Northfield Wastewater Treatment Plant Project

Facility Plan Update

Draft

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City of Northfield

Northfield Wastewater Treatment Plant Project

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Acronyms and Abbreviations

AAD	annual average day
AWW	average wet weather
BAF	biological aerated filter
BHP	brake horse power
BOD	biochemical oxygen demand
$CBOD_5$	five-day carbonaceous biochemical oxygen demand
HST	high speed turbo
HVAC	heating, ventilation, and air conditioning
icfm	inlet cubic feet per minute
Jacobs	Jacobs Engineering Group Inc.
kW	kilowatt
lb/d	pound(s) per day
mgd	million gallons per day
MMAD	maximum monthly average day
NPDES	National Pollutant Discharge Elimination System
PLC	programmable logic controller
RBC	rotating biological contactor
SBC	submersible biological contactor
scfm	standard cubic feet per minute
SCADA	supervisory control and data acquisition
TSS	total suspended solids
UV	ultraviolet
WWTP	wastewater treatment plant

1. Introduction

The City of Northfield (City) completed the Wastewater Treatment Facility Plan for its wastewater treatment plant (WWTP) in January 2016. Recently, Jacobs Engineering Group Inc. (Jacobs) performed an Operational Assessment and Condition Assessment at the WWTP (Appendix A). This work was authorized by the City in response to several incidents that have taken place at the WWTP since completion of the 2016 Facility Plan (Bolton & Menk, Inc., 2016). Incidents in question prompting the review include a fire in the biosolids handling facility, flooding of the pump room because of pipe failure, flooding of the scum/solids wet well because of an inadvertent repositioning of the scum trough during normal operations, and flooding of the Biological Aerated Filter (BAF) Building basement because of a pipe plug failure.

This Facility Plan Update provides updates to the January 2016 Wastewater Treatment Facility Plan and reprioritizes planned improvements based on a recent condition assessment performed as part of this project. The objectives of this Facility Plan Update include the following:

1) Review and update projected flows and loads to 2040.
2) Review the 2016 Facility Plan improvement alternatives, document the updated status of improvements that have already been completed, and identify additional improvement alternatives that were uncovered as part of the Operational Assessment and Condition Assessment. Provide updated cost estimates for updates and revisions that are identified.
3) Review the 2016 Facility Plan project costs and provide updated cost summaries based on the status of improvements that are already completed and the updates and revisions identified for this Facility Plan Update.

2. Flows and Loads

For the 2016 Facility Plan, flow and load projections were performed using projected population data, historical commercial and residential user mix, and projections from three significant industrial users. The 2016 Facility Plan developed flow projections using the Minnesota Pollution Control Agency guidelines. Load projections were calculated using historical per capita loading rates for five-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), and phosphorus.

2.1 Population

The 2016 Facility Plan population projections have not been realized. Population growth for the Northfield WWTP service area (consisting of City of Northfield and Dundas) has been slower and is projected to grow at 16 percent over the next 20 years, or 0.8 percent per year. Table 2-1 summarizes the service area population for the past 10 years from 2019 census data and the projected population to 2040.

Table 2-1. Population Projection

Year[a]	Northfield	Dundas	Total
2010	20,007	1,369	21,374
2015	20,415	1,485	21,900
2019	20,742	1,579	22,321
2025	21,585	1,643	23,228
2030	22,462	1,710	24,172
2035	23,375	1,779	25,155
2040	24,325	1,852	26,177

[a] 2010, 2015, and 2020 data from 2019 census. 2025, 2030, 2035, and 2040 data based on 0.8 percent annual growth.

2.2 Flow

Actual monthly average flow data for the period from 2015 to present were compared against the 2016 Facility Plan projections. Figure 2-1 shows a plot of average monthly influent flow rates and the projected trend plot for average wet weather (AWW) flow (defined as the daily average flow for the wettest 30 consecutive days) from 2015 to 2020 using 2016 Facility Plan data.

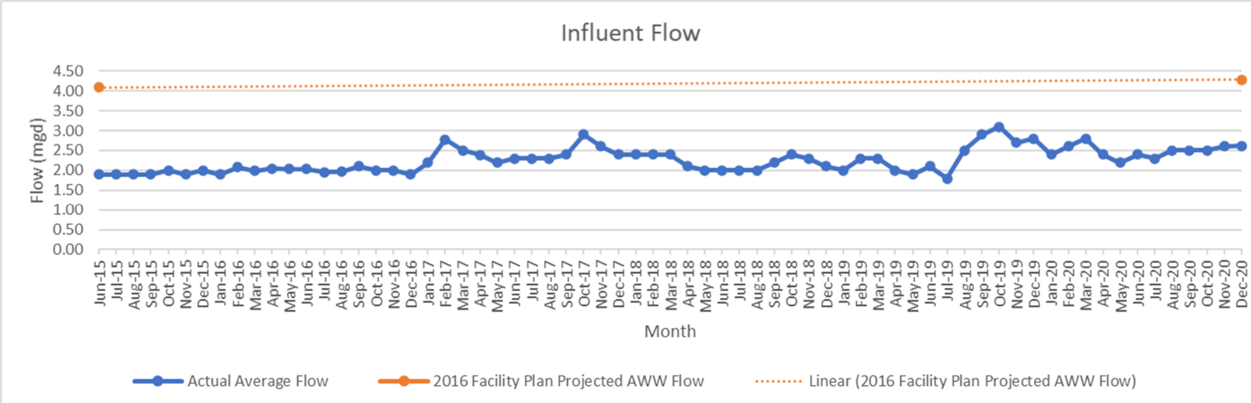

Figure 2-1. Influent Flow

Figure 2-1 shows that maximum month average day influent flow rates for the past 5.5 years are well below the projected AWW flow rates from the 2016 Facility Plan, with the highest monthly average flow of 3.1 million gallons per day (mgd) occurring in May 2019. The maximum month average day flow is not an exact representation of AWW flow. Maximum month average day flow measures the highest average influent flow rate over a calendar month, whereas the AWW flow is the daily average flow for the wettest 30 consecutive days. For this study the maximum month average day flow provides reasonable data for comparison purposes.

Using the highest recorded maximum month average day flow of 3.1 mgd in 2019, the projected maximum month flow can be estimated based on the 0.8 percent per year population growth factor. This assumes flow will increase at the same rate as population. Table 2-2 summarizes the projected flow to 2040.

Table 2-2. Flow Projection

Year	Maximum Month Average Day Flow (mgd) [a]
2025	3.25
2030	3.38
2035	3.51
2040	3.65

[a] Based on 0.8 percent annual growth from 3.1 mgd in 2019.

2.3 $CBOD_5$

Actual monthly average influent $CBOD_5$ data for the period from 2015 to present were compared against the 2016 Facility Plan average day and maximum month projections. Figure 2-2 shows a plot of average monthly influent $CBOD_5$ and the average day and maximum month projected trend plot for 2015 to 2020 using 2016 Facility Plan data.

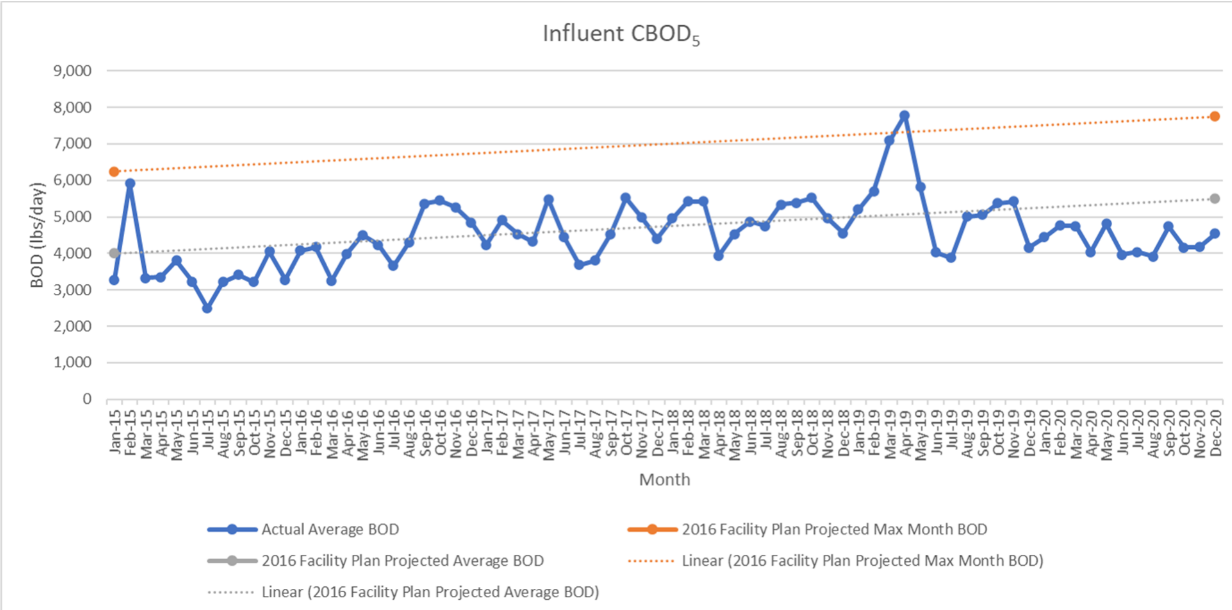

Figure 2-2. Influent $CBOD_5$

The average influent $CBOD_5$ for the past 5.5 years was 4,561 pounds per day (lb/d). The average influent $CBOD_5$ for the past 5.5 years was 4,561 lb/d. Figure 2-2 shows the maximum month influent $CBOD_5$ for the past 5.5 years, which slightly exceeded the projected maximum month influent $CBOD_5$ from the 2016 Facility Plan on a single occasion (7,788 lb/d in April 2019). This occasion is further discussed in Section 2.3. Overall, the plot indicates that the actual influent $CBOD_5$ is consistent with the 2016 Facility Plan projection through 2020.

The population data and influent $CBOD_5$ loads were evaluated for the period from 2015 to 2019. Actual sampled industrial loads from Northfield's three industrial sources were quantified and then subtracted from the total plant influent $CBOD_5$ loads to estimate average residential/commercial influent $CBOD_5$ loads to the plant. The population data and average residential/commercial influent $CBOD_5$ loads were used to estimate a residential/commercial $CBOD_5$ loading rate of 0.14 pound per capita per day.

The actual sampled average day and maximum month average day industrial loads from Northfield's three industrial sources were also quantified and then subtracted from the total plant influent $CBOD_5$ average day and maximum month average day loads. The results were used to estimate a maximum-month-to-average-day peaking factor for residential/commercial influent $CBOD_5$ of 1.19.

The projected population, residential/commercial loading rate, and maximum-month-to-average-day peaking factor are used to estimate residential/commercial $CBOD_5$ loading through 2040. Northfield has existing user agreements that allocate $CBOD_5$ loading to its three industrial customers. The industrial loading allocations are added to the residential/commercial to estimate the total plant influent $CBOD_5$ loading through 2040. The results are summarized in Table 2-3.

Table 2-3. CBOD$_5$ Plant Influent Load Projection

Year[a]	Population	Residential/Commercial		Industrial		Total	
		AAD (lb/d)	MMAD (lb/d)	AAD (lb/d)	MMAD (lb/d)	AAD (lb/d)	MMAD (lb/d)
2025	23,228	3,184	3,782	2,697	3,722	5,881	7,504
2030	24,174	3,313	3,935	2,697	3,722	6,010	7,657
2035	25,155	3,448	4,095	2,697	3,722	6,145	7,817
2040	26,177	3,588	4,262	2,697	3,722	6,285	7,984

Notes:

AAD = annual average day

MMAD = maximum month average day

2.4 Total Suspended Solids

Actual monthly average influent TSS data for the period from 2015 to present were compared against the 2016 Facility Plan projections. Figure 2-3 shows a plot of average monthly influent TSS and the projected trend plot for 2015 to 2020 using 2016 Facility Plan data. The average influent TSS for the past 5.5 years was 5,820 lb/d.

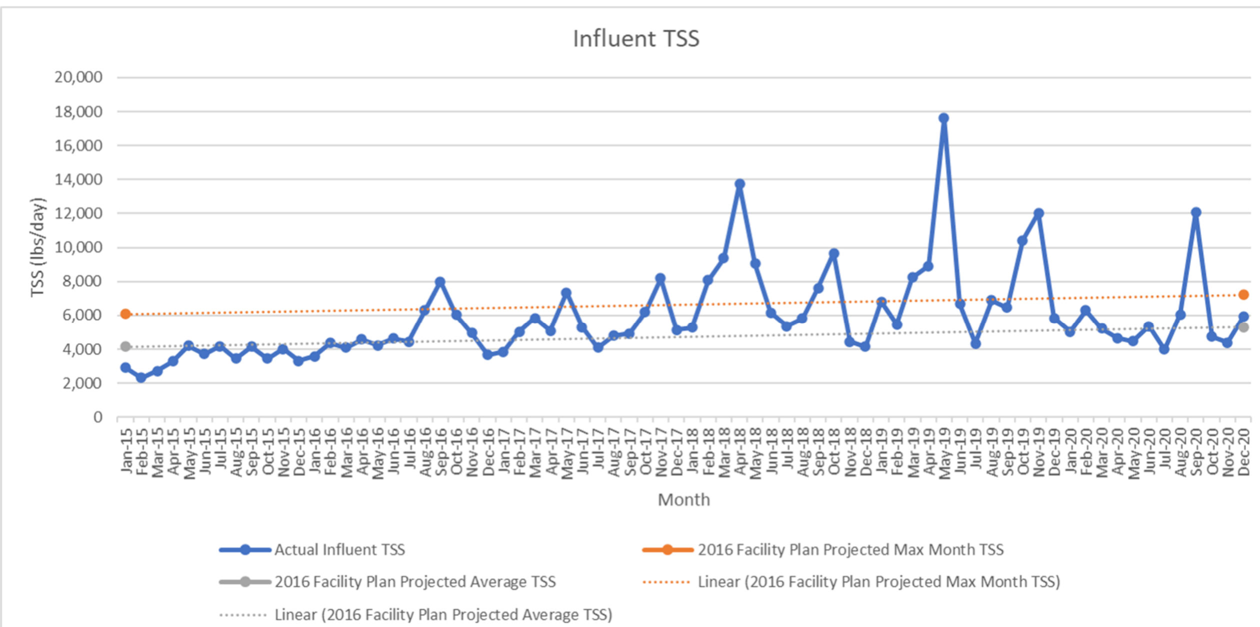

Figure 2-3. Monthly Average Influent TSS

Figure 2-3 shows that the maximum month influent TSS for the past 5.5 years has exceeded the projected maximum month influent TSS from the 2016 Facility Plan on multiple occasions. They are reviewed individually as follows:

- **September 2016**: The spike in influent TSS aligns with peaks in influent flow and influent CBOD$_5$. This suggests that the influent TSS spike is the result of a wet weather event or events. Further data review indicates that the Cannon River reached its second highest historical crest at 901.3 feet on September

24, 2016. At this level, downtown streets can flood, and sanitary manholes can be exposed to inflow if not completely sealed, making the plant influent vulnerable to high levels of river sediment.

- **May 2017**: The spike in influent TSS aligns with peaks in influent flow and influent $CBOD_5$. Further data review indicates that the Cannon River reached its eighth highest historical crest at 895.1 feet on May 17, 2017. These data suggest that the influent TSS spike is influenced by wet weather events and possibly flooding.
- **November 2017**: The spike in influent TSS does not align with peaks in influent flow and influent $CBOD_5$. It is also unusual that the TSS spike was not accompanied by a corresponding peak in $CBOD_5$. The plant has reported a problem with the influent sampler cleaning procedure that may have contributed to increased influent TSS values from 2016 to 2019.
- **February to May 2018**: The spike in influent TSS does not align with peaks in influent flow and influent $CBOD_5$. Figure 2-4 shows the plant influent TSS/$CBOD_5$ ratio for the past 5.5 years, and the major spike in April 2018 cannot be explained. The influent sampler cleaning procedure issue discussed above may have contributed to this outlier.

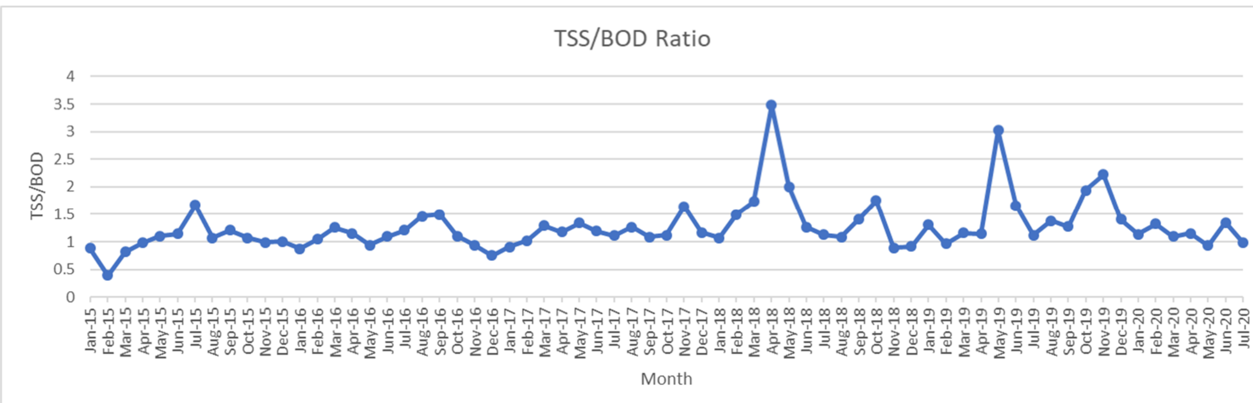

Figure 2-4. TSS/$CBOD_5$ Ratio

- **September to October 2018**: The spike in influent TSS does not align with peaks in influent flow and influent $CBOD_5$, and the spike is not readily explained by wet weather events. This spike may also be a sampling and testing error or the result of an accidental or unauthorized release into the sewer.
- **March to May 2019**: The spike in influent TSS aligns with peaks in influent flow and influent $CBOD_5$. Further data review indicates that the Cannon River reached its fifth highest historical crest at 899.10 feet on March 22, 2019. These data suggest that the influent TSS spike was influenced by wet weather events and possibly flooding. However, the peak TSS/$CBOD_5$ ratio that occurred in May. Typically, a peak TSS/biochemical oxygen demand (BOD) ratio would occur during a flood event with high inorganic TSS from river sediments entering the sewer system. This peak, however, appears to have occurred after the river crest and flood event.
- **October and November 2019**: The spike in influent TSS aligns with peaks in influent flow and influent $CBOD_5$. Further data review indicates that the Cannon River reached its seventh highest historical crest at 898.13 feet on October 6, 2019. These data suggest the influent TSS spike was influenced by wet weather events and possibly flooding. Corresponding peaks in the TSS/BOD ratio also support the potential influence of flooding on the influent TSS peak.

The population data and influent TSS loads were evaluated for the period from 2015 to 2019. Actual sampled industrial loads from Northfield's three industrial sources were quantified and then subtracted from the total plant influent TSS loads to estimate average residential/commercial influent TSS loads to the plant. The population data and average residential/commercial influent TSS loads were used to estimate a residential/commercial TSS loading rate of 0.2 pound per capita per day.

