



**CITY OF CEDARBURG
A MEETING OF THE COMMON COUNCIL
WEDNESDAY, DECEMBER 3, 2025 – 7:00 PM**

A Joint meeting of the Common Council and Public Works & Sewerage Commission of the City of Cedarburg, Wisconsin, will be held on Wednesday, December 3, 2025 at 7:00 PM. The meeting will be held in-person at City Hall, W63 N645 Washington Avenue, Cedarburg, WI., on the second floor, Council Chambers and online utilizing the Zoom app. To request access, send request to cityhall@cityofcedarburg.wi.gov

AGENDA

1. CALL TO ORDER

2. ROLL CALL

A. Present for Council: Mayor Patricia Thome, Council Members Melissa Bitter, Jim Fitzpatrick, Kristin Burkart, Amanda Didier, Robert Simpson, Kristian Lindo, Mark Mueller

Present for Public Works & Sewerage Commission: Mayor Patricia Thome, Council Member Robert Simpson, Andrew Hester, Charles Schumacher, Rick Verhaalen, Robert Dries, Terry Wagner, Timothy Larson

3. MOMENT OF SILENCE

4. PLEDGE OF ALLEGIANCE

5. STATEMENT OF PUBLIC NOTICE

6. COMMENTS AND SUGGESTIONS FROM CITIZENS

Comments from citizens on a listed agenda item will be taken when the item is addressed by the Council. At this time individuals can speak on any topic not on the agenda for up to 2 minutes, time extensions at the discretion of the Mayor. No action can be taken on items not listed except as a possible referral to committees, individuals, or a future Council agenda item.

7. PRESENTATIONS

8. PUBLIC HEARING

A. A Public Hearing to consider a new Water Recycling Center Facility Plan which includes upgrading and expanding the current facilities located at W54 N370 Park Lane, Cedarburg, WI.

9. NEW BUSINESS

A. Discussion and possible action to approve and submit the Water Recycling

Facility Plan to the DNR

- B. Discussion and possible action on repairs to oxidation ditch aeration trains at the existing Water Recycling Center.

10. ADJOURNMENT

Individual members of various boards, committees, or commissions may attend the above meeting. It is possible that such attendance may constitute a meeting of a City board, committee, or commission pursuant to State ex. rel. Badke v. Greendale Village Board, 173 Wis. 2d 553, 494 NW 2d 408 (1993). This notice does not authorize attendance at either the above meeting or the Badke Meeting but is given solely to comply with the notice requirements of the open meeting law. * Information attached for Council; available through City Clerk's Office. ** Citizen comments should be primarily one-way, from citizen to the Council. Each citizen who wishes to speak shall be accorded one opportunity at the beginning of the meeting. Comments should be kept brief. If the comment expressed concerns a matter of public policy, response from the Council will be limited to seeking information or acknowledging that the citizen has been understood. It is out of order for anyone to debate with a citizen addressing the Council or for the Council to take action on a matter of public policy. The Council may direct that the concern be placed on a future agenda. Citizens will be asked to state their name and address for the record and to speak from the lectern for the purposes of recording their comments. *** Information available through the Clerk's Office. City of Cedarburg is an affirmative action and equal opportunity employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, disability, age, sexual orientation, gender identity, national origin, veteran status, or genetic information. City of Cedarburg is committed to providing access, equal opportunity and reasonable accommodation for individuals with disabilities in employment, its services, programs, and activities. To request reasonable accommodation, contact the Clerk's Office, (262) 375-7606, email: cityhall@cityofcedarburg.wi.gov

CITY OF CEDARBURG

MEETING DATE: December 3, 2025

ITEM NO: A.

TITLE:

Discussion and possible action to approve and submit the Water Recycling Facility Plan to the DNR

ISSUE SUMMARY:

Over the past several years, City staff, the Public Works/Sewerage Commission, and the Common Council have collaborated to evaluate the future of the Water Recycling Facility. To support this effort, the City engaged Donahue and Associates to conduct a comprehensive study and present four options with varying costs. The resulting plan addresses both short-term and long-term facility needs to ensure regulatory compliance, operational efficiency, and sustainable service delivery, while also identifying strategies to meet current capacity challenges and prepare for future demand and environmental standards. Staff is now seeking direction from the Common Council on which option to pursue and authorization to submit the approved facility plan to the Wisconsin DNR, so that a coordinated strategy can move forward balancing fiscal responsibility, compliance requirements, and community needs.

STAFF RECOMMENDATION:

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

BUDGETARY IMPACT:

ATTACHMENTS:

1. Alternative Matrix Revised 2025-11-07
2. Revised Facility Plan 2025-10-16

INITIATED/REQUESTED BY:

Mike Wieser

FOR MORE INFORMATION CONTACT:

Mike Wieser, Engineer/Public Works Director

Water Recycling Facility Plan Alternative Matrix:

The following matrix provides each alternative from the Facility Plan compared to a variety of facility goals. This high-level comparison evaluates non-monetary goals to monetary goals. All facility goals are weighted evenly. The scoring method is High, Moderate, and Low. For each High rating, 3 points will be provided; Moderate will earn 2 points; and Low will earn 1 point.

Alternative Matrix	Reliability	Operational Flexibility	Monetary: Capital Cost	Implementation Timing	Safety	Staffing	Regulatory	Approval	Constructability	Score
Alt. 1 - Upgrades and Expansion of Existing WRC	High – rehab aging systems while providing new biosolids facility 3 points	High – allows for priority-based upgrades and customization 3 points	High – Lowest Capital Cost \$83.4M 3 points	High – phased implementation allows for flexibility in timing and project sizes 3 points	Moderate – existing safety features in place with opportunity for improved safety on new assets 2 points	Moderate – requires small increase for operation and maintenance 2 points	High – meet all permits 3 points	High – High probability of approval from WDNR 3 points	Low – Complex construction, rehab of existing facilities, long duration. 1 point	23 points
Alt. 2- Membrane Bioreactor and Biosolids Upgrade at Existing WRC	High – rehab aging systems while providing new MBR and biosolids facility 3 points	Moderate – MBR is a complex packaged system 2 points	Moderate – Second Lowest Capital Cost \$88.5M 2 points	Moderate – less flexibility with the need to complete the MBR prior to biosolids upgrades 2 points	Moderate – existing safety features in place with opportunity for improved safety on new assets 2 points	Moderate – requires small increase for operation and maintenance 2 points	High – meet all permits 3 points	Moderate – WDNR approval may be an issue due to higher TPW. 2 points	Low – Complex construction, rehab of existing facilities, long duration. 1 point	19 points
Alt. 3- New WRC Off Pioneer Road	High – provide all new treatment systems 3 points	High – new facility allows full customization and flexibility 3 points	Low – Highest Capital Cost \$ 134.5M 1 point	Moderate – less flexibility with the need to complete the new WRC prior to decommissioning the existing WRC 2 points	High – All new assets to meet high level of safety 3 points	Moderate – requires small increase for operation and maintenance 2 points	High – meet all permits 3 points	Low – WDNR approval unlikely due to highest TPW. 1 point	High - Existing WRC can maintain operation during full construction. 3 points	21 points
Alt. 4- Treatment to MMSD	Moderate – Dependent on downstream infrastructure and facilities. Out of City’s control 2 points	Low – minimal flexibility in project elements and operation 1 point	Moderate – Second Highest Capital Cost \$109.2M 2 points	Low – No flexibility and large time required before any implementation can occur. 1 point	High – removes the risk of operation of WRC 3 points	High – reduces the amount of operation and maintenance 3 points	High – reduced regulatory risk and effort 3 points	Low – Risk of MMSD denying Cedarburg’s flow after MMSD Facility Plan analysis 1 point	High - Existing WRC can maintain operation during full construction. 3 points	19 points

Abbreviations:

M: Million

TPW: Total Present Worth



City of Cedarburg

W63N645 Washington Avenue
Cedarburg, WI 53012

Facility Plan

October 16, 2025



Prepared by:

Donohue & Associates, Inc.

3311 Weeden Creek Road | Sheboygan, WI 53081
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Donohue Project No.: 14524

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ABBREVIATIONS

ADWF	Average Dry Weather Flow
AIS	Agricultural Impact Statement
ARI	Archaeological Report Inventory
BFP	Belt Filter Press
BOD	Biochemical Oxygen Demand
CMOM	Capacity, Management, Operation, and Maintenance
CWFP	Clean Water Fund Program
DO	Dissolved Oxygen
ERU	Equivalent Residential Unit
GBT	Gravity Belt Thickener
GIS	Geographic Information System
gpd	gallons per day
gpdpc	gallons per day per capita
gpm	gallons per minute
HPDE	High-Density Polyethylene
I&I	Inflow and Infiltration
LS	Lump Sum
MBR	Membrane Bioreactor
MCC	Motor Control Center
mgd	Million Gallons per Day
MMSD	Milwaukee Metropolitan Sewerage District
NH ₃	Ammonia
NIST	National Institute of Standards
O&M	Operation and Maintenance
RAS	Return Activated Sludge
PLC	Programable Logic Controller
ppd	pounds per day
ppdpc	pounds per day per capita
SCADA	Supervisory Control and Data Acquisition
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SF	Square Feet
SSA	Sewer Service Area
TAT	Technical Advisory Team
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
TP	Total Phosphorus
TPW	Total Present Worth
TWAS	Thickened Waste Activated Sludge
USEPA	United States Environmental Protection Agency
WAS	Waste Activated Sludge
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System
WRC	Water Recycling Center
WRF	Water Reclamation Facility
WWF	Wet Weather Flow
WWTP	Wastewater Treatment Plant

1. EXECUTIVE SUMMARY

1.1 EXECUTIVE SUMMARY

The City of Cedarburg owns and operates a municipal wastewater treatment facility known as the Cedarburg Water Recycling Center (WRC). The facility has a few structures from 1973, but a majority of the treatment structures were constructed in 1988. A biosolids upgrade was completed in 1998 and an ultraviolet disinfection upgrade was completed in 2022. The WRC is rated for 8 million gallons per day (mgd). The existing outfall from the WRC discharges to Cedar Creek which ultimately flows in the Milwaukee River.

The City of Cedarburg has a population of approximately 12,000 residents located in Ozaukee County just north of the City of Milwaukee. The community is predominantly residential units. The WRC currently treats a daily average flow of 2.3 mgd and a peak daily flow of 8.6 mgd.

Cedarburg retained Donohue to prepare a Facility Plan. The purpose of this Facility Plan is to document the existing condition of the WRC and provide alternatives to carry the City of Cedarburg into the future. While the City is relatively landlocked and does not anticipate a significant increase in development, the population is expected to increase to almost 16,000 by 2045.

Since the Cedarburg sewer service area is landlocked, consideration was given to the ultimate buildout for the service area. The population projections in Table ES-1 are recommended for use in this Facility Plan.

Table ES-1 Recommended Service Area Population Projections for Facility Plan

Service Area	2010 Census	2020 Census	2022 Estimate	2025 Projection	2035 Projection	2045 Projection	2075 Projection
Cedarburg Sewer Service Area	11,610	12,121	13,092	13,463	14,698	15,933	18,657

Based on the service area population projections, the following flows and loadings were projected and are summarized in Table ES-2.

Table ES-2 Projected Residential, Commercial, Industrial, Hauled Waste, and I&I Flows and Loadings

Year	Parameter	Annual Average	Max Month	Max Week	Peak Day	Peak Hour
2025	Flow (mgd)	2.3	4.4	6.1	8.7	10.7
	BOD (ppd)	3,778	4,801	6,480	9,117	-
	TSS (ppd)	5,295	7,290	8,198	11,434	-
	Ammonia (ppd)	288	388	435	478	-
	Phosphorus (ppd)	68	78	95	106	-
2035	Flow (mgd)	2.5	4.6	6.3	9.0	11.1
	BOD (ppd)	4,095	5,218	7,050	9,925	-
	TSS (ppd)	5,748	7,929	8,920	12,450	-
	Ammonia (ppd)	312	421	472	520	-
	Phosphorus (ppd)	74	85	103	116	-
2045	Flow (mgd)	2.6	4.8	6.5	9.2	11.4
	BOD (ppd)	4,413	5,636	7,619	10,733	-
	TSS (ppd)	6,201	8,569	9,641	13,465	-
	Ammonia (ppd)	336	454	510	561	-
	Phosphorus (ppd)	80	91	111	125	-
2075	Flow (mgd)	2.9	5.4	7.0	9.8	12.0
	BOD (ppd)	5,114	6,557	8,876	12,515	-
	TSS (ppd)	7,200	9,978	11,233	15,705	-
	Ammonia (ppd)	389	526	592	652	-
	Phosphorus (ppd)	92	106	129	145	-

A capacity analysis for the existing WRC was completed to determine which unit processes would require expansion upgrades to treat the projected 2045 flows and loadings from Table ES-2. Results from this analysis are summarized in Figure ES-1.

- Screening and grit removal are nearing capacity but are anticipated to adequately treat the projected peak hour flow of 11.4 mgd.
- Influent pumping will require a capacity upgrade since the firm pumping capacity of 8.6 mgd is well below the projected peak hour flow.
- The oxidation ditch is sized adequately for projected loadings; however, the aerators will require an upgrade to provide sufficient oxygen delivery.
- The clarifiers are projected to reach hydraulic capacity by 2045. However, Donohue believes they will adequately treat projected flows and can be re-assessed during a future facility plan.
- The RAS pumps have adequate capacity
- UV disinfection will require an expansion upgrade to treat the projected peak hour flow of 11.4 mgd.
- The gravity thickener and WAS pump have adequate capacity for the maximum month WAS flow and loading.
- The aerated holding tanks have adequate capacity for 15 days of sludge storage at maximum month conditions.

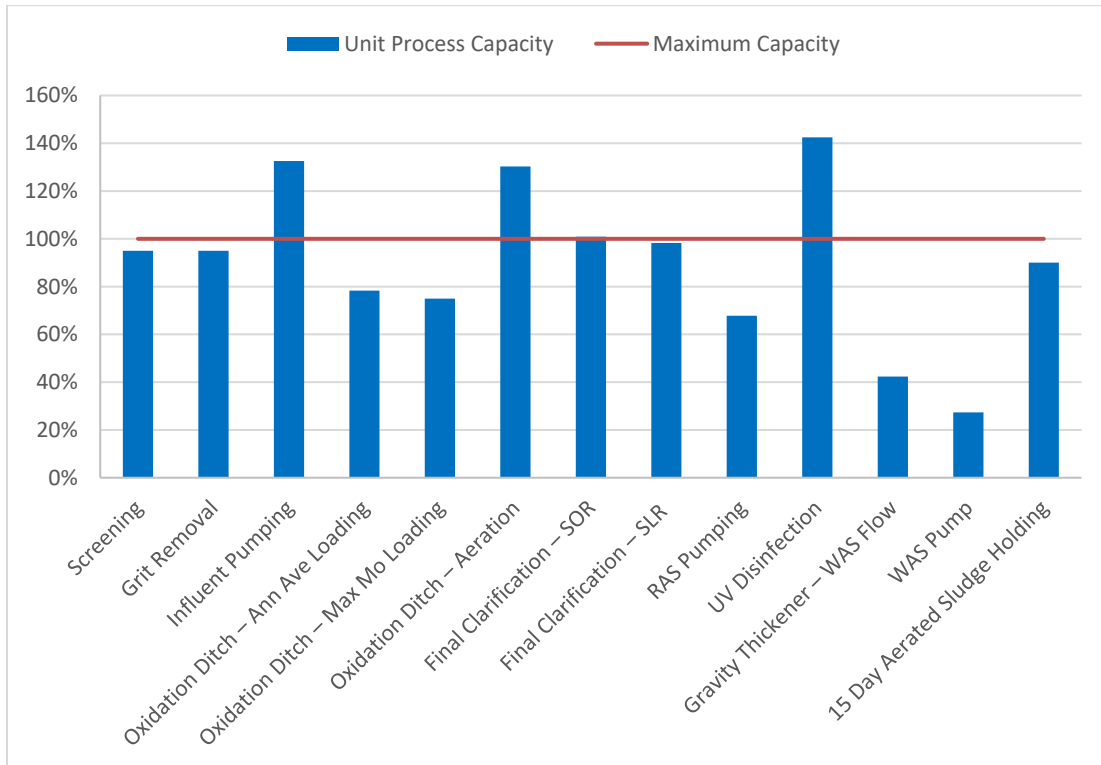


Figure ES-1 Unit Process Capacity Summary at Projected 2045 Conditions

The following significant areas of need were identified in this Facility Plan:

- Permit compliance: The WRC is facing stringent phosphorus limits and chloride limits.
- Peak flow management: There have been a few events that reach the Facility’s hydraulic limit of 8 mgd. One of those events in May of 2020 reached a peak flow of 10.6 mgd. The peak flows reaching the WRC exceed the USEPA thresholds for excessive infiltration and excessive inflow.
- Facility condition: A significant number of structures, processes, and utilities at the WRC are past their useful life and in need of refurbishment or replacement.
- Treatment capacity: The projected flows and loadings are above several unit process capacities including influent pumping, oxidation ditch aeration, and UV disinfection.
- Biosolids management: The current biosolids management system with relatively small holding tanks and reliance on a contractor for year-round hauling of biosolids has inherent risk and logistical complexity.

Donohue evaluated four alternatives to address the above areas of need. These alternatives are outlined below:

1. Upgrades and Expansion of the Existing WRC: This alternative considers replacements, upgrades, and expansion at the existing WRC site utilizing the existing outfall to Cedar Creek with biosolids management upgrades constructed on City-owned land north of Pioneer Road and east of the existing facility. This alternative includes construction of two sludge forcemains between the existing WRC site and the City owned site off Pioneer Road. One forcemain would convey sludge to the new site for processing and the other forcemain would convey filtrate and drain water

back to the existing WRC for treatment. Aerobic digestion, thickening, dewatering, and cake storage facilities would be constructed on a portion of the Pioneer Road site.

2. **Membrane Bioreactor and Biosolids Upgrade at the Existing WRC:** This alternative considers construction of a new membrane bioreactor (MBR) treatment system for secondary treatment, which would take the place of the current oxidation ditch, secondary clarifiers, and return activated sludge pumping. MBR treatment provides advanced treatment equivalent to secondary and tertiary treatment combined, which would eliminate the need for a tertiary filter system included in the previous alternative. The MBR system would be constructed on the open hill south of the maintenance building and west of the gravity thickener. After commissioning the new MBR system, the oxidation ditch, secondary clarifiers, and return activated sludge pumping structures would be demolished and provide sufficient footprint for construction of biosolids stabilization and handling facilities within the current WRC footprint. This alternative keeps all facilities and operations within the existing WRC footprint.

3. **New WRC Off Pioneer Road:** This alternative considers construction of a new facility on City-owned land north of Pioneer Road and east of the existing facility. The new facility would have a new outfall directly to the Milwaukee River. The existing WRC would be demolished, and the site would be restored for redevelopment. A new pump station would be constructed at the intersection of Green Bay Road and Pioneer Road along with a new segment of force main and gravity interceptor from the pump station to the Pioneer Road site to convey wastewater to the new WRC.

4. **Treatment to MMSD:** This alternative considers connecting to Milwaukee Metropolitan Sewerage District (MMSD) and sending all wastewater to MMSD for treatment. This alternative would involve conveying all of Cedarburg’s daily and peak flow to an MMSD owned structure to ultimately be treated at South Shore Water Reclamation Facility in Oak Creek, WI. The structure is identified to be on County Line Road and Cedarburg Road in Brown Deer. Cedarburg would be required to build an extension of their existing conveyance system from a newly constructed pump station at Green Bay Road and Pioneer Road. The conveyance assets would include dual 20-inch force mains for approximately nine miles. The City would be able to abandoned the existing WRC and offer it for redevelopment. This alternative would significantly decrease the WRC Operating Budget as MMSD would be responsible for treatments costs. However, Cedarburg would still be responsible for the collection system and lift station operation and maintenance. The residents of Cedarburg would be subject to MMSD Sewer Rates for wastewater treatment and Cedarburg sewer rates for operation and maintenance of the collection system.

A breakdown of estimated costs for each alternative and the calculated 20-year total present worth is provided below in Table ES-3.

Table ES-3 Cost Summary Table

Alternative	Capital Costs (\$)	Additional Annual (\$)	20-year TPW (\$)
1	83,370,000	295,000	85,547,000
2	88,468,000	496,000	96,183,000
3	134,518,000	231,000	130,885,000
4	109,152,000	(1,159,000)	85,290,000

After consideration of both economic and non-economic factors, Donohue recommended Alternative 1 as the most cost effective and advantageous alternative for Cedarburg for the following reasons:

1. Alternative 1 has the lowest estimated initial capital cost compared to the other three alternatives.
2. Alternative 1 has the lowest estimated residential user rate compared to the other three alternatives.
3. Alternative 4 has the lowest estimated total present worth; however, Alternative 1 is within 1% of this cost, which is within the margin of error for facility planning. In addition, the implementation timing for Alternative 4 leaves Cedarburg in an 8 to 9-year holding pattern with an existing WRC that has significant treatment and age-related issues.
4. Alternative 1 has the greatest flexibility for construction phasing and project timing. This allows the City to implement phases based on priority. This is the only alternative that can be phased into a longer time period and still address the high priority upgrades in the short-term.
5. The work identified for Alternative 1 falls within the existing WRC site, existing lift station sites, developed road corridors, and the already disturbed Pioneer Road site, which will have minimal environmental impacts.

Donohue recommends implementing Alternative 1 - Upgrades and Expansion of Existing WRC in three construction phases carried out over a 10-year period, which is outlined in the implementation plan of this report.

Table ES-4 Phasing Capital Cost Summary for Alternative 1

Phase	Estimated Capital Cost
Phase 1 – High Priority Improvements	\$24,840,000
Phase 2 – Biosolids Stabilization and Handling	\$33,393,000
Phase 3 – Lower Priority Improvements	\$25,137,000
Total	\$83,370,000

2. BACKGROUND

2.1 INTRODUCTION

The City of Cedarburg owns and operates a municipal wastewater treatment facility known as the Cedarburg Water Recycling Center (WRC). The facility has a few structures from 1973, but a majority of the treatment structures were constructed in 1988. A biosolids upgrade was completed in 1998 and an ultraviolet disinfection upgrade was completed in 2022. The forward flow unit processes at the WRC consist of fine screening, vortex grit removal, influent pump station, 3 channel oxidation ditch with an anaerobic selector for enhanced biological phosphorus removal, two clarifiers with RAS, WAS, and scum pumping, ultraviolet disinfection and a cascade aerator prior to discharging to Cedar Creek. The biosolids handling unit processes include a gravity thickener for WAS, two aerobic sludge holding tanks, and a liquid sludge loadout system. Biosolids are hauled and disposed by a contractor. Figure 2-1 displays an aerial view of the WRC. This facility is operating near capacity and is lacking a long term biosolids management plan. The purpose of this Facility Plan is to identify the future wastewater treatment needs of the City, evaluate alternatives to address those needs, and recommend a cost effective plan forward.

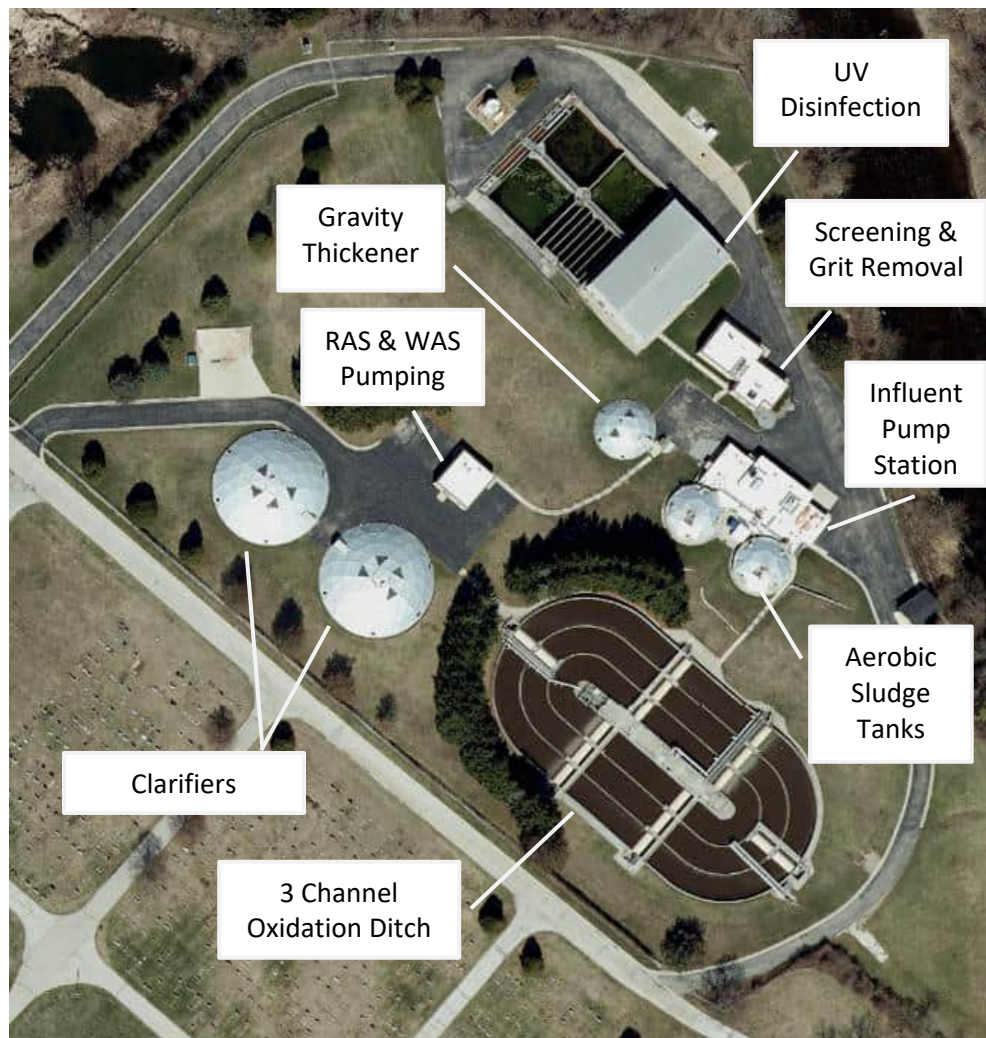


Figure 2-1 Aerial View of Cedarburg Water Recycling Center

2.2 PROJECT PLANNING AREA – CITY OF CEDARBURG

The City of Cedarburg is located in the southcentral portion of Ozaukee County. It is bounded by the Town of Cedarburg to the north, west, southwest and south east, the City of Mequon to the south, and the Village of Grafton to the northeast. The City is landlocked by these municipal boundaries.

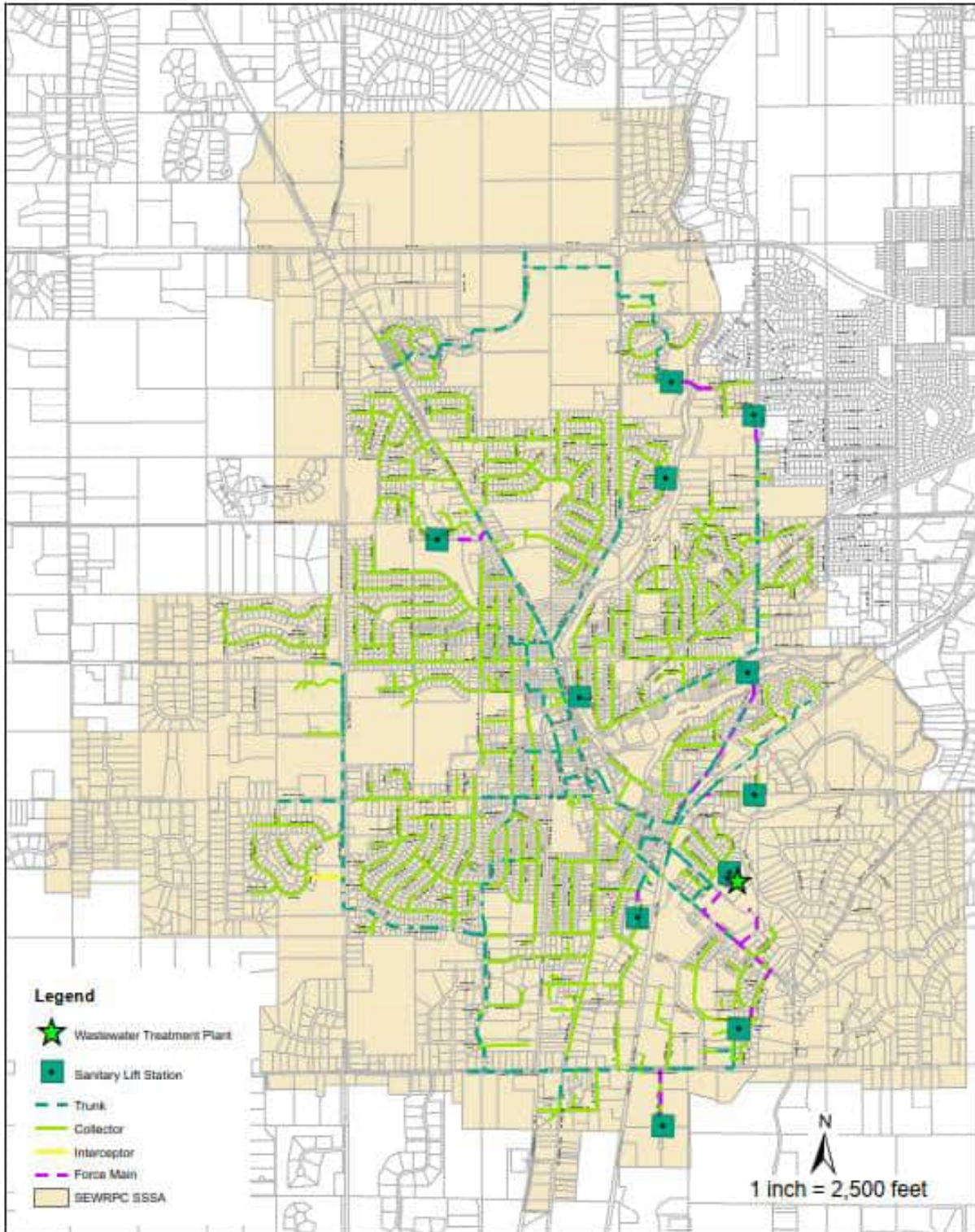


Figure 2-2 Cedarburg SEWRPC Sewer Service Area

2.2.1 WASTEWATER TREATMENT OVERVIEW

Wastewater flows by gravity to the WRC through a pair of 18-inch diameter interceptor pipes, which combine and enter a single 30-inch diameter pipe at manhole 1 on the north end of the site. A 16-inch forcemain delivers pumped wastewater flow from the Garfield Lift Station directly to manhole 1. Septage haulers dump directly into manhole 1 for septage receiving. The 30-inch pipe conveys the raw wastewater to the Bar Screen Building. A fine screen with ¼-inch slot size removes trash and any other large debris from the wastewater. Screenings are collected in a compactor and discharged to a garbage bin in the Bar Screen Building. Grit removal is accomplished by a 12-foot diameter vortex grit removal chamber immediately outside the south wall of the Bar Screen Building. The dewatered wastewater flows back through a channel in the Bar Screen Building and through a Parshall flume for influent flow metering. The collected grit is pumped by a grit pump into a concentrator and discharged to a garbage bin in the Bar Screen Building.

