sewer exists to mitigate consequence of failure. Serves much of east Madison, plus communities upstream.
Condition 3 of 5	Moderate to significant corrosion of concrete pipe.
Comment:	Follow up to NEI-FEI to SEI Relief/Replacement project, completed in 2013.
Risk score	9

B06 & B07 – Lower Badger Mill Creek Interceptor – Phases 5 & 6 (not on chart)

Main driver for project:	Growth in LBMC service area. Request from and coordination with customer communities.
Risk of not doing:	Midtown Road lift station will reach capacity and sanitary sewer overflows may occur if regional interceptor not constructed in a timely manner.
Other information:	Conforms to District's long-range plan to provide sewer service to LBMC service area.
Risk score	N/A, nonexistent facility

B08 – SEI Rehab – PS 9 to SEI-Dutch Mill Extension

Main driver for project:	Condition – moderate to significant corrosion.
Consequence of failure 2 of 5	Smaller diameter sewer running along U.S. Highway 51 between Pumping Station 9 (PS 9) and Beltline Highway. Serves primarily as a local sewer for Village of McFarland but can convey flow from PS 9 if needed.
Condition 3 of 5	Moderate to significant corrosion of asbestos cement pipe. Also, intermittent cracks and missing pipe material.
Comment:	U.S. Highway 51 scheduled for reconstruction by WDOT shortly after proposed sewer rehab.
Risk score	6

B09 – Pumping Station 6 to Pumping Station 10 Connector

Main driver for project:	Provide system redundancy for Pumping Station 6 and Pumping Station 10 in event that either station loses electrical power or its force main experiences a pipe failure.
Risk of not doing:	Basement back-ups upstream of these stations generally occur within two to three hours of station inactivity under average flow conditions and sooner in high flows. This project would mitigate this risk by diverting flow to a different part of the collection system.
Other information:	Conforms to District's Administrative Guideline #11 regarding operational continuity during loss of power to District facilities.
Comment:	Project addresses system redundancy and reliability. These types of diversions in other parts of the collection system have proved very useful in the past.
Risk score	N/A, nonexistent facility

B10 – NSVI Capacity Improvements – Phase 1

Main driver for project:	Fast growing area in southwest portion of collection system necessitates more system capacity.
Risk of not doing:	Potential for sanitary sewer outages in environmentally sensitive area if system capacity is not increased.
Other information:	This is the first phase of a four-phase project to increase system capacity of NSVI system between PS 11 and PS 12 before 2040.
Comment:	To coordinate with customer requests and anticipated growth.
Risk score	N/A, nonexistent facility

B11 – West Interceptor Rehab – Babcock Hall to Dayton Street

Main driver for project:	Condition – significant corrosion.
Consequence of failure 3 of 5	24-inch diameter sewer serving relatively small service area on west end of UW-Madison campus. Sewer is in busy traffic corridor on University Avenue.
Condition 4 of 5	Significant tuberculation occurring in old cast iron sewer.
Comment:	This is the oldest gravity sewer in collection system. Similar downstream sections have been rehabilitated within the past five years.
Risk score	12

B12 – District Flow Monitoring Stations

Main driver for project:	Flow metering facilities are needed to support development of District's I/I reduction program plan.
Risk of not doing:	Lack of good flow information will make it difficult for District's hydraulic model to accurately identify and quantify areas with excessive I/I.
Other information:	Monitoring stations will be built at select spots with good flow characteristics that are also safe for workers.
Comment:	Monitoring stations will provide long-term flow records that will be useful to identify changing conditions. May also be useful for service charge billing.
Risk score	N/A, nonexistent facility

C01 – Grass Lake Dike Stabilization

Main driver for project:	Repair progressing erosion of dike between Badfish Creek and Grass Lake so that the two bodies of water remain separated.
Consequence of failure 4 of 5	Effluent from Badfish Creek mixes with Grass Lake.
Condition 3 of 5	Erosion and sink holes are evident in dike and are worsening over time.
Comment:	District's easement in this area requires that effluent not discharge to lake (and vice versa). There was extensive litigation surrounding this issue in the 1980s.
Risk score	12

C04 – Pumping Station 17 Force Main Relief – Phase 2 (not on chart)

Main driver for project:	Provide additional capacity to serve new growth in LBMC service area.
Risk of not doing:	Risk of not having in place in time for new development.
Comment:	To coordinate with customer requests and anticipated growth.
Risk score	N/A, nonexistent facility