The actual sampled average day and maximum month average day industrial loads from Northfield's three industrial sources were also quantified and then subtracted from the total plant influent TSS average day and maximum month average day loads. The results were used to estimate a maximum-month-to-average-day peaking factor for residential/commercial influent TSS of 1.6.

The projected population, residential/commercial loading rate, and maximum-month-to-average-day peaking factor were used to estimate residential/commercial TSS loading through 2040. Northfield has existing user agreements that allocate TSS loading to its three industrial customers. The industrial loading allocations were added to the residential/commercial to estimate the total plant influent TSS loading through 2040. The results are summarized in Table 2-4.

Table 2-4. TSS Plant Influent Load Projection

		Residential/Commercial		Industrial		Total	
Year[a]	**Population**	**AAD (lb/d)**	**MMAD (lb/d)**	**AAD (lb/d)**	**MMAD (lb/d)**	**AAD (lb/d)**	**MMAD (lb/d)**
2025	23,228	4,646	7,408	1,209	1,409	5,855	8,817
2030	24,174	3,313	3,935	1,209	1,409	6,043	9,118
2035	25,155	3,448	4,095	1,209	1,409	6,240	9,432
2040	26,177	3,588	4,262	1,209	1,409	6,444	9,758

2.5 Design Capacity

The Northfield WWTP's National Pollutant Discharge Elimination System (NPDES) permit describes a permitted facility designed to treat an AWW design flow of 5.2 mgd, an average dry weather design flow of 3.23 mgd, a $CBOD_5$ demand strength of 185 milligrams per liter, and a TSS concentration of 150 milligrams per liter. These values are consistent with the Wastewater Treatment Facilities Improvements contract drawings (Bolton & Menk, Inc., 1999). A subsequent 2005 letter attachment to the 2016 Facility Plan documented increases to the plant's design capacity based on higher removal rates in the clarifier system observed during operational performance testing. The letter documents 60 percent removal in the primary clarifiers instead of 40 percent for both $CBOD_5$ and TSS, with corresponding design capacity increases of 1,240 lb/d $CBOD_5$ and 1,000 lb/d TSS.

Table 2-5 presents a summary of the existing documented flow, $CBOD_5$ and TSS design capacities, the updated projected flow, and $CBOD_5$ and TSS loadings to the plant. Both the original/permitted design basis and updated design basis are shown. The updated design basis assumes design capacity increases of 1,240 lb/d $CBOD_5$ and 1,000 lb/d TSS apply to both average day and maximum month influent loads.

Table 2-5. Design Capacity and Projected Flows and Loads

Item	Original/Permitted Design Basis[a]	Updated Design Basis[b]	2025	2030	2035	2040
Population			23,228	24,174	25,155	26,177
AWW Flow (mgd)	5.2	5.2	3.25	3.38	3.51	3.65
$CBOD_5$ – Average Day (lb/d)	6,200	7,440	5,881	6,010	6,145	6,285

Table 2-5. Design Capacity and Projected Flows and Loads

Item	Original/Permitted Design Basis[a]	Updated Design Basis[b]	2025	2030	2035	2040
$CBOD_5$ – Max Month (lb/d)	7,999	9,239	7,504	7,657	7,817	7,984
TSS – Average Day (lb/d)	5,001	6,001	5,855	6,040	6,240	6,444
TSS – Max Month (lb/d)	6,400	7,400	8,817	9,118	9,432	9,758

[a] From Wastewater Treatment Facilities Improvements contract drawings (Bolton & Menk, Inc., 1999) and Northfield Wastewater Treatment Facility NPDES permit issued June 1, 2020

[b] From 2005 letter attachment to Wastewater Treatment Facility Plan (Bolton & Menk, Inc., 2016)

The AWW flow projections show that AWW flow remains below both the original/permitted design capacity and the updated design capacity through 2040. The AWW flow projections assume that maintenance and rehabilitation of the collection system is performed to control inflow and infiltration at the same or better levels than those currently occurring.

The $CBOD_5$ load projections show that average day and maximum month $CBOD_5$ influent loads are predicted to remain at or below both the original/permitted design capacity and the updated design capacity through 2040.

The TSS load projections indicate that average day TSS influent load is predicted to exceed the original/permitted design capacity by 2025 and the updated design capacity by 2030. The current and projected maximum month TSS influent load already exceeds both the original/permitted design capacity and the updated design capacity.

2.5.1 TSS Capacity Review

The Northfield WWTP's historical performance and compliance with effluent permit limits suggest that the plant has a higher influent TSS load capacity than is currently documented. The primary clarifier data was reviewed to confirm primary clarifier performance and corresponding TSS loading to the secondary treatment (BAF) process. Figure 2-5 shows the monthly average plant influent and primary effluent TSS performance from 2012 to present.

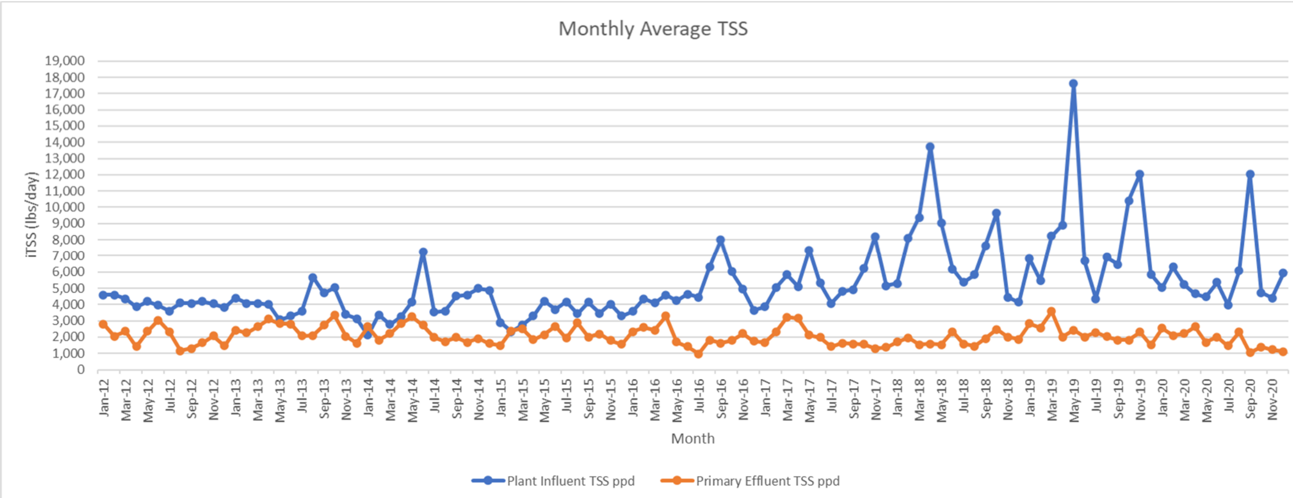

Figure 2-5. Monthly Average Plant Influent and Primary Effluent TSS

The data indicates that the primary clarifiers have historically produced consistent primary effluent TSS regardless of the plant influent TSS load. Monthly average primary effluent TSS load is relatively constant and never exceeds 3,600 lb/d into the BAF.

Jacobs obtained the original process design report from the BAF manufacturer, Kruger, to confirm the design TSS capacity of the BAF process (Kruger, 2000). The process design report identifies the TSS process limit to the BAF process at 2.3 kg/m3/d. This loading rate is equivalent to 6,480 lb TSS/d with all ten BAF cells in operation. Therefore, the actual monthly average TSS load into the BAF has never exceeded 56 percent of the process TSS limit for the BAF process.

Jacobs reviewed the performance data with Kruger's (now Veolia) process engineers to investigate why the plant performs so well at TSS loading rates above the permitted design capacity. The Veolia team indicated that because Northfield's installation was one of the first of its kind, the design tools used for sizing were more conservative than the design tools used today for sizing new BAF plants. Veolia provided a review of the Northfield performance data and modeled the plant's performance using their latest process design tools. Their results confirmed the existing 10 cell BAF process can handle the future flow and load cases through 2040 easily with 10 cells in service and can even handle more flow or higher strength wastewater. Veolia's simulation summary is presented in Table 2-6. Appendix B includes a letter from Veolia summarizing their review findings.

Table 2-6. Summary of BAF Process Simulations by Veolia

Parameter	Units	2025	2030	2035	2040
AWW Flow	mgd	3.25	3.38	3.51	3.65
BOD, Raw	mg/L	277	272	267	262
TSS, Raw	mg/L	325	324	322	321
TKN, Raw	mg/L	32	32	32	32
NH4-N, Raw	mg/L	25	25	25	25
BOD, Prim. Effl.	mg/L	160	153	151	148
TSS, Prim. Effl. (Fixed, based on op. data)	mg/L	115	115	115	115
TKN, Prim. Effl.	mg/L	26	26	26	26
Number of BIOSTYR Cells Operating	#	10	10	10	10
BOD, BIOSTYR Effl.	mg/L	12	12	12.5	12.7
TSS, BIOSTYR Effl.	mg/L	10	10	10	10
TKN, BIOSTYR Effl.	mg/L	2.8	3.5	3.5	3.6
NH4-N, BIOSTYR Effl.	mg/L	1.5	1.3	1.3	1.4
Process Air Demand	scfm	1,000	1,025	1,040	1,065
Daily Backwash Water - assuming 1 BW/d-cell	MG	0.85	0.85	0.85	0.85
Estimated Max duration between Backwashes	Hrs	45	44.5	43.8	43

The Veolia process simulations assumed a fixed primary effluent/BAF influent TSS loading based on the plant's actual historical operating data. The maximum month primary effluent TSS assumptions were 3,117 lb/d in 2025 up to 3,500 lb/d in 2040. The assumptions are consistent with the stable primary effluent TSS data shown in Figure 2-5, even under very high plant influent TSS loading conditions.

Veolia further noted the Multiflo primary clarification process TSS removals are lower than expected, with the 2020 average removal rate of 65 percent TSS removal, compared to an expected range of 75 to 80 percent removal. Veolia indicates the Multiflo operation could benefit from some optimization to improve TSS removal. The plant staff currently balance the need for increasing the primary clarifier removal performance with minimizing ferric chloride and polymer usage to reduce chemical costs.

Table 2-7 presents the estimated plant influent TSS capacity assuming 3,500 lb/d primary effluent load to the BAF used in Veolia's process simulation. The plant influent TSS capacity is estimated using a primary clarification process percent removal ranging from 65 to 80 percent removal. Even at the lower 65 percent primary clarifier TSS removal rate, the proposed maximum month plant influent TSS design capacity of 10,000 lb/d is exceeds the projected 2040 maximum month TSS load to the plant.

Table 2-7. Proposed TSS Design Capacity

Item	Plant Influent Maximum Month TSS (lb/d)	Primary Clarifier Percent Removal	Primary Effluent/BAF Influent TSS (lb/d)	Projected 2040 Maximum Month TSS (lb/d)
Original Design Basis	6,400			9,758
Proposed Design Basis at 65% Primary Clarifier Removal	10,000	65%	3,500	9,758
Proposed Design Basis at 70% Primary Clarifier Removal	11,667	70%	3,500	9,758
Proposed Design Basis at 75% Primary Clarifier Removal	14,000	75%	3,500	9,758
Proposed Design Basis at 80% Primary Clarifier Removal	17,500	80%	3,500	9,758

3. Facility Improvement Updates

This section provides a review the 2016 Facility Plan improvement alternatives, documents the status of improvements that have already been completed, and identifies additional improvement alternatives uncovered as part of the Operational Assessment and Condition Assessment and identified by plant staff.

3.1 Biosolids Storage and Treatment Facilities

The 2016 Facility Plan recommendations and implementation status are provided as follows:

1) Renovate the existing 180,000-gallon liquid sludge holding tank to serve as a dewatering feed tank. This work was completed in 2020. The 180,000-gallon storage provides 3 days' worth of storage at the 2035 average day sludge projection.
2) Replace the dewatering and lime/heat pasteurization process equipment with similar equipment. This work was completed in 2020 as part of the replacement project resulting from the fire. The new dewatering and biosolids treatment processes are commissioned and in operation.
3) Construct a liquid sludge storage tank to provide additional operator flexibility during long weekends or unplanned sick leave, and to provide flexibility for unplanned outages of dewatering and solids treatment processes. An additional 7 days for storage at the 2035 average day sludge projection was recommended. The additional sludge storage was programmed for 2021 construction completion; however, design has not yet been initiated.
4) Replace the existing biosolids cake storage facility with an expanded facility to provide up to 6 months of biosolids cake storage. The existing cake storage facility has limited capacity and is deteriorating because of age, and corrosion associated with the humid atmosphere and corrosive gases released from stored biosolids. The additional biosolids storage was programmed for 2021 construction completion; however, design has not yet been initiated.

3.1.1 Liquid Sludge Storage

The 2040 average day sludge projection was updated using the revised population and influent load data from Section 2 and is estimated at 54,078 gallons per day. The current 180,000-gallon liquid sludge holding tank provides 3 days of storage ahead of the dewatering and biosolids treatment processes at 2040 average day sludge projection. This is not enough storage to accommodate a major unplanned outage in the dewatering and biosolids treatment processes. The newly constructed biosolids treatment process consists of a single treatment train with no redundancy; therefore, a major equipment failure would require immediate corrective action. In addressing the liquid sludge storage ahead of the dewatering and biosolids treatment processes, the following issues need to be considered:

- The equipment failure occurs over a long holiday weekend affecting response time.
- The equipment failure requires long lead time replacement parts or attention by a specialty contractor.
- In a worst-case scenario, the corrective action response time requires implementing an emergency liquid sludge disposal plan.

The proposed new liquid sludge storage facility would provide an additional 7 days of storage at the 2040 average day sludge projection. The required additional storage volume is 360,000 gallons. The additional storage, when added to the existing 180,000-gallon sludge holding tank, provides 10 days of storage ahead of the dewatering and biosolids treatment processes. This 10-day window should provide enough time and flexibility to implement corrective actions or implement an emergency liquid sludge disposal plan in the event of a major equipment failure.

The proposed location of the new sludge storage tank is east of the Pretreatment/Clarifier Building in the location of the decommissioned buried sludge storage facility. A circular concrete storage tank is proposed with approximate dimensions of 60 feet in diameter and 19 feet of side water depth. Figure 3-1 shows a simplified process flow diagram of the liquid sludge storage tank.

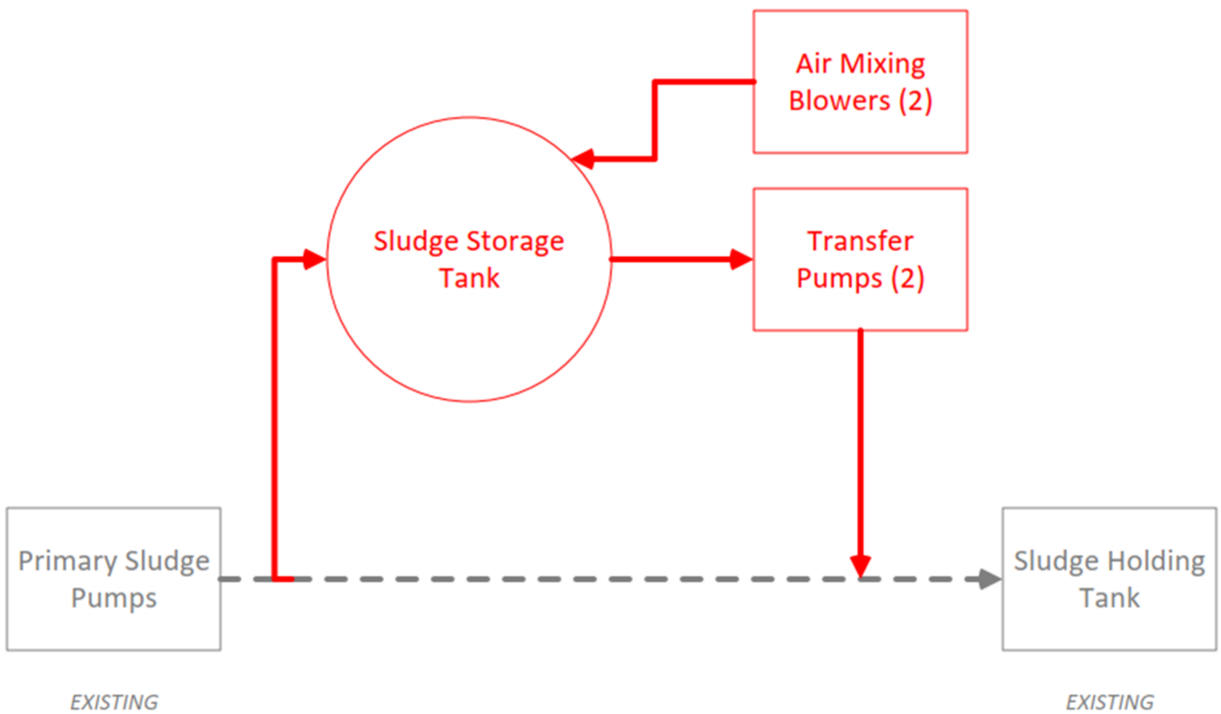

Figure 3-1. Sludge Storage Tank Process Flow Diagram

A tee connection and valves would be added to the primary sludge transfer piping between the primary sludge pumps and dewatering facility. The tee connection would divert primary sludge to the new sludge storage tank. Stored sludge would require pumping from the sludge storage tank back into the existing primary sludge transfer piping for conveyance to dewatering. Additional equipment assumptions include the following:

- New buried piping for tank feed and tank discharge
- Two sludge transfer pumps (duty and standby) to convey sludge from the storage tank to the dewatering facility, including isolation valves and check valves
- Two aeration blowers (duty and standby) for sludge storage tank mixing, including isolation and check valves
- One air diffuser system inside the tank for tank mixing
- New building structure for housing the transfer pumps, blowers, and electrical feed equipment

Figure 3-2 shows a simple site plan for the proposed facilities. The cost estimate for the liquid sludge storage facilities is summarized in Table 3-1.