Screened and dewatered wastewater flows to the influent wetwell outside the southeast corner of the Control Building. Three influent pumps located in the basement of the Control Building pump the wastewater to the oxidation ditch. Each dry pit centrifugal pump has a rated capacity of 3,000 gpm. The influent pumps are on variable frequency drives and are operated to control a wetwell level. A buried 20-inch forcemain conveys the pumped wastewater to the oxidation ditch.

The oxidation ditch is configured with an anaerobic selector basin at the center and three aeration channels. Influent wastewater and RAS are pumped into the anaerobic selector and flow in series through the outer, middle, and inner aeration channels. All six mechanical aerators are driven using variable frequency drives to adjust rotation speed. Aerators 1 and 2 are only used in peak loading conditions and are manually controlled by the operations staff. Aerators 3, 4, 5, and 6 are operated automatically based on dissolved oxygen (DO) setpoints. The outer channel is operated near zero DO, the middle channel is operated at a DO setpoint of 0.2 mg/L, and the inner channel is operated at a DO setpoint of 1.6 mg/L. A splitter box off the inner channel splits flow to the two 85-foot diameter clarifiers with geodesic dome covers.

Three RAS pumps (2,000 gpm capacity each) are located in the RAS Building basement and pump RAS back to the oxidation ditch anaerobic selector. WAS is sent to the gravity thickener using electrically actuated valves to cycle batches of flow based on the amount operations staff decides to waste each day. The cycle starts with opening the heavy sludge valve for one minute from each clarifier and then opening the WAS valve off the RAS pump discharge header for the remainder of the batch. The piping configuration utilizes one flow meter to totalize the flow for each batch. Scum from the clarifiers combines with the WAS flow to the gravity thickener.

Effluent from the clarifiers flows to the UV Disinfection building. The UV disinfection system was recently replaced in 2021 and is sized to seasonally disinfect (May through September) up to a peak flow of 10 mgd. After disinfection, the treated effluent flows over an effluent weir for flow metering and over a cascade step aerator prior to discharge into Cedar Creek.

WAS and scum from the clarifiers flows to the gravity thickener. A polymer system located in the RAS Building doses polymer to the flow for improved thickening. Thickened sludge from the thickener is pumped into the two aerobic sludge holding tanks by a rotary lobe pump in the basement of the Control Building. Overflow from the thickener flows to the influent wetwell, while scum collected from the thickener flows to a scum well in the basement of the Control Building and is pumped by a rotary lobe pump to the aerobic sludge holding tanks. The sludge in the holding tanks average a solids content between 2 and 3 percent. Two centrifugal pumps in the basement of the Control Building are used to

pump sludge from the holding tanks to contract hauler tanker trucks. The contract hauler takes care of hauling, storage, and land application of the liquid biosolids.

A general process flow diagram is shown in Figure 2-3.

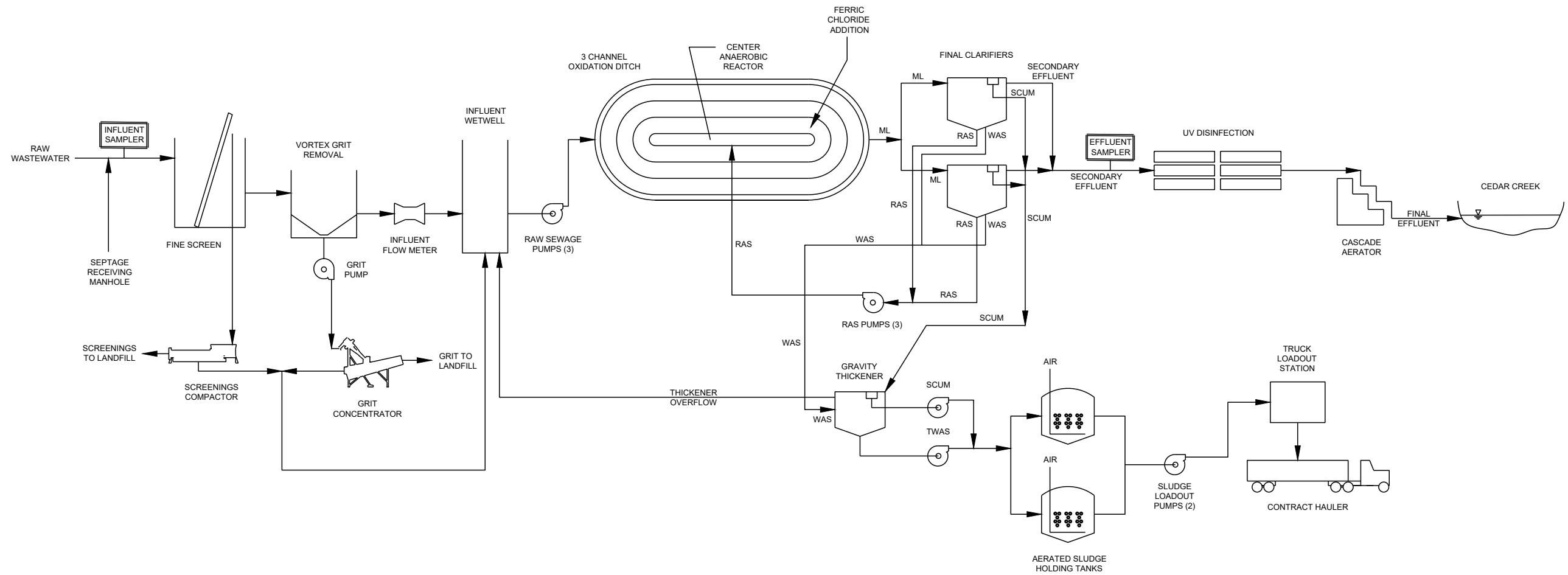


FIGURE 2-3
PROCESS FLOW SCHEMATIC
 CITY OF CEDARBURG, WI
 WATER RECYCLING CENTER
 W63N645 WASHINGTON AVENUE
 CEDARBURG, WISCONSIN

2.2.2 CURRENT EFFLUENT LIMITS

The WRC is currently operating under the Wisconsin Pollutant Discharge Elimination System permit (WPDES) 0020222-10-0, effective until March 31, 2027. The current permit limits are listed below in Table 2-1. Upon request, the WDNR provided planning limits for the WRC for discharging to the Milwaukee River, shown in Table 2-2 and Table 2-3. Limits in bold text in Table 2-2 and Table 2-3 indicate a change from the current permit limits. However, WDNR states in multiple locations of the planning memorandum that higher limits will only be allowed if a demonstration of need for higher limits is submitted and approved in accordance with the Wisconsin Administrative Code. The Planning Limits Memorandum is included in Appendix A.

Table 2-1 WPDES Permit Limits

Parameter	Limit Type	Limit	Units
BOD ₅ , Total	Weekly Avg. (Nov – Apr)	15	mg/L
BOD ₅ , Total	Weekly Avg. (May – Oct)	10	mg/L
BOD ₅ , Total	Monthly Avg. (Nov – Apr)	15	mg/L
BOD ₅ , Total	Monthly Avg. (May – Oct)	10	mg/L
BOD ₅ , Total	Weekly Avg. (Nov – Apr)	344	lbs/day
BOD ₅ , Total	Weekly Avg. (May – Oct)	229	lbs/day
TSS	Weekly Avg. (Nov, Dec, Jan, May)	15	mg/L
TSS	Weekly Avg. (Feb - Apr, Jun - Oct)	12	mg/L
TSS	Monthly Avg.	12	mg/L
TSS	Weekly Avg. (Jan)	323	lbs/day
TSS	Weekly Avg. (Feb - Dec)	344	lbs/day
Dissolved Oxygen	Daily Min	6	mg/L
pH Field	Daily Max	9.0	su
pH Field	Daily Min	6.0	su
E. Coli	Monthly Geometric Mean (May – Sep)	126	#/100ml
E. Coli	Monthly 10 Percent Exceedance	410	#/100ml
NH ₃ -N	Daily Max (Nov - Apr)	21	mg/L
NH ₃ -N	Weekly Avg. (Nov – Mar)	13	mg/L
NH ₃ -N	Weekly Avg. (Apr)	8	mg/L
NH ₃ -N	Weekly Avg. (May - Sep)	5.3	mg/L
NH ₃ -N	Weekly Avg. (Oct)	11	mg/L
NH ₃ -N	Monthly Avg. (Nov - Mar)	6.4	mg/L
NH ₃ -N	Monthly Avg. (Apr)	4	mg/L
NH ₃ -N	Monthly Avg. (May - Sep)	3.3	mg/L
NH ₃ -N	Monthly Avg. (Oct)	5.7	mg/L
TP	Monthly Avg.	0.8	mg/L
TP	6-Month Avg. (Adaptive Management Limit)	0.6	mg/L
Chloride	Weekly Avg. (effective Oct 1, 2024)	490	mg/L
Chloride	Monthly Avg. (effective Oct 1, 2024)	490	mg/L

Table 2-2 Comparison of Current Limits and Planning Limits for Milwaukee River Discharge

Parameter	Limit Type	Units	Current WPDES Permit Limits (Cedar Creek Discharge)	WDNR Planning Permit Limits (Milwaukee River Discharge)
BOD ₅ , Total	Weekly Avg. (Nov – Apr)	mg/L	15	46*
BOD ₅ , Total	Weekly Avg. (May – Oct)	mg/L	10	28*
BOD ₅ , Total	Monthly Avg. (Nov – Apr)	mg/L	15	46*
BOD ₅ , Total	Monthly Avg. (May – Oct)	mg/L	10	28*
BOD ₅ , Total	Weekly Avg. (Nov – Apr)	lbs/day	344	1,070*
BOD ₅ , Total	Weekly Avg. (May – Oct)	lbs/day	229	660*
TSS	Weekly Avg. (Nov, Dec, Jan, May)	mg/L	15	15
TSS	Weekly Avg. (Feb - Apr, Jun - Oct)	mg/L	12	12
TSS	Monthly Avg.	mg/L	12	12
TSS	Weekly Avg. (Jan)	lbs/day	323	323
TSS	Weekly Avg. (Feb - Dec)	lbs/day	344	344
Dissolved Oxygen	Daily Min	mg/L	6	6
pH Field	Daily Max	su	9.0	9.0
pH Field	Daily Min	su	6.0	6.0
E. Coli	Monthly Geometric Mean (May – Sep)	#/100ml	126	126
E. Coli	Monthly 10 Percent Exceedance	#/100ml	410	Not Provided
NH ₃ -N	Daily Max (Nov - Apr)	mg/L	21	20
NH ₃ -N	Weekly Avg. (Nov – Mar)	mg/L	13	13
NH ₃ -N	Weekly Avg. (Apr)	mg/L	8	6.1
NH ₃ -N	Weekly Avg. (May - Sep)	mg/L	5.3	23*
NH ₃ -N	Weekly Avg. (Oct)	mg/L	11	37*
NH ₃ -N	Monthly Avg. (Nov - Mar)	mg/L	6.4	6.3
NH ₃ -N	Monthly Avg. (Apr)	mg/L	4	3.0
NH ₃ -N	Monthly Avg. (May - Sep)	mg/L	3.3	12*
NH ₃ -N	Monthly Avg. (Oct)	mg/L	5.7	18*
TP	Monthly Avg.	mg/L	0.8	0.8
TP	Monthly Avg	Lbs/day	N/A	See Below
TP	6-Month Avg. (Adaptive Management Limit)	mg/L	0.6	0.6
Chloride	Weekly Avg. (effective Oct 1, 2024)	mg/L	490	710
Chloride	Monthly Avg. (effective Oct 1, 2024)	mg/L	490	710

* Note WDNR states in multiple locations of the planning limits memorandum that higher limits will only be allowed if a demonstration of need for higher limits is submitted and approved in accordance with the Wisconsin Administrative Code.

Table 2-3 WDNR WPDES Planning Limits Milwaukee River Discharge – TP TMDL

Month	Monthly Average TP Effluent Limit (lbs/day)
Jan	3.71
Feb	4.19
Mar	3.88
April	4.25
May	5.14
June	4.50
July	3.88
Aug	3.32
Sep	3.67
Oct	3.46
Nov	3.73
Dec	3.54

3. DOCUMENTATION OF NEEDS

Historical flows, loadings, treatment performance, and facility condition will be discussed in this chapter.

3.1 HISTORICAL FLOWS AND LOADS

3.1.1 CURRENT INFLUENT FLOWS AND LOADS

Historical influent flows and loadings from 2018 through 2024 were analyzed to determine current influent flows and loadings to the WRC. The results are summarized in Table 3-1.

Table 3-1 Historical Influent Flows and Loadings

Parameter	Average Annual	Max Month	Max Week	Peak Day	Peak Hour
Flow (mgd)	2.26	4.25	5.981	8.61	10.6
BOD5 (ppd)	3,416	4,488	6,122	8,687	-
TSS (ppd)	4,850	6,843	7,726	10,874	-
NH ₃ -N (ppd)	255	350	396	438	-
TP (ppd)	62	73	90	101	-

3.1.2 HISTORICAL FLOW

The WRC has been averaging 2.26 mgd of wastewater flow for 2018 through 2024. The most recent year of 2024 had an average annual flow of 2.5 mgd. The peak daily flow in the past 7 years occurred on May 18, 2020 when the facility received 8.61 mgd. Further discussion on peak flow is located in the I/I Evaluation section below. Flows over the last five years can be seen in Figure 3-1 and Table 3-2. The facility does appear to be influenced by inflow and infiltration (I&I) with elevated flows immediately following rainfall events. The influent flow to the facility has been consistent for the past seven years, as shown by the linear trendline in Figure 3-1. The facility is designed to handle 2.75 mgd as an average annual condition, 5.79 mgd as a maximum month condition, and 8 mgd as a peak hour condition.

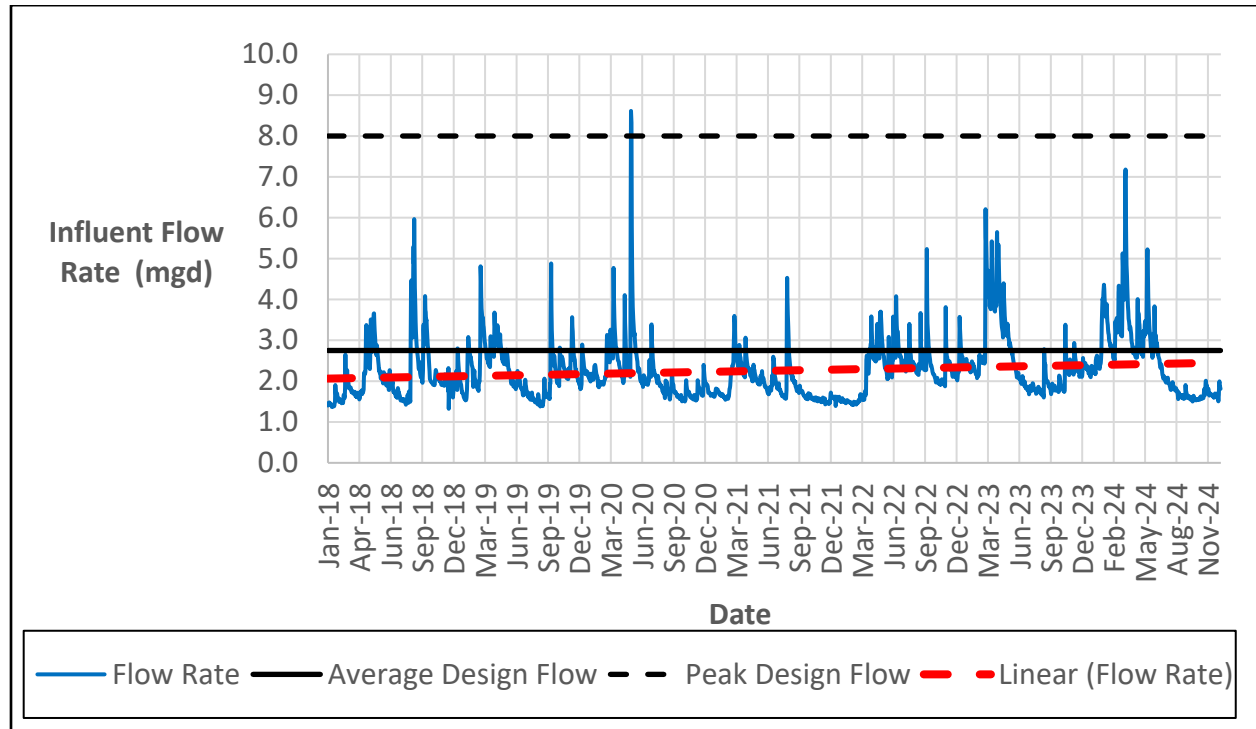


Figure 3-1 Influent Flow (mgd)

Table 3-2 Influent Flow (mgd)

Condition	2018	2019	2020	2021	2022	2023	2024
Average	2.12	2.23	2.19	1.92	2.23	2.51	2.53
Max Month	3.38	3.06	3.51	2.63	2.96	2.96	4.25
Max Day	5.97	4.88	8.61	4.53	5.23	5.23	7.18

3.1.3 HISTORICAL BOD LOADING

The WRC was designed to treat a maximum month biochemical oxygen demand (BOD) loading of 4,587 pounds per day (ppd). Actual loading over the past seven years is shown in Figure 3-2 and Table 3-3. The linear trend line indicates loadings have been increasing. For this reason, Donohue has selected the 2024 average of 3,416 ppd and the 2024 maximum month of 4,488 ppd for defining the current condition.

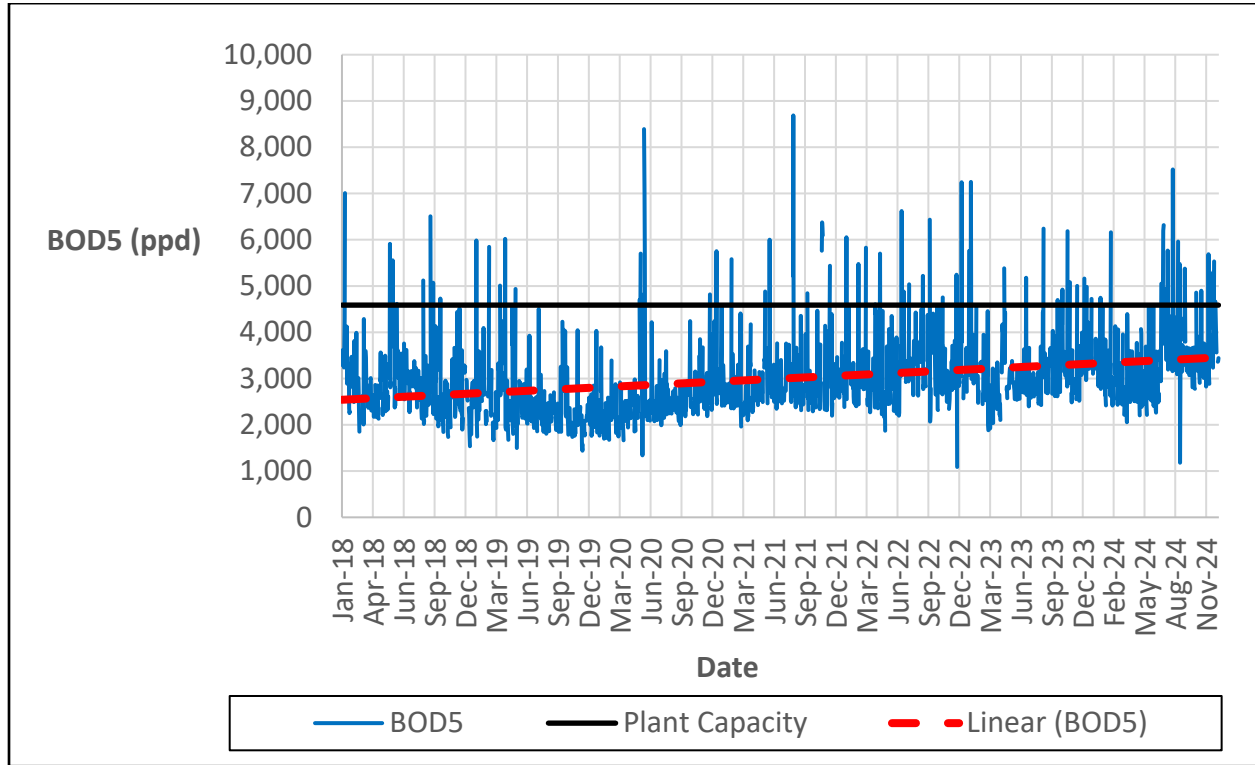


Figure 3-2 Influent BOD (lb/day)

Table 3-3 Influent BOD (lb/day)

Condition	2018	2019	2020	2021	2022	2023	2024
Average	2,920	2,484	2,579	3,066	3,224	3,228	3,416
Max Month	3,643	3,161	3,844	4,029	3,678	3,794	4,488

3.1.4 HISTORICAL TSS LOADING

The WRC is designed to treat a maximum month total suspended solids (TSS) loading of 4,587 pounds per day (ppd). Actual loading over the past seven years is shown in Figure 3-3 and Table 3-4. The linear trend line indicates loadings have been increasing. For this reason, Donohue has selected the 2024 average of 4,850 ppd and the 2024 maximum month of 6,843 ppd for defining the current condition.

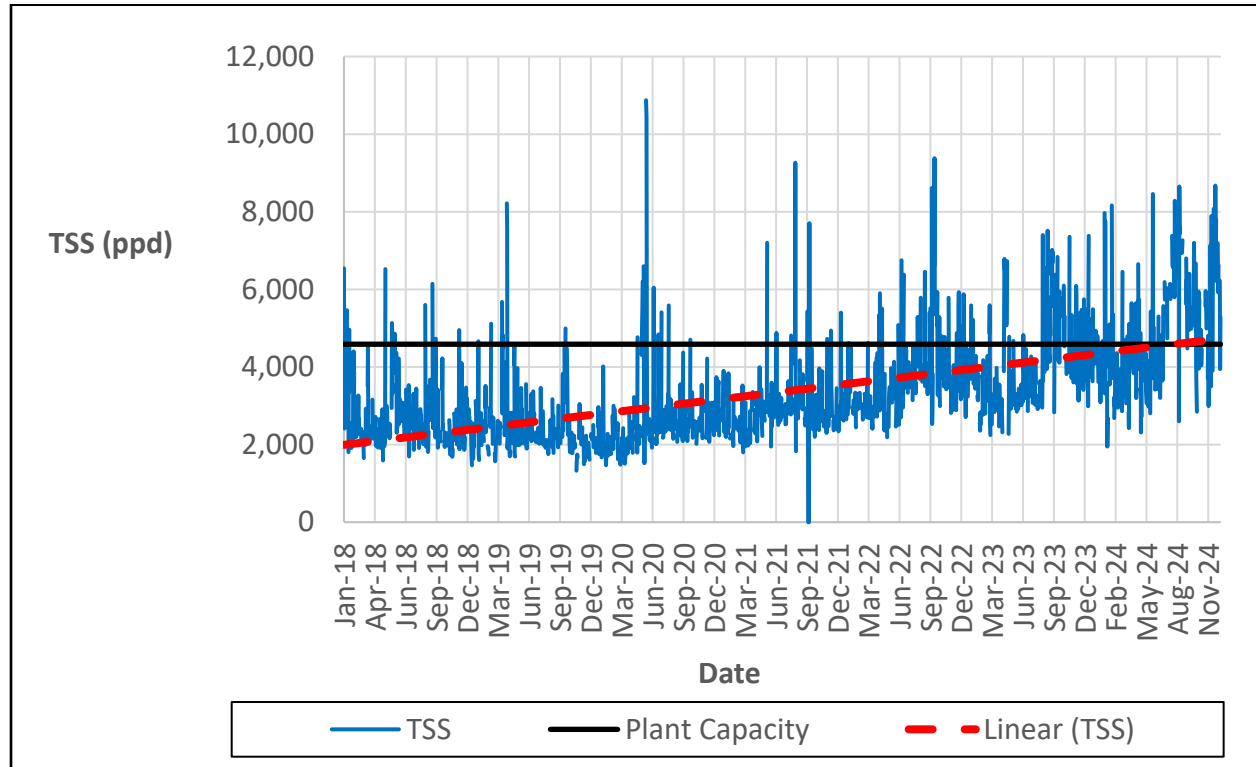


Figure 3-3 Influent TSS (ppd)

Table 3-4 Influent TSS (ppd)

Condition	2018	2019	2020	2021	2022	2023	2024
Average	2,742	2,468	2,629	2,940	3,734	4,115	4,850
Max Month	3,618	3,783	4,572	3,624	5,227	5,604	6,843

3.1.5 HISTORICAL AMMONIA LOADING

The WRC is designed to treat a maximum month ammonia loading of 459 pounds per day (ppd). Actual loading over the past five years is shown in Figure 3-4 and Table 3-5. The linear trend line indicates loadings have been increasing. For this reason, Donohue has selected the 2022 average of 255 ppd and the 2024 maximum month of 350 ppd for defining the current condition.

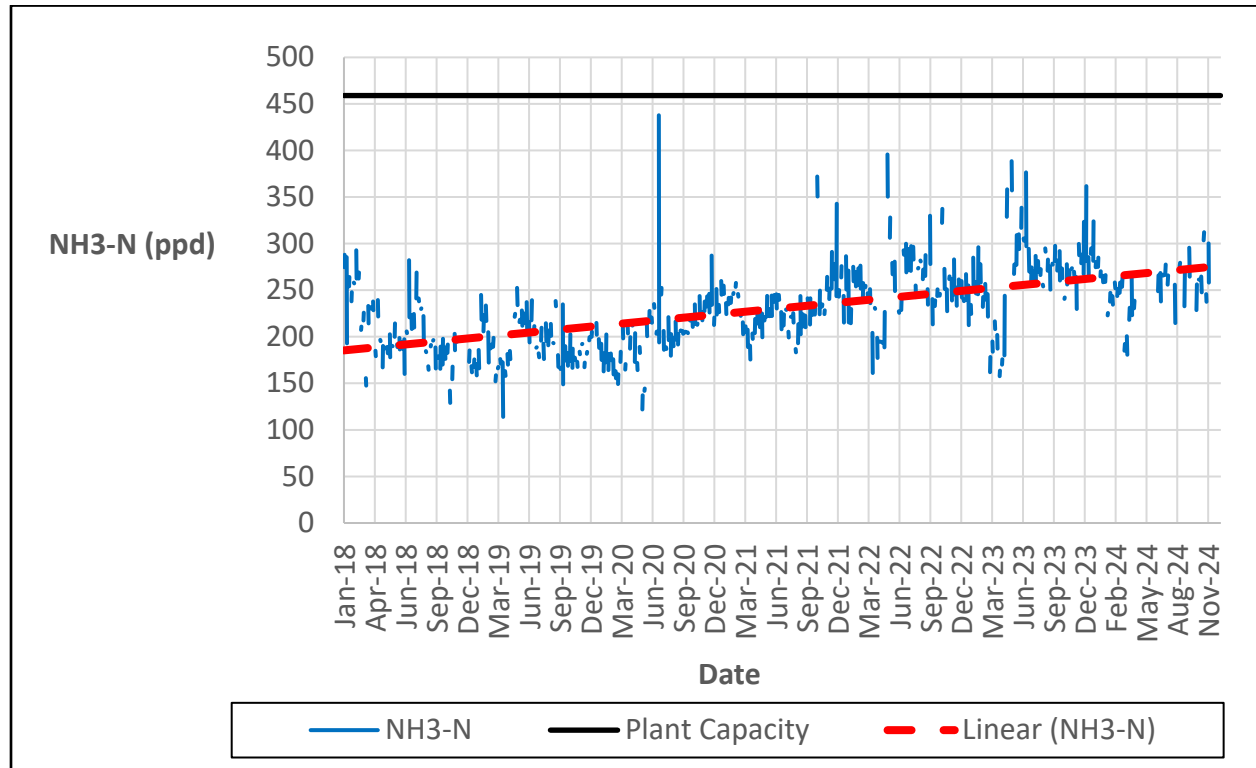


Figure 3-4 Influent Ammonia (ppd)

Table 3-5 Influent Ammonia (ppd)

Condition	2018	2019	2020	2021	2022	2023	2024
Average	207	192	202	232	255	246	254
Max Month	261	226	251	270	307	265	350

3.1.6 HISTORICAL PHOSPHORUS LOADING

The WRC is designed to treat a maximum month phosphorus loading of 115 pounds per day (ppd). Actual loading over the past five years is shown in Figure 3-5 and Table 3-6. The linear trend line indicates loadings have been increasing. For this reason, Donohue has selected the 2022 average of 62 ppd and the 2022 maximum month of 73 ppd for defining the current condition.

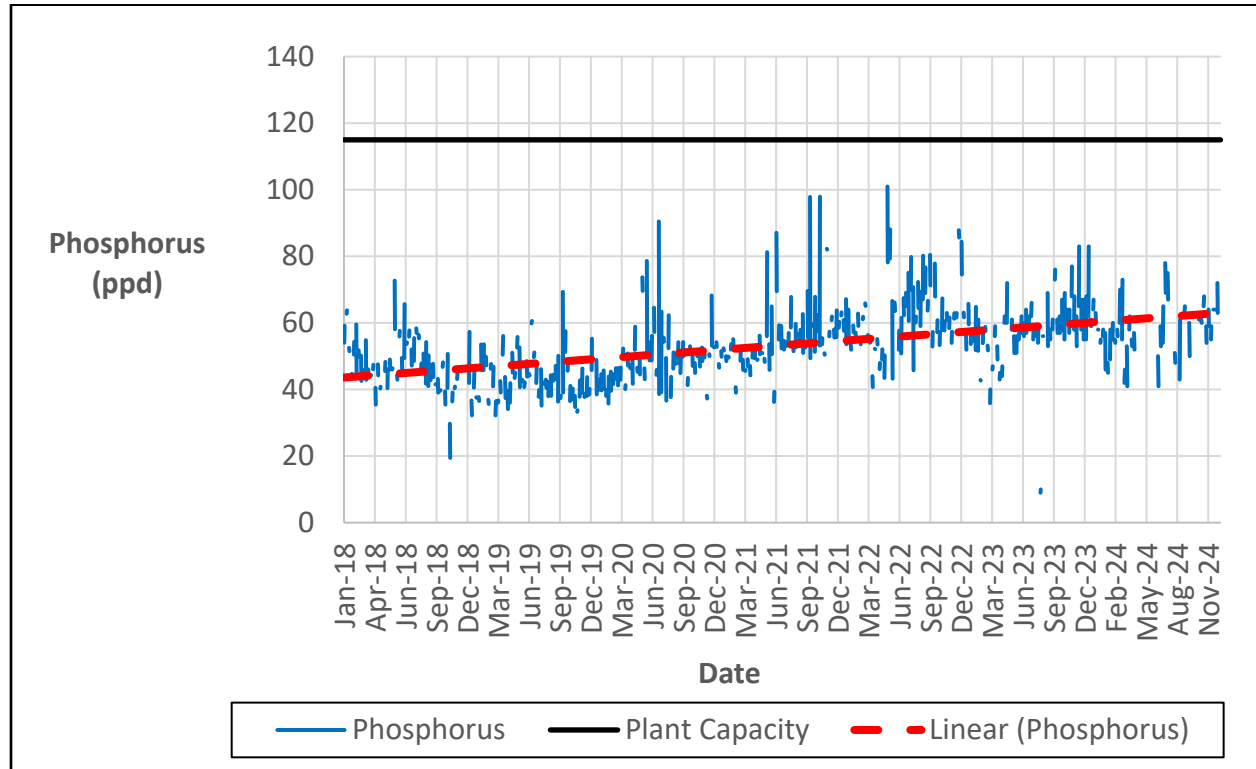


Figure 3-5 Influent Phosphorus (ppd)

Table 3-6 Influent Phosphorus (ppd)

Condition	2018	2019	2020	2021	2022	2023	2024
Average	47	43	49	55	62	53	58
Max Month	55	50	57	66	73	65	70

3.2 PEAKING FACTORS

Peaking factors are a metric used for comparing peak conditions to average conditions. Peaks in flow are generally caused by wet weather while peaks in loading are caused by sewer user activities that either increase the amount or the strength of wastewater generated. The peaking factors shown in Table 3-7 will be utilized when developing future conditions later in the report.