C05 – Pumping Station 16 Force Main Rehabilitation

Main driver for project:	Sections of Pumping Station 16 Force Main with identified corrosion.
Consequence of failure 4 of 5	Station 16 serves large portions of Middleton and southwest Madison. Some flow could bypass by gravity to Pumping Station 5, but the rest would overflow to area homes and Tiedeman's Pond conservancy area near Pumping Station 16.
Condition 3 of 5	Condition – non-submerged portions of force main showing corrosion.
Comment:	Lining gravity portions of force main to prevent failure.
Risk score	12

C06 – Emergency Power Generation at District Pumping Stations (not on chart)

Main driver for project:	Provide redundancy at all District pumping stations in the event of a loss of electrical power.
Risk of not doing:	Stations without on-site back-up power generation are susceptible to basement back-ups and sanitary sewer overflows.
Comment:	Design standard is to provide reliable operation at all District stations for at least a 72-hour period in the event of a loss of electrical grid power.
Risk score	N/A, nonexistent facilities

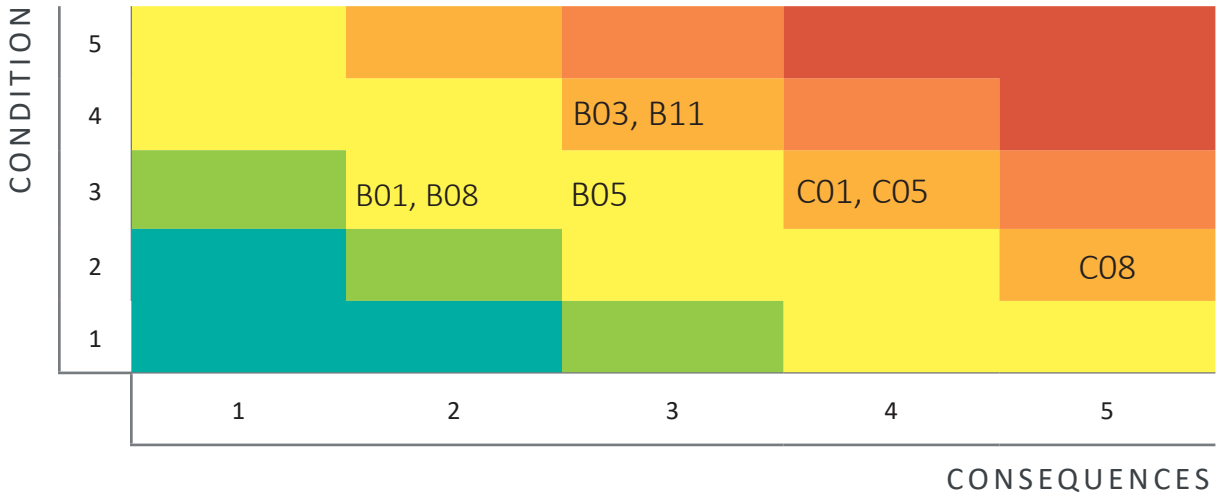
C08 – Force Main Condition Assessment

Main driver for project:	Evaluate condition of all District force mains. Inspection data for many of these assets is limited or nonexistent.
Consequence of failure 5 of 5	Unless diversion options exist, force main failures and outages can directly lead to basement back-ups and sanitary sewer overflows.
Condition 2 of 5	Condition – based on a limited amount of inspections, the District's force mains are in good condition.
Comment:	This project will use emerging technologies to inspect these assets without significant disruptions to service.
Risk score	10