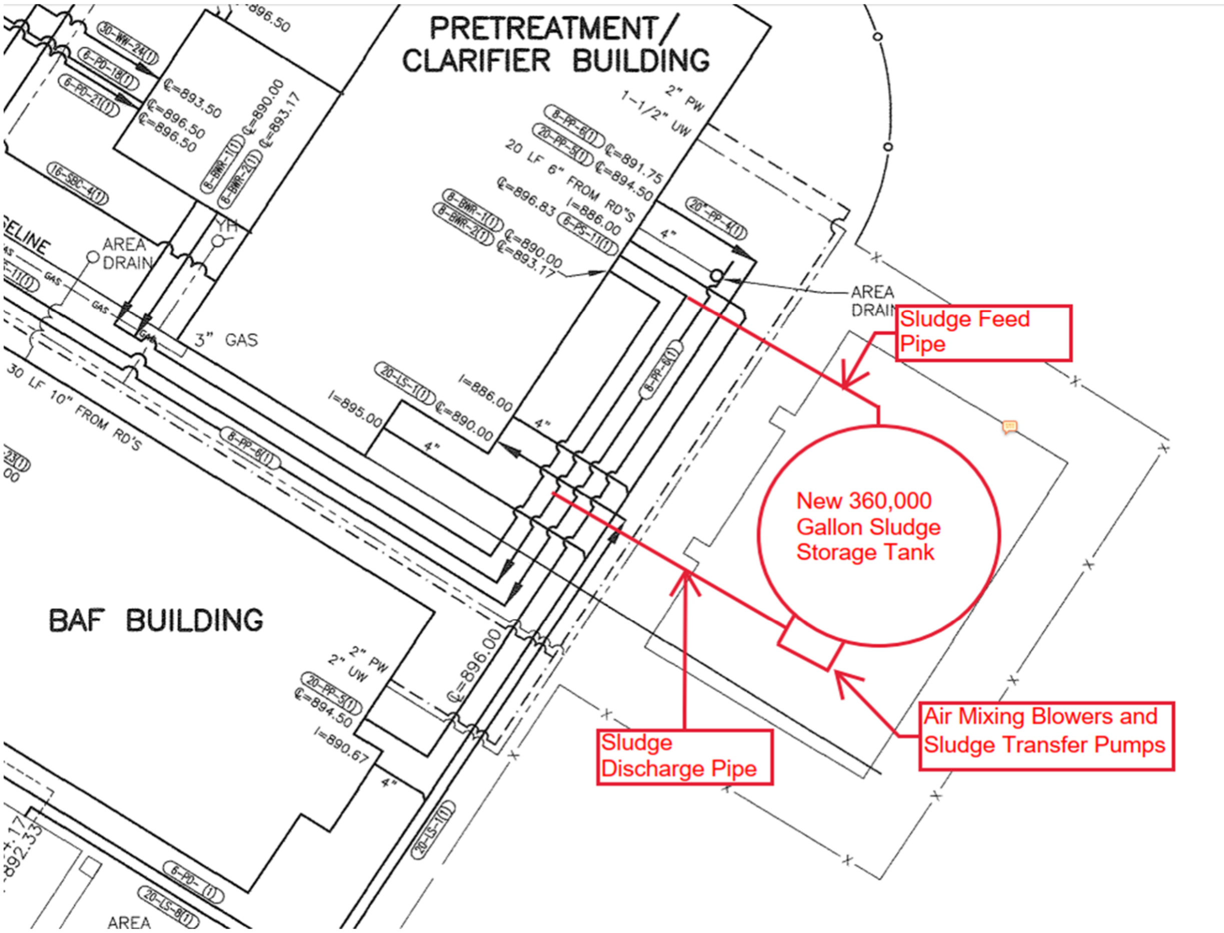

Figure 3-2. Sludge Storage Tank Site Plan

Table 3-1. Liquid Sludge Storage Cost

Item	Cost[a]
Sitework and Demolition	$61,250
Yard Piping	$115,000
Circular Concrete Tank	$1,072,500
Building and Equipment (Sludge Transfer Pumps, Blowers, Electrical)	$1,196,250
Subtotal	$2,445,000
Contingency (25%)	$611,250
Subtotal Construction Cost	$3,056,250
Engineering/Administration (25%)	$764,063
Total Capital Cost	$3,820,313

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

3.1.2 Biosolids Cake Storage

Biosolids storage is required for facilities like Northfield WWTP that practice land application. The ability to apply biosolids cake is limited in Minnesota, primarily because of weather effects on access to application land, frozen ground, and cropping practices. Land application of biosolids cake is limited to spring and fall, with typical design criteria for biosolids cake storage of 180 days.

The existing biosolids cake storage facility at Northfield WWTP provides approximately 6 to 12 weeks of biosolids cake storage, depending on the cake solids concentration. The available storage footprint is 82 feet by 72 feet by 16 feet tall. The vertical clearance of the existing building limits biosolids handling equipment and reduces available storage volume.

The proposed alternative is to demolish the existing biosolids cake storage facility (RBC Building) because it is undersized and needs repair. The footprint for a new biosolids cake storage facility would be expanded by demolishing the existing decommissioned submersible biological contactor (SBC) tanks. The resulting available footprint is approximately 125 feet by 100 feet. The new biosolids cake storage building is estimated to provide 180 days of cake storage at current average day solids production, and 120 days of storage at projected 2040 average day solids production. To achieve the full 180 days of cake storage at projected 2040 average solids production would require an additional 6,000-square-foot footprint on the plant site. To allocate this much of the plant’s footprint for cake storage at this time is not recommended, but the cake storage needs should be re-evaluated in the future.

Figure 3-3 shows the site layout for the proposed new biosolids cake storage building.

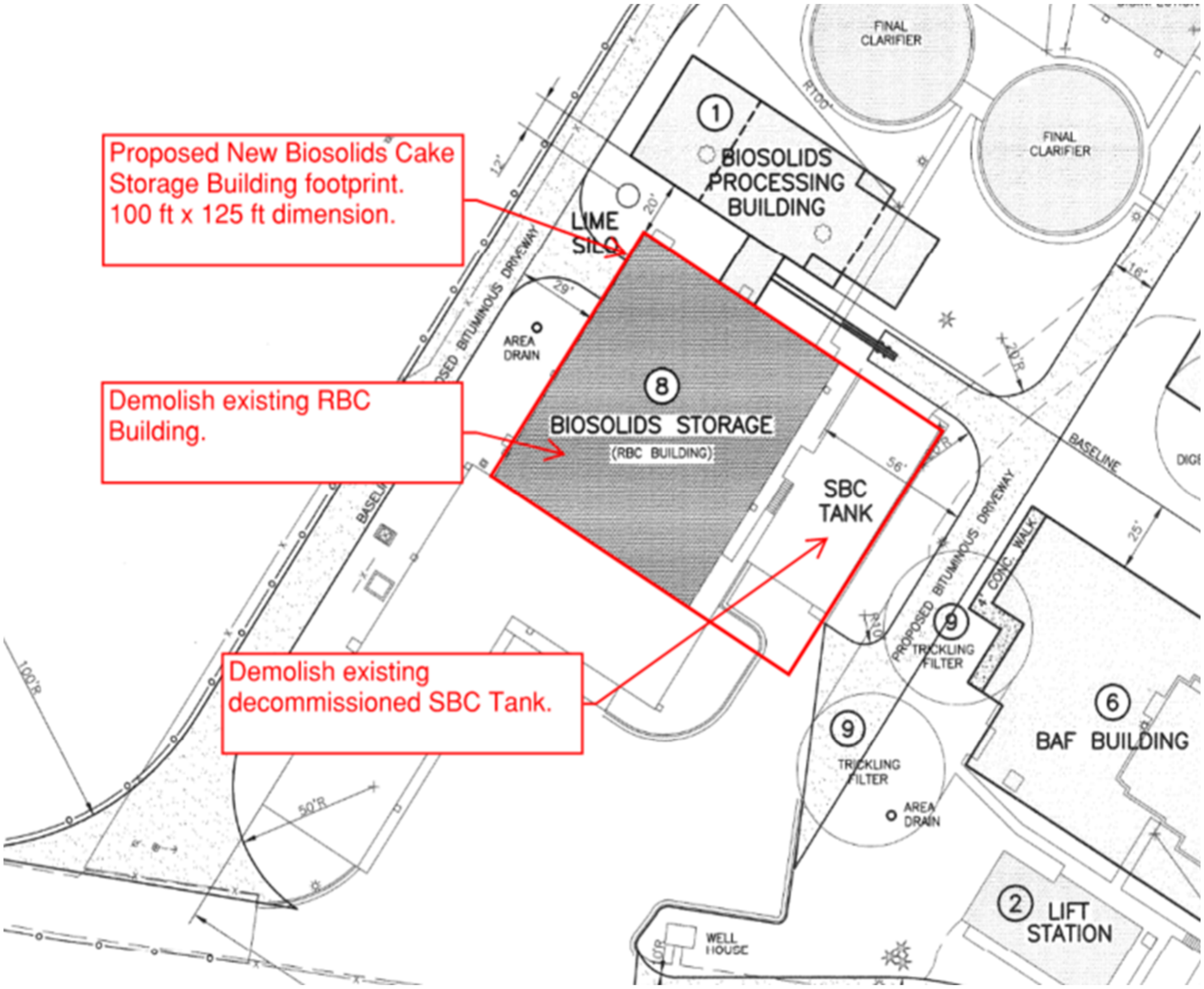

Figure 3-3. Layout for Proposed Biosolids Cake Storage Building

The work includes the following items:

- Demolish the existing SBC tank.
- Demolish the existing biosolids cake storage building (RBC Building).
- Install concrete footings, concrete flooring, and 10-foot-high perimeter concrete push walls.
- Install pre-engineered metal building to achieve a 20-foot minimum vertical clearance inside the storage area.
- Install overhead doors for vehicle entrance and exit.
- Install plumbing; heating, ventilation, and air conditioning (HVAC); and electrical.
- Complete site work and site restoration.

The cost estimate for the proposed biosolids cake storage building is summarized in Table 3-2.

Table 3-2. Proposed Biosolids Cake Storage Building Cost

Item	Cost[a]
RBC Building Demolition	$119,120
SBC Tanks Demolition	$143,920
Concrete Work	$430,880
Openings	$15,920
Building Enclosure	$802,640
Plumbing	$155,760
HVAC	$292,080
Electrical	$499,280
Earthwork	$35,920
Exterior Improvements	$29,840
Subtotal	$2,525,360
Contingency (25%)	$631,340
Subtotal Construction Cost	$3,156,700
Engineering/Administration (25%)	$789,175
Total Capital Cost	$3,945,875

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

3.2 Influent Lift Pumps

The influent lift pumps are critical to the operation of the WWTP. There are three influent lift pumps in a dry pit arrangement. The pumps convey influent wastewater to the preliminary treatment process.

While the pumps have adequate capacity, the 2016 Facility Plan recommended replacement of the pumps, adjustable frequency drives, and check valves and isolation valves because of their age and condition. The recommended completion date for pump replacement is 2023. Pump 3, including piping and adjustable frequency drive, was replaced in 2017.

The remaining pumps (Pumps 1 and 2, including piping, valves, and adjustable frequency drive) should be replaced as planned. Pump 3 valves should also be replaced. In addition, the influent lift pump wet well requires a condition inspection. The condition inspection was not able to be performed as part of this project because it requires wastewater bypassing to isolate the wet well. An allowance for condition assessment and repair is provided in the cost estimate. The cost estimate for the influent lift pumps work is summarized in Table 3-3. The estimate is based on the actual costs from the 2017 pump replacement.

Table 3-3. Influent Lift Pumps Cost Estimate

Item	Cost[a]
Pumps 1 and 2 replacement (including adjustable frequency drives and valves, installation, and contractor markups) and Pump 3 valves replacement.	$300,000
Contingency (25%)	$75,000
Engineering/Administration (25%)	$95,000
Subtotal	$470,000
Allowance for Wet Well Inspection/Repairs	$250,000
Total Capital Cost	$720,000

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

3.3 Preliminary Treatment

Influent screening is accomplished by one of two Lakeside rotating drum screen systems and followed by a Pista-Grit grit removal system. Grit and screenings are sent to a dumpster for disposal in a sanitary landfill. The 2016 Facility Plan did not recommend improvements to the preliminary treatment equipment. The December 2019 Condition Assessment categorized the preliminary treatment equipment as being in fair condition, indicating the asset has an estimated 50 percent of remaining life. No immediate concerns or issues were identified with the preliminary treatment equipment.

For capital planning purposes, a $300,000 allowance is proposed for future replacement of preliminary treatment equipment, to be scheduled in 2030-2035.

3.4 Primary Clarification

Primary clarification equipment includes two primary clarifiers, which provide redundant operation. The 2016 Facility Plan did not recommend improvements to the primary clarification equipment. As part of the December 2019 Condition Assessment, it was revealed that the primary clarifiers were installed more than 20 years ago, and the hardware components (sprockets, chains, flights, and wear strips) have never been replaced. A more detailed primary clarifier condition inspection was implemented on primary Clarifier 2 by an equipment manufacturer recommending replacement of the following:

- Longitudinal collector chain
- Drive chain
- Headshaft assembly
- Sprockets
- Wear strips

The plant staff further indicated that the existing primary clarifier V-notch weir requires re-leveling, and an in-line phosphorus analyzer should be included as part of the capital improvements. Phosphorus is removed via chemical addition to the primary clarifiers. The in-line phosphorus analyzer is recommended for compliance monitoring and to optimize the chemical dosing.

The cost estimate for the primary clarifier work is summarized in Table 3-4.

Table 3-4. Primary Clarifier Cost Estimate

Item	Cost[a]
Clarifier Equipment Replacement (two clarifiers)	$80,000
Equipment Installation	$40,000
Contingency (25%)	$30,000
In-line Phosphorus Analyzer (equipment and installation per recent contractor bid)	$204,000
Total Capital Cost	$354,000

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

3.5 Process Lift Pumps

The BAF process requires intermediate pumps to lift primary effluent to the BAF process. There are three non-clog submersible centrifugal pumps in a wet well. Each pump is rated at 3,615 gpm at 45 ft total dynamic head. The 2016 Facility Plan did not recommend improvements to these pumps. The December 2019 Condition Assessment categorized the preliminary treatment equipment as being in fair condition, indicating the asset has an estimated 50 percent of remaining life.

For capital planning purposes, a $210,000 allowance is proposed for future replacement of the Process Lift Pumps, to be scheduled in 2030-2035.

3.6 Biological Aerated Filter Gate Replacement

The 2016 Facility Plan recommended BAF gate replacement because several had become inoperable because of corrosion. The BAF gate replacement was completed in 2019.

3.7 Biological Aerated Filter Blower Replacement

3.7.1 Introduction

The BAF process includes 11 rotary lobe positive displacement blowers for aeration (10 regular operation blowers and 1 shared standby blower). The blowers were originally installed in 2000, and the 10 regular operation blowers have been replaced. The only original blower that remains is the standby blower. The blowers have been replaced instead of being rebuilt because replacement was determined to be cheaper. However, the motors have not been replaced and are all original. A complete blower replacement was recommended in the 2016 Facility Plan and still needs to be completed. The required blower replacement has been re-evaluated as part of the Facility Plan Update.

3.7.2 BAF Blower Replacement

The current blowers are Sutorbilt bi-lobe positive displacement blowers, 1 for each of the 10 BAF cells, plus 1 standby blower, resulting in a total of 11 blowers. An alternative approach, recently employed during another BAF facility upgrade, is to use fewer blowers and to use high efficiency blowers instead of positive displacement blowers. The reduction in the number of blowers is possible by using larger blowers, a common discharge header, and flow splitting to the BAF cells rather than having a dedicated blower per cell. This approach is commonly employed in the activated sludge process to split airflow between aeration basins and between diffuser grids within aeration basins. Higher efficiency can be achieved with high speed turbo (HST) blowers. The required changes to the existing aeration system are depicted on Figures 3-4 through 3-6. The aeration control strategy is to control blower speed to maintain a setpoint pressure in the common header and use flow meters and flow control valves to control airflow to each BAF cell.

Converting the BAF process to centralized blowers on a common discharge header instead of a dedicated blower per cell requires modifications and upgrades to the BAF control system. The modifications and upgrades are described in Section 3.8 Control System Replacement/Upgrades.