Table 3-7 Current Flow and Load Peaking Factors

Parameter	Annual Average	Max Month	Max Week	Peak Day	Peak Hour
Flow	1	1.89	2.65	3.82	4.70
BOD	1	1.31	1.79	2.54	-
TSS	1	1.41	1.59	2.24	-
Ammonia	1	1.37	1.55	1.71	-
Phosphorus	1	1.18	1.45	1.63	-

3.3 INFILTRATION AND INFLOW EVALUATION

Portions of flow to the WRC are attributed to inflow and infiltration, or I/I. Hourly flow for peak flow events from 2014 through March of 2019 are summarized in Figure 3-6. Five peak flow events, each represented by a different color curve, are shown in Figure 3-6. The beginning of each event, when flows began to rise, was set at Hour 0 and the curve was continued until the flow returned to pre-peak hour event levels. One storm in May of 2020 exceeded the current design peak hour flow of 8 mgd (5,560 gpm). This was a two day event on May 17 and 18, 2020 with 3.5 inches of precipitation on the 17th and 2.3 inches of precipitation on the 18th. The two day storm event had an approximate recurrence interval of 25 years. The peak hour flow observed at the WRC was 10.6 mgd (7,367 gpm). The peak hour to average annual flow peaking factor from this event is 4.75, which is consistent with an older system with I&I. Peak flow capacity and operation will be further evaluated in the alternatives evaluation.

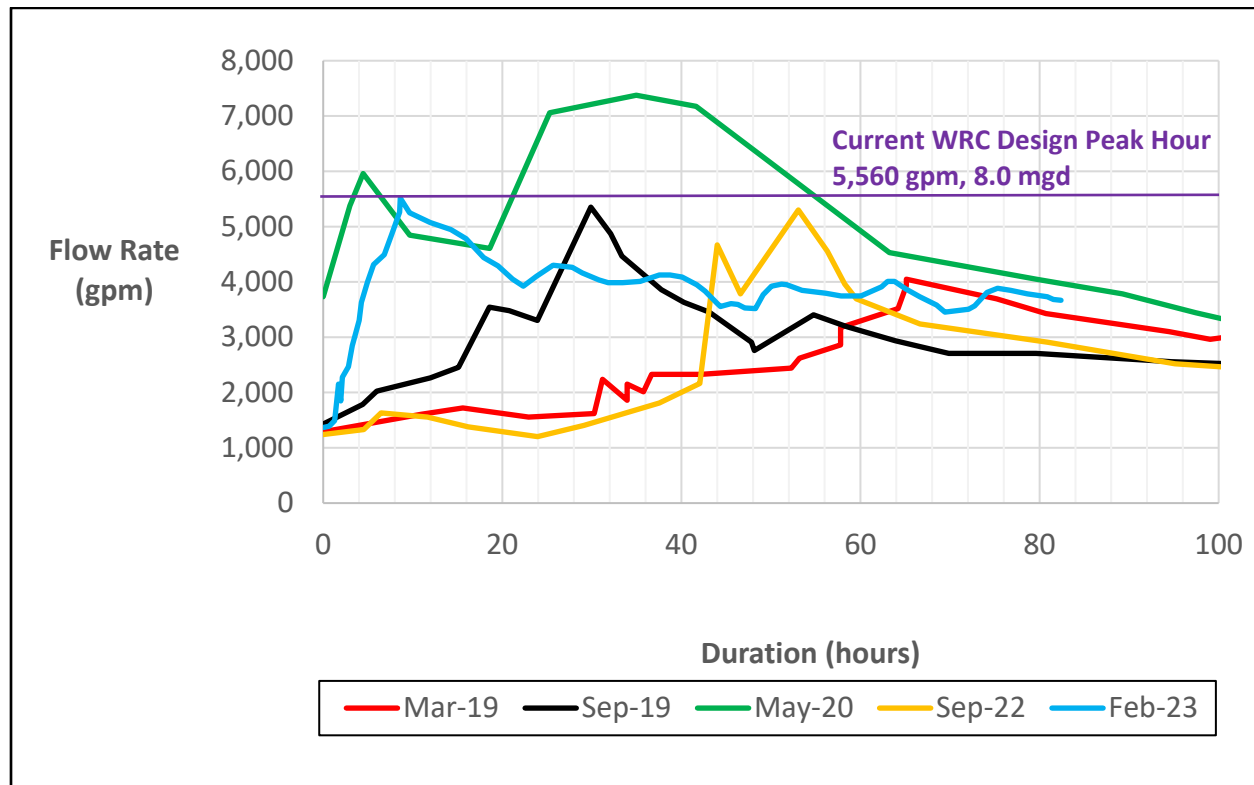


Figure 3-6 Historical Hourly Flow during Peak Flow Events – 2019 through February of 2023

The City invests in annual sewer televising, cleaning, and repairs for any issues that are found. Leaks identified during these inspections are repaired. The City will continue to follow their Capacity, Management, Operation, and Maintenance (CMOM) program to manage collection system infiltration and inflow.

3.4 WASTEWATER TREATMENT PERFORMANCE

3.4.1 BOD REMOVAL

The facility has discharged on average for the past seven years an effluent BOD concentration of 3 mg/L, which is well below the permit limits of 10 mg/L and 15 mg/L as summarized in Table 2-1. The WRC has been in full compliance with BOD permit limits over the past seven years as can be seen in Figure 3-7.

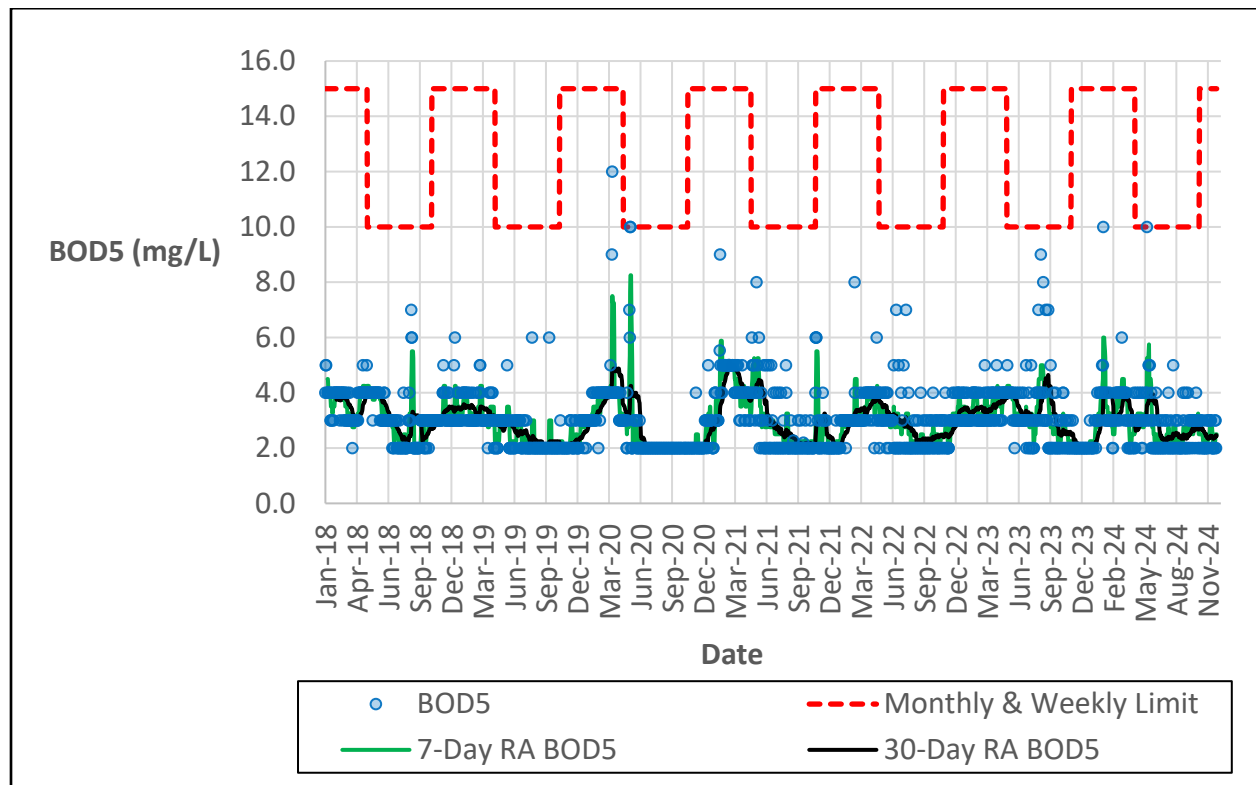


Figure 3-7 Effluent BOD Concentration (mg/L)

3.4.2 TSS REMOVAL

The facility has discharged on average for the past seven years an effluent TSS concentration of 2.5 mg/L, which is well below the permit limits of 12 mg/L and 15 mg/L as summarized in Table 2-1. The WRC has been in full compliance with TSS permit limits over the past seven years as can be seen in Figure 3-8.

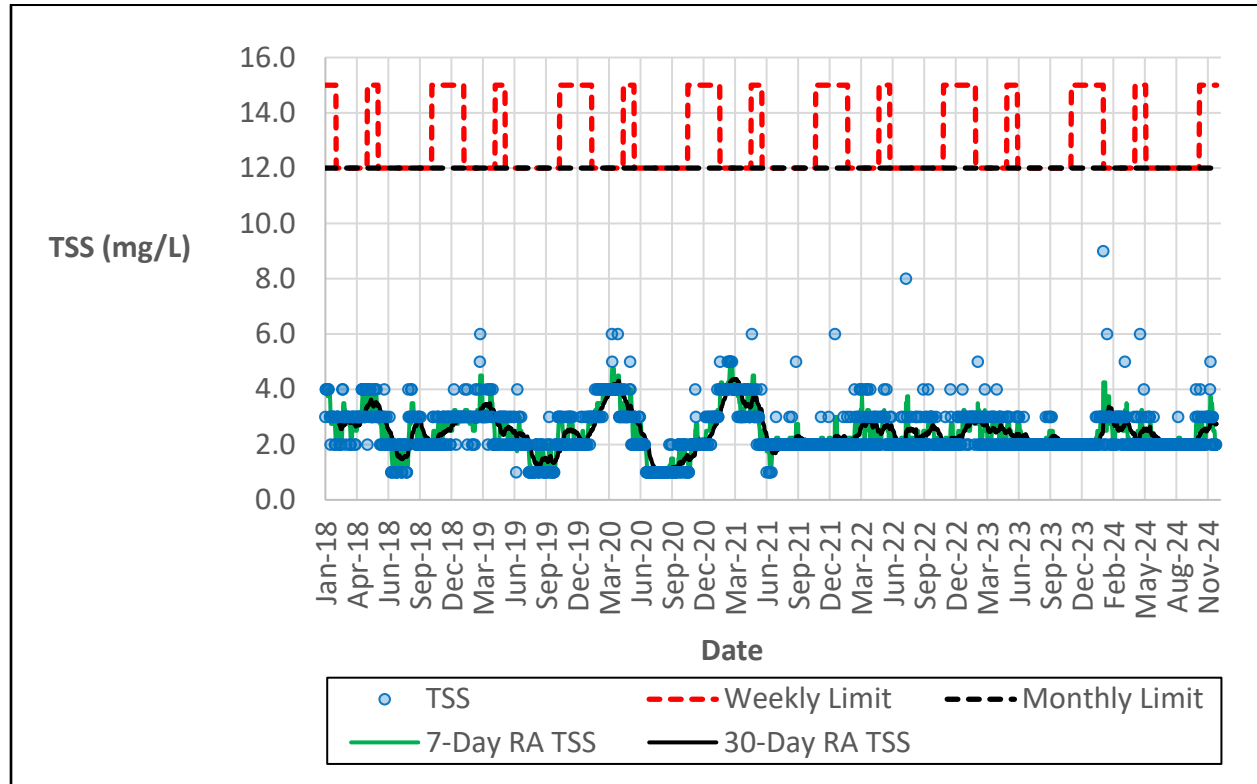


Figure 3-8 Effluent TSS Concentration (mg/L)

3.4.3 AMMONIA REMOVAL

The facility has discharged on average for the past seven years an effluent ammonia concentration of 0.05 mg/L, which is well below the permit limits which range between 3.3 mg/L and 21 mg/L as summarized in Table 2-1. The WRC has been in full compliance with ammonia permit limits over the past seven years as can be seen in Figure 3-9.

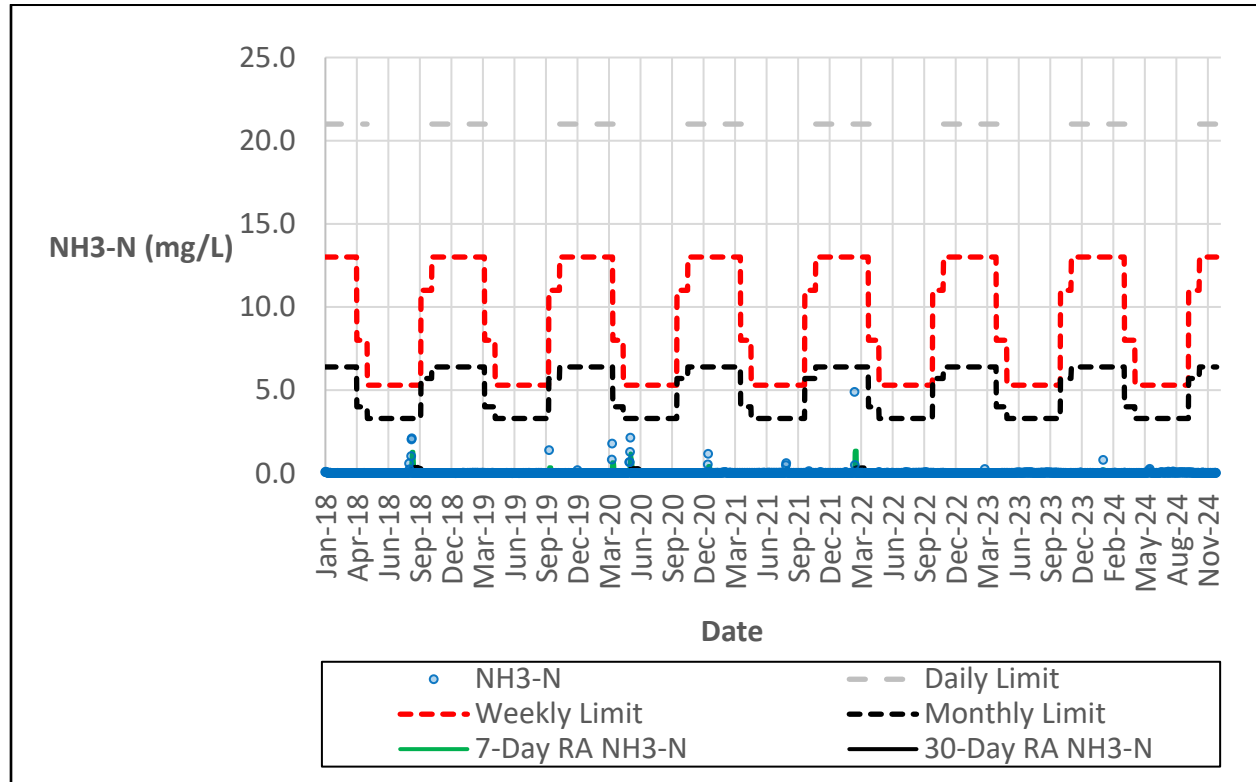


Figure 3-9 Effluent Ammonia Concentration (mg/L)

3.4.4 PHOSPHORUS REMOVAL

The facility has discharged on average for the past seven years an effluent phosphorus concentration of 0.25 mg/L, which is well below the permit limits which range between 0.6 mg/L and 0.8 mg/L as summarized in Table 2-1. The WRC has been in full compliance with phosphorus permit limits over the past seven years as can be seen in Figure 3-10.

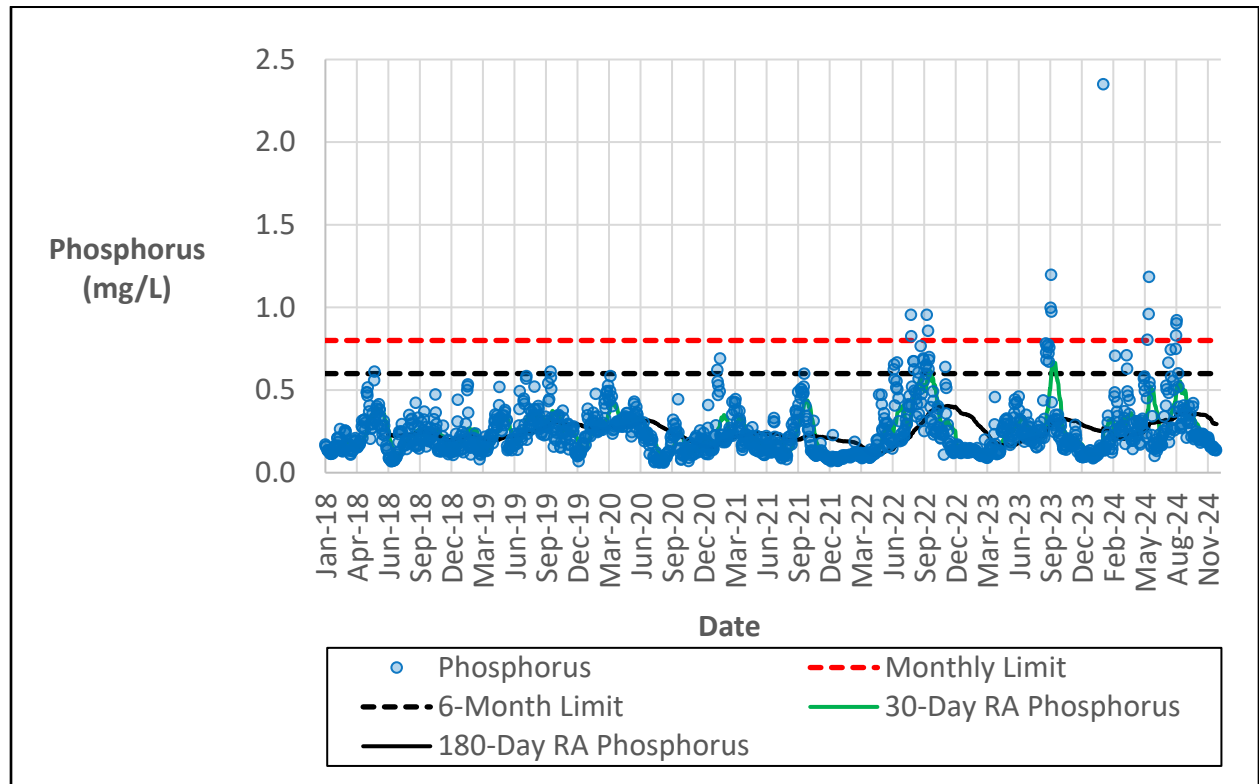


Figure 3-10 Effluent Phosphorus Concentration (mg/L)

3.4.5 CHLORIDES

The facility has a future weekly and monthly average chloride limit of 490 mg/L, which becomes effective in the permit on October 1, 2024. The facility has been steadily discharging lower chloride concentrations in the effluent but needs to continue to make progress in source reduction measures in order to reduce the risk of permit exceedances. The average effluent concentration in 2022 was 416 mg/L. Figure 3-11 below shows data collected from the past five years for chloride concentrations.

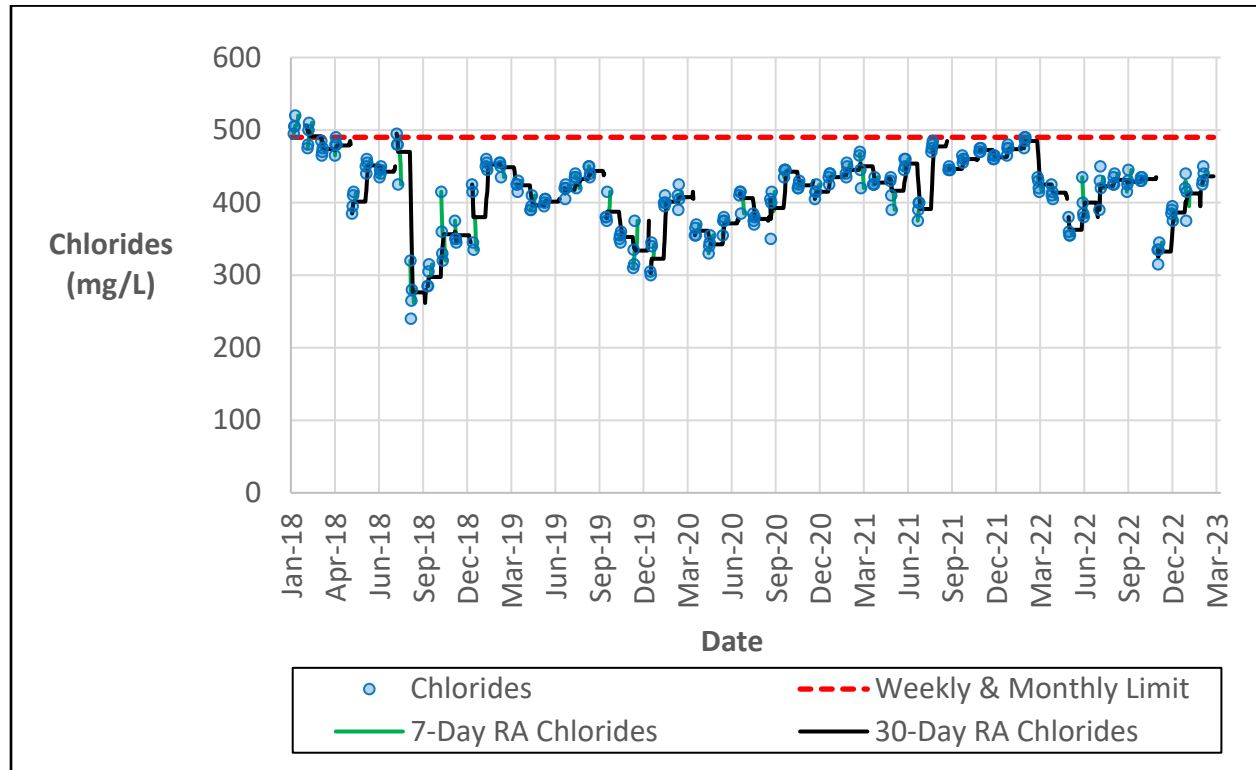


Figure 3-11 Effluent Chloride Concentrations (mg/L)

3.5 EXISTING FACILITY CONDITION ASSESSMENT

Donohue and City staff carried out a site walk-through and condition assessment at the existing WRC. The purpose of the condition assessment was to assess the physical condition, reliability, and performance of each unit process at the WRC and use the information collected during the assessment to guide the Facility Plan. Replacement and refurbishment activities were identified for facilities and systems to provide reliable service for the 20 year planning period. These recommended improvements are summarized by Structure in Table 3-8. The improvement items listed in Table 3-8 will be included in the cost evaluation in the alternatives evaluation.

Table 3-8 Identified Improvements from Condition Assessment

Structure	Recommended Improvement
WRC Site	<ul style="list-style-type: none"> • Septage receiving uses a manhole. There is no rock trap or pad containment. Construct dedicated septage receiving station. • Sludge Loadout Station is 35 years old and requires refurbishment of concrete and replacement of piping and valves • Abandoned tankage from 1970 facilities west of vehicle storage should be demolished for site restoration. • All buried piping and valves are 35 to 50 years old and require refurbishment or replacement. • Plant effluent system with pumping, piping, hydrants, and hose bibs should be considered for reuse of plant effluent for washdown water instead of City water. • All buried electrical and controls wiring and conduits are 35 years old and require replacement. • Paved surfaces and drives have deteriorated and require mill and overlay • Portions of sidewalks have settled/deteriorated and require replacement • Portions of retaining walls have shifted and require replacement • Entrance gate should be replaced with updated, actuated gate for improved site security with remotes for pushbutton entry.
Bar Screen Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • Gates are all manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Mechanism and gear box is 35 years old and in need of replacement. • Rehabilitate concrete on inside of channel and chamber.
Control Building	<ul style="list-style-type: none"> • Electrical switch gear and MCC equipment is 35 to 50 years old and requires replacement. • Backup generator is 35 years old and requires replacement • Air handling equipment and controls are 35 years old and in need of replacement. • Interior spaces for offices, laboratory, meeting room, locker room, breakroom are a mix of 35 to 50 years old and are in need of remodeling. • SCADA system hardware and software should be updated for site and lift stations • Floor drains are deteriorated and plugged requiring refurbishment. • Sump pumps in building should be piped to influent wetwell to remove clear water from sludge storage tanks. • Several wall leaks require crack injection and sealing between building and sludge holding tanks.

Structure	Recommended Improvement
	<ul style="list-style-type: none"> • Pump removal beams and hoists are needed for maintenance. • Influent pumps and valves are 35 years old and in need of replacement • Sludge loadout pumps, piping, and valves are 35 years old and in need of replacement
Oxidation Ditch	<ul style="list-style-type: none"> • Aerator discs, shafts, gear boxes, and motors are 35 years old and in need of replacement. • Walls and walkways require refurbishment with crack injection and concrete repairs. • Gates are manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Mixed liquor and RAS piping and valves are 35 years old and in need of replacement. • Level control gate is manually actuated. Replace with electrically actuated gate for automated level control.
Clarifiers	<ul style="list-style-type: none"> • Mechanisms, scum removal, weirs, baffles, and bridges are 35 years old and in need of replacement. • Crack injection and concrete repair is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
RAS Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • MCC equipment is 35 years old and in need of replacement. • RAS pumps and valves are 35 years old and in need of replacement. • Pump removal beams and hoists are needed for maintenance.
UV Disinfection and Vehicle Storage	<ul style="list-style-type: none"> • Air handling equipment and controls are 25 years old and in need of replacement. • A building addition is needed. Currently using 2 storage containers for additional storage. Also additional workshop space is needed and a welding booth. • Overhead door access is limited. Access and overhead doors on west side would be possible if abandoned tankage was demolished and site restored. • Larger water line is needed for filling vector truck.
Gravity Thickener	<ul style="list-style-type: none"> • Mechanism, scum removal, weir, baffle, and bridge are 50 years old and in need of replacement. • Crack injection and concrete repair is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
Aerobic Sludge Holding Tanks	<ul style="list-style-type: none"> • Aeration equipment and blowers are 35 years old and in need of replacement • Tank 1 is 50 years old. Tank 2 is 35 years old. Crack injection and concrete repair is necessary. • Ventilation equipment replacement is needed.

4. DESIGN FLOWS & LOADINGS

4.1 FLOW AND LOADING PROJECTIONS

The WDNR requires that future flow and loading estimates account for residential, commercial, industrial, and I&I sources. The following sections will step through the development of a 10-, 20-, and 50-year flow and loading projections for the WRC that account for each of these sources.

4.1.1 RESIDENTIAL AND COMMERCIAL GROWTH

Residential and commercial wastewater flows are generated by the public and flow in a diurnal flow that reflects the timing that water is used within the service area with peaks typically in the morning and evening hours. The residential and commercial flows typically correlate well with population and, as a result, projected flows and loadings are evaluated and developed into a flow and pound per day per capita value. The first step for developing residential and commercial growth projections is to project population over the planning period.

The South Eastern Wisconsin Regional Planning Commission (SEWRPC) monitors and projects population growth in the Cedarburg sewer service area and is the official planning agency recognized by WDNR for the WRC. SEWRPC’s Second Amendment to Vision 2050 report includes the most recent projections for the Cedarburg sewer service area and are shown in Table 4-1.

Table 4-1 SEWRPC Vision 2050 Sewer Service Area Population Projection

Service Area	2010 Population	2050 Projected Population
Cedarburg Sewer Service Area	11,610	16,550

In order to determine population projections for the years of interest for this Facility Plan, linear interpolation and projection was used. These population projections are shown in Table 4-2.

Table 4-2 Projections using Linear Interpolation from SEWRPC Data

Service Area	2010 Census	2020 Census	2022 Estimate	2025 Projection	2035 Projection	2045 Projection	2075 Projection
Cedarburg Sewer Service Area	11,610	12,121	13,092	13,463	14,698	15,933	19,638

Since the Cedarburg sewer service area is landlocked, consideration was given to the ultimate buildout for the service area. The City recently developed a buildout population estimate of 18,657 using the same methodology used in their 2008 Comprehensive Use Plan. For the purpose of this Facility Plan, Donohue assumed the SEWRPC linear projection rate would continue until the City buildout estimate was reached and population growth would then halt. The population projections in Table 4-3 are recommended for use in this Facility Plan. A graph summarizing this projection trend and the data used is shown in Figure 4-1.