TABLE C-1 | Interceptor & Force Main Projects and Associated Relative Risk

PROJECT		PRIMARY DRIVER	YEAR	CONSEQUENCE	CONDITION	RISK SCORE
B01	Northeast Interceptor Joint Grouting MH10-101 to MH10-106	**Condition**	2021-2022	2	3	**6**
B02	West Interceptor- Shorewood Relief (not on chart)	**Capacity**	2021- 2023	-	-	**-**
B03	NEI- Truax Extension Rehab (lining project)	**Condition**	2022	3	4	**12**
B04	NEI- Waunakee Extension Capacity Improvements (not on chart)	**Capacity**	2023- 2024	-	-	**-**
B05	NEI- FEI to SEI Rehab (lining project)	**Condition**	2024	3	3	**9**
B06	Lower Badger Mill Creek Interceptor- Phase 5 (not on chart)	**Growth/New**	2023	-	-	**-**
B07	Lower Badger Mill Creek Interceptor- Phase 6 (not on chart)	**Growth/New**	2024	-	-	**-**
B08	SEI Rehab- PS 9 to SEI-Dutch Mill Extension	**Condition**	2023	2	3	**6**
B09	Pumping Station 6 to Pumping Station 10 Connector (not on chart)	**Redundancy**	2024-2025	-	-	**-**
B10	NSVI Capacity Improvements- Phase 1 (not on chart)	**Capacity**	2027-2028	-	-	**-**
B11	West Interceptor Rehab- Babcock Hall to Dayton Street	**Condition**	2025	3	4	**12**
B12	District Flow Monitoring Stations (not on chart)	**I/I Reduction**	2026			
C01	Grass Lake Dike Stabilization	**Condition**	2021- 2022	4	3	**12**
CO4	PS 17 Force Main Relief Phase- 2 (not on chart)	**Growth/New**	2023	-	-	**-**
C05	PS 16 Force Main Rehabilitation	**Condition**	2023	4	3	**12**
C06	Emergency Power Generation at District Pump Stations (not on chart)	**Reliability**	2025-2030	-	-	**-**
C08	Force Main Condition Assessment	**Condition**	2024-2029	5	2	**10**

CHART C-1 | Interceptor & Force Main Projects and Associated Relative Risk



** Poor condition is assumed to increase the probability of failure.*

TABLE 5.1 | Pumping Station Rating Sheet
Assessment of Adequacy and Criticality

FACILITY	ADEQUACY/CONDITION OF MISSION CRITICAL CATEGORY *LIKERT SCALE (1-5) - CATEGORY DEPENDENT (SEE TEXT FOR EXPLANATION)*						TOTAL	WEIGHTING FACTOR (SLIDING SCALE OF 1 TO 2)	RATING	RANKING (1 - 17)
	PEAK FLOW CAPACITY QP (5 POINTS)	FIRM FLOW CAPACITY QF (5 POINTS)	POWER SYSTEM REDUNDANCY (5 POINTS)	MECHANICAL CONDITION/ (5 POINTS)	STRUCTURAL INTEGRITY (5 POINTS)	ELECTRICAL CONDITION (5 POINTS)				
PS NO. 1	1	1	1.5	1	1	1	6.5	1.75	11.38	9
PS NO. 2	1	1	1.5	1	1	1	6.5	1.95	12.68	5
PS NO. 3	1.5	1	3	1.5	4	1	12.0	1.00	12.00	7
PS NO. 4	2	1.5	3	1.5	2	3.5	13.5	1.15	15.53	3
PS NO. 5	1	1	1.5	1	1	1	6.5	1.20	7.80	16
PS NO. 6	1	1	1.5	1	1	1	6.5	1.30	8.45	15
PS NO. 7	1	1	1	1.5	1	1	6.5	1.75	11.38	9
PS NO. 8	1	1	1.5	1	1	1	6.5	1.85	12.03	6
PS NO. 9	1	1	1	1	2	1	7.0	1.10	7.70	17
PS NO. 10	1	1	1.5	1.5	1	1	7.0	1.70	11.9	8
PS NO. 11	1	1	1.5	1	1	1	6.5	1.70	11.05	11
PS NO. 12	1	1	1.5	1	1	1	6.5	1.50	9.75	14
PS NO. 13	2.5	2	4	1	3	3.5	16.0	1.30	20.80	1
PS NO. 14	2	1.5	4	1	3	3.5	15.0	1.15	17.25	2
PS NO. 15	1	1	1	1	1	1	6.0	1.25	7.50	18
PS NO. 16	1	1	2	2.5	2	1.5	10.0	1.10	11.00	12
PS NO. 17	3.5	3	1	4	1	1	13.5	1.15	15.53	3
PS NO. 18	1	1	1	1	1	1	6.0	1.75	10.50	13

ASSUMPTIONS/NOTES:

1. Pumping Station projects that are under construction or will soon be constructed include updated capacity and equipment condition assessments (e.g. PS 11 & PS 12 Rehabilitation (2015-2016), PS 15 Rehabilitation (2016) & PS 7 Improvements (2020).
2. All flow in the Lower Badger Mill Creek valley is assumed to be flowing to Pumping Station 17 in Year 2030. For Year 2015 all flows in the LBMC Valley South of Valley View Road are assumed to flow to PS 17. Station upgrades at PS 17 are not anticipated until the LBMC Interceptor is fully constructed (~2024).
3. No satellite treatment facilities are considered (e.g., Sugar River Treatment Plant).
4. Firm capacity and peak capacity are determined through comparison to actual 2015 flow measurements and projected 2030 flows. Flow projections are from Capital Area Regional Planning Commission's MMSD Collection System Evaulation (2018).
5. For PS 7, changed power system redundancy from 2 to 1, electrical condition from 3 to 1 and mechanical condition from 2.5 to 1.5 to refect PS 7 Improvements project.