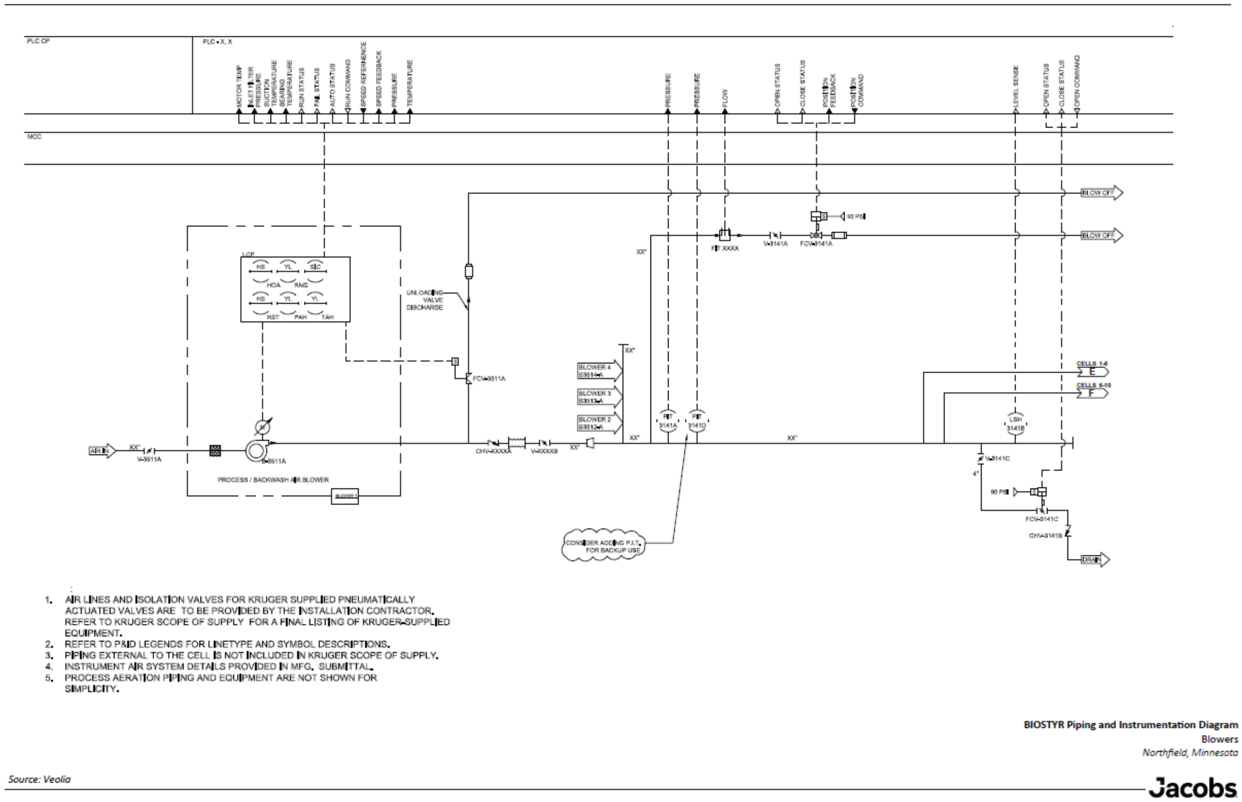

Figure 3-4. HST Blowers

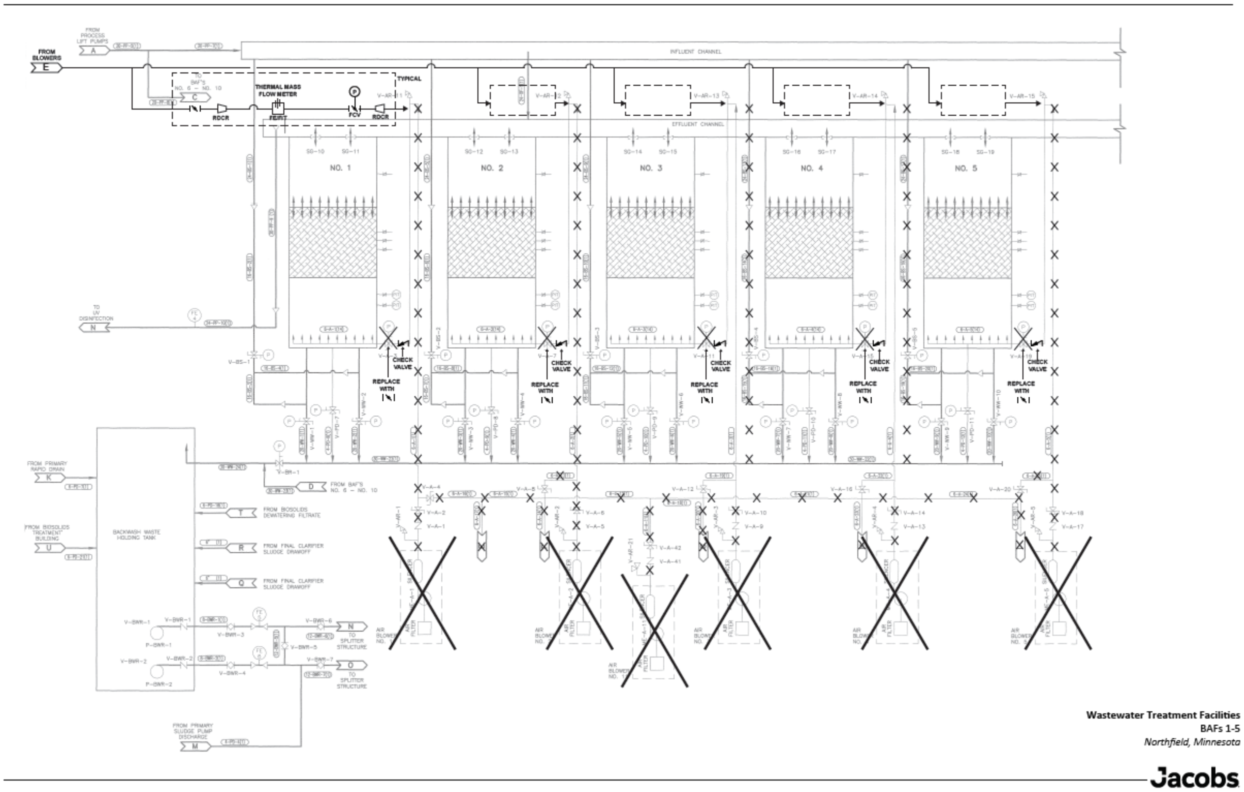

Figure 3-5. BAF Cells 1 to 5

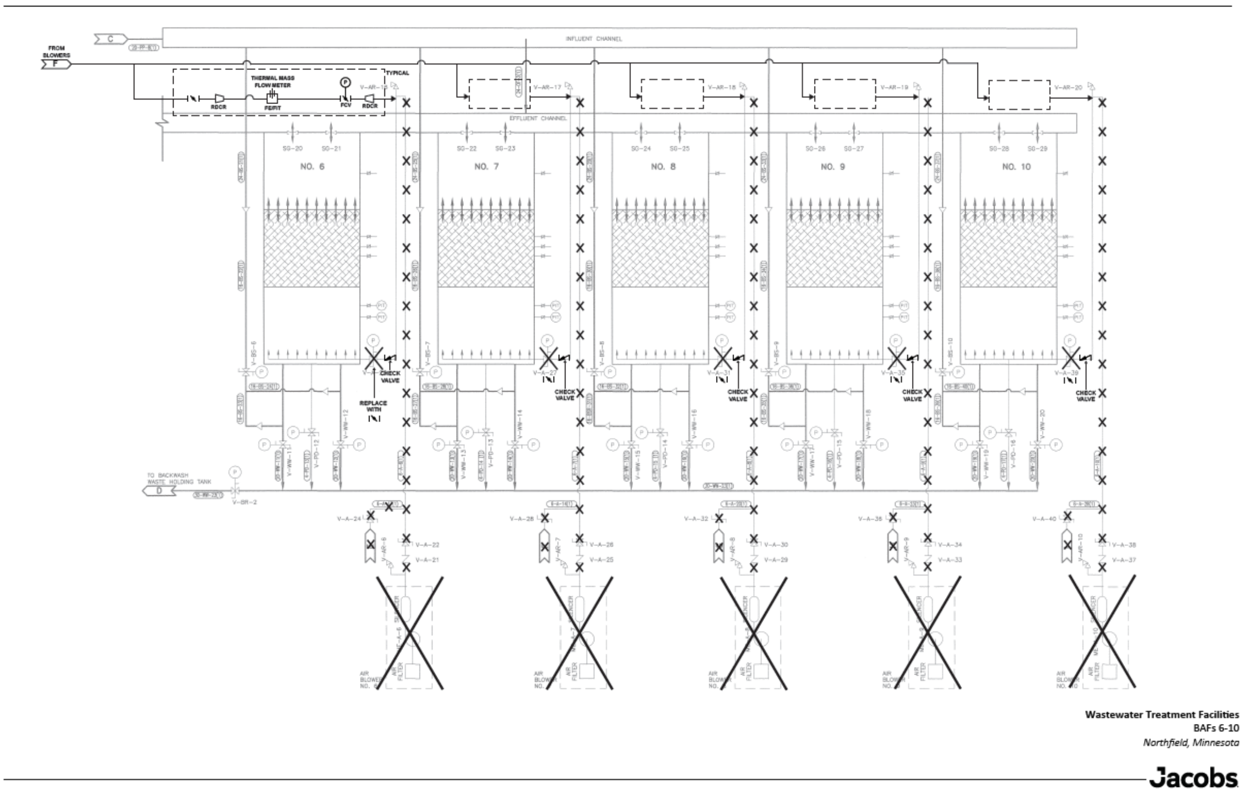

Figure 3-6. BAF Cells 6 to 10

HST blowers are gaining popularity because of the following features:

- High efficiency
- Turndown, which is typically 50 percent of maximum capacity or better
- Rotating impeller that levitates during operation, thereby limiting bearing wear to startup and shutdown
- Oil-free operation
- Low vibration
- Compactness

The energy usage at average loads with HSTs is estimated to be approximately 79 percent of rotary lobe blowers with variable speed drives at the Northfield WWTP.

The HST blowers have an integral variable speed drive provided by the manufacturer and typically a master control panel to coordinate the sequencing and speed adjustment of multiple blowers. The integral variable speed drives are part of the overall enclosure. A harmonic filter is also typically required in the vicinity of the variable speed drive. There have been reliability issues with some manufacturers' HSTs. The more prevalent issues are associated with controls, lack of backup power, and bearing wear or damage occurring during shutdowns. However, the HSTs from certain manufacturers have proven reliable and have lived up to the manufacturers' claims that their HSTs require less maintenance than other types of blowers. Therefore, it is important to limit which HST manufacturers are allowed in the specifications.

The following conceptual blower sizing was assumed for budgeting and alternatives evaluation:

- At maximum condition, all 10 cells are operating.
- The existing positive displacement blowers are 350 standard cubic feet per minute (scfm), 400 inlet cubic feet per minute (icfm).
- Kruger Veolia suggested sizing new blowers assuming 390 scfm per cell
- Only one cell is in backwash at a time, and airflow during the air scour portion of backwash is 300 icfm.
- 10 x 390 scfm = 3,900 scfm. Estimated icfm is 10 x 446 icfm = 4,460 icfm.
- Two duty blowers are required, rated at 1,950 scfm (2,230 icfm) per blower.

Determination of design loading to the BAF process will be necessary during design to finalize blower sizing, but this preliminary sizing is sufficient for budgetary purposes and alternatives evaluation.

Using 1,950-scfm HST blowers, turndown, assuming 50 percent of maximum capacity, would be 975 scfm. Practically speaking, this would allow as few as three BAF cells to be in operation.

Budgetary equipment pricing was solicited from two HST manufacturers. AERZEN provided a budgetary price of $115,034 per blower for 150-horsepower blowers (2 duty/1 standby), and $84,855 per blower for 100-horsepower blowers (3 duty/1 standby). APG-Neuros provided a budgetary price of $94,015 per blower for 150-horsepower blowers (2 duty/1 standby). The estimated equipment, construction, and capital costs for the blowers are summarized in Table 3-5. The estimate is based on the APG-Neuros blower equipment cost, plus contractor markup.

Table 3-5. HST Blowers Cost Estimate

Item	Cost[a]
Demolition	$33,100
Blower Equipment	$465,400
Piping, valves, instruments, electrical, and installation	$857,700
Subtotal	$1,356,200
Contingency (25%)	$339,000
Subtotal Construction Cost	$1,695,200
Engineering/Administration (25%)	$423,800
Total Capital Cost	$2,119,000

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

The life cycle cost of three larger HST blowers on a common discharge header was compared to the life cycle cost of replacing the 11 positive displacement blowers as currently configured but with variable speed drives. Budgetary equipment pricing was solicited from two positive displacement blower manufacturers. Gardner Denver provided a budgetary price of $407,000 for eleven 50-horsepower (37.6 brake horsepower [BHP] estimated at the design condition) tri-lobe Heliflow blowers. Gardner Denver quoted the more expensive Heliflow blowers given the historical maintenance issues at the Northfield WWTP because the Heliflow blowers are more robust than the existing Sutorbilt blowers. However, the local representative felt that the Gardner Denver change to oil splash lubrication rather than grease on both the Sutorbilt and Heliflow blowers, and the addition of fan-cooled sound enclosures, could address the observed maintenance issues if replacement in kind with Sutorbilts was desired. Kaeser provided a budgetary price of $289,000 for eleven 40-horsepower (34.5 BHP estimated at the design condition) tri-lobe Com-Pak Plus blowers. The addition of eleven variable speed drives increases the budgetary price to $456,827. The estimated equipment, construction, and capital costs for the blowers are summarized in Table 3-6. The equipment estimate is based on the lower Kaeser blower equipment cost, with variable speed drives, plus contractor markup.

Table 3-6. Positive Displacement Blowers Cost Estimate

Item	Cost[a]
Demolition	$18,800
Blower Equipment	$686,600
Piping, Valves, Instruments, Electrical, and Installation	$511,600
Subtotal	$1,217,000
Contingency (25%)	$304,300
Subtotal Construction Cost	$1,521,300
Engineering/Administration (25%)	$380,300
Total Capital Cost	$1,901,600

[a] Construction costs include contractor markups for overhead and profit, mobilization, demobilization, bonds, and insurance.

The average electric rate charge was $0.056 per kilowatt (kW)-hour, and the average demand charge was $8.78 per kW per month based on a review of 2020 electric bills. These costs were used to calculate annual and life cycle electric costs for new positive displacement blowers and HST blowers at the average condition. The electric costs were added to the capital cost estimates to estimate the life cycle cost of the capital and electric costs as summarized in Table 3-7. Based on discussions with Kruger Veolia, the BAFs' design airflows were as follows:

- 200 scfm/cell average condition
- 310 scfm max month
- 360 scfm peak day with Multiflo lamella primary clarification fully operational
- 390 scfm peak day with 1 of 2 Multiflo lamella primary clarification trains offline

Determination of design loading to the BAF process will be necessary during design to finalize blower sizing, but this preliminary sizing is sufficient for budgetary purposes and alternatives evaluation. Variable speed drives were included in the positive displacement blower alternative to minimize electrical consumption for comparison to the HSTs which include an integral variable speed drive. Maintenance cost differences are difficult to predict and were not included.

The life cycle cost analysis indicates the two alternatives are essentially equal. The HST blower alternative is estimated to have a higher capital cost. The higher estimated capital cost for HST blowers is associated with new piping incorporating a common header, flow splitting using flow control valves and flow meters, electrical equipment, and controls. The higher capital cost for HST blowers is estimated to pay for itself toward the end of the 20-year period used in the life cycle comparison.

Table 3-7. Life Cycle Cost Comparison Between HST and Positive Displacement Blowers

Blower Type	Capital Cost	Annual Electric Cost	20-year Life Cycle Electric Cost[a]	Life Cycle Cost of Capital and Electric
HST Blowers	$2,119,000	$48,900	$886,500	$3,005,500
Positive Displacement Blowers	$1,901,600	$62,200	$1,128,300	$3,029,900

Assumes 3.25% discount rate and 2.3% inflation

Changing to HSTs would be a significant change for plant operations. With the life cycle cost analysis being essentially equal, it is recommended that budgeting be based on the capital cost of the positive displacement blowers with variable speed drives.

3.8 Ultraviolet Disinfection Unit

The 2016 Facility Plan recommended replacement of the ultraviolet (UV) disinfection equipment. This work was completed in 2017 and included upgrades to the supervisory control and data acquisition (SCADA) system.

3.9 HVAC Equipment

The 2016 Facility Plan recommended replacement of 10 makeup air units throughout the WWTP. A more detailed HVAC equipment condition assessment was performed in 2017 and included recommendations for replacement and costs. A summary of equipment with expected 3 to 6 years of remaining service life expectancy based on the 2017 report is provided in Table 3-8. Equipment that has already been replaced is not shown in the table. It is recommended that the remaining equipment be programmed for replacement.

Table 3-8. HVAC Equipment Replacement Costs (2017 Condition Assessment Report[a])

Unit	Location	Year Installed	Replacement Cost[b]
Unit Heater 10	Lift Station	2000	$6,860
Unit Heater 19	Pretreatment/Clarifier Building	--	$6,860
Unit Heater 20	Pretreatment/Clarifier Building	--	$6,860
Ductless Split System 23	Pretreatment/Clarifier Building	2000	$11,455
Makeup Air Unit 1	Pretreatment/Clarifier Building	2000	$22,945
Makeup Air Unit 6	BAF Building	2005	$52,068
Rooftop Unit 18	BAF Building	2001	$15,520
Total			**$122,568**

[a] Schwickert's Tecta America, 2017

[b] Replacement costs by Schwickert's Tecta America are assumed to include installation and contractor markups.

Note:

Equipment that has already been replaced is not shown in the table.

-- = not available

The costs from the 2017 condition assessment report must be escalated to 2021 costs. Table 3-9 shows the recommended HVAC equipment replacement cost estimate used for the Facility Plan Update.

Table 3-9. HVAC Equipment Replacement Cost Summary

Item	Cost
HVAC Equipment Replacement (2017 dollars)	$122,568
Escalation to 2021 Dollars (3% per year)	$15,400
Contingency (25%)	$34,500
Engineering/Administration (25%)	$43,100
Total Capital Cost	**$215,568**

3.10 Control System and Card Access System Replacement/Upgrades

The 2016 Facility Plan recommended upgrading the existing SCADA systems for each process area. Since completion of the 2016 Facility Plan, major upgrades were completed on the UV Disinfection Facility (2017) and the Biosolids Dewatering and Process Facility (2020), including upgrades to the SCADA systems. The remaining process areas that require upgrades include the Pretreatment Building, BAF Building, and Influent Pump Building.

The upgrades to the BAF blower process and conversion to a centralized HST blower system (as described in Section 3.5) also require upgrading the existing BAF control system. The BAF vendor, Veolia, provided a proposal to make the upgrades. The proposed SCADA upgrades incorporate both the BAF process and the Multiflo primary treatment processes because they are part of the Veolia BAF system. The proposed upgrades include the following:

- PLC System Upgrades
  - Install new programmable logic controller (PLC) and human-machine interface hardware for BAF and Multiflo PLC panels.

  - Install new hardware for BAF control valve panels.
  - Update existing PLC programs to incorporate the latest process operating strategies, including programming, to facilitate conversion to a centralized HST blower system.
  - Implement and test the updated PLC programs via a combination of remote connection and onsite verifications.
  - Update control panel drawings.
- SCADA System Upgrades
  - Update SCADA graphics to High Performance Graphics, including re-rendering and resizing of SCADA screens as necessary for current resolutions.
  - Reconfigure SCADA screen graphics as appropriate for system modifications to a centralized HST blower station.
  - Update Wonderware version 2017 to latest version 2020.
  - Complete new Wonderware application upload, and testing.

The plant's site access and security systems consist of a card access reader at the main gate and main front door of the Control Building. Proposed upgrades include expanding the existing card access system to all external doors on each plant building, as follows:

- Control Building/Office – 7 doors
- Biosolids Processing Building – 4 doors
- UV Building – 1 door
- Pretreatment Building – 9 doors
- BAF Building – 4 doors
- Lift Station Building – 5 doors

Access control for the biosolids cake storage building doors is assumed to be unnecessary; however, access control will be required for the new cake storage facilities described in Section 3.1.2.

Table 3-10 shows the control system upgrades cost estimate. An allowance is included for controls upgrades to the Pretreatment Building that are not part of the BAF Multiflo process, and for the Influent Pump Building, based on escalated costs from the 2016 Facility Plan.

Table 3-10. Control System Upgrade/Replacement Costs

Item	Cost
BAF PLC and SCADA System Upgrades	$275,000
BAF Hardware Installation and Field Wiring	$80,000
Influent Pump Building	$80,000
Pretreatment Building	$70,000
Contingency (25%)	$126,000
Engineering/Administration (25%)	$158,000
Card Access System Upgrades	$75,000
Total Capital Cost	**$864,000**

3.11 Water Supply System

The WWTP utility water is supplied from an onsite well, which was recently replaced. The well is designated non-potable, and there is no potable water supply to the WWTP. The well has limited capacity, and WWTP personnel are investigating the need for a fire suppression system in the future with the code officials. The water supply system would require connection to the City water system or installation of a substantially larger well to meet the demands of a fire suppression system.

For this Facility Plan Update, an allowance of $1,000,000 is included to cover the cost of connecting to the City water supply if fire suppression is required.

3.12 Roof Replacement

The 2016 Facility Plan recommended roof replacement for all buildings. Since then, the roof replacement has been completed on the Biosolids Building and the portion of the Operations Building over the offices. The remaining roof replacement costs are estimated in Table 3-11. The costs are based on escalated costs from the 2016 Facility Plan.

Table 3-11. Estimated Roof Replacement Costs

Item	Cost
BAF Building	$320,000
Pretreatment/Clarifier Building	$350,000
Biosolids Building (complete)	$0
UV Disinfection Building	$35,000
Operations Building	$58,000
Total Construction Cost	**$763,000**

3.13 Standby Generator

The WWTP has a standby diesel generator to provide backup power in case of a power loss. The existing Caterpillar generator is rated at 1,500 kW and was installed in 2000. It appears to be in good condition and well maintained. Standby generators of this type have a life of at least 30 to 40 years if well maintained and parts availability is reliable to 40 years out.

Based on the age of the standby generator, the plant should plan for standby generator replacement in 2030. Caterpillar’s budget level replacement cost for a comparable diesel standby generator in a standalone enclosure is $600,000.

4. Facility Plan Update Cost Summary

The updated cost summary is presented in Table 4-1. The table includes the cost estimates from the 2016 Facility Plan and updated cost estimates based on the facility improvement updates in Section 3. Work completed since the 2016 Facility Plan is also noted.