Table 4-3 Recommended Service Area Population Projections for Facility Plan

Service Area	2010 Census	2020 Census	2022 Estimate	2025 Projection	2035 Projection	2045 Projection	2075 Projection
Cedarburg Sewer Service Area	11,610	12,121	13,092	13,463	14,698	15,933	18,657

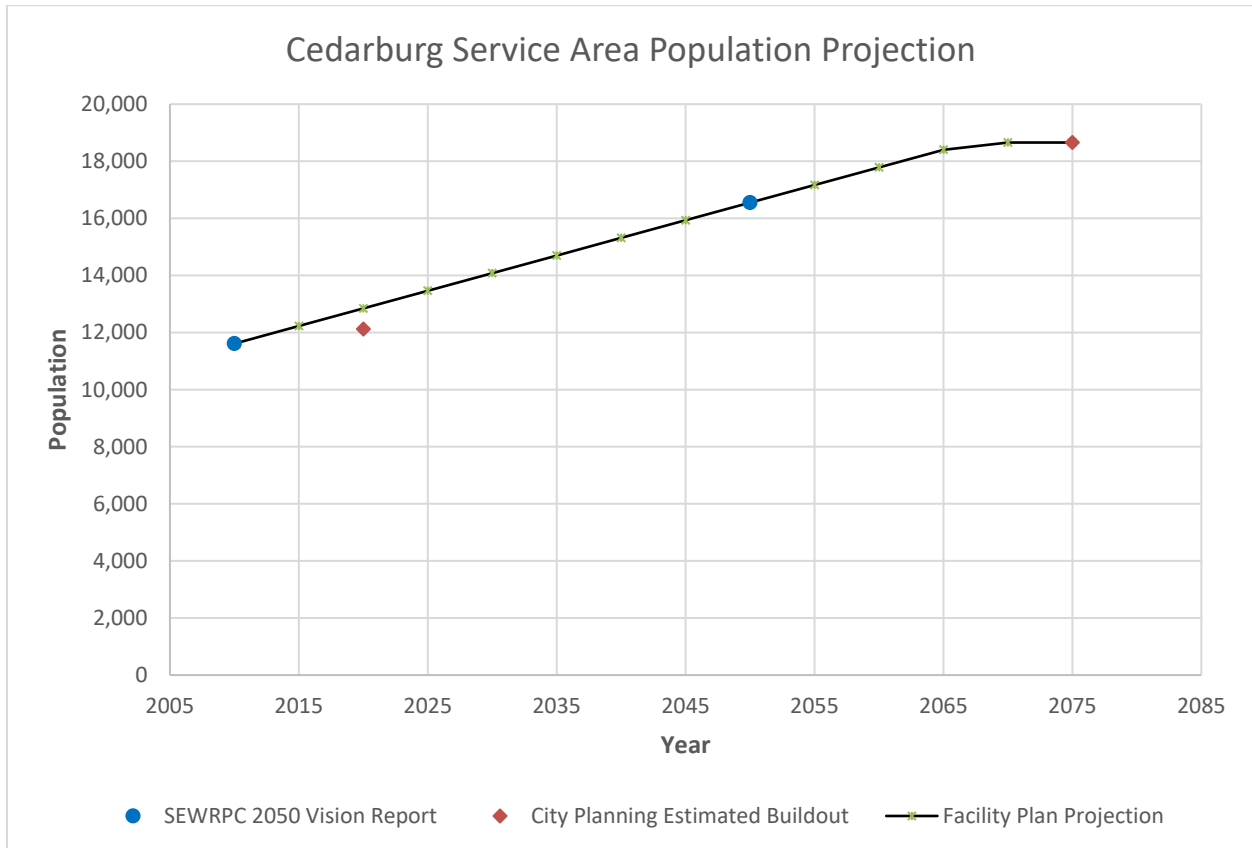


Figure 4-1 Cedarburg Sewer Service Area Population Projection

The second step to project residential and commercial flows and loadings is to determine the current per capita flow and loadings. Based on data from SEWRPC’s Second Amendment to Vision 2050 report, the estimated 2022 population for the service area is 13,092. The per capita flows and loadings were calculated by dividing the current residential and commercial flows and loadings for the average annual condition shown in Table 4-4 by the estimated service area population of 13,092. The calculated per capita values are shown in Table 4-5.

Table 4-4 Current Residential and Commercial Flows and Loadings

Parameter	Average Annual	Max Month	Max Week	Peak Day	Peak Hour
Flow (mgd)	2.10	4.08	5.80	8.44	10.4
BOD5 (ppd)	3,369	4,314	5,948	8,513	-
TSS (ppd)	4,801	6,687	7,570	10,717	-
NH ₃ -N (ppd)	255	349	395	437	-
TP (ppd)	60	69	85	97	-

Table 4-5 Average Annual Per Capita Flow and Loadings

Parameter	Average Annual
Flow (gpdpc)	161 ¹
BOD5 (ppdpc)	0.2573
TSS (ppdpc)	0.3667
NH ₃ -N (ppdpc)	0.0195
TP (ppdpc)	0.0046

¹ Current value. Future growth will be estimated using Ten States Standards recommendation of 100 gpdpc.

The per capita flow of 161 gpdpc is reflective of an older system with I&I. Population growth will likely take place in newer areas of the service system with construction of new portions of the sewer system. The newer sewer system areas will contribute less I&I to the WRC. The WDNR and Ten State Standards recommend assuming 100 gpdpc for flow for new growth. Thus, for the population projections, population growth was assumed to contribute 100 gpdpc. Reduced I&I does not affect the per capita loadings; therefore, the per capita loadings from Table 4-5 were used for the residential loading projection.

Newer areas of the system should also reduce the magnitude of high flow events, resulting in lower peaking factors. Peaking factors consistent with new growth from the Wisconsin Administrative Code (NR) 110 were assumed and are shown in Table 4-6. Note that the loading peaking factors did not change from the values shown in Table 3-7.

Table 4-6 New Growth Peaking Factors

Parameter	Annual Average	Max Month	Max Week	Peak Day	Peak Hour
Flow	1	1.89	1.8 ¹	2.00 ¹	2.50 ¹
BOD	1	1.31	1.79	2.54	-
TSS	1	1.41	1.59	2.24	-
Ammonia	1	1.37	1.55	1.71	-
Phosphorus	1	1.18	1.45	1.63	-
¹ Recommended flow peaking factors from Ten States Standards for new growth					

The projected residential and commercial flows and loadings for 2025, 2035, 2045, and 2075 are shown in Table 4-7. The projected flows in Table 4-7 include I&I.

Table 4-7 Projected Residential and Commercial Flows and Loadings

Year	Parameter	Annual Average	Max Month	Max Week	Peak Day	Peak Hour
2025	Flow (mgd)	2.1	4.1	5.9	8.5	10.5
	BOD (ppd)	3,464	4,440	6,119	8,756	-
	TSS (ppd)	4,937	6,879	7,786	11,022	-
	Ammonia (ppd)	262	359	406	449	-
	Phosphorus (ppd)	62	71	88	99	-
2035	Flow (mgd)	2.3	4.4	6.1	8.8	10.8
	BOD (ppd)	3,782	4,857	6,689	9,564	-
	TSS (ppd)	5,390	7,518	8,508	12,038	-
	Ammonia (ppd)	287	392	443	491	-
	Phosphorus (ppd)	68	78	96	109	-
2045	Flow (mgd)	2.4	4.6	6.3	9.0	11.1
	BOD (ppd)	4,100	5,275	7,258	10,372	-
	TSS (ppd)	5,843	8,157	9,230	13,053	-
	Ammonia (ppd)	311	425	481	532	-
	Phosphorus (ppd)	74	84	104	118	-
2075	Flow (mgd)	2.7	5.1	6.8	9.6	11.8
	BOD (ppd)	4,800	6,196	8,515	12,154	-
	TSS (ppd)	6,842	9,566	10,821	15,293	-
	Ammonia (ppd)	364	498	563	623	-
	Phosphorus (ppd)	86	99	122	139	-

4.1.2 INDUSTRIAL GROWTH

Currently the City has only one significant industrial contributor, Kemps Dairy. Flow and concentration data from the past three years (2020 – 2022) were analyzed. A summary of this data is shown in Table 4-8. Concentrations are relatively weak for this wastewater with values below the WRC’s typical influent wastewater.

Table 4-8 Kemps Dairy Flows and Concentrations

Condition	Flow (mgd)	BOD (ppd)	TSS (ppd)	Ammonia (ppd)	Tot-P (ppd)
Annual Average	0.154	47	48	0.1	1.5
Max Month	0.177	174	157	0.8	4.3

In order to be conservative regarding the future loadings from this industry, Donohue assumed a higher wastewater strength matching the current influent concentrations to the WRC. These higher concentrations were used for the estimated future loadings from Kemps Dairy.

The Cedarburg Business Park has approximately 33 acres of open land that is expected to be developed early in the planning period. Future industries would likely be dry type industries that mostly contribute sanitary wastewater to the collection system. Using an estimated 1500 gallons/day/acre of sanitary

wastewater generation (this value is consistent with the City's future planning estimate for industrial and commercial development), development is expected to contribute an additional 49,500 gpd of wastewater on an annual average basis. The resulting future flows and loadings from both Kemps Dairy and the business park development are summarized in Table 4-9. These values will be used for all future years in the combined flow and loading projections.

Table 4-9 Projected Future Industrial Flows and Loadings

Condition	Flow (mgd)	BOD (ppd)	TSS (ppd)	Ammonia (ppd)	Tot-P (ppd)
Annual Average	0.203	314	358	25	5.9
Max Month	0.234	361	412	29	6.8

4.1.3 HAULED WASTES

The City currently receives septage and holding tank waste directly into manhole 1 upstream of the Bar Screen Building. These flows and loadings are measured and sampled with the influent wastewater at the Bar Screen Building. The analysis for residential and commercial flows and loadings in this report included the hauled waste flows and loadings. This method assumes hauled wastes are projected to grow at the same rate as the service area population.

4.1.4 INFILTRATION AND INFLOW

I&I was included in the residential and commercial flow and loading projections. I&I has been an issue for the WRC and warrants further evaluation. The WRC was designed for an 8 mgd peak hour flow. However, a peak flow analysis completed in Section 3.3 showed that the design peak hour was exceeded with a peak hour flow of 10.6 mgd on May 18, 2020.

As discussed previously, the high per capita flow and peak hour peaking factor are reflective of an older system with excessive I&I. According to the United States Environmental Protection Agency (USEPA), infiltration is water that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes, other than wastewater. Infiltration is calculated by dividing the average dry weather flow (ADWF) by the population served to arrive at an average per capita dry weather flow. Excessive infiltration is considered to be occurring above the USEPA threshold of 120 gpdpc. The ADWF was determined by filtering 2020 through 2022 historical data for days in spring months where exceptionally high groundwater is expected, and no precipitation occurred. From this analysis, an ADWF of 2.56 mgd was determined, which equates to a per capita flow of 196 gpdpc. Because this flow exceeds the USEPA threshold, infiltration is considered excessive for the WRC.

Inflow is water other than wastewater that enters the sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross-connections between storm sewers and sanitary sewers, and catch basins. Inflow is calculated by dividing the average wet weather flow (WWF) by the population served. Excessive inflow is considered by the USEPA when the per capita WWF is greater than 275 gpdpc. Historical data were used to determine WWF. The historical data from 2020 through 2022 were filtered for precipitation events that exceeded 1.0 in, or to be consistent with the USEPA, storms large enough to cause surface ponding and runoff. The WWF for the WRC was estimated to be 4.22 mgd, which equates to a per capita flow of 322 gpdpc. Because this flow exceeds the USEPA threshold, inflow is considered excessive for the WRC.

Donohue recommends evaluating and addressing I&I at the WRC. This will be part of the alternatives evaluation later in the report.

4.1.5 FLOW AND LOADING PROJECTION SUMMARY

The overall 10-, 20-, and 50-year flow and loading projections that include residential, commercial, industrial, hauled wastes, and I&I contributions is provided in Table 4-10.

Table 4-10 Projected Residential, Commercial, Industrial, Hauled Waste, and I&I Flows and Loadings

Year	Parameter	Annual Average	Max Month	Max Week	Peak Day	Peak Hour
2025	Flow (mgd)	2.3	4.4	6.1	8.7	10.7
	BOD (ppd)	3,778	4,801	6,480	9,117	-
	TSS (ppd)	5,295	7,290	8,198	11,434	-
	Ammonia (ppd)	288	388	435	478	-
	Phosphorus (ppd)	68	78	95	106	-
2035	Flow (mgd)	2.5	4.6	6.3	9.0	11.1
	BOD (ppd)	4,095	5,218	7,050	9,925	-
	TSS (ppd)	5,748	7,929	8,920	12,450	-
	Ammonia (ppd)	312	421	472	520	-
	Phosphorus (ppd)	74	85	103	116	-
2045	Flow (mgd)	2.6	4.8	6.5	9.2	11.4
	BOD (ppd)	4,413	5,636	7,619	10,733	-
	TSS (ppd)	6,201	8,569	9,641	13,465	-
	Ammonia (ppd)	336	454	510	561	-
	Phosphorus (ppd)	80	91	111	125	-
2075	Flow (mgd)	2.9	5.4	7.0	9.8	12.0
	BOD (ppd)	5,114	6,557	8,876	12,515	-
	TSS (ppd)	7,200	9,978	11,233	15,705	-
	Ammonia (ppd)	389	526	592	652	-
	Phosphorus (ppd)	92	106	129	145	-

4.2 CAPACITY ANALYSIS

A capacity analysis for the existing WRC was completed to determine which unit processes would require expansion upgrades to treat the projected 2045 flows and loadings from Table 4-10. Results from this analysis are summarized in Table 4-11 and Figure 4-2.

- Screening and grit removal are nearing capacity but are anticipated to adequately treat the projected peak hour flow of 11.4 mgd.
- Influent pumping will require a capacity upgrade since the firm pumping capacity of 8.6 mgd is well below the projected peak hour flow.
- The oxidation ditch is sized adequately for projected loadings; however, the aerators will require an upgrade to provide sufficient oxygen delivery.

- The clarifiers are projected to reach hydraulic capacity by 2045. However, Donohue believes they will adequately treat projected flows and can be re-assessed during a future facility plan.
- The RAS pumps have adequate capacity
- UV disinfection will require an expansion upgrade to treat the projected peak hour flow of 11.4 mgd.
- The gravity thickener and WAS pump have adequate capacity for the maximum month WAS flow and loading.
- The aerated holding tanks have adequate capacity for 15 days of sludge storage at maximum month conditions.

Table 4-11 2045 Unit Process Capacity Summary

Unit Process	Capacity Description	Units	Rated Capacity	Projected 2045	% Capacity
Screening	Peak Hour	mgd	12	11.4	95%
Grit Removal	Peak Hour	mgd	12	11.4	95%
Influent Pumping	Peak Hour	mgd	8.6	11.4	133%
Oxidation Ditch – Ann Ave Loading	Annual Average	ppd	5,637	4,413	78%
Oxidation Ditch – Max Mo Loading	Max Month	ppd	7,515	5,636	75%
Oxidation Ditch – Aeration	Max Day	ppd O ₂	20,990	27,346	130%
Final Clarification – SOR	Peak Hour	mgd	11.3	11.4	101%
Final Clarification – SLR	Peak Hour	mgd	11.6	11.4	98%
RAS Pumping	Annual Average	mgd	3.83	2.6	68%
UV Disinfection	Peak Hour	mgd	8	11.4	143%
Gravity Thickener – WAS Flow	Max Month	gpm	97	41	42%
WAS Pump	Max Month	gpm	60	16	27%
15 Day Aerated Sludge Holding	Max Month	gal	394,000	354,784	90%

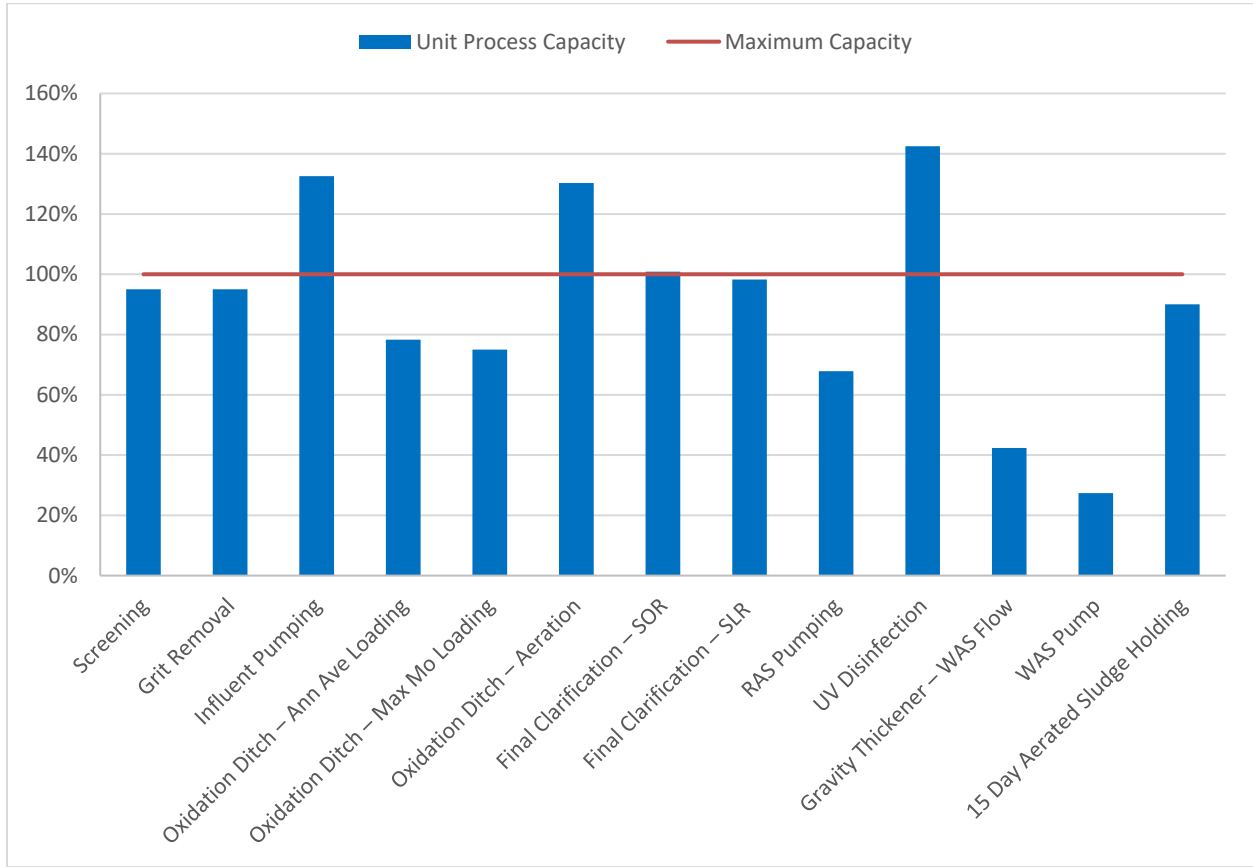


Figure 4-2 2045 Unit Process Capacity Summary

5. ALTERNATIVES ANALYSIS

The following significant areas of need were identified in the previous report chapters:

- Permit compliance: The WRC is facing stringent phosphorus limits and chloride limits.
- Peak flow management: There have been five peak events in the past five years that reached the facility's rated capacity of 8 mgd. One of those events in May of 2020 reached a peak flow of 10.6 mgd. The peak flows reaching the WRC exceed the USEPA thresholds for excessive infiltration and excessive inflow.
- Facility condition: A significant number of structures, processes, and utilities at the WRC are past their useful life and in need of refurbishment or replacement. These items are listed in Table 3-8.
- Treatment capacity: The projected flows and loadings are above several unit process capacities including influent pumping, oxidation ditch aeration, and UV disinfection.
- Biosolids management: The current biosolids management system with relatively small holding tanks and reliance on a contractor for year-round hauling of biosolids has inherent risk and logistical complexity.

The City has identified four alternatives to address the above areas of need.

1. Replacements, upgrades, and expansion at the existing WRC site utilizing the existing outfall to Cedar Creek with biosolids management upgrades constructed on City-owned land north of Pioneer Road and east of the existing facility.
2. Construction of a new membrane bioreactor treatment system, replacements, upgrades, and expansion at the existing WRC site utilizing the existing outfall to Cedar Creek with biosolids management upgrades at the existing site.
3. Construction of a new facility on City-owned land north of Pioneer Road and east of the existing facility. The new facility would have a new outfall directly to the Milwaukee River.
4. Connecting to Milwaukee Metropolitan Sewerage District (MMSD) and sending all wastewater to MMSD for treatment.

5.1 UPGRADES AND EXPANSION OF EXISTING WRC

The existing WRC is located off Park Lane in the City of Cedarburg on the west side of Cedar Creek. Figure 5-1 shows an aerial view of the site, which is space constrained between the cemetery and the creek. There is a significant amount of elevation difference going uphill from the creek to the oxidation ditch and clarifiers. Any new structures or tanks will require retaining walls and steps for access.



Figure 5-1 Existing WRC Site

5.1.1 IDENTIFIED UPGRADES

The upgrades shown in Table 5-1 were identified in the Chapter 3 treatment performance assessment, Chapter 3 facility condition assessment, and Chapter 4 capacity analysis. All upgrades would occur at the existing WRC site with the exception of the biosolids stabilization, handling, and storage improvements. There is insufficient footprint available at the existing site for the biosolids improvements. This alternative includes construction of two sludge forcemains between the existing WRC site and the City owned site off Pioneer Road. One forcemain would convey sludge to the new site for processing and the other forcemain would convey filtrate and drain water back to the existing WRC for treatment. Aerobic digestion, thickening, dewatering, and cake storage facilities would be constructed on a portion of the Pioneer Road site.

Table 5-1 Identified Improvements for the Upgrade and Expansion of Existing WRC Alternative

Structure	Recommended Improvement
Garfield Lift Station	<ul style="list-style-type: none"> • A mechanical screen and backup bar rack is needed at this station to protect the pumps and reduce downstream maintenance activities. • The structure requires an expansion to install a mechanical screen and backup bar rack.

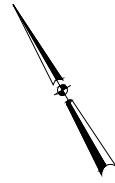
Structure	Recommended Improvement
	<ul style="list-style-type: none"> • Lift station pumps and valves are 35 years old and in need of replacement. • Air handling equipment and controls are 35 years old and in need of replacement. • Electrical MCC equipment is 35 years old and requires replacement. • Backup generator and automatic transfer switch requires replacement. • Rehabilitate concrete on inside of wetwell.
Existing WRC Site	<ul style="list-style-type: none"> • Septage receiving uses a manhole. There is no rock trap or pad containment. Construct dedicated septage receiving station. • Sludge Loadout Station is 35 years old and requires refurbishment of concrete and replacement of piping and valves • Abandoned tankage from 1970 facilities west of vehicle storage should be demolished for site restoration. • All buried piping and valves are 35 to 50 years old and require refurbishment or replacement. • Plant effluent system with pumping, piping, hydrants, and hose bibs is recommended for reuse of plant effluent for washdown water instead of City water. • All buried electrical and controls wiring and conduits are 35 years old and require replacement. • Paved surfaces and drives have deteriorated and require mill and overlay • Portions of sidewalks have settled/deteriorated and require replacement • Portions of retaining walls have shifted and require replacement • Entrance gate should be replaced with updated, actuated gate for improved site security with remotes for pushbutton entry.
Bar Screen Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • Gates are all manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Grit mechanism and gear box is 35 years old and in need of replacement. • Rehabilitate concrete on inside of channel and chamber. • Electrical MCC equipment is 35 years old and requires replacement.
Administration Building	<ul style="list-style-type: none"> • Construct an administration building with offices, meeting room, restrooms, and laboratory. Building is estimated as a single story 3,000 ft² building.
Control Building	<ul style="list-style-type: none"> • Electrical switch gear and MCC equipment is 35 to 50 years old and requires replacement. • Backup generator is 35 years old and requires replacement • Air handling equipment and controls are 35 years old and in need of replacement. • Interior spaces for offices, laboratory, meeting room, locker room, breakroom are a mix of 35 to 50 years old and are in need of remodeling. Offices, laboratory, and meeting room will move to new administration building. Grade level floor will be partially remodeled for SCADA room and locker rooms. Remainder of space will be utilized for additional electrical room and installing maintenance access hatches into the basement with lifting monorails and hoists for equipment removal and maintenance activities. • SCADA system hardware and software should be updated for site and lift stations • Floor drains are deteriorated and plugged requiring cleaning and refurbishment.

Structure	Recommended Improvement
	<ul style="list-style-type: none"> • Sump pumps in building should be piped to influent wetwell to remove clear water from sludge storage tanks. • Several wall leaks require crack injection and sealing between building and sludge holding tanks. • Pump removal beams and hoists are needed for maintenance. • Influent pumps and valves are 35 years old and in need of replacement. Capacity of replacement pumps should be 4,200 gpm each to provide a firm capacity of 12 mgd. Replacement piping and valves should be sized for the increased capacity. • Sludge loadout pumps, piping, and valves are 35 years old and in need of replacement
Oxidation Ditch	<ul style="list-style-type: none"> • Aerator discs, shafts, gear boxes, and motors are 35 years old and in need of replacement. Capacity of the replacement aeration system should be sized to deliver the projected 2045 peak day oxygen delivery of 27,000 lbs O₂/day. • Walls and walkways require refurbishment with crack injection and concrete rehabilitation. • Gates are manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Mixed liquor and RAS piping and valves are 35 years old and in need of replacement. • Level control gate is manually actuated. Replace with electrically actuated gate for automated level control.
Clarifiers	<ul style="list-style-type: none"> • Mechanisms, scum removal, weirs, baffles, and bridges are 35 years old and in need of replacement. • Crack injection and concrete repair is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
RAS Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • MCC equipment is 35 years old and in need of replacement. • RAS pumps and valves are 35 years old and in need of replacement. • Pump removal beams and hoists are needed for maintenance.
New Tertiary Filter Building	<ul style="list-style-type: none"> • Construct a new tertiary filter building to meet more stringent future total phosphorus limits. Building will receive secondary effluent from the clarifiers and route flow through a series of channels and gates to a treatment train consisting of coagulant addition, rapid mix tank, coagulation tank, polymer addition, flocculation tank, and two cloth media disc filters. The building will include the following rooms: electrical, mechanical, coagulant storage and dosing, polymer storage and dosing, and process room with tankage for rapid mix, coagulation, flocculation, and filtration. Filtered effluent will be routed to the existing UV Disinfection building.
UV Disinfection and Vehicle Storage	<ul style="list-style-type: none"> • The UV disinfection equipment does not have sufficient capacity for projected 2045 peak flow treatment. This equipment package should be replaced with a system sized to treat a peak hour flow of 12 mgd. • Air handling equipment and controls are 25 years old and in need of replacement.

Structure	Recommended Improvement
	<ul style="list-style-type: none"> • A building addition is needed. The City is currently using two storage containers for additional storage. Also, additional workshop space and a welding booth are needed. • Overhead door access is limited. Access and overhead doors on the west side are possible with the abandoned tankage demolished and site restored. • A larger water line is needed for filling the vector truck.
Gravity Thickener	<ul style="list-style-type: none"> • Mechanism, scum removal, weir, baffle, and bridge are 50 years old and in need of replacement. • Crack injection and concrete rehabilitation is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
Aerobic Sludge Holding Tanks	<ul style="list-style-type: none"> • Aeration equipment and blowers are 35 years old and in need of replacement. • Tank 1 is 50 years old. Tank 2 is 35 years old. Crack injection and concrete rehabilitation is necessary. • Ventilation equipment replacement is needed.
New Sludge Pumping Building	<ul style="list-style-type: none"> • Current site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a new sludge pumping building to pump sludge from the aerated holding tanks to a new forcemain conveying sludge to the City owned Pioneer Road site. Provide means for maintaining clean pipeline including flushing systems and pipeline insertion gauge cleaning.
Site Development at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Develop a portion of the City owned Pioneer Road site for these new processes. Site will require grading, electrical service, natural gas service, access roads, perimeter fence, entrance gate, sidewalks, and lighting.
Aerobic Digesters at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct two circular aerobic digester tanks approximately 50 feet in diameter on a portion of the City owned Pioneer Road site for sludge stabilization. Sludge will be conveyed to the digesters by a forcemain from the existing WRC site. Circular tanks provide compatibility with converting to anaerobic digesters in the future. Tanks would include diffused aeration and dome covers.
Thickening and Dewatering Building at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a thickening and dewatering building approximately 3,600 ft² with basement, grade floor, and upper floor on a portion of the City owned Pioneer Road site. The building would house the aerobic digester blowers, a gravity belt thickener to thicken sludge prior to the aerobic digesters, a belt filter press to dewater digested sludge into cake for storage and land application. Building will also house GBT and BFP feed pumps, GBT and BFP polymer feed systems, thickened sludge pumps, dewatered cake conveyor, and filtrate pumps to pump thickener and press filtrate along with any other process drain water through a forcemain back to the existing WRC for treatment. • The building would have an isolated electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.

Structure	Recommended Improvement
Cake Storage Building at Pioneer Road Site	<ul style="list-style-type: none"> Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a digested sludge cake storage building sized to hold 180 days of biosolids for land application. Dewatered cake sludge would be compatible with potential future Class A drying.

Figures 5-2 and 5-3 display conceptual site plans with new structures identified in Table 5-1 shown on the existing WRC site and the Pioneer Road site. In addition to recommended improvements in Table 5-1, additional conveyance assets are required to connect the existing WRC to the Proposed Pioneer Road Site for Biosolids Handling.



GENERAL NOTES:

- 1. ONLY NEW STRUCTURES ARE SHOWN.
- 2. SEE TABLE 5-1 FOR IDENTIFIED IMPROVEMENTS TO EXISTING STRUCTURES AND SITE IMPROVEMENTS.



UPGRADES AND EXPANSION TO EXISTING WRC SITE WITH ADDITIONAL RECOMMENDED STRUCTURES



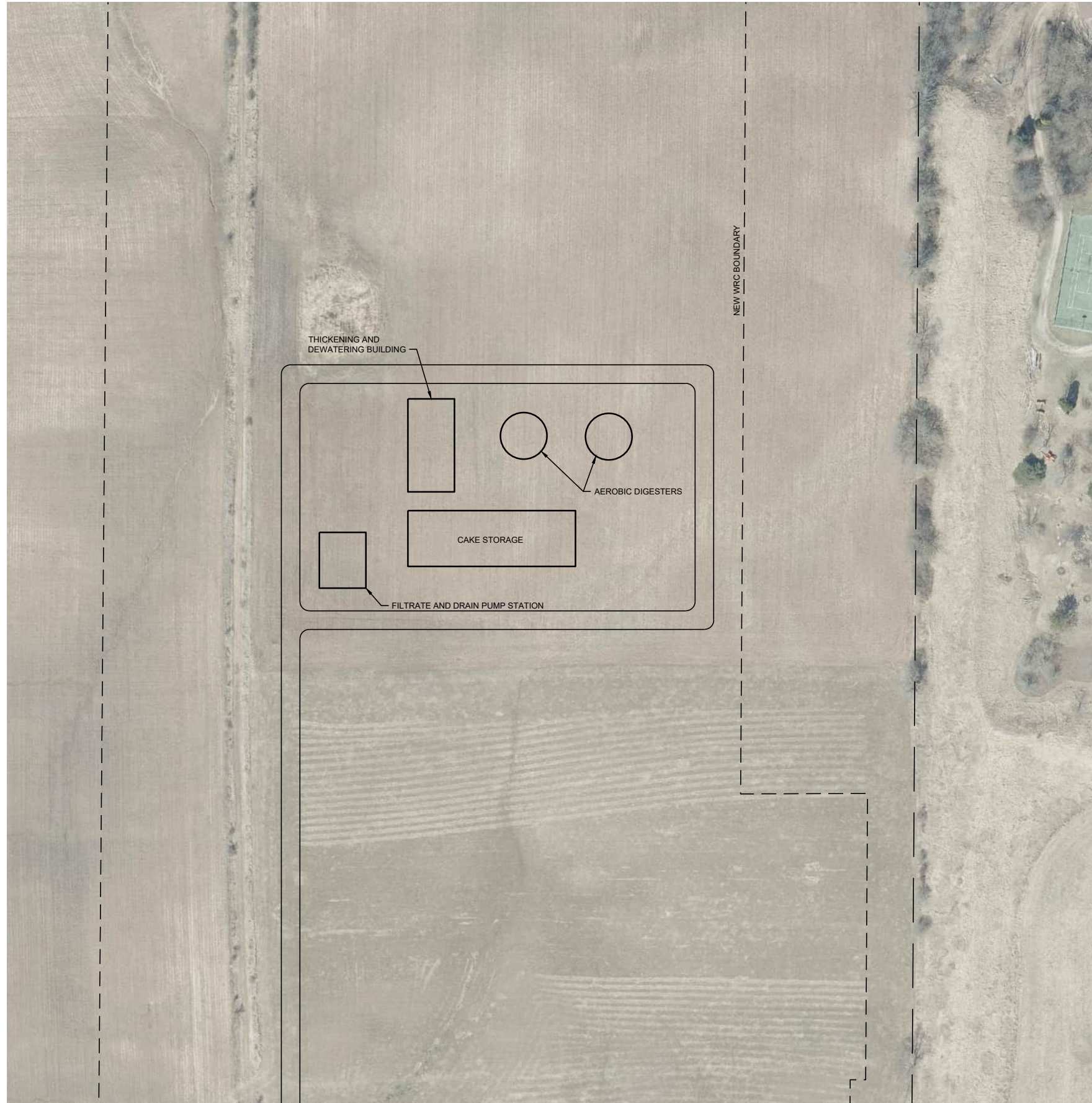
Figure 5-2
Current Site Layout
City of Cedarburg
Water Recycling Center
New Site Layout

Cedarburg, WI



SEP 2025

14524



GENERAL NOTES:

1. ONLY NEW STRUCTURES ARE SHOWN.
2. SEE TABLE 5-1 FOR IDENTIFIED IMPROVEMENTS TO EXISTING STRUCTURES AND SITE IMPROVEMENTS.