(5/21/20)

APPENDIX D: GLOSSARY

COMMON ACRONYMS

CARPC - Capital Area Regional Planning Commission

CIP - Capital Improvements Plan

CMMS - Computerized Maintenance Management System

CWF - Clean Water Fund (loan program for wastewater facilities)

DNR - Department of Natural Resources

FEI - Far East Interceptor

FOG - Fats, Oils and Grease

MH - Manhole

MMSD - Madison Metropolitan Sewerage District

NACWA - National Association of Clean Water Agencies

NEI - Northeast Interceptor

NSVI - Nine Springs Valley Interceptor

O&M - Operations and Maintenance

PCS - Process Control System

PS - Pumping Station

SEI - Southeast Interceptor

WAM - Work and Asset Management (MMSD's CMMS software)

WPDES - Wisconsin Pollutant Discharge Elimination System (District permit)

WRS- Wisconsin Retirement System

DISTRICT DEFINITIONS

ADAPTIVE MANAGEMENT - Watershed approach developed to comply with stringent phosphorus limits.

ADDITIONS - Major construction related additions, alterations, conversions, reconstruction, renovations, rehabilitations and replacements at the Nine Springs Wastewater Treatment Plant.

ANAEROBIC DIGESTION - Under this process, the organic sludge is treated in the absence of oxygen to reduce both the quantity and odor of sludges by breaking down the organic matter and producing methane and carbon dioxide.

ACID DIGESTION - One of the primary steps of the anaerobic digestion process in which soluble products are fermented to acids and alcohols of lower molecular weight.

ANNEXATION - The process whereby a city, village, town or other unit of government (e.g., District) expands its boundaries to include a specific geographic area.

ASSET MANAGEMENT - Comprehensive management of parts and physical infrastructure to provide needed levels of service with tolerable risk at an acceptable lifecycle cost.

BILLING PARAMETERS - District billing parameters include: carbonaceous biochemical oxygen demand (CBOD), total suspended solids (TSS), total phosphorus (TP), total Kjehldahl nitrogen (TKN), volume, equivalent meters and actual customers.

BIOSOLIDS - The soil-like residue of materials removed from sewage during the treatment process.

CAPITAL PROJECTS FUND - Fund that accounts for financial resources used for the acquisition, construction or rehabilitation of major capital facilities. The budget for this fund is often referred to as the capital projects budget or capital budget.

CLASS "A" PRODUCTS (BIOSOLIDS) - Refers to sludge that contains minute levels of pathogens (disease causing organisms). To achieve Class A certification, biosolids must undergo heating, composting, digestion or increased pH that reduces pathogens to below detectable levels. Once these goals are achieved, Class A biosolids can be land-applied without any pathogen-related restrictions at the site.

CLASS "B" PRODUCTS (BIOSOLIDS) - Refers to sludge that has undergone treatment that has reduced but not eliminated pathogens. Class B biosolids have less stringent standards for treatment and contain small but compliant amounts of pathogens. Class B requirements ensure that pathogens in biosolids have been reduced to levels that protect public health and the environment and include certain restrictions for crop harvesting, grazing animals and public contact. As is true of their Class A counterpart, Class B biosolids are treated in a wastewater treatment facility and undergo heating, composting, digestion or increased pH processes before leaving the plant.

CMOM/SSO REGULATIONS - Refers to a capacity, management, operation, and maintenance program (CMOM) that focuses on sewer collection systems with a goal of eliminating sanitary sewer overflows (SSO).

COLLECTION SYSTEM - A system of pipes and pumping facilities carrying sewage for disposal.

COLLECTION SYSTEM FACILITIES PLAN (CSFP) - An overall assessment of the condition and capacity of the key components that comprise the District's wastewater collection system. The plan identifies the scope and timing of required projects over the next 20 years so that the infrastructure continues to provide a high level of service to the District's customers while also addressing environmental concerns and regulatory requirements.

COMMISSION - A group appointed pursuant to law to conduct certain government business; the District has nine appointed Commissioners.

CONNECTION CHARGES - Charges related to connecting with District sewers.

CONVEYANCE SYSTEM - Synonymous with collection system.