Table 4-1. Facility Plan Update Cost Summary

Item	2016 Facility Plan Capital Cost	Status	Facility Plan Update Capital Cost
Biosolids Dewatering and Treatment	$3,025,000	Complete	$0
Liquid Sludge Storage	$1,038,125	Partially complete	$3,820,313
Biosolids Cake Storage	$618,750	Not started	$3,945,875
Influent Lift Pumps	$1,134,375	Partially complete	$720,000
Preliminary Treatment	$0	Not started	$300,000
Primary Clarification	$0	Not started	$354,000
Process Lift Pumps	$0	Not started	$210,000
BAF Gate Replacement	$756,250	Complete	$0
BAF Blower Replacement	$742,500	Not started	$1,901,600
UV Disinfection	$893,750	Complete	$0
Control System and Card Access System Upgrades	$1,375,000	Partially complete	$864,000
HVAC Equipment Replacement	$171,875	Partially complete	$215,568
Water Supply System	$151,250	Not complete	$1,000,000
Roof Replacement	$810,000	Partially complete	$763,000
Standby Generator	$600,000	Not complete	$600,000
Miscellaneous	$112,000		
Total	**$10,828,875**		**$14,694,356**

The cost summary in Table 4-1 shows large cost discrepancies from the 2016 Facility Plan for some items. The liquid sludge storage tank updated cost estimate is significantly higher than the cost presented in the 2016 Facility Plan. The 2016 Facility Plan estimated a 400,000-gallon concrete liquid sludge storage tank cost of $435,000. The Facility Plan Update cost estimate for a 360,000-gallon concrete storage tank is $1,072,500. The 2016 Facility Plan estimated $100,000 for pumps, piping, and mixers. The Facility Plan Update includes transfer pumps, mixing blowers, piping, valves, and electrical feed equipment housed in a small structure adjacent to the storage tank, with an estimated cost of $1,196,250.

The biosolids cake storage facility is another item with a large cost discrepancy. The 2016 Facility Plan proposed a fabric type structure on a new foundation. Limited details were provided, and it is assumed that the fabric structure would cover the biosolids cake storage facility from rain and snow, but the facility would be open to the outside air with no climate or odor control. The 2016 Facility Plan estimated

$210,000 for a new foundation, $210,000 for the fabric structure, and $30,000 for demolition. It was not specified which location was proposed for demolition – either the existing cake storage and SBC structure or the existing decommissioned final clarifiers.

The Facility Plan Update includes demolition of the existing cake storage and SBC structures and construction of a fully enclosed new cake storage facility. The demolition estimate prepared for the Facility Plan Update is $263,040. The estimate for the enclosed structure, including foundation, garage doors, HVAC, plumbing, and electrical is $2,262,320.

The contingency applied to each estimate also contributes to the discrepancy. The 2016 Facility Plan applied a 10 percent contingency on each estimate. The Facility Plan Update uses a 25 percent contingency on each estimate, which is more appropriate at this stage of planning and at the level of engineering detail completed.

Table 4-2 presents an implementation and spending schedule broken out into the first and second half of this decade. All costs assume 2021 dollars.

Table 4-2. Implementation and Spending Schedule

Item	2022-2025	2026-2030
Liquid Sludge Storage	$3,820,313	
Biosolids Cake Storage		$3,945,875
Influent Lift Pumps	$720,000	
Preliminary Treatment		$300,000
Primary Clarification	$354,000	
Process Lift Pumps		$210,000
BAF Blower Replacement	$1,901,600	
Control System and Card Access System Upgrades	$864,000	
HVAC Equipment Replacement	$215,568	
Water Supply System		$1,000,000
Roof Replacement	$763,000	
Standby Generator		$600,000
Total	**$8,638,481**	**$6,055,875**

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Appendix A
Condition Assessment of Wastewater Treatment Plant Assets

City of Northfield, MN – Wastewater Treatment Plant Operation and Facility Study

Condition Assessment of Wastewater Treatment Plant Assets

Rev 1

April 27, 2020

City of Northfield

City of Northfield, MN – Wastewater Treatment Plant Operation and Facility Study

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Acronyms and Abbreviations

ACES	Asset Condition Evaluation System
BAF	biologically active filter
CMMS	computerized maintenance management system
Jacobs	Jacobs Engineering Group Inc.
WWTP	wastewater treatment plant

1. Background/Scope

The City of Northfield requested that Jacobs Engineering Group Inc. (Jacobs) conduct a condition assessment of the equipment assets within the City's wastewater treatment plant (WWTP) as part of a larger project scope that included an Operations and Maintenance Assessment Report, which was conducted earlier.

The City requested this assessment in response to several incidents that have taken place at the WWTP so that similar issues are not repeated, and other operational risks can be identified that may be present at the facility.

The following incidents prompted the review: 1) a fire in the biosolids handling facility, 2) flooding of the pump room because of pipe failure, 3) flooding of the scum/solids wet well because of an inadvertent repositioning of the scum trough during normal operations, and 4) flooding of the biologically active filter (BAF) building basement because of a pipe plug failure.

The ultimate purpose of the condition assessment was to build a robust database of the equipment assets at the WWTP and record the assets' current condition. This information will establish a baseline for the City so that it can track asset condition going forward. The database includes the relevant equipment operating data as well as the condition assessment data. In addition to building the database, the Jacobs team is providing observations and recommendations based on staff interviews and WWTP observations during the site visit.

This report presents the results of the condition assessment and makes recommendations based on those results. It also incorporates and reiterates the recommendations from the earlier Operations and Maintenance Assessment. A copy of the earlier report is included in Appendix A.

2. Condition Assessment

To deliver the condition assessment, Bill Haberstroh and Steve Waters visited the WWTP site during the week of December 9, 2019. An orientation walkthrough was conducted on Monday afternoon and a kickoff meeting was held on Tuesday morning with Dave Bennett, Justin Wagner, and Darick Kvam. The purpose of the meeting was to review the scope and expectations for the condition assessment task.

The first step was to develop a complete list of assets based on records available from the City and discussions with staff. The plant staff were extremely helpful in providing the equipment records and data that were requested. The equipment data allowed the Jacobs team to produce a list of 317 wastewater assets, including assets at the raw wastewater pump station.[1]

The Jacobs team then inspected all of the assets using a rating system designed to assist in assessing the condition of the equipment. The asset rating system (see Figure 1) produces an equipment score based on the inspection. In addition to inspecting the equipment, the Jacobs team interviewed the operations staff and management to capture their experience with the equipment in an effort to identify additional data that may not have been evident with a visual inspection.

Asset Condition Rating	Estimated Percent of Remaining Life	Condition Description
1 Very Good	90% or Greater	Indicates that the asset is in like-new condition. Continuation of current maintenance and operating procedures is recommended
2 Good	75%	Indicates that the asset is in good condition. Some minor additional maintenance may be required. Continuation of current maintenance and operating procedures is recommended
3 Fair	50%	Indicates that the asset is in fair condition. The asset has one or more issues that require immediate attention. The current maintenance and operating procedures or intervals may need to be modified or adjusted to avoid recurrence of identified issues.
4 Poor	30%	Indicates that the asset is in poor condition. Planning for a major overhaul or replacement should begin. Review of current maintenance practices and procedures is recommended. If this a critical asset, a predictive maintenance program should be evaluated to prevent the asset from reaching this condition in the future.
5 Very Poor	10% or Less	Indicates that the asset is in very poor condition. Failure of the asset is imminent or has already occurred. Greater than 50% of the asset requires replacement. If this a critical asset, a comprehensive maintenance program should be evaluated to prevent the asset from reaching this condition in the future.

Figure 1. Asset Condition Rating System

The equipment scores along with items noted during the inspection and interviews were then entered into Jacobs proprietary Asset Condition Evaluation System (ACES). The program contains a database with most types of equipment and typical degradation mechanisms (failure modes) loaded. The Jacobs team also took photographs of the equipment assets, which have been uploaded to the database.

The ACES program can produce detailed and summary reports on the condition of individual assets based on the data described above. A summary report of all asset condition scores is included in

[1] The WWTP has gone through two large upgrades since its construction in the late 1950s. As a result, there is some equipment numbering duplication from the drawings, so Jacobs has used the same base number but added a lowercase letter on the end to differentiate assets with identical numbers.

Appendix B. Additionally, the equipment database can be sorted in numerous ways (including by asset type, location, and condition rating), providing the City staff with an effective tool for maintenance and capital planning. The database can also be used to improve the existing computerized maintenance management system (CMMS) (OpWorks) or build a new CMMS program. Jacobs provided the City with access to the ACES database and an overview of the system so that staff can review the data and produce reports independently.

The results of the condition assessment show that overall, the WWTP is in good condition. Most of the equipment assets (277) were scored a 3, representing fair condition. This is common for a plant that has been reasonably maintained and upgraded over the course of its lifetime. Another way to look at the result is that assets are decaying on pace, maybe slightly ahead, of their typical useful life. 38 equipment assets were scored a 2, or good condition and one asset, the new Lime Silo was scored a 1, or very good condition. Three of the 317 assets were scored a 4, representing poor condition. The three assets are:

1. STR 11 Biological Filters 1-10. This is a major asset that encompasses the overall Biologically Active Filter (BAF) area. The reason for the poor rating is due to numerous valves and actuators that are out of service that could lead to a treatment process failure or effluent violation. Once these repairs are addressed the score could be lowered to a 3 or below. The BAF issues are further discussed in Section 3.

2. STR 13 Final Clarifiers. Two final clarifiers have been taken out of service for an extended period. The final clarifiers are no longer required for the secondary treatment process and there are no plans for returning the final clarifiers to service.

3. BLDG06 Submersible Biological Contactor (SBC) Building. The SBC building and equipment are no longer required there are no plans for returning this equipment to service.

The overall results indicate that maintaining and improving the condition of most of the equipment assets can be addressed through preventative maintenance combined with a well-planned capital replacement program. However, some equipment issues found during the condition assessment should be addressed in the near term. These issues are addressed in Section 3.

3. Observations and Near-term Recommendations

While performing the condition assessment described in Section 2, the Jacobs team noted issues with the biologically active filter (BAF) area, the primary clarifiers, ultraviolet (UV) disinfection, and odor scrubber chemical storage. These issues are discussed in Sections 3.1 through 3.4.

3.1 Biologically Active Filter Area

There is concern with several process valves and actuators taken out of service at the BAF area. The staff expressed concern that with so many cells online, there is not enough food to maintain the biology inside the cells. This situation would need to be confirmed with lab analysis (nitrites, nitrates, ammonia, dissolved oxygen, etc.). Currently, the staff only perform pH measurements, so additional testing would be required to determine the extent to which the process is underloaded. Without this information, it is difficult to monitor and track the performance of the reactors.

With numerous actuator and valve condition problems, the BAF area could lead to causing an effluent violation.

Near-term Recommendations for BAF

- Bring Kruger in to perform an evaluation of the system, no matter the current condition. It is better to address the BAF now, not later after a possible excursion.
- Make repairs to all broken or damaged valves and actuators.
- Complete repairs for stop log effluent gates on the cells (need to shut flow to individual cells to drain and inspect depth of media).
- Attend to air blowers (Gardner Denver, shown on Figure 2) soon. Several units have vibration readings with more than 2 mils of displacement, and some of the heat signatures are greater than 220 degrees Fahrenheit on the blowers with soundproof cabinets open. Some vibration could be caused by a bad drive belt; therefore, the staff should verify that matched sets of belts are installed on the air blowers. The pulley alignment and condition should also be checked. Additionally, there were several blowers with noticeable pools of oil in the bottom of the cabinets. These blowers should be checked for leaks, and the oil should be cleaned up. It is also recommended that the City use Gardner Denver's maintenance program for overhauling the blowers on a scheduled basis. Gardner Denver will provide exchange units that can be installed while the current blowers are sent out for service.

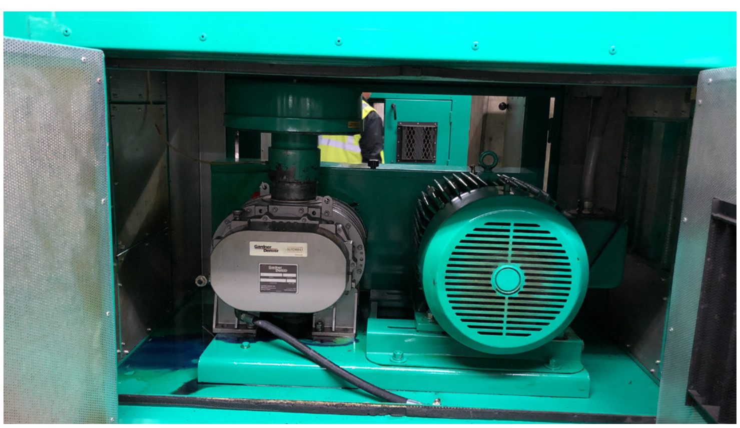

Figure 2. BAF Blower (Gardner Denver)

3.2 Primary Clarifiers

The primary clarifiers were installed more than 20 years ago, and discussions with plant staff revealed that the hardware components (sprockets, chains, flights, wear strips) have never been replaced. Figure 3 shows a primary clarifier.

Near-term Recommendations for Primary Clarifiers

- Perform a thorough inspection of the offline primary clarifier, including inspection of the chains, sprockets, wear strips, and flights for wear and to confirm age. While the loadings on the primary clarifiers may be lighter than design load, the chains and especially the pins holding the chains together will wear and ultimately fail over time.
- Test the chain drive assembly to ensure that the quick release/break away system is functional to prevent any type of catastrophic failure to the primary chains and flights.
- Make sure water remains in the primary tanks when they are taken out of service. The absence of water causes the hardware components to dry out, which increases the chance of failure over time.

Figure 3. Primary Clarifier (In Service)

3.3 Ultraviolet Disinfection

The ultraviolet (UV) disinfection system was out of service while the condition assessment was performed. This is an ideal time to perform preventative maintenance tasks on the system.

Near-term Recommendations for Ultraviolet Disinfection

- Tighten all electrical connections. The screws and electrical lag bolts tend to loosen from heating and cooling of the electrical wires.
- Perform the following tasks with all banks of the UV system in the up position:
  - Clean all residual off the UV bulb liners. CLR works well for deposits resulting from the use of ferric chloride.

- Check each UV lamp electrical connection by unscrewing the connection cords and checking the internal O-rings. Replace O-rings if there is any doubt about their ability to seal. The greatest problem with UV lamps is the buildup of moisture inside the glass tube, thus ruining the lamp because connections are not tight or sealed.
- Check all actuator/limit switches for operation while in the up position.
- Inspect all cords for any abrasions or unsmooth surfaces. Abrasions or rough surfaces are a good indicator that a cord may have been overheated or damaged. Cords on the UV system are shown on Figure 4.

Figure 4. UV System Showing Cords

3.4 Odor Scrubber Chemical Storage

During the condition assessment, the Jacobs team noticed that the sodium bisulfate storage tank (near Odor Control Unit 1 in the Clarifier Building) was straddling the containment pit, which did not appear to be designed for the storage tank (Figure 5). Upon further investigation, it was discovered that the original design of the odor control system called for three chemicals (sodium hypochlorite, sodium hydroxide, and sulfuric acid). The containment area where the sodium bisulfate storage tank was located was designed for a much smaller tank (possibly drums) of sulfuric acid.

The current arrangement is dangerous and has the potential to cause serious health and property damage in the event of a spill. Sodium bisulfate and sodium hypochlorite react violently when mixed, and the reaction generates chlorine gas.

Near-term Recommendations for Odor Scrubber Chemical Storage

- Procure and install a portable containment unit and place the sodium bisulfate storage tank on the containment unit. The portable containment unit should be sized to contain the entire volume of the storage tank.
- Use drums of sodium bisulfate, increase the size of the existing containment area, or procure and install a double-wall tank to provide secondary containment.

Figure 5. Odor Scrubber Chemical Storage (Containment under Bisulfate Tank Is Inadequate)

The Jacobs team noticed that a similar situation exists in the new biosolids processing area that is under construction and not yet in service. The storage and containment in this area should be reviewed and corrected as well.

4. Recommendations

The following condition assessment recommendations are provided in addition to the near-term recommendations presented in Section 3.

4.1 Condition Assessment Results and Database

It is recommended that the City of Northfield use the asset information gathered during the condition assessment to establish and implement an effective maintenance program with the purpose of improving the condition of the equipment assets over time. At a minimum, the City should modify or update the existing OpWorks CMMS platform to standardize the asset listings and equipment data and include standard maintenance procedures and supporting data. Additionally, a procedure should be established to track parts and record man-hours expended on work orders. OpWorks is only capable of recording labor hours and cannot track the cost of parts.

For a more accurate accounting of maintenance costs, the City should consider implementing a more robust CMMS that allows the recording and tracking of labor costs and a spare parts inventory. This is the industry norm because it allows for superior planning and budgeting of maintenance costs.

Data collected and entered into the ACES database during the condition assessment will be beneficial in updating the existing CMMS or establishing a new, more robust system.

4.2 Training

Jacobs recommends that the City invite the main equipment suppliers to visit the site and conduct workshops with the staff. This is an effective method to supplement the staff's training at little or no cost. Most equipment suppliers are willing to provide this service. A short list of the equipment suppliers to target is as follows:

- Wedeco - UV disinfection system
- Gardner Denver - air blowers
- Polycam - plastic chain system for primary clarifiers
- Kruger - BAF and ActiFlo
- Flygt - submersible and dry pumps

Additionally, Jacobs can provide training services on a range of operational and maintenance topics, including lab skills (sampling and testing) and instruments and controls (basics).

Appendix A
Operations and Maintenance Assessment Report

JACOBS

Memorandum

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Subject	**Operations Study/Recommendations – Rev. 2**
Project Name	Wastewater Treatment Plant Operation and Facility Study, City of Northfield, MN
Attention	Dave Bennett, Public Works Director
From	John Borghesi, Jim Borton, and Steve Waters
Date	April 22, 2020
Copies to	Justin Wagner, Utilities Manager

1. Background/Scope

The City of Northfield requested that Jacobs conduct an operations and maintenance (O&M) evaluation to review the following categories within the wastewater treatment plant (WWTP):

- Management/Staffing
- Process Control and Regulatory Compliance
- Maintenance Practices/Computerized Maintenance Management System (CMMS)/Condition Assessments

The City requested this report in response to several incidents that have taken place at the WWTP so that similar issues are not repeated and to identify other operational risks may be detected within the facility. Recent staff turnover further prompted City managers to be concerned about the possibility that the incidents could have been prevented with more staff on hand or staff with higher levels of experience. This has created a desire to determine if the WWTP is staffed according to industry standards.

Incidents in question prompting the review included a fire in the biosolids handling facility, flooding of the pump room because of pipe failure, flooding of the scum/solids wet well because of an inadvertent repositioning of the scum trough during normal operations, and flooding of the Biological Aerated Filter (BAF) building basement due to a pipe plug failure.

The ultimate purpose of the evaluation was to determine the overall status of the utility as it relates to industry standards and to provide insight for potential improvements to the WWTP's O&M. This included a review of management practices, staffing levels, process control methods, plant design, maintenance practices, current operating conditions, and compliance with applicable standards. This report serves as an interim update that will allow the City to proceed with implementation of new procedures and practices immediately. A review of asset conditions was completed in December and a draft report on this is pending. This will be completed prior to the end of January, at which time a draft report will be issued with recommendations for improvements in managing the City's wastewater assets.