UPGRADES AND EXPANSION TO EXISTING WRC SITE PIONEER SITE WITH ADDITIONAL RECOMMENDED STRUCTURES



Figure 5-3
Biosolids at New Site
 City of Cedarburg
 Water Recycling Center
 New Site Layout
 Cedarburg, WI



5.1.2 SITE INVESTIGATION ON PIONEER ROAD SITE

To evaluate the feasibility of utilizing the Pioneer Road site as a future WRC or Biosolids Handling Facility, a site investigation was completed. The site is approximately 116 acres located at 1838 Pioneer Road in the City of Cedarburg. Based on information provided by the City, the City of Cedarburg purchased the site in 2000. Between 2000 and 2020, the site was leased back to the prior owner for agricultural practices. In 2023, a new tenant entered into a one-year agreement with the City to utilize the land for agricultural practices. Agricultural activities ceased in 2024 and as of the date of this report, no on-going agricultural activities are occurring on the site. The City has planted a portion of the site with native grasses and some trees. In the City of Cedarburg's Smart Growth Comprehensive Land Use Plan 2050 ([Plan](#)), the site is designated as transportation, communication or utility facilities.

Site features include flat topography, predominantly silt loam soil, and adjacency to Cedar Creek and the Milwaukee River. Cedar Creek and the Milwaukee River bounds the parcel to the north. The western border neighbors a residential development. The southern portion of the property is adjacent to Pioneer Rd which is County Trunk Highway C. The eastern boundary borders privately owned agricultural land and an additional residential property. The adjacent property owners and land uses are considered when evaluating the site constraints.

NR 110 Site Setbacks

According to State Statute NR 110.15(3)d ([NR 110.15\(3\)\(d\)](#)), a variety of separation distances shall be maintained based on the proposed WRC layout in order to minimize odors, noise, and other nuisances associated with wastewater treatment. A 500-foot offset is required from mechanical treatment facilities, effluent holding, and polishing ponds. As the western property boundary and portions of the eastern boundary are adjacent to a residential development, a 500-foot setback from the property line was used. A 50-foot offset from vacant agricultural land was utilized in portions of the northern and western boundary. Figure 5-4 provides the available footprint for the future WRC or Biosolids Handling based on the noted setbacks. The offset space shall be reserved to provide the buffer to the adjacent property owners.

WDNR Endangered Resources Review:

As part of the site investigation, the site was analyzed for Endangered Resources Review in conjunction with the Bureau of Natural Heritage Conservation. The agency reviewed the site for potential impacts on endangered resources. The results are favorable for future site development. One bee, two fish varieties, one plant, and one snake species were noted as potential impacts. The impacts of site development can be minimized by proper erosion control during construction and a plant survey of the site which is not required but recommended. The full report is provided in Appendix B – Site Investigations.

Cultural Resource Review:

The City had concerns over the historical significance of the site as it is adjacent to rivers and other historically significant sites along Green Bay Road. The site was cross referenced with the four available databases on the State Historic Preservation Office websites. The databases include Archaeological Report Inventory (ARI), Archaeological Sites Inventory, Architecture and History Inventory and National Register of Historic Places. The ARI was the only database to identify a result for project site. Portions of the Pioneer Road right-of-way was investigated in 2005, with no notable results or recommended field work. The output from all the databases can be viewed in Appendix B – Site Investigations.



Figure 5-4 Available Footprint for Future Development

Department of Agricultural, Trade, and Consumer Protection:

The final site investigation effort was to engage in a conversation with the Department of Agricultural, Trade, and Consumer Protection regarding preparing an Agricultural Impact Statement (AIS). An AIS analyzes the impacts of public projects on agricultural land use or farms. A public project is when the owner has eminent domain power. In this case, City of Cedarburg, is a local municipality and has the

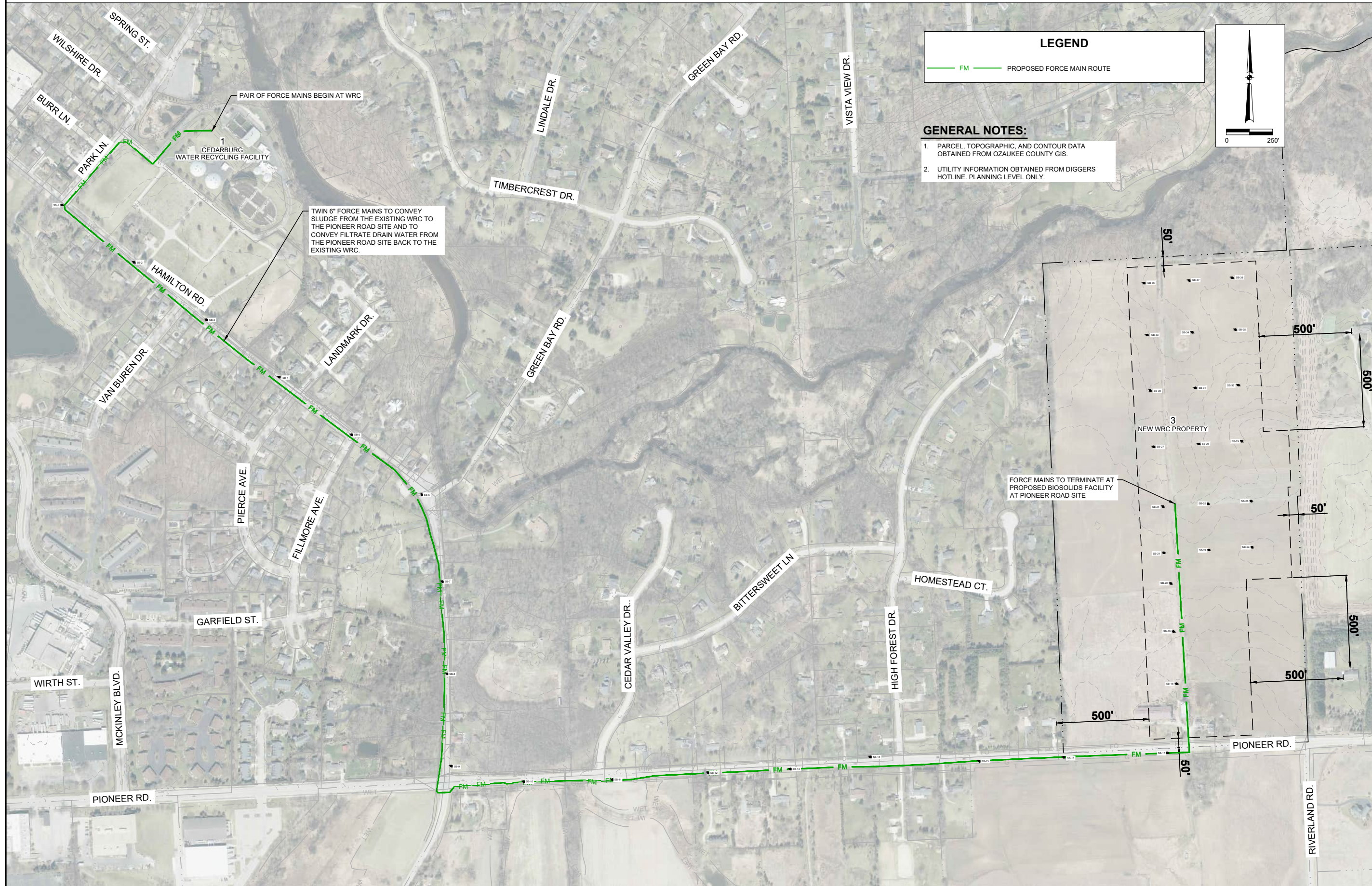
authority to condemn property for public use which includes roads, airports, parks, utilities, and wastewater treatment plants. Based on email correspondence from the Department in March of 2025, this site does not qualify for an AIS since the City already owns the property to be expanded upon. Email documentation is provided in Appendix B – Site Investigation.

5.1.3 ADDITIONAL CONVEYANCE ASSETS FOR BIOSOLIDS HANDLING

To utilize the existing WRC and expand the Pioneer Road site for Biosolids handling, conveyance structures are required to connect the two sites through a pipeline. In this Alternative, all existing wastewater flow is conveyed to the existing WRC using existing infrastructure. In section 5.1.1, two forcemains are described. One 6-inch for sludge to convey to the Pioneer Road site for Biosolids Handling and the other 6-inch to convey filtrate water back to the existing WRC for treatment and discharge. The alignment of the forcemains are identified in the attached Figure 5-5. The figure displays the existing Cedarburg sanitary sewer, storm sewer, and water mains. Other Utilities were contacted through Diggers Hotline to obtain planning level tickets. This was done to understand the space available for the future forcemains and to maintain proper offsets. The Utilities that responded were We Energies and Charter. The plan view of telephone, fiber optic, electrical and gas lines are displayed on the figures. An 8-foot offset is used for the watermain to the proposed sludge forcemains. Between each of the proposed forcemains a 4-foot offset was used. All existing utilities, proposed forcemains and allowable offsets can be aligned within the allowable right-of-way Hamilton Road, Green Bay Road, and Pioneer Road.

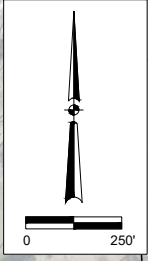
To convey sludge from the existing WRC site to the Pioneer Road site, the flow would be pumped in a forcemain. A second parallel forcemain would allow filtrate water from the Pioneer Road site to be pumped to the existing WRC for treatment. The pipe hydraulics and locations for valve vaults and cleaning access points would be confirmed during design. The piping and valve configuration at each site would allow either forcemain to be utilized for either flow for redundancy and scheduling of cleaning.

The City expressed concerns related to shallow bed rock locations along Green Bay and Hamilton Road. As part of a site investigation for the forcemain alignment, 39 soil borings were drilled along the proposed forcemain route and on the Pioneer Road site. Appendix D includes three expanded figures along the route with boring locations and notes where auger refusal occurred. A geotechnical report with the findings is provided in Appendix C. The report notes areas where alternative foundation or installation methods would have to be explored on the Pioneer Road site but no notable issues that would impact the ability to further develop the site. Along Boring B-1 to B-7 auger refusal did occur at varying depths which is noted in the geotechnical report. Boring B-1 to B-7 is located along Green Bay and Hamilton Road and confirms the City's suspicions about bed rock depth. When installing the forcemains or any future utility, it is expected that the excavation could take longer than expected and specialize techniques like blasting may be required. This should be investigated further during design. No geotechnical issues were noted at the boring at the future pump station property as well.



LEGEND

FM PROPOSED FORCE MAIN ROUTE



- GENERAL NOTES:**
1. PARCEL, TOPOGRAPHIC, AND CONTOUR DATA OBTAINED FROM OZAUKEE COUNTY GIS.
 2. UTILITY INFORMATION OBTAINED FROM DIGGERS HOTLINE. PLANNING LEVEL ONLY.

TWIN 6" FORCE MAINS TO CONVEY SLUDGE FROM THE EXISTING WRC TO THE PIONEER ROAD SITE AND TO CONVEY FILTRATE DRAIN WATER FROM THE PIONEER ROAD SITE BACK TO THE EXISTING WRC.

FORCE MAINS TO TERMINATE AT PROPOSED BIOSOLIDS FACILITY AT PIONEER ROAD SITE

OVERALL UTILITY PLAN ALTERNATIVE 1
 CITY OF CEDARBURG
 CITY OF CEDARBURG
 FACILITY PLAN PHASE 2
 CEDARBURG, WI.



SEP 2025

4524

5.2 MEMBRANE BIOREACTOR AND BIOSOLIDS UPGRADE AT EXISTING WRC

The existing WRC site is constrained with insufficient space for adding biosolids stabilization and handling. This alternative considers construction of a new membrane bioreactor (MBR) treatment system for secondary treatment, which would take the place of the current oxidation ditch, secondary clarifiers, and return activated sludge pumping. MBR treatment provides advanced treatment equivalent to secondary and tertiary treatment combined, which would eliminate the need for a tertiary filter system included in the previous alternative. The MBR system would be constructed on the open hill south of the maintenance building and west of the gravity thickener. After commissioning the new MBR system, the oxidation ditch, secondary clarifiers, and return activated sludge pumping structures would be demolished and provide sufficient footprint for construction of biosolids stabilization and handling facilities. This alternative keeps all facilities and operations within the existing WRC footprint.

5.2.1 IDENTIFIED UPGRADES

The upgrades shown in Table 5-2 are identified to correct the deficiencies discussed in the Chapter 3 treatment performance assessment, Chapter 3 facility condition assessment, and Chapter 4 capacity analysis. All upgrades would occur at the existing WRC site. This alternative identifies construction a new MBR system and a new biosolids stabilization, handling, and storage system at the existing site. The new biosolids system would include aerobic digestion, thickening, dewatering, and cake storage facilities. Construction of these new systems requires demolition of the existing oxidation ditch, secondary clarifiers, and RAS Pump Station.

Table 5-2 Identified Improvements for the MBR and Biosolids Upgrade to the Existing WRC

Structure	Recommended Improvement
Garfield Lift Station	<ul style="list-style-type: none"> • A mechanical screen and backup bar rack is needed at this station to protect the pumps and reduce downstream maintenance activities. • The structure requires an expansion to install a mechanical screen and backup bar rack. • Lift station pumps and valves are 35 years old and in need of replacement. • Air handling equipment and controls are 35 years old and in need of replacement. • Electrical MCC equipment is 35 years old and requires replacement. • Backup generator and automatic transfer switch requires replacement. • Rehabilitate concrete on inside of wetwell.

Structure	Recommended Improvement
Existing WRC Site	<ul style="list-style-type: none"> • Septage receiving uses a manhole. There is no rock trap or pad containment. Construct dedicated septage receiving station. • Sludge Loadout Station is 35 years old and requires refurbishment of concrete and replacement of piping and valves • Abandoned tankage from 1970 facilities west of vehicle storage will be demolished for site restoration. • This alternative replaces the buried piping and valves that are not part of the secondary treatment system being demolished. • Plant effluent system with pumping, piping, hydrants, and hose bibs should be considered for reuse of plant effluent for washdown water instead of City water. • This alternative replaces the buried electrical and controls wiring and conduits that are not part of the secondary treatment system being demolished. • Paved surfaces and drives have deteriorated and require mill and overlay • Portions of sidewalks have settled/deteriorated and require replacement • Portions of retaining walls have shifted and require replacement • Entrance gate should be replaced with updated, actuated gate for improved site security with remotes for pushbutton entry.
Bar Screen Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • Gates are all manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Grit mechanism and gear box is 35 years old and in need of replacement. • Rehabilitate concrete on inside of channel and chamber. • Electrical MCC equipment is 35 years old and requires replacement.
Administration Building	<ul style="list-style-type: none"> • Construct an administration building with offices, meeting room, restrooms, and laboratory. Building is estimated as a single story 3,000 ft² building.
Control Building	<ul style="list-style-type: none"> • Electrical switch gear and MCC equipment is 35 to 50 years old and requires replacement. • Backup generator is 35 years old and requires replacement • Air handling equipment and controls are 35 years old and in need of replacement. • Interior spaces for offices, laboratory, meeting room, locker room, breakroom are a mix of 35 to 50 years old and are in need of remodeling. Offices, laboratory, and meeting room will move to new administration building. Grade level floor will be partially remodeled for SCADA room and locker rooms. Remainder of space will be utilized for additional electrical room and installing maintenance access hatches into the basement with lifting monorails and hoists for equipment removal and maintenance activities. • SCADA system hardware and software should be updated for site and lift stations • Floor drains are deteriorated and plugged requiring refurbishment. • Sump pumps in building should be piped to influent wetwell to remove clear water from sludge storage tanks. • Several wall leaks require crack injection and sealing between building and sludge holding tanks. • Pump removal beams and hoists are needed for maintenance.

Structure	Recommended Improvement
	<ul style="list-style-type: none"> Influent pumps and valves are 35 years old and in need of replacement. Capacity of replacement pumps should be 4,200 gpm each to provide a firm capacity of 12 mgd. Replacement piping and valves should be sized for the increased capacity. Sludge loadout pumps, piping, and valves are 35 years old and in need of replacement
Oxidation Ditch	<ul style="list-style-type: none"> Remove existing equipment, demolish, and backfill existing structure.
Clarifiers	<ul style="list-style-type: none"> Remove existing equipment, demolish, and backfill existing structure.
RAS Building	<ul style="list-style-type: none"> Remove existing equipment, demolish, and backfill existing structure.
New Membrane Bioreactor System	<ul style="list-style-type: none"> Construct a new MBR system as combined secondary and tertiary treatment. This system is capable of meeting low level phosphorus treatment. The system would receive flow from the influent pump station and route through fine screening and pre-anoxic zones before entering the membrane bioreactor tanks. Ferric chloride or alum will be dosed to achieve low level phosphorus treatment. Treated effluent will be routed to the existing UV Disinfection building.
MBR Process Building	<ul style="list-style-type: none"> Construct a new process building attached on the west side of the MBR system. The process building will include the following rooms: blower, electrical, mechanical, pump, chemical storage and dosing, and storage.
UV Disinfection and Vehicle Storage	<ul style="list-style-type: none"> The UV disinfection equipment does not have sufficient capacity for projected 2045 peak flow treatment. This equipment package should be replaced with a system sized to treat a peak hour flow of 12 mgd. Air handling equipment and controls are 25 years old and in need of replacement. A building addition is needed. Currently using 2 storage containers for additional storage. Also, additional workshop space is needed and a welding booth. Overhead door access is limited. The abandoned tankage on the west side will be demolished and backfilled to restore that portion of the site. Overhead doors will be added to the west side of the building. Larger water line is needed for filling vector truck.
Gravity Thickener	<ul style="list-style-type: none"> Remove Gravity Thickener equipment, piping, and valves Demolish and backfill structure
Aerobic Sludge Holding Tanks	<ul style="list-style-type: none"> Rehabilitate aerobic sludge holding tanks as WAS holding tanks prior to thickening. Tank 1 is 50 years old. Tank 2 is 35 years old. Perform crack injection and concrete repair as necessary.
New Aerobic Digesters	<ul style="list-style-type: none"> After demolition and backfill of the existing oxidation ditch, secondary clarifiers, and RAS pump station, the WRC site will have open space for new biosolids stabilization, handling, storage, and loadout facilities. Construct two circular aerobic digester tanks approximately 50 feet in diameter where the oxidation ditch was for sludge stabilization. WAS will be pre-thickened using a gravity belt thickener prior to being conveyed to the digesters. Circular tanks provide compatibility with converting to anaerobic digesters in the future. Tanks would include diffused aeration and dome covers.

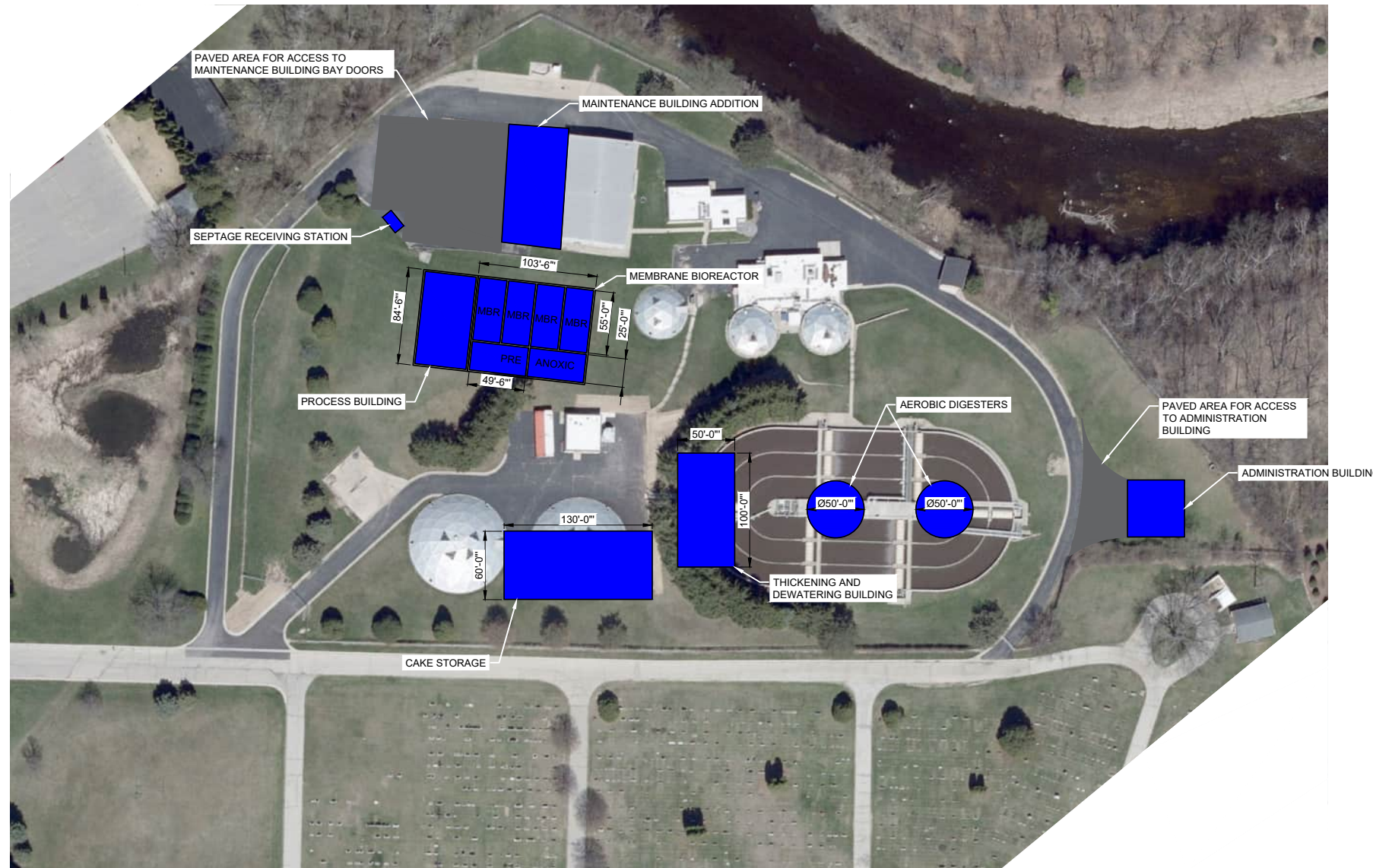
Structure	Recommended Improvement
<p style="text-align: center;">New Thickening and Dewatering Building</p>	<ul style="list-style-type: none"> • Construct a thickening and dewatering building approximately 3,600 ft² with basement, grade floor, and upper floor where the oxidation ditch was. The building would house the aerobic digester blowers, a gravity belt thickener to thicken WAS prior to the aerobic digesters, a belt filter press to dewater digested sludge into cake for storage and land application. Building will also house GBT and BFP feed pumps, GBT and BFP polymer feed systems, thickened sludge pumps, dewatered cake conveyor, and filtrate pumps to pump thickener and press filtrate along with any other process drain water through a pipe back to the beginning of the plant for treatment. • The building would have an isolated electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
<p style="text-align: center;">New Cake Storage Building</p>	<ul style="list-style-type: none"> • Construct a digested sludge cake storage building sized to hold 180 days of cake biosolids for land application. Dewatered cake sludge would be compatible with potential future Class A drying.

Figure 5-6 displays a conceptual site plan with the new structures identified in Table 5-2 shown on the existing WRC site.



GENERAL NOTES:

- 1. ONLY NEW STRUCTURES ARE SHOWN.



**NEW MEMBRANE
BIOREACTOR AND BIOSOLIDS
STORAGE SITE LAYOUT**



5.3 NEW WRC OFF PIONEER ROAD

The proposed site for a new WRC is located north of Pioneer Road and east of the existing WRC and is shown in Figure 5-4. The City owned property totals 116 acres of which 87 acres is usable for development. A previous study prepared by Symbiont in 2021 estimated a site requirement of 51.5 acres for the new WRC. A second study prepared by Symbiont evaluated and detailed several collection system and forcemain improvements to direct wastewater to the new site.

5.3.1 UNIT PROCESS TREATMENT UPGRADES

The upgrades shown in Table 5-3 were identified for construction of a new WRC at the Pioneer Road site. This alternative would eliminate all renovation and expansion upgrades at the existing WRC site. The existing WRC would be decommissioned, demolished, and the site would be restored into developable land following startup and commissioning of the new WRC.

Table 5-3 Identified Improvements for the New WRC Construction Alternative

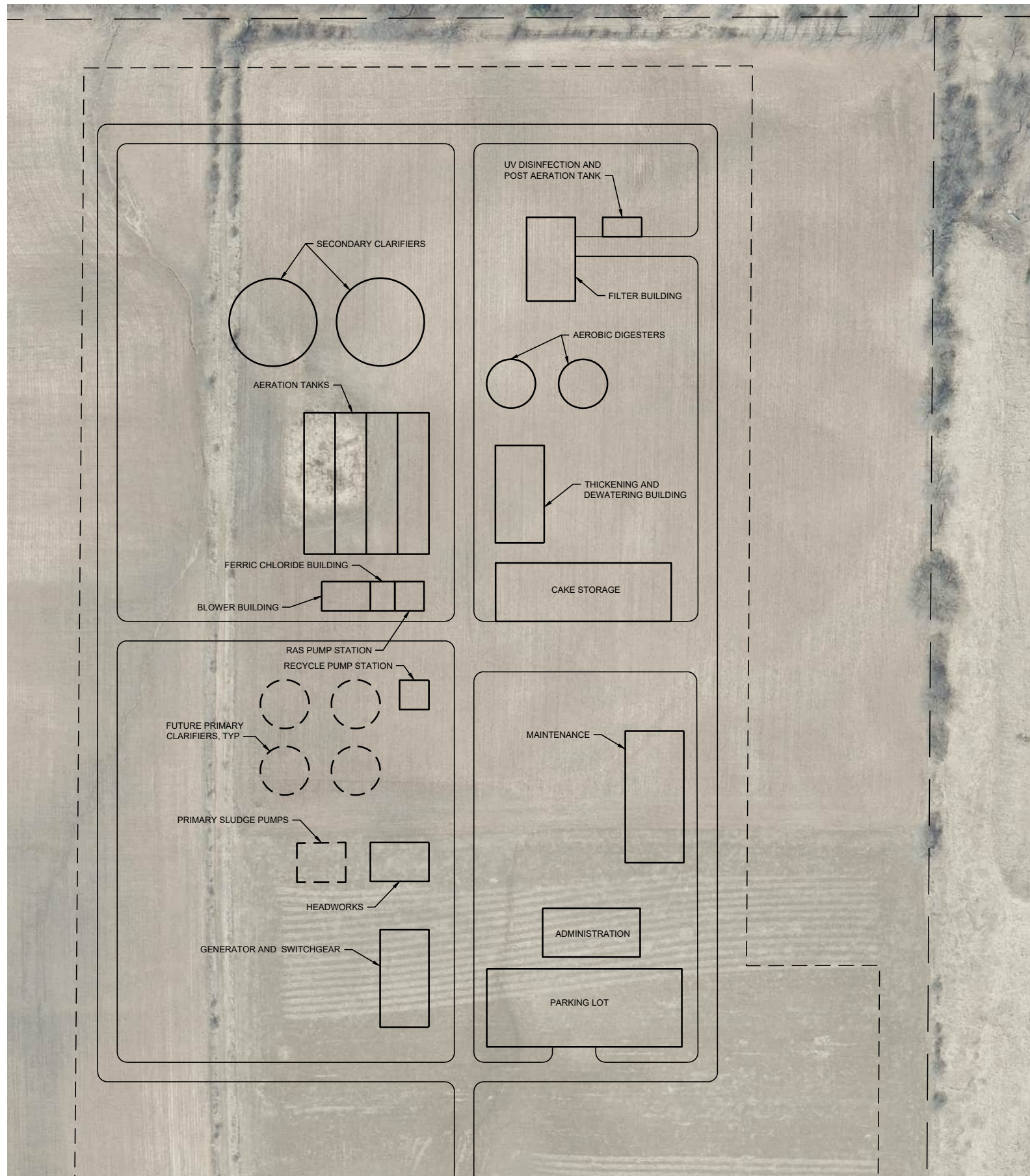
Structure	Recommended Improvement
Interceptors, Lift Station, and Forcemain to New WRC	<ul style="list-style-type: none"> • Construct a new gravity interceptor sewer from the corner of Hamilton Road and Park Lane to the intersection of Green Bay and Pioneer roads. • Construct a new gravity interceptor sewer from the location of Garfield Lift Station to the intersection of Green Bay and Pioneer roads. • Demolish the Garfield Lift Station and refurbish the site at that location. • Construct a new lift station at the intersection of Green Bay and Pioneer roads to pump the full collection system wastewater flow to the new WRC site located at the Pioneer Road site. The new lift station will include screening to protect the pumps and provide screening for the new WRC. The new lift station will include a backup generator and automatic transfer switch for backup power. • Construct a new forcemain along Pioneer Road from the new lift station to the topographic high point. • Construct a new gravity interceptor sewer from the topographic high point on Pioneer Road to the new WRC site.
WRC Site	<ul style="list-style-type: none"> • Construct dedicated septage receiving station. • Install buried piping between unit processes. • Install plant effluent washwater system with pumping, piping, hydrants, and hose bibs for reuse of plant effluent as washdown water instead of City water. • Install electrical service and construct electrical distribution system for buildings and unit processes including duct banks, conduit, cables, and site lighting. • Install site natural gas service and site piping to buildings. • Construct asphalt site roadways and parking areas. • Construct concrete sidewalks between buildings and unit processes. • Install site stormwater collection and conveyance piping and features. • Install a well for potable water service. • Install site fence and entrance gate for site security. Gate will have remote pushbutton entry.
Administration Building	<ul style="list-style-type: none"> • Construct an administration building with offices, restrooms, locker rooms, SCADA room, and laboratory. Building is estimated as a single story 5,000 ft² building.