DEBT SERVICE FUND - A fund established by a government agency or business for the purpose of reducing debt by repaying or purchasing outstanding loans and securities held against the entity. The District transfers a portion of its collected service charges to this fund to pay for its debt service.

EFFLUENT - Wastewater, treated or untreated, that flows out of a treatment plant or sewer outfall. The Nine Springs Wastewater Treatment Plant returns treated effluent to the environment.

EXECUTIVE TEAM - Refers to the Executive Team at the District.

FORCE MAIN - The discharge pipeline of a pumping station.

CONVEYANCE FACILITY CONNECTION CHARGE (CFCC) - CFCC represents the user's "fair share" of collection system investments the District has made to install interceptor sewers and pumping stations.

INFLUENT - Water or wastewater entering a physical structure or process such as a treatment plant, pumping station or tank.

INTERCEPTOR - Large sewer lines that convey the flow of sewage to a pumping station or treatment plant by gravity.

LINING - A rehabilitation process in which a coating material is introduced to extend the life of the existing sewer.

MASTER PLAN - The District's 50-year blueprint for the future.

METROGRO - A program that recycles liquid biosolids to agricultural land as fertilizer and soil conditioner.

METROMIX - A "soil like" material created by the District that combines biosolids with amendments such as sand, sawdust and/or bulking agents. Metromix is intended for use in landscaping, turf production, general gardening and other similar applications.

NINE SPRINGS WASTEWATER TREATMENT PLANT (NSWTP) - Wastewater treatment plant originally constructed in the late 1920s in Madison, WI. Since then, the plant has experienced numerous changes and additions. The plant presently serves 26 communities in the Madison area.

NUTRIENT REMOVAL - The removal of phosphorus and nitrogen from wastewater. The District uses a process called biological nutrient removal (BNR) that removes nitrogen and phosphorus from wastewater by using specific groups of micro-organisms and providing suitable conditions for their growth.

ONBASE - OnBase is a software application that electronically captures, stores and manages documents generated or received by a company.

OPERATING FUND - In government accounting, fund used to account for all assets and liabilities of a nonprofit entity except those particularly assigned for other purposes in another more specialized fund. The cost of normal operations is expended from this fund.

OSTARA - A process to recover phosphorus-containing fertilizer (struvite) as a natural byproduct of wastewater treatment.

PLAN REVIEW FEE - Customer communities pay sewer plan review fees for the District's plan review of modifications or additions to their sewer systems.

PRETREATMENT - Processes used by industrial or commercial customers to reduce or eliminate the contaminants in non-domestic wastewater to alter its nature, before discharging it into the collection system.

PUMPING STATIONS - Also called lift stations, pumping stations are normally designed to handle raw sewage that is fed from underground gravity pipelines (pipes that are laid at an angle so that a liquid can flow in one direction by gravity). Sewage is fed into and stored in an underground pit, commonly known as a wet well. The well is equipped with instruments to detect the level of sewage present. When the sewage level rises to a predetermined point, a pump will start and lift the sewage upward through a pressurized pipe system called a sewer force main. The sewage discharges into another gravity sewer or its final destination a treatment plant.

RELIEF SEWER- A sewer built to carry the flows in excess of the capacity of an existing sewer; generally in parallel with the existing sewer.

SEPTAGE - The waste content found in a septic tank.

SERVICE CHARGES - Annual amounts collected through customer rates that are used to fund the District's ongoing operations and debt service.

SEWER EXTENSION PERMIT - Refers to a required permit for an extension, addition or modification to the sanitary sewer collection system.

STRUVITE - A phosphate mineral (magnesium ammonium phosphate).

TELEVISING - A method using video camera(s) to assess the condition of a sewer line in real time. It can reveal blockages from debris, roots or grease; show cracks, breaks or deterioration of a pipe. It allows detailed diagnosis without the need for excavation, saving time and money.

THERMAL REQUIREMENTS - Potential regulatory requirements to meet particular thermal temperatures in effluent receiving streams.

TREATMENT PLANT CONNECTION CHARGE (TPCC) - Represents a new users' fair share of the total cost of the wastewater treatment plant.

USER CHARGE - Service charge based on wastewater flow and loadings data for a specific customer. The wastewater flow and loadings are used to develop customer bills (see also billing parameters).

THIS DOCUMENT IS USED FOR PLANNING PURPOSES ONLY.
THE FINAL CAPITAL IMPROVEMENTS PLAN IS APPROVED AS PART OF THE DISTRICT BUDGET PROCESS.