The observations and recommendations in this technical memorandum are the result of onsite interviews and a review of plant information from October 15 to 17, 2019. The evaluation team consisted of John Borghesi, Project Manager; Jim Borton, Director of Operations Consulting; and Steve Waters, Principal Wastewater Engineer.

2. Operations Review

2.1 Facility

The Northfield WWTP is a 5.2-million-gallon-per-day (mgd) design facility employing an influent pump station consisting of three variable frequency drive (VFD) 86.25-horsepower (hp) dry pit submersible pumps (two older Fairbanks Morse, one new Flygt; see Figure 1) that pump from the wet well to the influent screening process. Influent screening is accomplished by one of two Lakeside rotating drum screen systems and followed by a Pista-Grit grit removal system. Grit and screenings are sent to a dumpster for disposal in a sanitary landfill. Following preliminary treatment, wastewater is dosed with ferric chloride and polymer, and mixed to enhance settling in one of two primary clarifiers (one is normally online). Scum and sludge produced from the primary clarifiers is removed to the solids treatment process.

Figure 1. Left: Two Fairbanks Morse (Tan), New Flygt (Gray) Pumps. Right: Rotary Screens.

The preliminary/primary treatment building is maintained under negative pressure to capture odors and remove corrosive gases (i.e., hydrogen sulfide). The foul air is sent to a wet odor scrubber system where sodium hypochlorite is used to oxidize odors before the air is vented to the atmosphere. Blowdown wastewater is dechlorinated with sodium bisulfate before being recycled into the treatment plant. Mixers and clarifiers are shown on Figure 2.

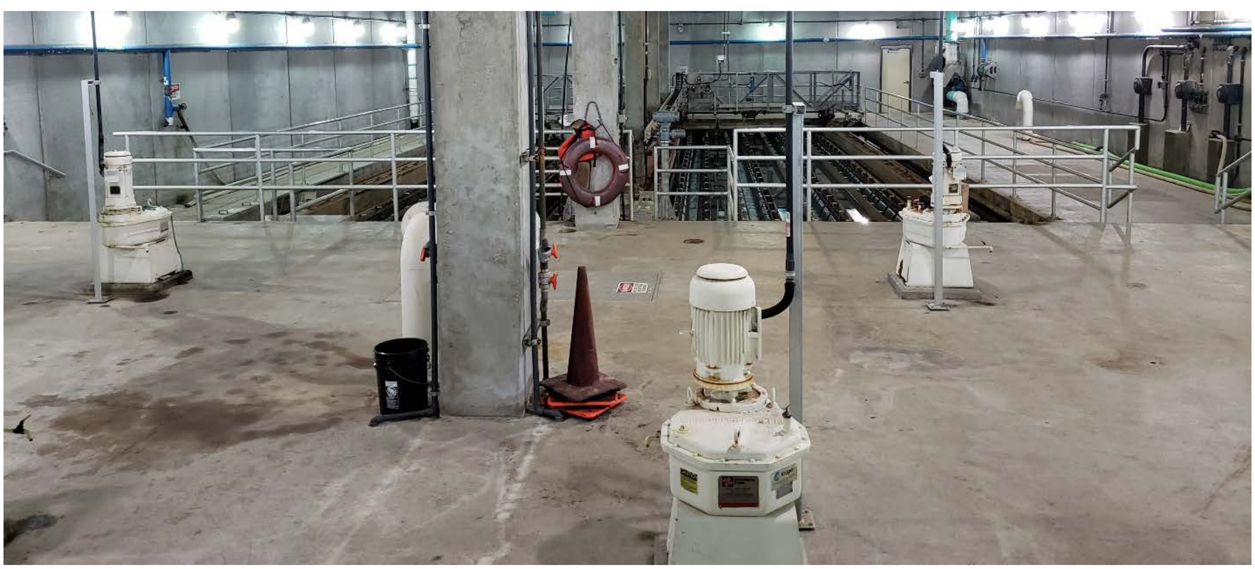

Figure 2. Foreground, flash mix and flocculator mixers. Background, primary clarifiers.

After primary settling, wastewater is pumped to 1 of 10 BIOSTYR treatment system cells arranged in five cells per side grouping. BIOSTYR is a process that uses a proprietary styrene based media, air, and bacteria to treat organic constituents (i.e., biochemical oxygen demand or BOD) in the wastewater. The styrene media provide a place for bacteria to grow and affix itself, allowing for the BOD removal. The styrene serves as a filtration media to capture any solids in the waste stream. Cells are rotated online and offline to facilitate reaction time with wastewater and allow the backwash cycle to remove excess solids captured during treatment. Backwash solids are returned to the primary clarifier influent. The process also removes ammonia as Northfield's NPDES permit includes ammonia discharge limits from April through November and monitoring requirements from December through March. The blower room and a BIOSTYR cell is shown on Figure 3.

Figure 3. Left: Blower Room. Right: Top of BIOSTYR Cells with Treated Wastewater on Surface.

Air supplied to the BIOSTYR process comes from eleven 50-hp positive displacement blowers. Blowers are either on or off; no VFD control is provided for these units. Each blower is valved to a BIOSTYR cell with one backup blower unit for all blowers. Blowers were recently replaced as part of the ongoing capital improvements program discussed in Section 2.4.

Treated water then flows to the ultraviolet (UV) disinfection process prior to discharge to the Cannon River. This process allows the facility to meet its fecal coliform limit to comply with the NPDES permit. The UV system, shown on Figure 4, was recently updated as part of the capital improvements program.

Figure 4. Left: UV Controls. Right: UV Light in Water.

Solids removed from the primary clarifier are sent to the solids treatment process (see Figure 5). Currently, a temporary Schwing Bioset unit is in place for solids handling. Solids are pumped to an existing decommissioned clarifier. The clarifier is used for solids flow equalization before solids undergo the Bioset process.

Figure 5. Left: Solids Storage in Decommissioned Clarifier. Right: Temporary Dewatering, Lime Addition, and Reactor.

Solids from the clarifier flow are pumped to the Bioset dewatering process where excess water is removed. Solids then move to the lime addition and mixing portion of the process. Solids are stabilized within a reactor vessel and then conveyed to a truck for transport to a location for land application or to an onsite storage facility prior to future land application (weather dependent). The dewatering process and lime addition/reactor process are not operated in a fully automatic mode and are not connected to the plant supervisory control and data acquisition (SCADA) system; therefore, these processes require constant operator attention.

Once the new permanent unit is brought online, solids will go to an aerated holding tank and will then be pumped to a larger capacity Bioset unit. At current loadings, the temporary unit needs to be operated 60 hours per week to keep up with solids production, while the permanent unit, expected in spring 2020, will only need to be operated 18 hours per week. Figure 6 shows a newly installed screw press and the solids dewatering room.

Figure 6. Left: Newly Installed Screw Press for Solids Dewatering. Right: Newly Renovated (Still in Process) Solids Dewatering Room.

Most of the plant (except the temporary Bioset process) is connected to the plantwide SCADA system, which allows the monitoring and, in most cases, control of the processes remotely. The SCADA system has a dial-out capability, so that alarms can be reported to programmed phone numbers to inform operations personnel of any alarm or out-of-specification condition. Not all conditions within the plant are covered by SCADA; however, important, critical alarms are included and are typical of a WWTP this size. As SCADA is updated, increased capabilities are inherent to new systems that would allow monitoring of additional conditions and parameters, even remote operation of the system. Monitoring of 100 percent of all plant parameters is not cost effective and can be balanced out with determining critical failure paths and monitoring conditions along that pathway.

The facility is covered by a standby diesel generator capable of full load operation of the facility within a few seconds of power loss. The generator contains automatic switch gear that allows the plant to go onto and off generator power in the event of an outage and an automatic paralleled transfer back to utility once external power is restored.

The plant has an onsite laboratory, which is used only for two NPDES reportable parameters: pH and dissolved oxygen. The remainder of the required compliance sampling is contracted out to a certified laboratory. The plant laboratory has the capability to test all process control parameters necessary to optimize the facility, including a Hach 3900 Spectrophotometer that can test many parameters. In addition, a jar testing unit is onsite and can be used to optimize polymer and coagulant dosing. Unfortunately, due to staffing limitations Northfield staff admit that there is insufficient time to utilize the on-site equipment for optimization testing and only absolutely required NPDES testing is completed on-site. Test equipment is shown on Figure 7.

Figure 7. Left: Hach DR3900 Spectrophotometer. Right: Lab Bench with Jar Testing Apparatus under Cover.

2.2 Staffing

The Northfield Utilities Department is split into two primary divisions: Utilities, which includes 5 drinking water wells with chemical feed, 96 miles of water distribution mains, 80 miles of wastewater collection lines, and 56 miles of stormwater lines; and Wastewater, which is responsible for the O&M of the WWTP. The current, basic organization showing headcounts is provided on Figure 8.

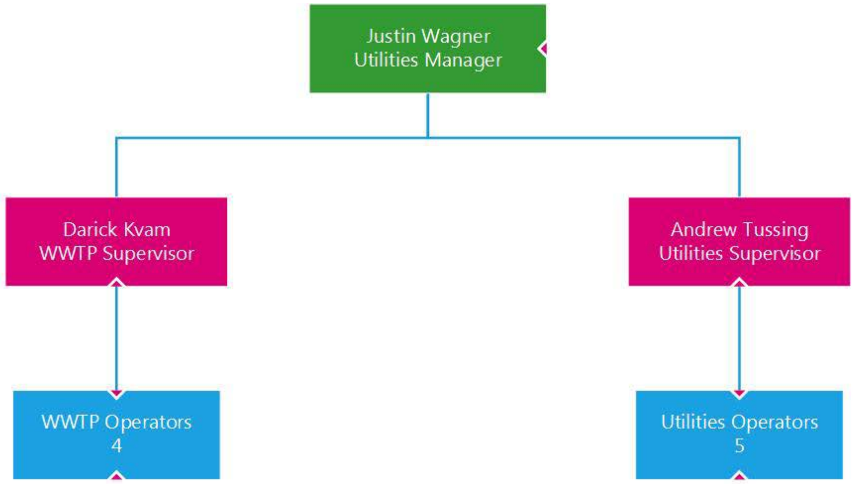

Figure 8. Organizational Chart

While the WWTP treats wastewater 24 hours per day/7 days a week, it is currently staffed Monday through Friday, 5:00 a.m. to 5:00 p.m. to man the temporary biosolids process. However, upon the completion of the biosolids upgrades the City can revisit this situation. Depending on the season, needs of the facility and/or management preference, several options are available. Industry standards vary on what is the most appropriate methodology for staffing a plant that can operate in an unstaffed condition. One option is to continue Monday through Friday, 5:00 a.m. to 5:00 p.m. with 8 hours per day/employee coverage (i.e. some staff are 5:00 a.m. to 1:30 p.m. and others are 8:30 a.m.-5:00 p.m.). This spreads out the available staff to provide 12 hours of on-site coverage with approximately 3-4 hours of overlap to accomplish tasks that require additional staffing.

A second option is to maximize staffing on-site during shifts by reducing hours that staff are on site for coverage (i.e. all staff are Monday through Friday, 8:00 a.m. to 4:30 p.m. - times are provided for illustration only) and relying more on SCADA systems. In both options, coverage is provided by an on-call team member who is required to visit the plant Saturdays, Sundays, and holidays to check in on the process and do a set of operational rounds. Operational rounds involve a review of all settings and gauge/meter readings. Rounds require a look at mechanical equipment to ensure proper operating temperatures and lack of vibration, and to note abnormal behavior, etc. These readings are captured on a paper form and then later entered into the plant data management system for tracking purposes. The on-call staff member is also responsible for accepting alarm calls from the plant dialer system.

Both options provide for 40 hours per week per employee plus any hours earned for coverage work on weekends and holidays. Both options have advantages and disadvantages with the preferred schedule being dictated by the community's needs, collective bargaining agreements and management preference. If considerable call ins are noticed, for example, from excessive alarms requiring operator intervention, extended on-site coverage may be needed until the condition(s) causing the alarms can be corrected.

Plants of Northfield's size are generally not staffed more than 12 hours per day, and most are between 8 to 10 hours per day with operational checks on weekends and holidays. In general, the work load is created by the system components such as the processes utilized, age of equipment, permit limitations, regulatory requirements (i.e. some regulators require x hours of staffing/day) and utility resources.

Currently, one supervisor and four operators are onsite and all O&M duties are divided among the four staff. The plant supervisor typically handles process decision-making, data management activities, including filling out permit-required reports and coordinating contract laboratory data. Operators conduct rounds, take care of preventative and reactive maintenance, and monitor and adjust process parameters, especially the current temporary biosolids process.

Staff members, by industry standards, are inexperienced. Except for one staff member with approximately 30 years of experience, the most experienced staff member at the plant has only 2 years of experience. The utility industry has been in an industry-wide changeover of employees of late because many treatment facilities expanded or were built for the first time in the late 1980s; employees from that era are retiring nationwide, taking significant institutional knowledge with them. Their retirement has created a “brain drain” in industry circles. Northfield also lost two staff members who pursued an opportunity in another town. With a smaller number of staff, the staffing gap is more apparent. Loss of two staff members in Northfield equates to approximately 50 percent of the workforce.

Table 1 presents a comparison of Northfield’s staff levels to both nearby and nationwide comparably sized wastewater treatment plant staffing levels.

Table 1. Staffing Comparisons

Municipality	Design Flow (mgd)	Average Flow (mgd)	Total No. Staff Onsite, Full Time	Manager/ Supervisors on-site Full Time	Comments
Northfield, MN	5.2	2.5	4	1.5	BAF process, solids dewatering and stabilization, UV disinfection, three significant industrial users
Faribault, MN	7	4.5	4	2	Roughing filters/activated sludge process, five significant industrial users
New Prague, MN	1.83	0.75	3	1	BAF process, use part-time help from Street Department for biosolids hauling
Red Wing, MN	4.0	2.5	5	1	City manages two WWTPs with staff listed; Trickling filter municipal plant, physical/chemical and solids dewatering industrial plant pretreatment by another department
Delphos, OH	3.83	1.5	4	1.5	Membrane treatment WWTP with ATAD solids digestion, solids dewatering
Duncan, OK	4.5	N/P	5	1	Trickling Filters/Activated sludge, solids drying beds. Staff includes Lab, IPP and Manager
Pampa, TX	3.0	N/P	3.5	1	Oxidation ditch, solids dewatering.
Stephenville, TX	3.0	N/P	3	1	Oxidation ditch, solids dewatering, chlorination/dechlorination
Mercedes, TX	5.0	N/P	4.5	1	Oxidation ditch, dewatering and drying beds, UV disinfection
Berryville, AR	2.4	N/P	3.5	1	Activated sludge, solids dewatering, UV disinfection
Westerly, RI	3.3	N/P	5	1	IFAS, solids thickening/dewatering, chlorination/dichlorination. Staff include one FTE for Lab/IPP
Carol Stream, IL	6.0	N/P	5	2	Activated sludge, solids thickening/dewatering, chlorination/dichlorination. Staff includes one FTE for Lab/IPP

Note:

BAF = biological aerated filter

ATAD = Autothermal Thermophilic Aerobic Digestion

N/P = Not Provided

IPP = Industrial Pretreatment Program

IFAS = Integrated Fixed Film Activated Sludge

As can be seen in Table 1, staffing at the facility is within an expected range for the size and type of facility operated, but clearly on the lower end. Other considerations for staffing should include the potential to develop bench strength within the utility, the maturity of various programs (such as predictive/preventative maintenance or the newly delegated industrial pre-treatment programs), and the effort required to establish and maintain such programs in their infancy. Not considered in Table 1 is the complexity of the processes, current loads, age and condition of equipment, regulatory requirements beyond basic permit compliance, and functionality of plant automation.

From a facility and Utility-wide management structure, the City's current set up is an effective arrangement that can be enhanced via staff sharing and cross training. Cities that are similar in size to Northfield continue to struggle with staffing and keeping enough experienced staff available. By maintaining a common Utility Manager over both wastewater treatment and water/distribution/collection utilities, with an Assistant (or Supervisor) for each utility, Northfield can reduce the amount of management staff as compared to a Manager/Assistant Manager arrangement for each utility. This provides budget savings that can be allocated to front line operations staff or a reduction in operating costs. Other advantages in letting Supervisors assist the opposite side of the utility when appropriate include 1) developing bench strength to help fill temporary supervision vacancies due to injury, illness or retirement, and 2) providing for a succession plan for the Utility Manager role.

For the current management structure to be most effective, consistent and regular communication between the Manager and Supervisors, as well as the sharing of occasional duties, is necessary. Sharing of duties can come from providing coverage for on-call rotations, assisting at the counterpart's facility when extra hands are needed for a task or during an absence. Ideally, cross training would include not only experience at the counterpart's location, as required by the state for certification, but also training opportunities in the opposite field. Training may consist of operations related classes, professional conferences or specialty courses.

Cities the size of Northfield where effective operation is maintained with smaller staffing must be innovative with use of team members to ensure enough coverage is available when needed. Hiring excess staff members for "just in case" is not always fiscally practical or possible. As such, the above cross training structure can be applied to front line operations staff as well. This would further bolster the experience level of staff and provide for a larger pool of staff members to draw upon should it be necessary to provide coverage due to unexpected resignations, retirements, illness and so on. Staff members that desire to gain the additional experience in their counterpart's operation should be encouraged to do so when appropriate. Similar for supervision above, staff can be utilized whenever projects dictate the need for additional help or when they can assist with plant coverage working with an experienced operator.

2.3 Operations Practices

Overall, the facility appears to be well operated by the existing staff. During the evaluation, the plant's onsite process control methods were discussed. Generally, the facility operates well with limited adjustments, which are evaluated from time to time except for the temporary solids process, which requires significant adjustments and operator attention. The fact that the plant does not require significant and frequent adjustments is good news and suggests the processes and facilities can handle the wastewater flows and loads without excessive operator attention. However, it may also suggest there is an opportunity to improve process optimization and reduce costs. Additional attention to process control testing and optimization would require more operator attention and take time away from regular responsibilities.

In a facility such as the Northfield WWTP, jar testing should be done weekly, unless significant flow changes are observed, in which case the adjustment of coagulant and polymer doses may need more frequent attention. With facility performance in compliance (with minimal exception), it is acknowledged that the process is operating well and the recommendation is purely for cost optimization. Additionally, as seasons change and permit requirements for ammonia become more relaxed or more stringent, additional nitrogen testing (ammonia, nitrate, TKN) can point toward additional optimization (i.e. take units off line) or to prepare for upcoming lower limits (i.e. get additional unit(s) ready to come on line as well as to monitor trends for potential performance issues).

Current operation dictates one blower per BIOSTYR cell. The blowers are set to maximum output because there are no VFD controls on the blowers, resulting in the following: 1) excessive aeration and the general underloading of the plant allow nitrification to occur, and 2) the blower settings increase energy consumption.

One pound of oxygen is needed to treat 1 pound of BOD, and amounts more than these are a waste of aeration energy. Likewise, nitrification requires 4.6 pounds of oxygen per pound of ammonia nitrified. However, because the treatment facility is required by permit to remove ammonia, albeit at varying levels seasonally, operations could investigate installing VFD control on the blowers. Currently, the primary clarifier effluent ammonia is not tracked, so it is difficult to determine how much excess air is being applied as indicated above. Utilizing influent ammonia as tested for NPDES reporting may not give the full picture of the loads placed on the BIOSTYR cells. Using average domestic concentrations of approximately 20 milligrams per liter (mg/L) of influent ammonia and an average flow of 2.4 mgd (as compared to average influent carbonaceous biochemical oxygen demand of 250 mg/L), it is likely that the facility is over-aerating by at least 35 percent.