Structure	Recommended Improvement
Process Drain Pump Station	<ul style="list-style-type: none"> Construct a process drain pump station to receive drain flows from any of the unit process tanks and channels. The submersible pump station would pump the drain flow to the headworks for treatment.
Headworks (Preliminary Treatment) Building	<ul style="list-style-type: none"> Construct a headworks building to house pumping, and grit removal processes. Building is estimated as a 2,000 ft² building with a basement and grade level. Equipment in the building would include three centrifugal influent pumps, one vortex grit tank with a grit pump in the basement, one grit washer, a dumpster bay, and various gates, piping, and valves. The building would have an isolated electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
Ferric Chloride Building	<ul style="list-style-type: none"> Construct a building for storage and dosing of ferric chloride to multiple unit processes. Building is estimated as a single story 750 ft² building housing one large chemical storage tank and multiple chemical dosing pumps. Coatings, equipment, and piping will be suitable for a corrosive environment.
Aeration Splitter Box	<ul style="list-style-type: none"> Construct a concrete splitter box to receive wastewater from the Headworks and split the flow using gates and weirs to four aeration basins.
Aeration Basins	<ul style="list-style-type: none"> Construct four aeration basins approximately 142 feet long and 30 feet wide for activated sludge secondary treatment. Basins would be configured with selectors for enhanced biological phosphorus removal (EBPR) and fine pore membrane disc aeration diffusers in the aerobic zones. DO and ORP probes would be installed to monitor conditions and provide data for automated aeration control. A network of aeration air piping and electrically actuated valves would be installed for the automated aeration control.
Blower Building	<ul style="list-style-type: none"> Construct a blower building to house the activated sludge aeration blowers and aerobic digester blowers. Building is estimated as a single story 1,500 ft² building housing four aeration blowers and three digester blowers. The building would have an electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
Clarifier Splitter Box	<ul style="list-style-type: none"> Construct a concrete splitter box to receive mixed liquor flow from the Aeration Basins and split the flow using gates and weirs to two clarifiers.
Clarifiers	<ul style="list-style-type: none"> Construct two clarifiers approximately 90 feet in diameter for receiving mixed liquor from the Aeration Basins, settling the suspended solids, and discharging the secondary effluent over a peripheral weir to a launder trough. Clarifiers would include surface skimming and scum removal equipment. Geodesic dome covers would be installed to protect the equipment from freezing and block sunlight to minimize algae growth in the tanks. The clarifier mechanisms would include an energy dissipating inlet and rapid sludge removal using a suction header. Stamford baffles would be installed in the clarifiers for improved performance during peak flows.
RAS/WAS Pump Building	<ul style="list-style-type: none"> Construct a RAS/WAS Pump building to house the RAS pumps, WAS pumps, and scum pumps. Building is estimated as a 900 ft² building with a basement and grade level. Three RAS pumps, two WAS pumps, and two scum pumps would be located in the basement.

Structure	Recommended Improvement
	<ul style="list-style-type: none"> The building would have an electrical room on the grade level for control panels, PLC panel, MCC sections, power panel, and lighting panel.
New Tertiary Filter Building	<ul style="list-style-type: none"> Construct a new tertiary filter building to meet total phosphorus limits. Building will receive secondary effluent from the clarifiers and route flow through a series of channels and gates to a treatment train consisting of coagulant addition, rapid mix tank, coagulation tank, polymer addition, flocculation tank, and two cloth media disc filters. Building is estimated as a single story 4,300 ft² building. The building will include the following rooms: electrical, mechanical, coagulant storage and dosing, polymer storage and dosing, and process room with tankage for rapid mix, coagulation, flocculation, and filtration. Filtered effluent will be routed to UV Disinfection.
UV Disinfection Building	<ul style="list-style-type: none"> Construct a UV Disinfection building to house the channels and equipment for UV disinfection. Building is estimated as a single story 800 ft² building. Gates will be installed to direct flow through either the UV disinfection equipment or the bypass channel. The building would have an electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
Post Aeration Tank and Outfall	<ul style="list-style-type: none"> Construct a post aeration tank approximately 40 feet long and 20 feet wide for meeting effluent DO limits. DO probes would be installed to monitor conditions. A network of air piping, valves, and fine pore membrane disc diffusers would be installed for aeration. Two blower packages with outdoor enclosures would be installed near the tank and piped to the aeration system. An outfall pipe would be installed from the post aeration tank to the Milwaukee River outfall to convey treated effluent to the river.
Aerobic Digesters	<ul style="list-style-type: none"> Construct two circular aerobic digester tanks approximately 50 feet in diameter for sludge stabilization. Sludge will be conveyed to the digesters by the WAS pumps. Circular tanks provide compatibility with converting to anaerobic digesters in the future. Tanks would include diffused aeration and dome covers.
Thickening and Dewatering Building	<ul style="list-style-type: none"> Construct a thickening and dewatering building approximately 3,600 ft² with basement, grade floor, and upper floor. The building would house a gravity belt thickener (GBT) to thicken sludge prior to aerobic digestion, a belt filter press (BFP) to dewater digested sludge into cake for storage and land application. Building will also include GBT and BFP feed pumps, GBT and BFP polymer feed systems, thickened sludge pumps, and dewatered cake conveyor. The building would have an isolated electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
Cake Storage Building	<ul style="list-style-type: none"> Construct a digested sludge cake storage building sized to hold 180 days of biosolids for land application (approximately 10,800 ft²). Building would be a pre-engineered metal building with partially open walls (not fully enclosed). Dewatered cake sludge would be compatible with potential future Class A drying.

Structure	Recommended Improvement
Maintenance Garage	<ul style="list-style-type: none"> • Construct a maintenance garage approximately 8,000 ft² to house WRC vehicles and a workshop. • Building would be a pre-engineered metal building with heat, ventilation, and insulation. • Building would be arranged with four drive through bays plus the workshop.

Figure 5-7 displays a conceptual site plan with new structures identified in Table 5-3 shown on the Pioneer Road site.



GENERAL NOTES:

1. NOT ALL IDENTIFIED IMPROVEMENTS ARE SHOWN
2. SEE TABLE 5-2 FOR LIST OF IDENTIFIED IMPROVEMENTS.

**NEW WRC OFF PIONEER ROAD
SITE WITH RECOMMENDED STRUCTURES**



**Figure 5-7
New Site Layout**
City of Cedarburg
Water Recycling Center
New Site Layout
Cedarburg, WI



5.3.2 ADDITIONAL CONVEYANCE ASSETS FOR NEW WRC

New conveyance assets are needed for routing all wastewater flow to the new Pioneer Road site. Figure 5-8 displays the route for the interceptor sewers and forcemains along with the location of a new lift station. In this Alternative, a new gravity interceptor would be constructed from the corner of Hamilton Road and Park Lane to the intersection of Green Bay and Pioneer Road. A new lift station would be constructed at this location, which is land currently owned by the City, to pump all wastewater to the Pioneer Road site. The Garfield lift station would be demolished, and the site would be reclaimed. A new forcemain would be constructed from the new pump station to a high point in Pioneer Road, which is approximately at High Forest Drive. At this point, the forcemain would transition to a gravity interceptor sewer. Utilizing gravity flow would reduce the pump size required.

Figure 5-8 displays the existing Cedarburg sanitary sewer, storm sewer, and water mains. Other Utilities were contacted through Diggers Hotline to obtain planning level tickets. This was done to understand the space available to maintain proper offsets. The Utilities that responded were We Energies and Charter. The plan view of telephone, fiber optic, electrical and gas lines are displayed on the figures. An 8-foot offset is used for the watermain to the proposed forcemain and gravity sewer. All existing utilities, proposed forcemain, interceptor sewer, and allowable offsets can be aligned within the allowable right-of-way Hamilton Road, Green Bay Road, and Pioneer Road.

The City expressed concerns related to shallow bed rock locations along Green Bay and Hamilton Road. As part of a site investigation for the forcemain and sewer alignment, 39 soil borings were drilled along the proposed route and on the Pioneer Road site. Appendix D displays three expanded figures with the boring locations and notes where auger refusal occurred. A geotechnical report with the findings is provided in Appendix C. The report notes areas where alternative foundation or installation methods would have to be explored on the Pioneer Road site but no notable issues that would impact the ability to further develop the site. Along Boring B-1 to B-7 auger refusal did occur at varying depths which is noted in the geotechnical report. Boring B-1 to B-7 is located along Green Bay and Hamilton Road and confirms the City's suspicions about bed rock depth. When installing the sewer or any future utility, it is expected that the excavation could take longer than expected and specialize techniques like blasting may be required. This should be investigated further during design. No geotechnical issues were noted at the boring at the future pump station property as well.

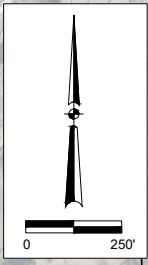


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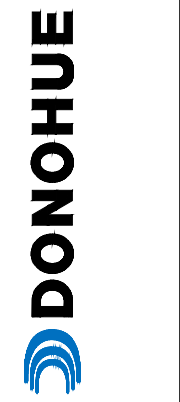
FM PROPOSED FORCE MAIN ROUTE

SAN PROPOSED GRAVITY SEWER ROUTE

- GENERAL NOTES:**
1. PARCEL, TOPOGRAPHIC, AND CONTOUR DATA OBTAINED FROM OZAUKEE COUNTY GIS.
 2. UTILITY INFORMATION OBTAINED FROM DIGGERS HOTLINE. PLANNING LEVEL ONLY.



OVERALL UTILITY PLAN ALTERNATIVE 3
 CITY OF CEDARBURG
 CITY OF CEDARBURG
 FACILITY PLAN PHASE 2
 CEDARBURG, WI.



SEP 2025

4524

5.4 TREATMENT TO MMSD

As part of the alternatives analysis, connection to MMSD was also evaluated. MMSD is a regional metropolitan sewerage district that serves 29 communities in the Greater Milwaukee Area. Wastewater flow from these communities is discharged through a network of sanitary sewer assets to either South Shore Water Reclamation Facility (WRF) in Oak Creek or Jones Island WRF in Milwaukee. Typically, dry weather flow is conveyed to South Shore. Wet weather peak flow, the City of Milwaukee, and the Village of Shorewood flow is conveyed to Jones Island. The Inline Storage System can also be utilized for communities where dry weather flow is typically routed to South Shore WRF. For purposes of this evaluation, Cedarburg's flow would likely be conveyed to South Shore WRF.

Communities that are within Milwaukee County are considered member communities and communities outside of Milwaukee County would be considered non-member communities. The designation of non-member versus members is applicable for the assessment of sewer rates. MMSD has taxing jurisdiction in Milwaukee County, therefore they can directly tax property owners in the County. Non-community members are taxed through their governing municipality. In this case Cedarburg is considered a non-member community.

This alternative is a regional approach to wastewater treatment. Conceptually Cedarburg would abandon their current WRC and transfer all wastewater treatment responsibilities to MMSD. Cedarburg would still maintain their existing local conveyance system, new conveyance system for delivering wastewater to MMSD's collection system, and be subject to meeting the rules established by MMSD. There are several government agencies involved with this option. They include MMSD, Southeastern Wisconsin Regional Planning Commission (SEWRPC) and Wisconsin DNR (WDNR). Each agency would have to approve this alternative through their own approval process. The timeline for this approval can be lengthy. A number of other entities may be involved in the approval of the new collection system facilities depending upon the routing of new infrastructure. Note there may be principal forgiveness funding available through the Clean Water Loan program based on regionalization. Currently the principal forgiveness amount is capped at \$3M for a qualifying project.

5.4.1 MMSD PROCESS FOR ACCEPTANCE

The City of Cedarburg, MMSD, and Donohue met on June 30, 2025, to discuss the process of connection to MMSD. At that meeting, MMSD stated that the evaluation of Cedarburg's flow would have to be conducted in the next Facility Plan. The Facility Plan is slated to begin in 2027 with submission to the WDNR in 2030. This Facility Plan would conduct a conveyance capacity analysis on the metropolitan interceptor sewers that MMSD owns which convey flow to South Shore WRF. Cedarburg's flow would discharge in MMSD's system at County Line Road. There is a metropolitan interceptor sewer in County Line Road that conveys flow to South Shore WRF. The Facility Plan would further evaluate WRF hydraulic, treatment, and biosolids capacity specifically at South Shore WRF.

It would be recommended that Cedarburg makes a formal recommendation to MMSD and SEWRPC to begin this process prior to 2027.

MMSD has outlined the steps required for approval and acceptance:

- Agreement between SEWRPC's Regional Water Quality Management Plans and District plans
 - See section on SEWRPC Coordination below

- WDNR approval
- MMSD Commission approval to add Cedarburg to the District
- Discussions with MMSD's Technical Advisory Team (TAT) to get input on addition of Cedarburg
 - The TAT are representatives from each community that MMSD's serves. Typically, the representative is from public works or engineering.
- Evaluation of capital improvements needed to add Cedarburg and alternatives analysis of adding Cedarburg versus not adding Cedarburg
 - This evaluation would be completed as part of the 2030 Facility Plan.
- Evaluation of impacts to District operations and maintenance from addition of Cedarburg

Considerations to South Shore WRF Operations:

Based on existing flow capacity and operations at South Shore WRF, the additional Cedarburg flow could lead to further WRF upgrades, evaluations, and impacts. Cedarburg's average daily flow of 2.8 mgd is approximately 1.5-2% of the average flows and loadings that South Shore WRF typically receives. South Shore WRF is designed for 300 mgd to 375 mgd (after first flush) peak hour flow. This capacity is frequently reached during wet weather events. An additional 12 mgd of Cedarburg's peak flow could require increased hydraulic capacity at South Shore WRF. There are opportunities for storage and increased travel time of the peak flow through the conveyance and tunnel system, particularly the Inline Storage System. This would have to be evaluated and determined during the Facility Plan Analysis that MMSD would conduct after the request is made.

In addition to overall plant hydraulic capacity a number of process areas could be impacted. The noted areas are outlined below:

- Preliminary treatment capacity – Capacity limited to 375 mgd. If there is no increase, then likely there would not be an issue.
- Primary treatment capacity – Current District Project S01013. Unknown what the design capacity is. The existing primary treatment process system is likely at max capacity.
- Secondary treatment capacity -
 - Current District project S02015. Scope includes a full redesign of the aeration basins. Project is currently under construction. It is assumed that the 2050 future flows and loadings were used as design parameter. This system could likely handle additional flow but would have to be confirmed.
 - Secondary clarifiers. Max capacity is 300 mgd. There is a 75 mgd bypass of secondary treatment for 375 mgd. If no change to 375 mgd, then no issue.
 - Return activated sludge pumping – Current District Project 2018 in construction. Scope includes replacement of seven of the eight pumps. Likely additional capacity is available.

- Disinfection capacity - Current District Project S03006 in design. Scope includes rehab and replacement of equipment. If no change to 375 mgd, then no issue.
- Biosolids capacity – Current District Projects S04029 and S04039 in design. Both projects provide new and rehab biosolids storage, capacity and processing. Likely additional capacity is available or could accommodate based on the project schedule. This would have to be confirmed.

Coordination with SEWRPC:

SEWRPC was contacted in June of 2025 to discuss the potential obstacles with connection to MMSD's service area. The first notable obstacle is a gap between City of Mequon's sewer service area and Cedarburg. A snapshot of the gap is provided below in Figure 5-9. A full version of the map is located on SEWRPC website or [here](#). SEWRPC states that a contiguous sewer service area must be developed; however, per input provided by SEWRPC via email exchange, there is an exception to regional interceptor sewers where gaps can occur. The intent of a regional interceptor sewer is to provide conveyance from one community to another where sanitary sewer service in the gap will not be provided within the planning horizon.

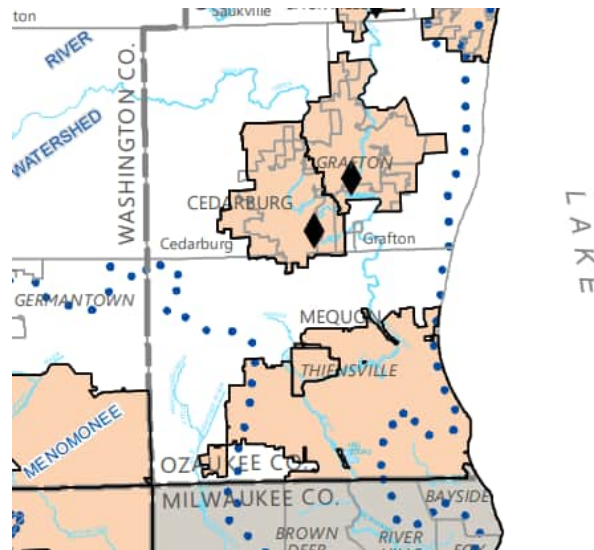


Figure 5-9 Map of State Approved Sewer Service Areas

The capital infrastructure that Cedarburg would construct to convey flow to MMSD would be considered a regional interceptor sewer. The installation of this infrastructure would eliminate the gap by providing a regional interceptor sewer. SEWRPC advised that a SSA (Sewer service area) amendment and update should be completed. This would be done under the advisement of SEWRPC staff. It was also noted that any expansion of the SSA should be coordinated with local regional plans and municipalities.

The City of Mequon staff has been made aware of this effort and has been a resource in providing insight.

5.4.2 CAPITAL INFRASTRUCTURE IMPROVEMENTS

Extensive capital infrastructure would be needed for this option to be feasible. Cedarburg would have to convey flow to County Line Road. MMSD has identified manhole 14853 in the public right-of-way near West County Line Road and North Green Bay Road in Brown Deer. A snapshot from MMSD's GIS system provides the manhole below in Figure 5-10. A 48-inch pipe discharges south of the manhole. This pipe will likely need to increased capacity to accept Cedarburg's flow.



Figure 5-10 MMSD's Existing Infrastructure in County Line Road

For a conceptual layout of the infrastructure needed, Cedarburg's projected buildout peak flow of 12 mgd and average annual daily flow of 2.8 mgd was used. Two 20-inch forcemains would be constructed from a pump station at the northwest corner of Green Bay Road and Pioneer Road. One forcemain could convey Cedarburg's average dry weather flow of 2.8 mgd with a 2 foot per second velocity.

Two feet per second is an acceptable velocity for sewers and provides a cleansing velocity to reduce solids accumulation. A redundant forcemain would be installed to provide reliability and handle peak flows. During periods of wet weather, both forcemains would be operational. The maximum velocity in the forcemains would be 4.3 feet per second. This is an acceptable velocity.

To minimize the septicity in the wastewater flow due to the extended travel time, treatment would be provided in the forcemain at the Lift Station. An ozone system will be included in the alternative analysis cost to provide treatment to the septicity of the wastewater.

Table 5-4 Required Infrastructure for Alternative 4

Asset	Purpose
Lift Station	City owned parcel on Green Bay Road and Pioneer Road. This station would house the pumps required to convey flow to the discharge point. Ozone treatment would be done at the effluent at this location.
2-20" HDPE Forcemains	Convey dry weather and wet weather flow from the proposed lift station to Manhole 14853 approximately 6 miles.
Air Release Valves	Air release valves would be placed to release trapped air in the pipeline and optimize peak performance.
Access vaults	Due to the length of the pipeline, access vaults with valving would be located along the forcemain. This provides access for cleaning and general maintenance. Based on location, the City would have to purchase land for these structures.
New Administration and Maintenance Building	A new administration and maintenance building will be constructed with a combination of office space and maintenance garage. The public works staff responsible for administration, collection system operation, and collection system maintenance will no longer have office space and maintenance garage at the demolished WRC site.

A conceptual layout of the forcemains is provided in Figure 5-11. It should also be noted that the WDNR is generally in favor of regionalize treatment facilities and offers principal forgiveness loans up to a certain dollar value that could be utilized for construction of the assets noted in Table 5-4.

It is expected that MMSD’s infrastructure in County Line Road would need to be enhanced in order to accept Cedarburg average dry weather and wet weather flow. Cedarburg was made aware during the June 30, 2025 meeting with MMSD, that improvements to MMSD assets as a result of acceptance of Cedarburg’s flow would be incorporated into MMSD sewer rates. Cedarburg would not be individually assessed for the infrastructure upgrade. It is also expected that there might required improvements at South Shore WRF. But again, any improvements would be included in MMSD’s capital budget.

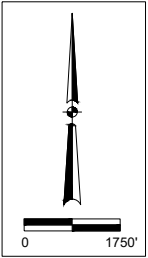
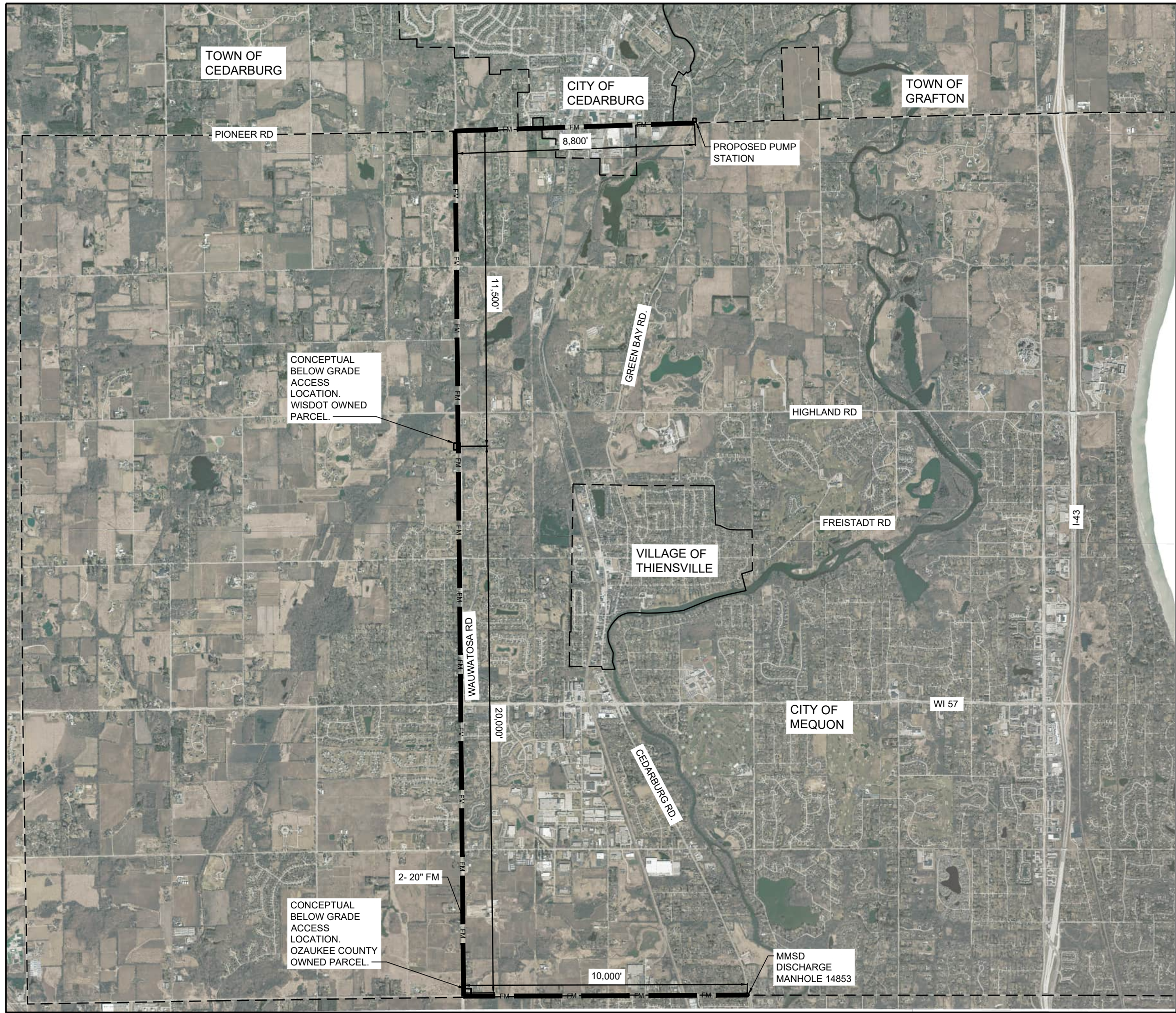


FIGURE 5-11
MMSD CONCEPTUAL FORCEMAIN LAYOUT
 CITY OF CEDARBURG
 WATER RECYCLING CENTER FACILITY PLAN
 MMSD CONCEPTUAL LAYOUT

CEDARBURG, WI



SEP 2025

4524

MMSD Sewer Rates:

With this alternative, Cedarburg would be subject to MMSD's sewer rates. Since Cedarburg would be a non-member community like Mequon, their rates are explained in the cost recovery manual ([Manual](#)) For purposes of understanding the sewer rates Cedarburg would be subject to, Mequon's rates will be utilized as a benchmark. MMSD rates are broken down to a volumetric charge and a connection charge. The volumetric charge is comprised of flow, BOD, and TSS. The total flow per resident is a combined charge from domestic wastewater, watercourse fee, and green infrastructure. The breakdown of each source of flow is provided below.

Flow:

Domestic: The predominant source of wastewater flow is residential generated flow. Residential rates are generated using an Equivalent Residential Unit (ERU) which is the average number of people residing in a residence. Mequon's ERU is 2.29. Domestic flow is 49 gallons/capita/day across MMSD's service area. For Mequon, this is \$1.64/1000 gallons used. It is assumed that the residential properties discharge the amount of water they utilize and the 1000 gallon usage is based on their water bill.

Watercourse: Non-member communities are subject to watercourse fee based on the watershed they reside. For Cedarburg, Mequon's rates are applicable as they both reside in Milwaukee River Watershed. Mequon's rate is \$0.09/1000 gallons used.

Green Infrastructure: In 2017, MMSD amended a Commission Policy 1-11.05 to allow non-member communities to be billed differently for Green Infrastructure. Mequon's rate is \$1.73/1000 gallons used.

Total Flow Rate is \$1.73/1000 gallons.

Volumetric Charge:

The volumetric charge is the flow rate, plus the cost to treat BOD and TSS per ERU. These fees across the service area are based on community. Mequon's rates are:

- BOD: \$0.30/1000 gallons
- TSS: \$0.67/1000 gallons
- Flow: \$1.73/1000 gallons

With the sum of these three parameters, the total volumetric flow charge is \$2.70/1000 gallons.

MMSD also applies an annual connection fee to each residential unit of \$60.14. The Cost Recovery manual states that the average household charge is annually \$170.94 for Mequon residents. To develop the annual fee, MMSD utilizes the domestic flow of 49 gallons/capita/day x 2.29 (Mequon's ERU) x 365 days in a year x \$2.70 divided by 1000 gallons. It would be assumed that likely Cedarburg's domestic wastewater is similar to Mequon's. City of Cedarburg Housing Data report for 2024 ([2024 Housing Data Report](#)) includes the number of housing units is 5,390. The City's website includes the current population as 12,121. This data is utilized to calculate a ERU of 2.25. A general calculation using Mequon's volumetric charge is approximately, the domestic flow of 49 gallons/capita/day x 2.25 (Cedarburg's ERU) x 365 days in a year x \$2.70 divided by 1000 gallons is \$108.65 plus the connection fee of \$60.14. This would result in approximately \$168.76 per year for each Cedarburg's housing unit.

Commercial customers are evaluated based similar calculations. The standard industry code and wastewater strengths are also considered when building the volumetric charges. It is recommended that Cedarburg coordinate with MMSD and the commercial users to understand the impact of the charges.

Operation and Maintenance:

Each community member must adhere to MMSD's rules and regulations. The chapters that would impact Cedarburg routinely are Chapter 3 and Chapter 13.

Chapter 3 is Management, Operations, and Maintenance of Tributary Sewers. This chapter defines that all public and private sewers that are tributary to the MMSD treatment system are maintained to standard level. The notable areas that should be evaluated are roof drain connections, peak flow rate reduction, sewer cleaning, and annual reporting. It likely that Cedarburg is already maintaining their sewers to standards acceptable to MMSD.

Chapter 13 is Surface Water and Stormwater. This chapter is only for stormwater quantity not quality. So, the City of Cedarburg's Title 14 Chapter 2 for quality would likely still be applicable. There should be a comparison of the quantity regulation between MMSD and City of Cedarburg's existing stormwater guidelines. Title 14 Chapter 2 uses peak discharge rate reduction while MMSD's chapter 13 uses a runoff release rate method. There is also a component of disturbed area when considering the volume permitted to runoff. This rule would likely not impact future development in Cedarburg greatly.

5.5 ALTERNATIVES EVALUATION

The alternatives evaluation presented in this report considers economic and non-economic factors, as discussed below. The economic and non-economic analyses were performed in parallel, and an alternative is recommended based upon both factors.

The four alternatives to be evaluated are listed below:

1. Alternative 1- Upgrades and Expansion of Existing WRC
2. Alternative 2- Membrane Bioreactor and Biosolids Upgrade at Existing WRC
3. Alternative 3- New WRC Off Pioneer Road
4. Alternative 4- Treatment to MMSD

5.5.1 PRESENT WORTH ANALYSIS

The economic component of the alternatives evaluation involved developing a 20-year total present worth (TPW) for each alternative. The 20-year TPW was based on each alternative's capital and annual costs. The WDNR mandated discount rate of 2.625% was used for the 20-year TPW life-cycle calculations. Assumptions required for the 20-year TPW analysis are provided in Table 5-5. Electricity and natural gas escalation rates were taken from the National Institute of Standards (NIST), Annual Supplement to NIST Handbook 135 (2022) and the companion Energy Escalation Rate Calculator. Initial unit energy costs were based on recent utility bills and are provided in

Table 5-6. The 20-year TPW also included annual operation and maintenance (O&M) costs, discussed in the next section, and salvage costs. Buried piping, buildings, and structures were assumed to have a lifespan of approximately 40 years. Thus, half of the initial capital costs were included as salvage values in year 20 of the TPW analysis. All other equipment was assumed to have a lifespan of 20 years and would not be salvaged at the end of the 20-year TPW.

Table 5-5 Discount and Energy Escalation Rates

Parameter	Value
Discount Rate	2.625% ¹
Electricity Escalation Rate (0-5 years)	0.5% ²
Electricity Escalation Rate (6-20 years)	1.0% ²
Natural Gas Escalation Rate	1.5% ²

¹ WDNR Guidance per NR 110.09(1)(a)

² National Institute of Standards, Annual Supplement to NIST Handbook 135 (2022) and Companion Energy Escalation Rate Calculator.

Table 5-6 Initial Unit Energy Costs

Parameter	Value
Electricity	\$0.11 per kWh
Natural Gas	\$1.02 per therm

5.5.2 OPERATION AND MAINTENANCE COSTS

The existing facility's annual cost (2023 Budget) is \$3,970,000. Additional O&M costs for Alternative 1, 2, 3, and 4 are shown in Table 5-7, Table 5-8, Table 5-9, and Table 5-10 respectively.

Alternative 1 and 3 include two new processes: tertiary filtration and biosolids handling. However, the O&M costs for tertiary filtration and biosolids handling should be similar between the alternatives. The O&M costs associated with the new tertiary filter building shown in Table 5-7 and Table 5-9 are expected to be the same. However, because the biosolids handling facility would be separate from the main WRC with Alternative 1, Alternative 1 was assumed to require more staffing and thus would incur higher O&M costs, as shown in Table 5-7. Lastly, the new equipment for the new facility (Alternative 3) is expected to be more efficient than the older Alternative 1 equipment. For this analysis, the newer Alternative 3 equipment was assumed to be approximately 10% more efficient than the older Alternative 1 equipment, which equates to an annual electricity efficiency credit of \$10,700.