Another observation is that the corrosion of the sluice gates in the effluent of the BIOSTYR process could be related to the unintended nitrification. This concept was not investigated, but experience suggests it may be occurring. Nitrification reduces alkalinity to the point that water becomes aggressive and speeds corrosion of metals and concrete within the process. Simple testing in the lab by monitoring alkalinity values can rule out this possibility and serve to prolong equipment life. A minimum recommended residual alkalinity level to prevent corrosion is 50 mg/L.

2.4 Capital Planning

The City is in the middle of a 10-year capital improvements plan. The plan, developed in January 2016, was intended to identify equipment items at or near the end of their respective useful life and to replace or upgrade the equipment to ensure plant functionality. To date, several of the items on the list in Table 2 have been or are currently in the process of being upgraded or repaired, even if in an incremental phase of work (i.e., one unit at a time).

It appears that the City has taken the appropriate steps to plan for future work at the treatment facility. The condition assessment portion of this project will help determine the following: whether additional work is necessary, if the listed priorities need further review, or if additional work efforts are required. As for the upgrades, if all projects were combined into one larger project, there may be cost savings and more consistent technology used. Combining the projects also has the advantage of operations being disrupted one time for a year rather than continuously for the next 5 years. Cost savings are typically seen in the mobilization and demobilization costs for general contractors and economy of scale for a larger project.

Table 2. Capital Plan Improvements

Item	Proposed Completion per Capital Plan	Actual Completion	Comments
UV Disinfection	3/2017	3/2017	In service April to October, per permit
BAF Gate Replacement	11/2019	In process	Shop drawings in review
Biosolids Treatment Upgrades	12/2021	3/2020 anticipated startup date	Treatment process under construction; originally to be completed with storage project
Biosolids Storage	12/2021	-	Separated from biosolids treatment project due to fire mishap
SCADA Upgrade	12/2022	-	
Influent Lift Pumps	12/2023	In process	One pump replaced
Blower Replacement	12/2024	In process	Some units already replaced
Water Reuse System	12/2025	-	

3. Maintenance Review

3.1 Maintenance Program Overview

The plant staff consists of a Plant Supervisor and 4 operators who cover 60 hours of plant operations via an overlapping 12-hour-shift schedule 5 days a week. Staff is responsible for the maintenance of the plant and the day-to-day operations. The operators perform limited routine maintenance tasks (lubrication, calibration, and minor maintenance on equipment). Larger, more complicated maintenance tasks are handled by local contractors (i.e., mechanical and electrical). The Utilities Department has implemented and is using the OpWorks CMMS platform to manage preventative maintenance (PM) tasks at the facilities. OpWorks is a cloud-based solution with the data hosted on OpWorks servers. The CMMS platform is discussed in more detail in Section 3.2.

Currently, most of the equipment maintenance is corrective and reactive in nature, and very little preventive maintenance is carried out. This inefficient way of using the limited resources available to maintain the facility is a common problem in the industry for facilities of this size. In addition, it is difficult for a limited staff to get ahead of the planning curve. This frequently leads to maintenance programs devolving into a reactionary mode, which creates additional costs because of inefficient deployment of resources and unexpected equipment costs.

There are no documented maintenance procedures, except for the PM tasks set up in the CMMS, but these do not provide much detail other than a short description of the required task (i.e., CHECK OR GREASE & CHECK AND ADJUST BELTS). The lack of maintenance procedures can create problems, especially with an inexperienced staff. A good set of maintenance procedures based on the equipment manufacturer's recommendations and industry standard practices is essential. Well-documented procedures are an excellent asset for training purposes, ensuring that the required maintenance is completed properly, increasing the efficiency of the staff, and minimizing re-work.

Although spare parts are stocked onsite, the plant does not have an organized or documented spare parts inventory; as a result, parts usage and inventory costs are not tracked. The plant relies on historical knowledge rather than documentation to determine the parts inventory, which is inefficient and problematic. Without documented usage, it is difficult to determine critical spares and the appropriate stocking levels. It can also lead to situations where critical spares are not immediately available, thus forcing an unintended shutdown.

Maintenance costs for the facility are only tracked at a high level in a limited number of cost accounts, making it difficult to determine the effectiveness of the maintenance program and determine critical tasks. Additionally, costs or labor hours are not tracked on Work Orders, so it is difficult to compare the amount of preventative versus corrective maintenance performed or to identify the amount of effort expended on individual equipment assets. That said, the staff and plant management have a good sense of the equipment "bad actors" and the areas of the plant that present greater maintenance challenges. Maintenance tracking is a common challenge in the industry, but the robust documentation of maintenance costs is essential to effective maintenance planning in both the short term (daily, weekly, and monthly) and long term (capital replacement). This will be discussed further in Section 3.2.

There appears to be minimal coordination with contractors performing capital and maintenance work onsite. During the evaluation team's visit, contractors were onsite installing the new biosolids stabilization system, and a heating, ventilation, and air conditioning contractor performed work in the primary building. Work performed by contractors is not captured in the CMMS, and there does not appear to be a permit (hot work or other) system in place to control the work. Coordination with contractors performing maintenance is critically important in preventing operational excursions. Contractor actions that can lead to operational problems include an incorrect breaker thrown or an incorrect valve isolation, among others. Understandably, coordination of contractors is difficult with minimal resources; however, a good control program is important in preventing operational excursions.

3.2 Computerized Maintenance Management System

The Utilities Department is using OpWorks, a cloud-based CMMS with the data hosted on remote servers. Jacobs was provided access to the CMMS through a user account so that the system and data could be reviewed. The following observations were made while navigating the CMMS platform and data:

- The interface is user-friendly, and navigation through the program is easy and intuitive.
- The system is used for both the water and wastewater assets of the City.
- The system uses the equipment run-time taken from the WWTP's SCADA system to generate PM Work Orders as required.
- There are 365 assets set up in the system for the WWTP; the following were observed about those assets:
  - There are 32 asset types set up from blowers to VFDs.
  - There does not appear to be a uniform approach to categorizing assets.
  - There is limited asset data captured in the system (mostly just equipment identifiers).
- There are 291 PM tasks established in the system, and there are currently 102 PM Work Orders in the backlog.
- The platform can track labor hours on a work order but not the cost associated with those labor hours. Tracking of labor hours is not used currently.
- The platform does not have the ability to control a spare parts inventory or track the cost of parts used on work orders

Overall, management has done a decent job in implementing the OpWorks CMMS platform for use in the plant; however, the CMMS platform requires additional work (asset data, PM procedures, man-hour tracking, planning) to realize its full potential to increase efficiency. CMMS is a good program for scheduling and planning, but as it is currently used, it does not have capabilities in cost capture/reporting and inventory control. As compared to industry standards, Northfield is on the entry level, along with many other facilities that are starting to implement CMMS into their daily routines. To reach the next level additional efforts are required.

The Plant Supervisor performs most of the maintenance planning with feedback from the operations staff. The bulk of the maintenance, however, is reactive in nature because the planning is minimal. The CMMS is used in a limited manner for planning and documenting corrective maintenance work; however, there is a real opportunity to significantly improve maintenance efficiencies with minor modifications to the existing CMMS or implementation of a CMMS with cost and inventory management capabilities.

4. Recommendations (Pending Asset Condition Analysis Report)

The following recommendations are presented for the City's consideration:

1) Hire one additional full-time staff member and bring the total number of operations personnel under the Supervisor to five. This position should focus on:
   a) Maintenance activities,
      i) planning,
      ii) scheduling,
      iii) CMMS input, and
      iv) work order execution.
   b) Additionally, this staff member should be trained in operations and encouraged to gain licensing to fill in for employees on sick leave and vacations. A typical job description for this position is included in the attachment.

2) Restructure operator duties:
   a) Place Supervisor in position to coordinate work efforts and rely on sufficient staffing levels to complete the tasks under normal circumstances. Allows more focus on process decisions, compliance issues, contractor coordination (see work permits) and related duties.
   b) Ensure that operators rotate through all facets of plant operation to gain experience on current systems and to enhance knowledge for state certification exams.
   c) Train operators in laboratory work so that they can complete testing and generate data for process control decision-making.
   d) Allow operators to assist the new staff member with maintenance activities
3) Evaluate VFDs to reduce blower output and achieve better control of the system for energy conservation.
4) Investigate installing valves that would allow half of the BIOSTYR process to be offline. The plant is currently underloaded, which would provide the ability to isolate portions of the plant to conserve energy and to facilitate future maintenance.
5) Investigate the potential for consolidating all capital projects into one large project. Typically, cost of construction is lower as one project due to mobilization and administration costs. Likewise, when looking at system integration it yields a more functional control system to design and install systems at the same time.
6) Initiate new and increase the frequency of existing process control testing, including monitoring of primary clarifier influent/effluent parameters, BIOSTYR effluent quality including alkalinity, and jar testing of primary clarifier influent (prior to chemical dosing).
7) Develop and implement standardized maintenance procedures to cover both preventative and corrective maintenance work.
8) Implement an industry-standard work order system to track maintenance costs at a more detailed level. This can be accomplished in a few different ways
   a) At a minimum, the City should modify or update the existing OpWorks CMMS platform to standardize the asset listings and equipment data and include standard maintenance procedures and supporting data. Additionally, a procedure should be established to track and record labor hours expended on work orders. Note that OpWorks is only capable of recording labor hours and cannot track the cost of parts used.
   b) For a more accurate accounting of maintenance costs, the City should consider implementing a more robust CMMS that allows the recording and tracking of labor costs and a spare parts inventory. This is the industry norm as it allows for superior planning and budgeting of maintenance costs.
9) Establish a database and control system to manage the City's existing spare parts inventory. This will allow the staff to track inventory levels and costs, and record usage data. The data gathered will allow for better inventory control and reduced costs.
10) Establish a permit system to control the maintenance work performed in the plant by plant personnel and contractors. This system would establish procedures for obtaining permission to start work and notifying staff management when work has been completed. This would apply to any cold or hot work (welding, cutting) carried out in the plant. In order to implement an effective permit system, the City will need to develop written procedures, train the staff to carry out the procedures, and establish a records management system for storage of the permit records. It is essential that a permit system has the full support of senior management so that the staff using the system daily take it seriously and implement it to its full effect.
11) Review and update the safety program with, at a minimum, documented requirements for minimum personal protective equipment (safety shoes, hard hats, safety glasses, reflective vests) in the plant and a safety orientation for contractors and visitors.

Attachment

Attachment. Scheduler/Planner Job Description

POSITION SUMMARY	
Under direction of the Plant Supervisor, supports a department or area in maintaining all equipment and facilities as assigned in a safe and efficient working condition for the Utilities Department. This position will be accountable for ensuring the timeliest and cost-effective maintenance of wastewater conveyance and treatment equipment, electrical power, instrumentation, mechanical systems, and auxiliary equipment in the safest manner possible, or as mandated to ensure regulatory compliance and achievable metrics. The Maintenance Scheduler/Planner's responsibility is to improve maintenance workforce productivity and work quality by anticipating and eliminating potential delays through planning and coordination of manpower, parts and material and equipment access, while maintaining compliance with all regulatory permits.	
Direct Reports 0	Budget Responsibility 0

PRIMARY RESPONSIBILITIES/JOB DUTIES

- Assists with development, administering, and management of departmental budgets.
- Interacts with front line supervisors, managers, operators, and shift supervisors to guarantee the efficient, safe, and permit-compliant operation of the system.
- Interacts with Plant Supervisor for reporting on, maintaining, or operating the system in an efficient, safe, and permit-compliant manner.
- Supports capital projects.
- Required to be administratively proficient and detail-oriented to manage key performance indicators along with project management.
- Participates in development and coordination of planned assignments for staff and contractors, and/or work efforts of weekly, monthly, quarterly, and annual work schedule for designated areas focusing on department goals.
- Plans and evaluates the quality and quantity of work needed to accomplish work group goals within set limits of time, cost, and permits.
- Maintains effectiveness in changing environment.
- Is comfortable dealing with the competing priorities and missions within the Department.
- Prepares clear and concise records, reports, and other written materials; reads and understands blueprints, drawings, specifications, and sketches pertaining to the work.
- Reviews documentation to ensure concise and accurate equipment data descriptions, work procedures, and limited development of standard maintenance procedures.
- Assists in initial identification of plant improvements, including development of criteria for job scope and engineering review.
- Exercises purchasing knowledge to find obsolete parts; finds new vendors and establishes reliable contacts for industry, ensuring support of critical equipment and process.

PRIMARY RESPONSIBILITIES/JOB DUTIES
• Performs warehouse identification of spare parts; oversees stocking notifications matching equipment/parts descriptions in system; checks levels, criticality, and pricing. • Manages service contract.

KNOWLEDGE, SKILLS, and EXPERIENCE	
Minimum Required	• A working knowledge in chemical, process, or mechanical engineering; or related fieldwork experience; or a Bachelor's Degree in related field • 5+ years in a maintenance, engineering, or process environment • 3+ years formal maintenance planning experience • Ability to operate in a team environment and lead projects as necessary • Ability to shift priorities frequently and to effectively perform under pressure • Ability to operate a personal computer and other office equipment as needed • Ability to function in both a plant and office environment • Ability to write logical work packages • Ability to organize and communicate work assignments • Strong mathematics and analytical abilities, including statistical analysis • Computer skills to include Microsoft Office Suite, Microsoft Access, computerized maintenance management system (CMMS) and other software applications • Strong technical knowledge of mechanical and electrical systems associated with industrial processes • Knowledge of occupational hazards and safety precautions needed in an industrial environment for the performance of mechanical, electrical, and control system maintenance work • Thorough knowledge of the repair and maintenance of turbines, gasoline and diesel engines, mechanical equipment and/or electrical equipment, and transmission systems • Minimum of 5 years of relevant experience in maintenance planning, with preferred experience in heavy manufacturing, chemical, or utilities industry • Superior interpersonal and communication skills; ability to develop and maintain good working relationships with client, public, purchasing, operations, employees, etc. • Excellent management and organizational skills
Preferred	• Knowledge and experience in the operation and maintenance of a water and wastewater reclamation facility • Maintenance planning certification • 3 to 5 years progressive supervisory experience in an industrial environment • Experience in process/operations management; quality assurance/quality control procedures; safety, environmental, and facilities management • Knowledge of purchasing, procurement, ordering of equipment also a plus • Knowledge and experience in reliability-centered maintenance

KNOWLEDGE, SKILLS, and EXPERIENCE	
	• Experience supervising in a union environment • Experience in developing and managing a budget greater than $500,000 • Leadership skills for leading and facilitating work efforts and projects

WORK ENVIRONMENT
Physical effort required: bending, standing, lifting and carrying up to 50 pounds, climbing ladders, walking, climbing and balancing, stooping, crouching, crawling, and smelling **Working conditions** (50 percent of time in operations environment and 50 percent of time in office environment): Worker in this position will be exposed to temperature extremes, noise, fumes, odors, confined spaces, elevated heights, and dust. Working conditions include sitting for prolonged times in front of computer. May need to work outside in inclement weather conditions. **Travel**: Occasional travel for training or meetings. This function is largely in an industrial environment, so the job includes frequent visits to maintenance and repair locations. **Potential for on-call work**: This position requires on-call time.

Appendix B
Summary Report for All Assets

Asset Type MAJOR ASSET

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
VA15	Air Blower No 4 Control Valve	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA16	Aeration Header Control Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA17	Air Blower No 5 Check	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA18	Air Blower No 5 Isolation	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA19	Air Blower No 5 Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA2	Air Blower No 1 Isolation Valve	BAF	Blower Gallery	BAF		Butterfly	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA20	Aeration Header Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA21	Air Blower No 6 Check	BAF	Pipe Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA22	Air Blower No 6 Isolation	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA23	Air Blower No 6 Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA24	Aeration Header Control	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA25	Air Blower No 7 Check	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA26	Air Blower No 7 Isolation	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA27	Air Blower No 7 Control	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA28	Aeration Header Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
EL04	UV A B Ballast Transformer	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
FE2	Pretreatment Flow Meter	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Mag Meter 14"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
FE3	SBC Flow Meter	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Mag Meter 6"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
FE4	BAF discharge Flow meter	BAF	BAF Pipe Gallery	BAF		Mag Meter 12"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
FE5	P-BWR1 Flow Meter	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Mag Meter 6"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
FE7	Belt Filter Press Flow Metering	BioSolids	BioSolids Building	BioSolids		Mag Meter 6"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
Genset	Emergency Generator	Generator	Bio-Solids			GenSet	12/28/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
HUMD01	UV Dehumidifier 1	UV Disinfection	UV Building	UV Disinfection		Air Handling	12/28/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
HUMD02	UV Dehumidifier 2	BAF Pipe Gallery	BAF	BAF Pipe Gallery		Air Handling	12/28/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
HUMD03	UV Dehumidifier 3	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Air Handling	12/28/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEA1	Air Blower 1	BAF	Baf Gallery Blower	BAF		Air Blower	12/15/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	2	3	3	3	3
MEA10	Air Blower 10	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
MEA11	Air Blower 11	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA12	Air Blower 12	BioSolids	Biosolids Building	BioSolids		Air Blower	12/30/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
1G1AB	UV Lamps Ballast panel A B	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	12/15/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
1G1CD	UV Lamps Ballast panel C D	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	12/15/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
4FC1	Chemical Storage Tank 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Tank	12/15/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	3	2
4FC2	Chemical Storage Tank 2	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Tank	12/15/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	3	2	3	2
BLDG01	Fleet garage maint and Offices	Treatment plt	Garage Bldg	Treatment plt		Building	12/15/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
BLDG03	Bio-solids storage	Treatment plt	Bio-Solids Bldg	Treatment plt		Building	12/17/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
BLDG06	O/S Bio-contact chambers	Treatment plt	Submersible Biologic Contractor Bldg	Treatment plt		Building	12/17/2019	Bill Haberstroh	Poor. Condition Grade 4. Unable To Meet Level Of Service Life. Failure Imminent.	3	4	4	3	4
BLDG09	Solids Handling	Treatment plt	BioSolids Processing Bldg	Treatment plt		Building	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
BLDG11	UV Disinfection	Treatment plt	UV Building	Treatment plt		Building	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
BLDG14	Primary Clarifier/influent screening/Odor	Treatment plt	Pretreatment/Clarifier Bldg	Treatment plt		Building	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
BLDG17	Kurger CN	Treatment plt	BAF Bldg	Treatment plt		Building	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
BLDG20	Plant influent lift station	Treatment plt	Lift Station Bldg	Treatment plt		Building	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
EL02	UV Electrical Transformer	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
EL03	UV C D Ballast Transformer	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	12/28/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG22	BAF No. 7 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG23	BAF No. 7 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG24	BAF No. 8 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG25	BAF No. 8 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG26	BAF No. 9 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
SG27	BAF No. 9 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
SG28	BAF No. 10 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
SG29	BAF No. 10 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
SG3	Fine Screen Isolation Gate 3	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG30	SBC Flow Control Gate 1	BAF	BAF	BAF		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG31	SBC Flow Control Gate 2	BAF	BAF	BAF		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG32	SBC Flow Control Gate 3	BAF	BAF	BAF		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG33	SBC Flow Control Gate 4	BAF	BAF	BAF		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
SG34	SBC Flow Control Gate 5	BAF	BAF	BAF		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG4	Fine Screen Isolation Gate 4	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG5	Grit Chamber Isolation Gate 1	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG6	Grit Chamber Isolation Gate 2	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG7	Grit Chamber Isolation Gate 3	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG8	Splitter Structure Chamber Gate 1	Pretreatment/Clarifier Bldg	Pretreatment Bldg	Pretreatment/Clarifier Bldg		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG9	Splitter Structure Chamber Gate 2	Pretreatment/Clarifier Bldg	Pretreatment Bldg	Pretreatment/Clarifier Bldg		Slide Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR01	Lift Station Tank	Lift Station	Treatment Plant	Lift Station		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR02	Votex Grit Removal Tank	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR03	Clarifier Splitter Tank	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR04	Tank, Rapid#1	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR05	Tank, Rapid#2	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR06	Tank, Rapid#3	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR07	Flocculation Tank	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR08	Pri Clarifier	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR09	Eff WetWell	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SAM07	Plant effluent Sampler	Effluent flow	UV Building	Effluent flow		Sampler	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
SG1	Fine Screen Isolation Gate 1	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG10	BAF No. 1 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG11	BAF No. 1 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG12	BAF No. 2 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG13	BAF No. 2 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG14	BAF No. 3 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG15	BAF No. 3 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG16	BAF No. 4 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG17	BAF No. 4 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG18	BAF No. 5 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG19	BAF No. 5 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
SG2	Fine Screen Isolation Gate 2	Pretreatment/Clarifier Bldg	Pretreatment Channel	Pretreatment/Clarifier Bldg		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG20	BAF No. 6 Isolation Gate 1	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
SG21	BAF No. 6 Isolation Gate 2	BAF	BAF	BAF		Slide Gate	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PLS1	Raw Influent pump #1	Lift Station	Lift Station	Lift Station		CENTRIFUGAL	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PLS10	Lift Station Effluent pump #1	Lift Station off-site	Babcock Lift	Lift Station off-site		SUBMERSIBLE CENTRIFUGAL	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
PLS11	Lift Station Effluent pump #2	Lift Station off-site	Babcock Lift	Lift Station off-site		SUBMERSIBLE CENTRIFUGAL	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
PLS2	Raw Influent pump #2	Lift Station	Lift Station	Lift Station		CENTRIFUGAL	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PLS3	Raw Influent pump #3	Lift Station	Lift Station	Lift Station		DRY SUBMERSIBLE CENTRIFUGAL	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
PPP1	Process Pump 1	Pretreatment	Pretreatment Pipe Gallery	Pretreatment		SUBMERSIBLE CENTRIFUGAL	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PPP2	Process Pump 2	Pretreatment	Pretreatment Pipe Gallery	Pretreatment		SUBMERSIBLE CENTRIFUGAL	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PPP3	Process Pump 3	Pretreatment	Pretreatment Pipe Gallery	Pretreatment		SUBMERSIBLE CENTRIFUGAL	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PPS1	Primary Sludge Pump 1	Pretreatment	Clarifier Pipe Gallery	Pretreatment		Air Diaphragm	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PPS2	Primary Sludge Pump 2	Pretreatment	Clarifier Pipe Gallery	Pretreatment		Air Diaphragm	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PPS3	Primary Sludge Pump 3	Pretreatment	Clarifier Pipe Gallery	Pretreatment		Air Diaphragm	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PST1	Sludge Feed pmp 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PST2	Sludge Feed pmp 2	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEAS1	Air Scrubber 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Air Scrubber	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEST4	Dewatering Screw Press 2	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Screw Press	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST5	Screw Conveyor	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Conveyor	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST6	Mixing Chamber Conveyor	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Conveyor	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST7	Solids Pump	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEST8	Hydraulic Power Pack	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST9	Reactor Pump	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Vessel	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEUV1	Disinfection Equipment 1	UV Disinfection	UV Building	UV Disinfection		Disinfection Equipment	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEUV2	Disinfection Equipment 2	UV Disinfection	UV Building	UV Disinfection		Disinfection Equipment	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PBWR1	Backwash Waste Return Pump 1	Pretreatment	Backwash Waste Holding Tank	Pretreatment		Submersible Centrifugal	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
PBWR2	Backwash Waste Return Pump 2	Pretreatment	Backwash Waste Holding Tank	Pretreatment		Submersible Centrifugal	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
PGS1	Grit Pumping	Pretreatment	Pretreatment Pipe Gallery	Pretreatment		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
MEPC1	Primary Clarifier 1	Pretreatment	Primary Clarifier No. 1	Pretreatment		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEPC1a	Scum Bridge #1	Pretreatment	Primary Clarifier No. 1	Pretreatment		Bridge	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEPC2	Primary Clarifier 2	Pretreatment	Primary Clarifier No. 2	Pretreatment		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEPC2b	Scum Bridge #2	Pretreatment	Primary Clarifier No. 2	Pretreatment		Bridge	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEST1	Reaction Tank 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST10	Reactor Screw Conveyor	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Conveyor	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST11	Ammonia Scrubber Tank	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Vessel	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEST12	Lime Silo	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/4/2020	Bill Haberstroh	Very Good. Condition Grade 1. New Or Nearly New. Only Normal Maintenance Required.	1	1	1	1	1
MEST13	Odor Scrubber Tank	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEST2	Reaction Tank 2	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEST3	Dewatering Screw Press 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Screw Press	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	1	2	2	2
MEFS1	Fine Screen 1	Pretreatment	Pretreatment	Pretreatment		Fine Screen	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX4	Mixers, Flocculation Chamber 1	Pretreatment	Flocculation Chamber 1	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEGS2	Grit Cyclone	Pretreatment	Pretreatment	Pretreatment		Grit Cyclone	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEGS3	Grit Dewatering Screw	Pretreatment	Pretreatment	Pretreatment		Grit Dewatering Screw	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX1	Mixers 1	Pretreatment	Rapid Mix 1	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX2	Mixers 2	Pretreatment	Rapid Mix 2	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX3	Mixers 3	Pretreatment	Rapid Mix 3	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEFC1	Chemical feed pump 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX5	Mixers 4	Pretreatment	Rapid Mix 4	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX6	Mixers 5	Pretreatment	Rapid Mix 5	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX7	Mixers 6	Pretreatment	Rapid Mix 6	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEMX8	Mixers, Flocculation Chamber 2	Pretreatment	Flocculation Chamber 2	Pretreatment		Mixers	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEOC1	Odor Control Unit 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Exhaust fan	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEOC1A	Air Compressor 1A	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Air Compressor	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEOC1B	Air Compressor 1B	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Air Compressor	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEOC1C	Odor control mix pmp	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
MEA13	Air Blower 13	Pretreatment/Clarifier Bldg	Control Building	Pretreatment/Clarifier Bldg		Air Blower	12/30/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEA1A	Air Blower	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Air Blower	12/30/2019	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEA2	Air Blower 2	BAF	Baf Gallery Blower	BAF		Air Blower	12/15/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA3	Air Blower 3	BAF	Baf Gallery Blower	BAF		Air Blower	12/15/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA4	Air Blower 4	BAF	Baf Gallery Blower	BAF		Air Blower	12/15/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA5	Air Blower 5	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA6	Air Blower 6	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA7	Air Blower 7	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA8	Air Blower 8	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEA9	Air Blower 9	BAF	Baf Gallery Blower	BAF		Air Blower	12/16/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
FE6	P-BWR2 Flow Metering	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Mag Meter 6"	12/30/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	2	3	3
MEFC2	Chemical feed pump 2	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEFS2	Fine Screen 2	Pretreatment	Pretreatment	Pretreatment		Fine Screen	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEFS3	Screening Auger	Pretreatment	Pretreatment	Pretreatment		Screening Auger	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEGS1	Prista Grit Separator	Pretreatment	Pretreatment	Pretreatment		Grit Removal	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW5	BAF No. 3 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW6	BAF No. 3 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW7	BAF No. 4 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW8	BAF No. 4 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW9	BAF No. 5 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41AB	UV Main Light Bank A B	UV Disinfection	UV Building	UV Disinfection		Control Panel	12/17/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41ABa	Ultra Voilent light bank A	UV Disinfection	UV Building	UV Disinfection		Lights	12/17/2019	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41ABb	Ultra Voilent light bank B	UV Disinfection	UV Building	UV Disinfection		Lights	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41CD	UV Main Light Bank C D	UV Disinfection	UV Building	UV Disinfection		Control Panel	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41CDa	Ultra Voilent light bank C	UV Disinfection	UV Building	UV Disinfection		Lights	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W41CDb	Ultra Voilent light bank D	UV Disinfection	UV Building	UV Disinfection		Lights	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W51AB	UV AB Main Power Disconnect	UV Disinfection	UV Building	UV Disinfection		Control Panel	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
W51CD	UV CD Main Power Disconnect	UV Disinfection	UV Building	UV Disinfection		Control Panel	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
WF1	Main program panel HMI	UV Disinfection	UV Building	UV Disinfection		Electrical Panel	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR10	Backwash Waste Holding	Pretreatment/Clarifier Bldg	Treatment Plant	Pretreatment/Clarifier Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR11	Biological Filters 1-10	BAF	Treatment Plant	BAF		Tank	1/4/2020	Bill Haberstroh	Poor. Condition Grade 4. Unable To Meet Level Of Service Life. Failure Imminent.	4	4	4	4	4
STR12	UV Disinfection Tank	UV Disinfection	Treatment Plant	UV Disinfection		Tank	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
STR13	Final Clarifier	Final Clarifiers	Treatment Plant	Final Clarifiers		Tank	1/2/2020	Bill Haberstroh	Poor. Condition Grade 4. Unable To Meet Level Of Service Life. Failure Imminent.	4	4	4	4	4
TK05	Sodium Hypochlorite Tank	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
TK06	Sodium Bisulfite Tank	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Tank	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
UPS01	Backup Battery power 1	Plant Scada	Main Office			UPS	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
UPS02	Backup Battery power 2	UV disinfection	UV building			UPS	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
UPS03	Backup Battery power 3	BAF	BAF Building			UPS	1/2/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
VA1	Air Blower No 1 Check Valve	BAF	Blower Gallery	BAF		Check	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA10	Air Blower No 3 Isolation Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA11	Air Blower No 3 Control Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA12	Aeration Header Control Valve	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA13	Air Blower No 4 Check Valve	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA14	Air Blower No 4 Isolation Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW1	BAF No. 1 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW10	BAF No. 5 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW11	BAF No. 6 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW12	BAF No. 6 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW13	BAF No. 7 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW14	BAF No. 7 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW15	BAF No. 8 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW16	BAF No. 8 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW17	BAF No. 9 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW18	BAF No. 9 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	2	2	3	3
VWW19	BAF No. 10 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW2	BAF No. 1 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
VWW20	BAF No. 10 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW3	BAF No. 2 Backwash Waste Control Valve 1	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VWW4	BAF No. 2 Backwash Waste Control Valve 2	BAF	BAF	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS11	Primary Sludge Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS2	Primary sludge Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS3	Primary sludge Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS4	Primary sludge Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS5	Primary sludge pump 1 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS6	Primary sludge pump 2 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS7	Primary sludge pump 3 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS8	Primary sludge pump 1 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS9	Primary sludge pump 2 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VSBC 1	SBC Control Valve 1	SBC	SBC Yard	SBC		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VSBC 2	SBC Control Valve 2	SBC	SBC Yard	SBC		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VSBC 3	SBC Control Valve 3	SBC	Splitter Structure	SBC		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VSBC 4	SBC Control Valve 4	SBC	Splitter Structure	SBC		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP2	Process Lift Pump No #1 Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	NA	3	3	3	3
VPP3	Process Lift Pump No #2 Check Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP4	Process Lift Pump No #2 Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP5	Process Lift Pump No #3 Check Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP6	Process Lift Pump No #3 Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP7	SBC Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP8	SBC Flow Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP9	UV Isolation Gate	UV Disinfection	UV Building Yard	UV Disinfection		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS1	Primary sludge Control Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPS10	Primary sludge pump 3 isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD3	Flocculator No 2 Drain Valve	Pretreatment/Clarifier Bldg	Floc	Pretreatment/Clarifier Bldg		Mud	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD4	Primary Sludge Drawdown Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
VPD5	Clarifier No 1 Drain Valve	Pretreatment/Clarifier Bldg	Primary Sludge Drain	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD6	Clarifier No 2 Drain Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD7	Drain Valve, BAF No 1	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD8	Drain Valve, BAF No 2	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD9	Drain Valve, BAF No 3	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP1	Process Lift Pump No #1 Check Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP10	UV Isolation Gate	UV Disinfection	UV Building Yard	UV Disinfection		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP11	Flow Control Gate	UV Disinfection	UV Building Yard	UV Disinfection		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP12	Flow Control Gate	UV Disinfection	UV Building Yard	UV Disinfection		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP13	Final Clarifier No 1 Isolation Valve	Final Clarifiers	Final Clarifier Splitter Box	Final Clarifiers		Plug Drain	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPP14	Final Clarifier No 2 Isolation Valve	Final Clarifiers	Final Clarifier Splitter Box	Final Clarifiers		Plug Drain	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS8	Raw Lift Pump No 3 Check Valve	Lift Station	Influent Lift Station	Lift Station		Check	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
VLS9	Raw Lift Pump No 3 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
VPD1	Grit Chamber Drain Valve	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD10	Drain Valve, BAF No 4	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD11	Drain Valve, BAF No 5	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD12	Drain Valve, BAF No 6	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD13	Drain Valve, BAF No 7	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD14	Drain Valve, BAF No 8	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD15	Drain Valve, BAF No 9	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD16	Drain Valve, BAF No 10	BAF	BAF Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VPD2	Flocculator No 1 Drain Valve	Pretreatment/Clarifier Bldg	Floc	Pretreatment/Clarifier Bldg		Mud	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR5	Backwash Waste Return Control Valve 1	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR6	Backwash Waste Return Control Valve 2	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR7	Backwash Waste Return Control Valve 3	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VGS1	Grit Pump Isolation Valve	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VGS2	Grit Pump Check Valve	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VGS3	Grit Pump Isolation Valve	Pretreatment/Clarifier Bldg	Pretreatment Pipe Gallery	Pretreatment/Clarifier Bldg		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
VLS1	Raw Lift Pump No 1 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS2	Raw Lift Pump No 2 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS3	Raw Lift Pump No 3 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
VLS4	Raw Lift Pump No 1 Check Valve	Lift Station	Influent Lift Station	Lift Station		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS5	Raw Lift Pump No 1 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS6	Raw Lift Pump No 2 Check Valve	Lift Station	Influent Lift Station	Lift Station		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VLS7	Raw Lift Pump No 2 Isolation Valve	Lift Station	Influent Lift Station	Lift Station		Valve	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBR2	BAF Backwash Regulator Valve 2	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS1	Supply Valve,BAF No 1	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS10	Supply Valve,BAF No 10	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS2	Supply Valve,BAF No 2	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS3	Supply Valve,BAF No 3	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS4	Supply Valve,BAF No 4	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS5	Supply Valve,BAF No 5	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS6	Supply Valve,BAF No 6	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS7	Supply Valve,BAF No 7	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS8	Supply Valve,BAF No 8	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBS9	Supply Valve,BAF No 9	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR1	PBWR1 Check Valve	Pretreatment/Clarifier Bldg	Backwash holding tank	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR2	PBWR2 Check Valve	Pretreatment/Clarifier Bldg	Backwash holding tank	Pretreatment/Clarifier Bldg		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR3	PBWR1 Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBWR4	PBWR2 Isolation Valve	Pretreatment/Clarifier Bldg	Clarifier Pipe Gallery	Pretreatment/Clarifier Bldg		Plug	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA43	Air Blower No 12 Check	BAF	Biosolids Building	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA44	Air Blower No 12 Isolation	BAF	Biosolids Building	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA45	Air Blower No 13 Isolation	BAF	Control Building Basement	BAF		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA46	Air Blower No 13 Check	BAF	Control Building Basement	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA47	Air Blower No 13 Isolation	BAF	Control Building Basement	BAF		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA48	SBC Control Gate 1	BAF	Control Building Basement	BAF		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
VA49	SBC Control Gate 2	BAF	Control Building Basement	BAF		Gate	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA5	Air Blower No 2 Check Valve	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA50	SBC Control Valve 1	SBC	SBC Sturture	SBC		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA51	SBC Control Valve 2	SBC	SBC Sturture	SBC		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA52	SBC Control Valve 3	SBC	SBC Sturture	SBC		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA53	SBC Control Valve 4	SBC	SBC Sturture	SBC		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA6	Air Blower No 2 Isolation Valve	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA7	Air Blower No 2 Control Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA8	Aeration Header Control Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA9	Air Blower No 3 Check Valve	BAF	Pipe Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VBR1	BAF Backwash Regulator Valve 1	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA29	Air Blower No 8 Check	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA3	Air Blower No 1 Control Valve	BAF	Pipe Gallery	BAF		Butterfly	1/2/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA30	Air Blower No 8 Isolation	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA31	Air Blower No 8 Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA32	Aeration Header Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA33	Air Blower No 9 Check	BAF	Pipe Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA34	Air Blower No 9 Isolation	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA35	Air Blower No 9 Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA36	Aeration Header Control	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA37	Air Blower No 10 Check	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA38	Air Blower No 10 Isolation	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA39	Air Blower No 10 Control	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA4	Aeration Header Control Valve	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA40	Aeration Header Control	BAF	Blower Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA41	Air Blower No 11 Check	BAF	Blower Gallery	BAF		Check	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
VA42	Air Blower No 11 Isolation	BAF	Pipe Gallery	BAF		Butterfly	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEOC1D	Odor control mix pmp 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Asset ID	Asset Description	System	Location	Level 1 Asset	Level 2 Asset	Level 3 Asset	Review Date	Reviewer	Condition Category	Civil - Structural	Electrical - General	I&C - General	Mechanical - General	Process Control
MEOC2	Odor Control Unit 2	BioSolids	Biosolids Building	BioSolids		Exhaust fan	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP0	Chemical Metering pump 0	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP00	Chemical Metering pump 00	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP1	Chemical Metering pump 1	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP10	Polymer metering pmp 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEP11	Polymer metering pmp 2	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP12	Sodium Hypo metering pmp 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP13	Sodium Bisulfite metering pmp 1	BioSolids Processing Bldg	Bio-Solids	BioSolids Processing Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3
MEP1A	Polymer mixing skid 1A	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		mixer	1/4/2020	Bill Haberstroh	Good. Condition Grade 2. Minor Wear.	2	2	2	2	2
MEP2	Chemical Metering pump 2	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg	Pretreatment/Clarifier Bldg		Pump	1/4/2020	Bill Haberstroh	Fair. Condition Grade 3. Major Wear Impacting Level Of Service.	3	3	3	3	3

Appendix B
Veolia Letter Review of Design Capacity