Alternative 2 also includes two new processes: membrane bioreactor and biosolids handling. The O&M costs for the biosolids handling should be similar between Alternative 2 and Alternative 1 and 3. The O&M costs for the new membrane bioreactor system and biosolids handling are shown in Table 5-8.

Since Alternative 4 includes decommissioning of the existing plant and sending treatment to MMSD, the associated O&M costs are identified as credits as shown in Table 5-10.

Table 5-7 Alternative 1 Tertiary Filter Building and Biosolids Handling O&M Costs

Operation and Maintenance Costs	# of Units	Units	\$/units	Annual Cost
Tertiary Filter Building				
Ferric Chloride Chemical	20,440	gal/yr	\$3.00	\$61,320
Polymer Chemical	6,935	lb/yr	\$2.00	\$13,870
Maintenance and Repair	1	LS	\$54,000	\$54,000
Annual Power	1	LS	\$15,177	\$15,177
Staffing	0.25	person/yr	\$86,000	\$21,500
Annual O & M Cost				\$165,867

Biosolids Handling				
Thickening Polymer	5,110	lb/yr	\$2.00	\$10,220
Dewatering Polymer	9,855	lb/yr	\$2.00	\$19,710
Maintenance and Repair	1	LS	\$120,240	\$120,240
Annual Power	1	LS	\$68,054	\$68,054
Staffing	1	person/yr	\$86,000	\$86,000
Contract Hauling Credit	50%	/yr	\$350,000	(\$175,000)
Annual O & M Cost				\$129,204

Table 5-8 Alternative 2 Membrane Bioreactor and Biosolids Handling O&M Costs

Operation and Maintenance Costs	# of Units	Units	\$/units	Annual Cost
Membrane Bioreactor				
Ferric Chloride Chemical	20,440	gal/yr	\$3.00	\$61,320
MBR Cleaning Chemical	7,300	gal/yr	\$4.00	\$29,200
Maintenance and Repair	1	LS	\$100,000	\$100,000
Annual Power	1	LS	\$158,994	\$158,994
Staffing	0.33	person/yr	\$86,000	\$28,380
Annual O & M Cost				\$377,894
Biosolids Handling				
Thickening Polymer	5,110	lb/yr	\$2.00	\$10,220
Dewatering Polymer	9,855	lb/yr	\$2.00	\$19,710
Maintenance and Repair	1	LS	\$120,240	\$120,240
Annual Power	1	LS	\$57,214	\$57,214
Staffing	1	person/yr	\$86,000	\$86,000
Contract Hauling Credit	50%	/yr	\$350,000	(\$175,000)
Annual O & M Cost				\$118,384

Table 5-9 Alternative 3 Tertiary Filter Building and Biosolids Handling O&M Costs

Operation and Maintenance Costs	# of Units	Units	\$/units	Annual Cost
Tertiary Filter Building				
Ferric Chloride Chemical	20,440	gal/yr	\$3.00	\$61,320
Polymer Chemical	6,935	lb/yr	\$2.00	\$13,870
Maintenance and Repair	1	LS	\$54,000	\$54,000
Annual Power	1	LS	\$15,177	\$15,177
Staffing	0.25	person/yr	\$86,000	\$21,500
Annual O & M Cost				\$165,867
Biosolids Handling				
Thickening Polymer	5,110	lb/yr	\$2.00	\$10,220
Dewatering Polymer	9,855	lb/yr	\$2.00	\$19,710
Maintenance and Repair	1	LS	\$120,240	\$120,240
Annual Power	1	LS	\$57,214	\$57,214
Staffing	0.5	person/yr	\$86,000	\$43,000
Contract Hauling Credit	50%	/yr	\$350,000	(\$175,000)

Electricity Efficiency Credit	10%	/yr	\$107,000	(\$10,700)
Annual O & M Cost				\$64,684

Table 5-10 Alternative 4 Treatment to MMSD O&M Costs

Operation and Maintenance Costs	# of Units	Units	\$/units	Annual Cost
Maintenance and Repair Credit	1	LS	\$284,000	(\$284,000)
Staffing Credit	1	LS	\$430,000	(\$430,000)
Contract Hauling Credit	1	LS	\$350,000	(\$350,000)
Annual Power Credit	1	LS	\$74,900	(\$74,900)
Natural Gas Credit	1	LS	\$4,000	(\$4,000)
Chemicals Credit	1	LS	\$16,000	(\$16,000)
Annual O & M Cost				(\$1,158,900)

5.5.3 TOTAL PRESENT WORTH EVALUATION

Table 5-11 shows the capital costs, average annual costs (in addition to the current WRC annual costs), and the 20-year TPW costs. Alternative 1 had the lowest capital costs and the lowest 20-year TPW. Alternative 4 the lowest overall average annual costs. The full opinion of probable cost is provided in Appendix D.

Table 5-11 Cost Summary Table

Alternative	Capital Costs (\$)	Additional Annual (\$)	20-year TPW (\$)
1	83,370,000	295,000	85,547,000
2	88,468,000	496,000	96,183,000
3	134,518,000	231,000	130,885,000
4	109,152,000	(1,159,000)	85,290,000

5.5.4 RESIDENTIAL USER RATE COMPARISON

The current average residential user rate is \$64.96 per month. In order to compare potential impacts to residential user rates, the estimated capital cost for each alternative was converted into an annual debt service payment assuming the Clean Water Fund Loan program is utilized for a 20-year term loan at the current subsidized interest rate of 2.475%. The estimated annual debt service payment along with the additional annual operation and maintenance cost was inputted into the City’s sewer rate model to estimate average residential user rates for each alternative. Table 5-12 shows the estimated average residential user rates for each alternative. These estimated user rates are for comparison of alternatives only. A rate study will be necessary to determine recommended rates.

Table 5-12 Average Residential User Rate Comparison

Alternative	Estimated Annual Debt Service	Estimated Annual O&M Increase	User Rate Fixed Monthly Charge	User Rate Monthly Volume Charge	Estimated Monthly Residential User Rate
1	\$5,335,261	\$295,000	\$18.90	\$30.17	\$148.61
2	\$5,661,575	\$496,000	\$18.90	\$31.81	\$155.69
3	\$8,608,579	\$231,000	\$18.90	\$40.18	\$191.67
4	\$6,985,263	(\$1,159,000)	\$18.90	\$30.78	\$151.24

5.5.5 NONMONETARY CONSIDERATIONS

The non-economic component of the alternatives evaluation included factors that are not easily or directly translated into costs. A discussion of the non-economic considerations is provided in the following section.

Location

Alternative 1:

Figure 5-2 shows the location of Alternative 1 at the existing WRC site. Alternative 1 is both an update and expansion of the existing facility and utilizes existing infrastructure and space to the maximum possibility. However, the location of Alternative 1 has a few drawbacks. First, the existing location is close to residential areas, providing minimal buffer between the facility operations and residents. Septage trucks that frequent the facility must drive through residential areas on residential streets. The proximity also requires increased scrutiny of odors, lighting, and noises, which could result in complaints from neighbors. Second, the site is landlocked, and there is little space for future expansion. There isn't enough space to fit the Alternative 1 proposed treatment system, requiring the proposed new biosolids handling to be built at the Pioneer Road location. Figure 5-3 shows the location for the new biosolids handling facility at the Pioneer Road location. Further future expansions would also need to be located at the Pioneer Road location. Third, the existing site was built on a hill, requiring retaining walls, which reduces accessibility between buildings and around the site. Lastly, the site is prime land for additional residential development.

Alternative 2:

Figure 5-6 shows the location of Alternative 2 at the existing WRC site. Alternative 2 is an upgrade of the existing facility and utilizes existing infrastructure and space to the maximum possibility. Alternative 2 will have similar drawbacks to Alternative 1. The existing location is close to residential areas, providing minimal buffer between the facility operations and residents. Sludge and septage trucks that frequent the facility must drive through residential areas on residential streets. The proximity also requires increased scrutiny of odors, lighting, and noises, which could result in complaints from neighbors. Potential odors from locating the biosolids handling on the existing site increase the risk of complaints from neighbors. The site is landlocked, and there is little space for future expansion. The existing site was built on a hill, requiring retaining walls, which reduces accessibility between buildings and around the site. Lastly, the site is prime land for additional residential development.

Alternative 3:

Figure 5-7 shows the location of Alternative 3. The larger site footprint for Alternative 3 would allow the entire treatment system to be located on the same site and provide a larger buffer between it and residential areas. Vehicular access is improved with Alternative 3 because Pioneer Road is a county

highway and not a residential street. The location for Alternative 3 is also large enough to accommodate expansion into the future.

Alternative 4:

Figure 5-10 provides the location for the capital infrastructure for Alternative 4. The majority of the infrastructure will be installed outside of Cedarburg's municipal limits. The proposed alignment is installed within STH 181. Therefore, this project would require significant coordination with WisDOT for construction permitting and other activities. Installation of the force main would require significant coordination between all the municipal agencies such as Ozaukee County, Mequon, Thiensville, and Milwaukee County. While access locations are provided at the below grade vault/pigging stations or below grade conceptual below grade vaults, maintenance may require additional communication with municipalities.

Implementation Timeline and Phasing Flexibility

Alternative 1:

This alternative provides the greatest flexibility for implementation timeline. The City will be able to prioritize the upgrade elements at the existing WRC site and the Pioneer Road site and phase the construction over a time period. One option would be to break the upgrades into three phases carried out over a 10-year period:

Phase 1: High priority upgrades at the existing WRC – start project in 2026 and complete in 2029.

Phase 2: Biosolids stabilization and handling at the new Pioneer Road site – start project in 2029 and complete in 2032.

Phase 3: Lower priority upgrades at the existing WRC – start project in 2032 and complete in 2035.

This flexibility offered by Alternative 1 allows the City to phase construction projects based on priority and necessity.

Alternative 2:

This alternative has less flexibility regarding implementation timeline compared to Alternative 1. The MBR upgrade would need to occur concurrently with high priority WRC upgrades due to the significant interconnections required to tie in the new MBR system to the remaining unit processes. One option would be to break the upgrades into two phases carried out over a 6-year period:

Phase 1: High priority upgrades to the existing WRC along with MBR system construction – start the project in 2026 and complete in 2029.

Phase 2: Demolition of the oxidation ditch, clarifiers, and thickener along with the biosolids stabilization and handling upgrades – start the project in 2030 and complete in 2033.

Alternative 3:

Most work associated with this alternative does not have flexibility for timing and phasing. The entire new WRC along with the lift station and collection system improvements must be completed before the existing WRC can be taken out of service and demolished. One option for implementation would be to break the upgrades into two phases carried out over a 6-year period:

Phase 1: Construct the new WRC along with all lift station and collection system improvements – start the project in 2026 and complete in 2030.

Phase 2: Demolition and reclamation of the existing WRC site – start the project in 2031 and complete in 2033.

Alternative 4:

This alternative has the potential for the longest implementation timeline. Due to the timing of MMSD’s facility planning, no project work can be started until all planning is complete and approvals have been given by MMSD, SEWRPC, and WDNR. This could take until 2033 or 2034 to reach all approvals for the project. There is also risk that MMSD does not approve the project based on impacts identified in their facility planning work. This timing leaves Cedarburg in an 8 to 9-year holding pattern with an existing WRC that has significant treatment and age-related issues.

Utilization of Staff

Alternative 1:

Due to the treatment system being split between two locations, staff will be required to travel between sites.

Alternative 2:

Due to the entire treatment system being at one location, facility staff can be more efficiently utilized.

Alternative 3:

Due to the entire treatment system being at one location, facility staff can be more efficiently utilized.

Alternative 4:

Decommissioning of the existing plant and sending treatment to MMSD will downsize the number of necessary staff.

Environmental Impact

Alternative 1:

The environmental impacts associated with Alternative 1 are related to the impacts at the existing site and expanding the Pioneer Road Site. The environmental disturbances with the Pioneer Road Site have been documented in Section 5.1.2 Pioneer Road Site Investigation. The impacts include coordinating with future site disturbance activities identified during the Endangered Resource Review and maintaining noise and odor nuisances to the neighboring properties. Since this alternative includes using the Pioneer Road site for the Biosolids Handling Facility, the footprint should be smaller than the full WRC expansion in Alternative 3. The existing outfall will be maintained at the existing WRC and will meet all permit compliance. Water quality will not be impacted with continued operations at the WRC.

Alternative 2:

The environmental impacts for Alternative 2 are negligible for this alternative as there is no planned expansion outside the existing footprint of the WRC. This alternative will meet permit compliance and water quality will not be impacted.

Alternative 3:

Similar to Alternative 1, the environmental impacts associated with Alternative 3 are related to the impacts with the expansion of the Pioneer Road Site. As this alternative includes a full WRC at the site, the impacts will be greater in terms of land disturbance. Still the guidelines presented in the Endangered Resource Review, will need to be followed during construction activities. However, with this alternative the existing WRC will be demolished. All existing facilities will be removed so that this site can be utilized

for future development. An outfall for the new WRC site will be established to the Milwaukee River. All permit compliance will be met, therefore there are no water quality concerns.

Alternative 4:

This alternative is unique in that there is not an expansion of an undisturbed parcel and the existing WRC site can be demolished and available for redevelopment. Therefore, the environmental impacts are relatively minor. There will be new infrastructure in urbanized areas therefore disturbance to new land is minimized.

5.6 RECOMMENDED ALTERNATIVE

After evaluating cost effectiveness and non-monetary considerations, Donohue recommends Alternative 1 – Upgrades and Expansion of Existing WRC for the following reasons:

1. Alternative 1 has the lowest estimated initial capital cost compared to the other three alternatives.
2. Alternative 1 has the lowest estimated residential user rate compared to the other three alternatives.
3. Alternative 4 has the lowest estimated total present worth; however, Alternative 1 is within 1% of this cost, which is within the margin of error for facility planning. In addition, the implementation timing for Alternative 4 leaves Cedarburg in an 8 to 9-year holding pattern with an existing WRC that has significant treatment and age-related issues.
4. Alternative 1 has the greatest flexibility for construction phasing and project timing. This allows the City to implement phases based on priority. This is the only alternative that can be phased into a longer time period and still address the high priority upgrades in the short-term.
5. The work identified for Alternative 1 falls within the existing WRC site, existing lift station sites, developed road corridors, and the already disturbed Pioneer Road site, which will have minimal environmental impacts.

6. IMPLEMENTATION PLAN & USER RATE IMPACTS

6.1 RECOMMENDED IMPLEMENTATION PLAN

Donohue recommends implementing Alternative 1 - Upgrades and Expansion of Existing WRC in three construction phases carried out over a 10-year period:

- Phase 1: High priority upgrades at the existing WRC – start project in 2026 and complete in 2029.
- Phase 2: Biosolids stabilization and handling at the new Pioneer Road site – start project in 2029 and complete in 2032.
- Phase 3: Lower priority upgrades at the existing WRC – start project in 2032 and complete in 2035.

Donohue reviewed the list of identified improvements for Alternative 1 shown in Table 5-1 and prioritized each improvement as a Phase 1, Phase 2, or Phase 3 with Phase 1 being the highest priority. The below sections describe each phase.

6.1.1 PHASE 1 – HIGH PRIORITY UPGRADES AT EXISTING WRC

Phase 1 would consist of the highest priority upgrades at the existing WRC that should be completed in the short-term between 2026 and 2029. These would include the improvements listed in Table 6-1.

Table 6-1 Phase 1 Recommended Improvements

Structure	Phase 1 Recommended Improvement
Garfield Lift Station	<ul style="list-style-type: none"> A mechanical screen and backup bar rack is needed at this station to protect the pumps and reduce downstream maintenance activities. The structure requires an expansion to install a mechanical screen and backup bar rack. Lift station pumps and valves are 35 years old and in need of replacement. Air handling equipment and controls are 35 years old and in need of replacement. Electrical MCC equipment is 35 years old and requires replacement. Backup generator and automatic transfer switch requires replacement. Rehabilitate concrete on inside of wetwell.
Existing WRC Site	<ul style="list-style-type: none"> Abandoned tankage from 1970 facilities west of vehicle storage should be demolished for site restoration. All buried electrical and controls wiring and conduits are 35 years old and require replacement.
Bar Screen Building	<ul style="list-style-type: none"> Air handling equipment and controls are 35 years old and in need of replacement. Gates are all manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. Grit mechanism and gear box is 35 years old and in need of replacement. Rehabilitate concrete on inside of channel and chamber. Electrical MCC equipment is 35 years old and requires replacement.
Administration Building	<ul style="list-style-type: none"> Construct an administration building with offices, meeting room, restrooms, and laboratory. Building is estimated as a single story 3,000 ft² building.

Structure	Phase 1 Recommended Improvement
Control Building	<ul style="list-style-type: none"> • Electrical switch gear and MCC equipment is 35 to 50 years old and requires replacement. • Backup generator is 35 years old and requires replacement • Air handling equipment and controls are 35 years old and in need of replacement. • Interior spaces for offices, laboratory, meeting room, locker room, breakroom are a mix of 35 to 50 years old and are in need of remodeling. Offices, laboratory, and meeting room will move to new administration building. Grade level floor will be partially remodeled for SCADA room and locker rooms. Remainder of space will be utilized for additional electrical room and installing maintenance access hatches into the basement with lifting monorails and hoists for equipment removal and maintenance activities. • SCADA system hardware and software should be updated for site and lift stations • Floor drains are deteriorated and plugged requiring cleaning and refurbishment. • Sump pumps in building should be piped to influent wetwell to remove clear water from sludge storage tanks. • Several wall leaks require crack injection and sealing between building and sludge holding tanks. • Pump removal beams and hoists are needed for maintenance. • Influent pumps and valves are 35 years old and in need of replacement. Capacity of replacement pumps should be 4,200 gpm each to provide a firm capacity of 12 mgd. Replacement piping and valves should be sized for the increased capacity. • Sludge loadout pumps, piping, and valves are 35 years old and in need of replacement
RAS Building	<ul style="list-style-type: none"> • Air handling equipment and controls are 35 years old and in need of replacement. • MCC equipment is 35 years old and in need of replacement. • RAS pumps and valves are 35 years old and in need of replacement. • Pump removal beams and hoists are needed for maintenance.
UV Disinfection and Vehicle Storage	<ul style="list-style-type: none"> • The UV disinfection equipment does not have sufficient capacity for projected 2045 peak flow treatment. This equipment package should be replaced with a system sized to treat a peak hour flow of 12 mgd. • Air handling equipment and controls are 25 years old and in need of replacement. • A building addition is needed. The City is currently using two storage containers for additional storage. Also, additional workshop space and a welding booth are needed. • Overhead door access is limited. Access and overhead doors on the west side are possible with the abandoned tankage demolished and site restored. • A larger water line is needed for filling the vector truck.

6.1.2 PHASE 2 – BIOSOLIDS STABILIZATION AND HANDLING IMPROVEMENTS

Phase 2 would consist of the biosolids stabilization and handling upgrades that can be implemented following phase 1 between 2029 and 2032. These improvements will take place at the existing WRC site and the new Pioneer Road site. These would include the improvements listed in Table 6-2.

Table 6-2 Phase 2 Recommended Improvements

Structure	Recommended Improvement
Gravity Thickener	<ul style="list-style-type: none"> • Mechanism, scum removal, weir, baffle, and bridge are 50 years old and in need of replacement. • Crack injection and concrete rehabilitation is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
Aerobic Sludge Holding Tanks	<ul style="list-style-type: none"> • Aeration equipment and blowers are 35 years old and in need of replacement. • Tank 1 is 50 years old. Tank 2 is 35 years old. Crack injection and concrete rehabilitation is necessary. • Ventilation equipment replacement is needed.
New Sludge Pumping Building	<ul style="list-style-type: none"> • Current site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a new sludge pumping building to pump sludge from the aerated holding tanks to a new forcemain conveying sludge to the City owned Pioneer Road site. Provide means for maintaining clean pipeline including flushing systems and pipeline insertion gauge cleaning.
Site Development at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Develop a portion of the City owned Pioneer Road site for these new processes. Site will require grading, electrical service, natural gas service, access roads, perimeter fence, entrance gate, sidewalks, and lighting.
Aerobic Digesters at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct two circular aerobic digester tanks approximately 50 feet in diameter on a portion of the City owned Pioneer Road site for sludge stabilization. Sludge will be conveyed to the digesters by a forcemain from the existing WRC site. Circular tanks provide compatibility with converting to anaerobic digesters in the future. Tanks would include diffused aeration and dome covers.
Thickening and Dewatering Building at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a thickening and dewatering building approximately 3,600 ft² with basement, grade floor, and upper floor on a portion of the City owned Pioneer Road site. The building would house the aerobic digester blowers, a gravity belt thickener to thicken sludge prior to the aerobic digesters, a belt filter press to dewater digested sludge into cake for storage and land application. Building will also house GBT and BFP feed pumps, GBT and BFP polymer feed systems, thickened sludge pumps, dewatered cake conveyor, and filtrate pumps to pump thickener and press filtrate along with any other process drain water through a forcemain back to the existing WRC for treatment. • The building would have an isolated electrical room to house the control panels, PLC panel, MCC sections, power panel, and lighting panel.
Cake Storage Building at Pioneer Road Site	<ul style="list-style-type: none"> • Current WRC site does not have available footprint for biosolids stabilization, handling, storage, and loadout facilities. Construct a digested sludge cake storage building sized to hold 180 days of biosolids for land application. Dewatered cake sludge would be compatible with potential future Class A drying.

6.1.3 PHASE 3 – LOWER PRIORITY UPGRADES AT EXISTING WRC

Phase 3 would consist of the lower priority upgrades at the existing WRC that can be implemented later in the planning period, between 2032 and 2035. These would include the improvements listed in Table 6-3.

Table 6-3 Phase 3 Recommended Improvements

Structure	Recommended Improvement
Existing WRC Site	<ul style="list-style-type: none"> • Septage receiving uses a manhole. There is no rock trap or pad containment. Construct dedicated septage receiving station. • Sludge Loadout Station is 35 years old and requires refurbishment of concrete and replacement of piping and valves • All buried piping and valves are 35 to 50 years old and require refurbishment or replacement. • Plant effluent system with pumping, piping, hydrants, and hose bibs is recommended for reuse of plant effluent for washdown water instead of City water. • Paved surfaces and drives have deteriorated and require mill and overlay • Portions of sidewalks have settled/deteriorated and require replacement • Portions of retaining walls have shifted and require replacement • Entrance gate should be replaced with updated, actuated gate for improved site security with remotes for pushbutton entry.
Oxidation Ditch	<ul style="list-style-type: none"> • Aerator discs, shafts, gear boxes, and motors are 35 years old and in need of replacement. Capacity of the replacement aeration system should be sized to deliver the projected 2045 peak day oxygen delivery of 27,000 lbs O₂/day. • Walls and walkways require refurbishment with crack injection and concrete rehabilitation. • Gates are manual hand pulls, which are a safety concern. Replace with new gates that include manual gear actuators for one person operation. • Mixed liquor and RAS piping and valves are 35 years old and in need of replacement. • Level control gate is manually actuated. Replace with electrically actuated gate for automated level control.
Clarifiers	<ul style="list-style-type: none"> • Mechanisms, scum removal, weirs, baffles, and bridges are 35 years old and in need of replacement. • Crack injection and concrete repair is necessary. • Ventilation equipment replacement is needed. • Door replacement is needed. • Washdown piping and valves are needed.
New Tertiary Filter Building	<ul style="list-style-type: none"> • Construct a new tertiary filter building to meet more stringent future total phosphorus limits. Building will receive secondary effluent from the clarifiers and route flow through a series of channels and gates to a treatment train consisting of coagulant addition, rapid mix tank, coagulation tank, polymer addition, flocculation tank, and two cloth media disc filters. The building will include the following rooms: electrical, mechanical, coagulant storage and dosing, polymer storage and dosing, and process room with tankage for rapid mix, coagulation,

Structure	Recommended Improvement
	flocculation, and filtration. Filtered effluent will be routed to the existing UV Disinfection building.

6.1.4 PHASING COST SUMMARY

The cost summary for each phase is presented below in Table 6-4.

Table 6-4 Phasing Cost Summary

Phase	Estimated Capital Cost
Phase 1 – High Priority Improvements	\$24,840,000
Phase 2 – Biosolids Stabilization and Handling	\$33,393,000
Phase 3 – Lower Priority Improvements	\$25,137,000
Total	\$83,370,000

6.2 AVAILABLE FUNDING

The cost of the upgrade projects will be funded through the use of low-interest rate loans available for municipal wastewater treatment plant development through the WDNR Clean Water Fund Program (CWFP). The CWFP is a federal-state partnership that provides communities a permanent, independent source of low-cost financing for a wide range of water quality infrastructure projects. An Intent to Apply must be submitted to the WDNR in October the year prior to starting design and a loan application must be submitted by the end of September the year prior to starting construction. The design of the project must also be complete by the end of September in order to submit the bidding drawings and specifications to the WDNR for review with the loan application.

CWFP offers both 20- and 30-year terms, used most frequently by WWTP projects and conveyance projects, respectively. The City may also be eligible for the CWFP's principal forgiveness program for certain qualifying upgrades. One example is the phase 3 tertiary filter upgrade, which may qualify since the upgrade is based on meeting a more stringent phosphorus limit.

6.3 USER RATE IMPACT

Based on the estimated user rates calculated in Section 5.5.4 of this report, the estimated average residential user rate for implementation of Alternative 1 is \$148.61 per month. This estimated rate is for alternatives evaluation only. A rate study will be required to determine user rates for project implementation. The current average residential user rate is \$64.96 per month.

6.4 PUBLIC HEARING

A public hearing to review the findings of this facility plan will be held at a special meeting of the Common Council and Public Works and Sewage Commission.

APPENDICIES

- Appendix A – Limits Memo
- Appendix B – Site Investigation
- Appendix C – Geotechnical Report
- Appendix D- Boring Locations with Auger Refusal
- Appendix E – Opinion of Probable Costs

Appendix A

Limits Memo

DATE: 09/15/2023

TO: Ben Wacker – WY/3

FROM: Nicole Krueger – SER *Nicole Krueger*

SUBJECT: Planning Limitations for the Cedarburg Wastewater Treatment Facility
WPDES Permit No. WI-0020222

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from Cedarburg Wastewater Treatment Facility in Ozaukee County. Cedarburg has requested planning limits based on projected 2045 design flows. The facility has also requested limits for an alternate discharge location to the Milwaukee River.

This municipal wastewater treatment facility (WWTF) currently discharges to the Cedar Creek, located in the Cedar Creek Watershed in the Milwaukee River Basin. This discharge is included in the Milwaukee River Basin Total Maximum Daily Load (TMDL) as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

The following recommendations are made on a chemical-specific basis at Outfall 001.

Current discharge location

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD ₅ November – April May – October			15 mg/L 344 lbs/day 10 mg/L 229 lbs/day	15 mg/L 10 mg/L		1,2
TSS						1,3
Dissolved Oxygen		6.0 mg/L				1
pH	9.0 s.u.	6.0 s.u.				1
Bacteria <i>E. coli</i>				126 #/100 mL geometric mean		1,4
Ammonia Nitrogen November – March April May – September October	20 mg/L 20 mg/L		8.3 mg/L 3.9 mg/L 5.3 mg/L 11 mg/L	4.1 mg/L 1.9 mg/L 3.3 mg/L 5.7 mg/L		
Phosphorus Interim AM Interim Limit Final				0.80 mg/L TMDL	0.60 mg/L	3
Chloride			490 mg/L 11,000 lbs/day	490 mg/L		1,2
Mercury						5
Temperature						5



Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
PFOS and PFOA						6
TKN, Nitrate+Nitrite, and Total Nitrogen						7
Acute WET						8,9
Chronic WET				1.3 TUc		8,9

Footnotes:

1. No changes from the current permit.
2. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.
3. The TSS and phosphorus mass limits are based on the Total Maximum Daily Load (TMDL) for the Milwaukee River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA in March 2018. Some of the months of TSS mass limits are continued from the current permit.

Month	Monthly Average TP Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (mg/L)	Monthly Average TSS Effluent Limit (mg/L)
Jan	3.71	323	15	12
Feb	4.19	344	12	12
Mar	3.88	344	12	12
Apr	4.25	344	12	12
May	5.14	344	15	12
Jun	4.50	344	12	12
Jul	3.88	344	12	12
Aug	3.32	344	12	12
Sep	3.67	344	12	12
Oct	3.46	344	12	12
Nov	3.73	344	15	12
Dec	3.54	344	15	12

4. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
5. Monitoring only.
6. Monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (TKN) (all expressed as N).
8. Annual acute and chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 76%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Cedar Creek.
9. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

If Cedarburg would like to request an increase to the existing permit limits an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter-by-parameter basis and includes consideration of operations, maintenance and temporary upsets. **Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits should be continued in the reissued permit.** The table below shows the calculated limits based on 1/3rd of the assimilative capacity.

Milwaukee River – limits based on 1/3rd assimilative capacity

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD ₅ November – April May – October			46 mg/L 1070 lbs/day 28 mg/L 660 lbs/day	46 mg/L 28 mg/L		1
TSS						2
Dissolved Oxygen		6.0 mg/L				3
pH	9.0 s.u.	6.0 s.u.				3
Bacteria <i>E. coli</i>				126 #/100 mL geometric mean		3,4
Ammonia Nitrogen November – March April May – September October	20 mg/L 20 mg/L		13 mg/L 6.1 mg/L 23 mg/L 37 mg/L	6.3 mg/L 3.0 mg/L 12 mg/L 18 mg/L		
Phosphorus Interim AM Interim Limit Final				0.80 mg/L TMDL	0.60 mg/L	2
Chloride			710 mg/L 16,600 lbs/day	710 mg/L		1
Mercury						5
Temperature November			60 deg F			
PFOS and PFOA						6
TKN, Nitrate+Nitrite, and Total Nitrogen						7
Acute WET						8,9
Chronic WET				1.3 TUc		8,9

Footnotes:

1. Limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.
2. The TSS and phosphorus mass limits are based on the Total Maximum Daily Load (TMDL) for the Milwaukee River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA in March 2018. Some of the months of TSS mass limits are continued from the current permit.

Month	Monthly Average TP Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (mg/L)	Monthly Average TSS Effluent Limit (mg/L)
Jan	3.71	323	15	12
Feb	4.19	344	12	12
Mar	3.88	344	12	12
Apr	4.25	344	12	12
May	5.14	344	15	12
Jun	4.50	344	12	12
Jul	3.88	344	12	12
Aug	3.32	344	12	12
Sep	3.67	344	12	12
Oct	3.46	344	12	12
Nov	3.73	344	15	12
Dec	3.54	344	15	12

3. No changes would be recommended based on the alternative discharge location.
4. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
5. Monitoring only.
6. Monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (TKN) (all expressed as N).
8. Annual acute and chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 24%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Milwaukee River.
9. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, Map, & Thermal Table

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Curt Nickels, Wastewater Engineer – SER
 Bryan Hartsook, Regional Wastewater Supervisor – SER
 Diane Figiel, Water Resources Engineer – WY/3

Attachment #1
**Water Quality-Based Effluent Limitations for
 Cedarburg Wastewater Treatment Facility**

WPDES Permit No. WI-0020222

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The City of Cedarburg operates a municipal wastewater treatment plant with an annual average design flow of 2.75 MGD. Treatment consists of a bar screen, washer press, grit classifier, a three-ring oxidation ditch and two secondary clarifiers. The three-ring oxidation ditch consists of an anaerobic channel at the beginning for biological nutrient (phosphorus) removal, and an anoxic zone at the beginning of the first (outer) ditch for denitrification. Ferrous chloride is added to the outer ring to aid in phosphorus removal. The oxidation ditches are aerated with mechanical aerators. The effluent is disinfected with ultraviolet light and flows through a cascade aerator before being discharged to Cedar Creek. Waste sludge is gravity thickened and stabilized with aerobic digestion before being hauled off-site to another permitted treatment facility. In 2016, the Cedarburg WWTP signed a contract with the Sheboygan WWTP to haul sludge to the Sheboygan WWTP. If sludge is land applied, it must be applied onto Department approved agricultural sites.

Cedarburg is requesting planning limits for projected 2045 design flows at both the current discharge location as well as an alternative discharge location downstream to the Milwaukee River.

Attachment #2 is a map of the area showing the approximate location of Outfall 001 as well as the alternative discharge to the Milwaukee River.

Existing Permit Limitations

The current permit, expiring on 03/31/2027, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD ₅ November – April			15 mg/L 344 lbs/day	15 mg/L		
May – October			10 mg/L 229 lbs/day	10 mg/L		
TSS						1
Dissolved Oxygen		6.0 mg/L				
pH	9.0 s.u.	6.0 s.u.				
Bacteria						
<i>E. coli</i>				126 #/100 mL geometric mean		
Ammonia Nitrogen November – March	21 mg/L		13 mg/L	6.4 mg/L		
April	21 mg/L		8.0 mg/L	4.0 mg/L		

Attachment #1

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
May – September October			5.3 mg/L 11 mg/L	3.3 mg/L 5.7 mg/L		
Phosphorus Interim AM Interim Limit Final				0.8 mg/L TMDL	0.6 mg/L	1
Chloride			490 mg/L 11,000 lbs/day	490 mg/L		2
Mercury						3
Temperature						3
TKN, Nitrate+Nitrite, and Total Nitrogen						3
Acute WET						4
Chronic WET				1.3 TUc		4

Footnotes:

1. The TSS and phosphorus mass limits in the table below are based on the TMDL for the Milwaukee River basin. Some of the months of TSS mass limits are continued from the current permit.

Month	Monthly Average TP Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (lbs/day)	Weekly Average TSS Effluent Limit (mg/L)	Monthly Average TSS Effluent Limit (mg/L)
Jan	3.71	323	15	12
Feb	4.19	344	12	12
Mar	3.88	344	12	12
Apr	4.25	344	12	12
May	5.14	344	15	12
Jun	4.50	344	12	12
Jul	3.88	344	12	12
Aug	3.32	344	12	12
Sep	3.67	344	12	12
Oct	3.46	344	12	12
Nov	3.73	344	15	12
Dec	3.54	344	15	12

2. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.
3. Monitoring only.
4. Acute and chronic WET testing is required 1x yearly. The IWC for chronic WET was 76%.

Receiving Water Information

- Name: Cedar Creek
- Waterbody Identification Code (WBIC): 21300
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport

Attachment #1

Fish (WWSF) community, non-public water supply. Note: Cold Water and Public Water Supply criteria are used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.

- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code:
The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station 04086500 (updated 03/05/2021), where Outfall 001 is located at Cedar Creek.

7-Q₁₀ = 5.3 cfs (cubic feet per second)

7-Q₂ = 13 cfs

90-Q₁₀ = 11 cfs

Harmonic Mean Flow = 24.7 cfs using a drainage area of 124 mi²

The Harmonic Mean has been estimated based on average flow and the 7-Q₁₀ using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q ₁₀ (cfs)	11	13	23	48	26	13	9.1	8.2	9.1	11	16	13
7-Q ₂ (cfs)	33	34	69	87	54	33	21	18	18	25	37	38

The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station 0408660, at the Milwaukee River near where the alternative discharge location would be:

7-Q₁₀ = 56 cfs

7-Q₂ = 93 cfs

- Hardness = 339 mg/L as CaCO₃. This value represents the geometric mean of data from 11/06/2019 – 02/18/2020.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data from Cedar Creek is used for this evaluation. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: None
- Impaired water status: The current immediate receiving water (Cedar Creek) is 303(d) listed as impaired for PCBs. The Milwaukee River is 303(d) listed as impaired for PCBs, total phosphorus, and E. coli.

Effluent Information

- Design flow rate(s):

	Current Design Flows (MGD)	2045 Design Flows (MGD)
Annual Average	2.75	2.8
Peak Monthly	4.3	4.4
Peak Weekly	6.0	7.4
Peak Daily	7.9	10

- Hardness = 431 mg/L as CaCO₃. This value represents the geometric mean of data from 04/01/2021 –

04/15/2021 from the permit reissuance application.

- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells.
- Additives: Ferric chloride is added for phosphorus removal.

Increased/New Discharger

Cedarburg is proposing an increase in design flow from 2.75 MGD to 2.8 MGD at the current outfall location as well as downstream to the Milwaukee River.

Significant lowering of water quality (SLOWQ) occurs when the WQBELs in the permit are calculated using the full available assimilative capacity (AC) of the receiving water (s. NR 207.05(2)(d), Wis. Adm. Code). Limits to prevent SLOWQ are calculated using one third of the available AC, using the formula below:

$$\frac{1}{3} AC WQBEL = \frac{WQBEL - WQC}{3} + WQC$$

This formula is not applicable for BOD since this parameter is not directly regulated through BOD criteria but indirectly through dissolved oxygen criteria. Currently, ch. NR 207, Wis. Adm. Code specifies 1/3rd AC to prevent SLOWQ. 1/10th AC is in the updated draft code but has not yet been promulgated but these limits are also shown in this memo.

In order to receive limits based on the full assimilative capacity of the receiving water, an alternatives analysis would be required as described in s. NR 207.04(1)(d), Wis. Adm. Code, to show that there are no feasible treatment alternatives that would prevent SLOWQ.

In order to receive any higher limits for any parameter, an assessment of effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. **Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits should be continued in the reissued permit.**

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent

limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)
 if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C_s = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for Cedarburg.

All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L) and mercury (ng/L).

Current Discharge Location

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 4.24 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT*	1-day P ₉₉	1-day MAX. CONC.
Chloride (mg/L)	757	100	1400	536	495

*The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q₁₀ flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 1.325 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	4-day P ₉₉	4-day MAX. CONC.
Chloride (mg/L)	395	100	485	468	485

Milwaukee River Discharge Location

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 44.5 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

Attachment #1

SUBSTANCE	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT*	1-day P ₉₉	1-day MAX. CONC.
Chloride (mg/L)	757	100	1514	536	495

*The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q₁₀ flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 13.9 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/3 AC WEEKLY AVE. LIMIT	1/10 AC WEEKLY AVE. LIMIT	4-day P ₉₉	4-day MAX. CONC.
Chloride (mg/L)	395	100	1343	711	490	468	485

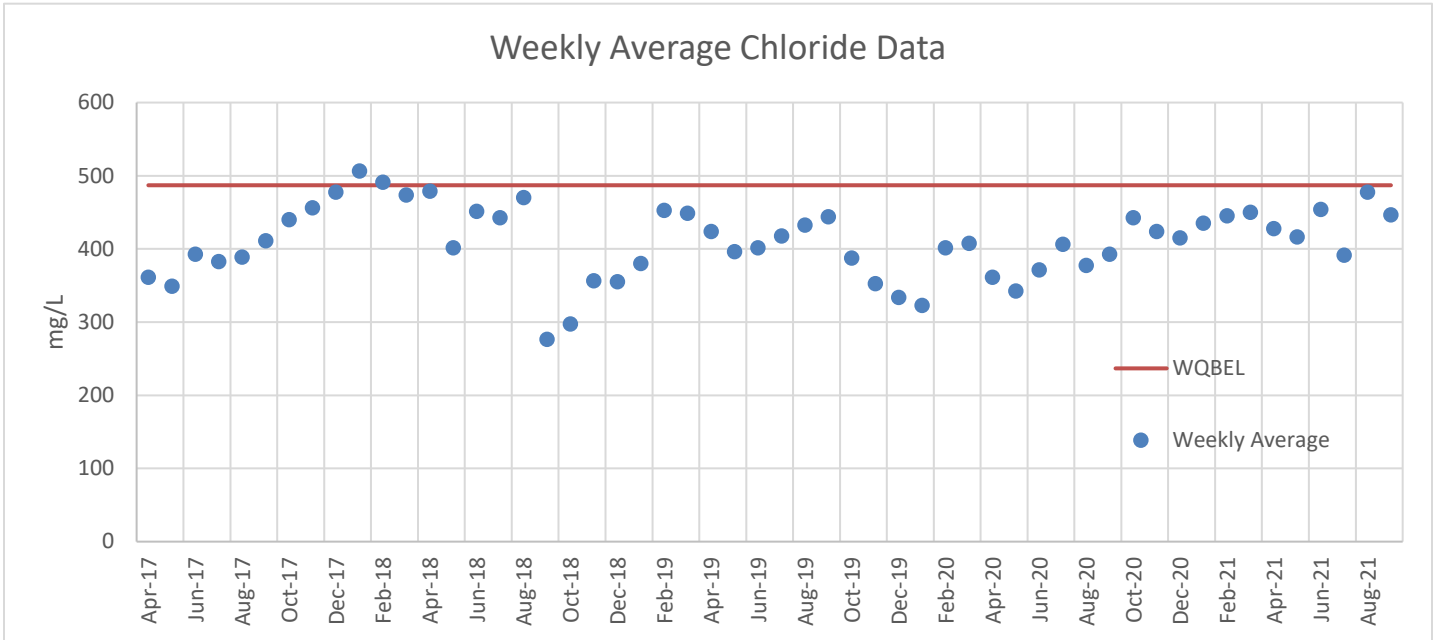
Conclusions and Recommendations

Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are required for chloride.

Chloride – The current permit has weekly and monthly average chloride limits of 490 mg/L. These limits would continue with the projected 2045 design flow at the current discharge location.

If the discharge moved to the Milwaukee River, the calculated weekly limit is 1340 mg/L based on the full AC and 710 mg/L (rounded) based on 1/3rd AC which is less stringent than the current weekly average and monthly average limits. The calculated mass limit based on a weekly average limit of 710 mg/L and an updated design flow of 2.8 MGD would result in 16,600 lbs/day rounding to two significant figures (710 mg/L × 2.8 MGD × 8.34).

In order to receive less restrictive limits, a demonstration of need would need to be submitted per s. NR 207.04(1)(a), Wis. Adm. Code. Based on the review of chloride data reported from the current permit term, there were a couple of incidences of exceedances of the WQBEL at the current discharge location. The current data is shown in the graph below, in comparison to the current limit of 490 mg/L.



PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the effluent flow rate, PFOS and PFOA monitoring is recommended at a once every two-month frequency.

PART 3 – BIOLOGICAL OXYGEN DEMAND

In establishing BOD₅ (Biochemical Oxygen Demand) limitations, the primary intent is to prevent a lowering of dissolved oxygen levels in the receiving water below water quality standards as specified in ss. NR 102.04(4)(a) and (b). The 26-lb method is the most frequently used approach for calculating BOD₅ limits when resources are not available to develop a detailed water quality model. This simplified model was developed in the 1970's by the Wisconsin Committee on Water Pollution on the Fox, Wisconsin, Oconto, and Flambeau Rivers. Further studies throughout the 1970's proved this model to be relatively accurate. The model has since then been used by the Department on many occasions when resources are not available to perform a site-specific model. The "26" value stems from the following equation:

$$\frac{26 \text{ lbs/day}}{\text{ft}^3/\text{sec}} * \frac{1 \text{ day}}{86,400 \text{ sec}} * \frac{454,000 \text{ mg}}{\text{lbs}} * \frac{1 \text{ ft}^3}{28.32 \text{ L}} = 4.8 = 2.4 * 2 \text{ mg/L}$$

The 4.8 has been calculated by taking 2.4 which is the number one receives when converting 26 lbs of BOD/day/cfs into mg/L, multiplied by 2.0 which is the change in the DO level. A typical background DO level for Wisconsin waters is 7 mg/L, so a 2 mg/L decrease is allowed in order to meet the 5 mg/L standard for warm water streams. The above relationship is temperature dependent and an appropriate temperature correction factor is applied. The 26-lb method is based on a typical 24°C summer value for warm water streams. Adjustments for temperature are made using the following equation:

$$k_t = k_{24} (0.967^{(T-24)})$$

Where $k_{24} = 26 \text{ lbs of BOD/day/cfs}$

Calculations based on Full Assimilative Capacity at 7Q10 Conditions:

$$Limitation(mg / L) = 2.4(DO_{stream} - DO_{std}) \left(\frac{({}_7Q_{10} + Q_{eff})}{Q_{eff}} \right) (0.967^{(T-24)})$$

Where:

Q_{eff} = effluent design flow = 2.8 MGD

DO_{stream} = background dissolved oxygen = 7 mg/L

DO_{std} = dissolved oxygen criteria from s. NR 102.04(4) = 5 mg/L

7Q₁₀ = 5.3 cfs for Cedar Creek

T = Receiving water temperature from s. NR 102.25

Cedar Creek

BOD Effluent Limitations (26 LB Method)		Summer	Winter
Dissolved Oxygen mg/L	Effluent Limit	6	6
	Background	7	7
	Mix DO	6.71	6.71
	Criteria	5	5
Weekly Ave Limit Full AC	Concentration Limits (mg/L)	10	17
	Mass (lbs/day)	238	386

The current BOD₅ limits of 10 mg/L for summer and 15 mg/L for winter are the same or more restrictive than the calculated limits based on full AC. The demonstration of need would need to be submitted per s. NR 207.04(1)(a), Wis. Adm. Code. Because Cedarburg can meet the current limits, **the current limits would be recommended to remain the same.**

Calculations based on 1/3rd Assimilative Capacity at 7Q10 Conditions for increased limits:

$$Limitation (mg/L) = 2.4 \left(\frac{(DO_{stream} - (\frac{2}{3}DO_{stream} + \frac{1}{3}DO_{std})) ({}_7Q_{10} + Q_{eff})}{Q_{eff}} \right) (0.967^{(T-24)})$$

Where:

Q_{eff} = effluent design flow = 2.8 MGD

DO_{stream} = background dissolved oxygen = 7 mg/L

DO_{std} = dissolved oxygen criteria from s. NR 102.04(4) = 5 mg/L

7Q₁₀ = 56 cfs for Milwaukee River

T = Receiving water temperature from s. NR 102.25

Milwaukee River

BOD Effluent Limitations (26 LB Method)		Summer	Winter
Dissolved Oxygen mg/L	Effluent Limit	6	6
	Background	7	7
	Mix DO	6.93	6.93
	Criteria	5	5

Attachment #1

Weekly Ave Limit Full AC	Concentration Limits (mg/L)	79	128
	Mass (lbs/day)	1,841	2,990
Weekly Ave Limit 1/3rd AC	Adjusted DO Criterion for 1/3 rd AC (mg/L)	6.24	6.24
	Concentration Limits (mg/L)	28	46
	Mass (lbs/day)	660	1071
Weekly Ave Limit 1/10th AC	Adjusted DO Criterion for 10% AC (mg/L)	6.67	6.67
	Concentration Limits (mg/L)	17	26
	Mass (lbs/day)	392	610

Because the current BOD₅ from the facility is expected to degrade from the current outfall location to the alternative location to the Milwaukee River, moving the discharge downstream would also constitute as lowering of water quality for the downstream segment.

The current BOD₅ limits of 10 mg/L for summer and 15 mg/L for winter are the same or more restrictive than the calculated limits. In order to receive less restrictive limits, a demonstration of need would need to be submitted per s. NR 207.04(1)(a), Wis. Adm. Code. Cedarburg can meet the current limits at this time so the **current limits would be recommended to continue.**

If Cedarburg does demonstrate need for the higher weekly average limits, then monthly average limits equivalent to weekly would be recommended as well per expression of limits requirements in s. NR 106.07(3), Wis. Adm. Code.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

Attachment #1

The effluent pH data was examined as part of this evaluation. A total of 1059 sample results were reported from 07/03/2018 – 07/31/2023. The maximum reported value was 8.32 s.u. (Standard pH Units). The effluent pH was 7.91 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.89 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.98 s.u. Therefore, a value of 7.98 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.89 s.u. into the equation above yields an ATC = 10 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are either set equal to two times the nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	21
1-Q ₁₀	20

The 1-Q₁₀ method yields the most stringent limits for Cedarburg.

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, because those limits relate to the assimilative capacity of the receiving water.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Sport Fish Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$CTC = E \times \{ [0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})] \} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or

C = $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and

T = the temperature (°C) of the receiving water – (Early Life Stages Present), or

T = the maximum of the actual temperature (°C) and 7 - (Early Life Stages Absent)

Attachment #1

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q₁₀ (4-Q₃, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q₅ (estimated as 85% of the 7-Q₂ if the 30-Q₅ is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in Cedar Creek and Milwaukee River, based on conversations with local fisheries biologists. So “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a warmwater sport fish classification.

The “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, because minimum ambient data is available. These values are shown in the table below, with the resulting criteria and effluent limitations.

Current Discharge Location – Cedar Creek

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		November – March	April	May – September	October
Effluent Flow	Q _e (MGD)	2.8	2.8	2.8	2.8
Background Information	7-Q ₁₀ (cfs)	5.3	5.3	5.3	5.3
	7-Q ₂ (cfs)	13	13	13	13
	Ammonia (mg/L)	0.11	0.04	0.03	0.05
	Average Temperature (°C)	2	9	18	10
	Maximum Temperature (°C)	4	9	21	10
	pH (s.u.)	7.97	7.97	8.21	7.97
	% of Flow used	25	25	100	25
	Reference Weekly Flow (cfs)	1.325	1.325	5.3	1.325
	Reference Monthly Flow (cfs)	2.76	2.76	11.1	2.76
Criteria mg/L	4-day Chronic				
	Early Life Stages Present		2.99	4.41	
	Early Life Stages Absent	6.38			17.7
	30-day Chronic				
	Early Life Stages Present		1.20	1.76	
Early Life Stages Absent	2.55			7.09	
Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present		3.9	9.8	
	Early Life Stages Absent	8.3			23
	Monthly Average				
	Early Life Stages Present		1.9	6.2	
Early Life Stages Absent	4.1			12	

Alternative Discharge Location – Milwaukee River

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		November – March	April	May – September	October
Effluent Flow	Qe (MGD)	2.8	2.8	2.8	2.8
Background Information	7-Q ₁₀ (cfs)	56	56	56	56
	7-Q ₂ (cfs)	93	93	93	93
	Ammonia (mg/L)	0.11	0.04	0.03	0.05
	Average Temperature (°C)	2	9	18	10
	Maximum Temperature (°C)	4	9	21	10
	pH (s.u.)	7.97	7.97	8.21	7.97
	% of Flow used	25	25	100	25
	Reference Weekly Flow (cfs)	13.9	13.9	55.7	13.9
Reference Monthly Flow (cfs)	19.8	19.8	79.2	19.8	
Criteria mg/L	4-day Chronic				
	Early Life Stages Present		2.99	4.41	
	Early Life Stages Absent	6.38			17.7
	30-day Chronic				
	Early Life Stages Present		1.20	1.76	
Early Life Stages Absent	2.55			7.09	
Full AC Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present		12	61	
	Early Life Stages Absent	27			75
	Monthly Average				
	Early Life Stages Present		6.5	33	
Early Life Stages Absent	14			39	
1/3rd AC Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present		6.1	23	
	Early Life Stages Absent	13			37
	Monthly Average				
	Early Life Stages Present		3.0	12	
Early Life Stages Absent	6.3			18	
10% AC Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present		3.9	10	
	Early Life Stages Absent	8.4			23
	Monthly Average				
	Early Life Stages Present		1.7	4.9	
Early Life Stages Absent	3.7			10	

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 08/19/2018 – 07/31/2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in Cedarburg’s permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Attachment #1
Effluent Ammonia Data

Ammonia Nitrogen mg/L	November – March	April	May – September	October
1-day P ₉₉	0.56	0.031	0.59	0.43
4-day P ₉₉	0.41	0.028	0.39	0.28
30-day P ₉₉	0.22	0.017	0.18	0.13
Mean*	0.033	0.011	0.04	0.02
Std	0.42	0.0037	0.26	0.28
Sample size	433	84	457	88
Range	<0.011 – 4.894	<0.011 – 0.034	<0.011 – 2.147	<0.011 – 1.394

*Values lower than the level of detection were substituted with a zero

The permit currently has daily maximum, weekly average, and monthly average limits year-round. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

(b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Antidegradation

Cedar Creek

The calculated weekly and monthly average limits for May – October are less restrictive than the limits in the current permit. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, **the current limits for these months must be continued in the reissued permit.**

Milwaukee River

The calculated monthly and the weekly average limits based on 1/3rd AC for May – October are less restrictive than the limits for these months in the current permit. All of the calculated limits based on the full AC are less restrictive than the current limits. **Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits must be continued in the reissued permit.**

**PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS
FOR BACTERIA**

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

PART 5 – PHOSPHORUS**Milwaukee River TMDL**

The TMDL report addresses phosphorus water quality impairments within the Milwaukee River Basin and provides waste load allocations (WLAs) required to meet water quality standards. Effluent limitations based on these WLAs must be included in WPDES permits according to s. NR 217.16, Wis. Adm. Code. The TMDL-derived phosphorus limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification if certain conditions are met and the s. NR 217.13, Wis. Adm. Code WQBEL has not yet taken effect.

Because the Milwaukee River Basin TMDL was developed to protect and improve the water quality of all streams and rivers within the basin, and the s. NR 217.13, Wis. Adm. Code, and the WQBEL has not taken effect for Cedarburg, the TMDL-based limits can be included in the WPDES permit in place of the s. NR 217.13, Wis. Adm. Code, WQBEL. The TMDL-based limits should be expressed in a manner consistent with the wasteload allocation and assumptions of the TMDL.

The monthly average total phosphorus (TP) effluent limits in lbs/day are calculated based on the maximum monthly phosphorus WLA given in pounds per month as suggested in the TMDL report and implementation guidance. The monthly maximum TP WLAs for this facility are found in Appendix A of the Milwaukee River Basin TMDL report. **The monthly average limits shown in the table below are recommended in place of the s. NR 217.13, Wis. Adm. Code, limit, and should be expressed in pounds per day.**

Total Phosphorus Wasteload Allocations and Effluent Limits

Month	Monthly Maximum TP WLA ¹ (lbs/month)	Days Per Month	Monthly Average TP Effluent Limit ² (lbs/day)
Jan	115.09	31	3.71
Feb	117.30	28	4.19
Mar	120.42	31	3.88
Apr	127.57	30	4.25
May	159.38	31	5.14
Jun	134.94	30	4.50
Jul	120.26	31	3.88
Aug	102.89	31	3.32
Sep	110.09	30	3.67
Oct	107.40	31	3.46
Nov	112.03	30	3.73
Dec	109.72	31	3.54

Footnotes:

1- Milwaukee River Basin TMDL Appendix A. Monthly Total Suspended Solids Wasteload Allocation by Permitted Point Source. Table A.17 for the Milwaukee River Watershed

2- Monthly Average Total P effluent limit (lbs/day) = monthly Total P WLA (lbs/month) ÷ days per month

These WLAs must be included in the reissued permit for either discharge location.

Adaptive Management Interim Limit

Cedarburg currently has an adaptive management (AM) plan to comply with the phosphorus WQBELs. The required interim limits for AM are 0.6 mg/L for the 1st permit term and 0.5 mg/L for the 2nd and 3rd permit terms, expressed as a 6-month average and 1.0 mg/L as a monthly average per s. NR 217.18(3)(e)1, Wis. Adm. Code. These interim limits would be the same for either discharge location.

PART 6 – TOTAL SUSPENDED SOLIDS

The TMDL also has wasteload allocations (WLAs) for total suspended solids (TSS). For a municipal facility, the limits for TSS must be expressed as weekly and monthly averages. The current permit includes a weekly and a monthly average limit of 15 mg/L.

Monthly average and weekly average mass effluent limitations derived from the TMDL WLAs should be included in the permit according to the table below, along with the currently imposed concentration limits. Consistent with Section 6.4.1 of the Milwaukee River TMDL Report, in cases where the equivalent TSS concentration limit is ≤ 12 mg/L, the effluent limit will be expressed as a concentration of 12 mg/L monthly average.

The projected design flow rate of 3.07 MGD is used to calculate the equivalent concentration limits instead of the current design flow of 2.75 MGD. The projected design flow was used in the TMDL calculations and is used in this memo to calculate the corresponding concentration limits. This is greater than the projected design flow rate of 2.8 MGD. The higher flow of 3.07 MGD is used instead because using a lower design flow would result in less stringent limits due to more months having equivalent concentrations of less than 12 mg/L.

Total Suspended Solids Wasteload Allocations

Month	Monthly TSS WLA ¹ (lbs/month)	Days Per Month	Monthly Ave TSS Effluent Limit ² (lbs/day)	Equivalent Conc. Limit ³ at 3.07 MGD (mg/L)	Weekly Ave TSS Effluent Limit ⁴ (lbs/day)	Equivalent Conc. Limit ³ at 3.07 MGD (mg/L)
Jan	5,276.20	31	170.20	6.6	323.38	12.6
Feb	3,896.23	28	139.15	5.4	264.39	10.3
Mar	3,030.82	31	97.77	3.8	185.76	7.3
Apr	3,157.64	30	105.25	4.1	199.98	7.8
May	5,766.30	31	186.01	7.3	353.42	13.8
Jun	4,619.32	30	153.98	6.0	292.56	11.4
Jul	4,370.90	31	141.00	5.5	267.89	10.5
Aug	3,585.46	31	115.66	4.5	219.75	8.6
Sep	4,537.58	30	151.25	5.9	287.38	11.2
Oct	4,665.37	31	150.50	5.9	285.94	11.2
Nov	5,477.75	30	182.59	7.1	346.92	13.5
Dec	5,808.26	31	187.36	7.3	355.99	13.9

Footnotes:

1- Milwaukee River Basin TMDL Appendix A. Monthly Total Suspended Solids Wasteload Allocation by Permitted Point Source. Table A.19 for the Milwaukee River Watershed

2- Monthly average TSS effluent limit (lbs/day) = maximum monthly TSS WLA (lbs/month) ÷ days per month

3- Equivalent Concentration = mass / (annual average design flow * 8.34)

4- Weekly average effluent limit (lbs/day) = monthly average limit (lbs/day) x multiplier

The multiplier used in the weekly average calculation was determined according to implementation

Attachment #1

guidance. A coefficient of variation was calculated, based on TSS mass monitoring data, to be 0.9. This is the standard deviation divided by the mean of mass data. However, it is believed that the optimization of the wastewater treatment system to achieve the WLA-derived permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by the facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies TSS monitoring as 4/week; if a different monitoring frequency is used, the stated limits should be reevaluated.

Because the monthly average limits year-round and the weekly average limits for February – April and June – October equate to concentration limits of less than 12 mg/L, mass-based limits for TSS are not needed for permit reissuance. Instead, **it is recommended that the monthly average limit of 12 mg/L year-round and the weekly average limit of 12 mg/L for February – April and June – October be included in the reissued permit.**

The weekly average limits for November – January and May equate to concentration limits of greater than 12 mg/L, so the mass-based limits for TSS are recommended for these months. Because the current permit has a weekly average mass limit of 344 lbs/day, this limit is recommended to continue in the for the months that the TMDL-based mass limits are less restrictive and for all other months without a TMDL-based mass limit. Therefore, **344 lbs/day as a weekly average limit is recommended to continue for February – December. The TMDL-based weekly average limit of 323 lbs/day is recommended for January. The current weekly average limit of 15 mg/L is also recommended to continue for November – January and May.**

Below is the summary table of limits recommended for TSS:

Month	Weekly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (mg/L)	Monthly Ave TSS Effluent Limit (mg/L)
Jan	323	15	12
Feb	344	12	12
Mar	344	12	12
Apr	344	12	12
May	344	15	12
Jun	344	12	12
Jul	344	12	12
Aug	344	12	12
Sep	344	12	12
Oct	344	12	12
Nov	344	15	12
Dec	344	15	12

Limits based on a WLA should be given in a permit regardless of reasonable potential for either outfall location. The following table lists the statistics for effluent TSS as both a concentration and a mass, from 07/01/2018 – 07/31/2023.

Effluent TSS Data

	TSS (mg/L)	TSS (lbs/day)
1-day P ₉₉	5.33	153

Attachment #1

	TSS (mg/L)	TSS (lbs/day)
4-day P ₉₉	4.06	90.3
30-day P ₉₉	2.67	50.7
Mean	2.04	33.9
Std	0.94	32.8
Sample Size	1062	1267
Range	0 – 8	0 – 309

PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. The flow rates are based on the future design weekly average and daily maximum flows.

Current Location – Cedar Creek

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2020 – 12/31/2020.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	51	52	61	103
FEB	50	51	60	90
MAR	50	51	63	104
APR	53	54	66	120
MAY	58	59	70	94
JUN	64	66	82	93
JUL	67	69	87	92
AUG	70	71	86	89

Attachment #1

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
SEP	67	69	77	87
OCT	64	65	66	91
NOV	61	62	57	102
DEC	55	55	59	100

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
 - (a) The highest recorded representative daily maximum effluent temperature
 - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
 - (a) The highest weekly average effluent temperature for the month.
 - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, weekly average temperature maximum limits are necessary for the month of November.

A dissipative cooling (DC) study was approved in 2014 and the facility has stated that there have been no substantial changes in operation or thermal loadings to the treatment facility since the study. It was concluded that the effluent likely does not have a significant impact on the fish and aquatic life in the receiving water and that there is a zone of free passage. Therefore, temperature limits would not be recommended. A new DC study would be required for the increase in design flow for protection of aquatic life.

Alternative Location – Milwaukee River

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2020 – 12/31/2020. The flow rates are based on the future design weekly average and daily maximum flows.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	51	52	68	115
FEB	50	51	69	114
MAR	50	51	69	112
APR	53	54	64	107
MAY	58	59	74	104
JUN	64	66	88	100
JUL	67	69	96	99
AUG	70	71	98	99
SEP	67	69	89	102
OCT	64	65	74	107
NOV	61	62	60	110
DEC	55	55	66	113

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
 - (a) The highest recorded representative daily maximum effluent temperature
 - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
 - (a) The highest weekly average effluent temperature for the month.
 - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Based on this analysis, weekly average temperature maximum limits are necessary for the month of November. A new DC study would be needed in accordance with NR 106.59(4), Wis. Adm. Code for the Milwaukee River to get relief from this temperature limit.

PART 8 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET

limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022)*.

Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC is calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

Current Location

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100 = \mathbf{77\%}$$

Where:

- Q_e = annual average flow = 2.8 MGD = 4.332 cfs
- f = fraction of the Q_e withdrawn from the receiving water = 0
- Q_s = ¼ of the 7-Q₁₀ = 5.3 cfs ÷ 4 = 1.3 cfs

Milwaukee River

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100 = \mathbf{24\%}$$

Where:

- Q_e = annual average flow = 2.75 MGD = 4.332 cfs
- f = fraction of the Q_e withdrawn from the receiving water = 0
- Q_s = ¼ of the 7-Q₁₀ = 55.68 cfs ÷ 4 = 13.9 cfs

Chronic WET limits are calculated using the equation below:

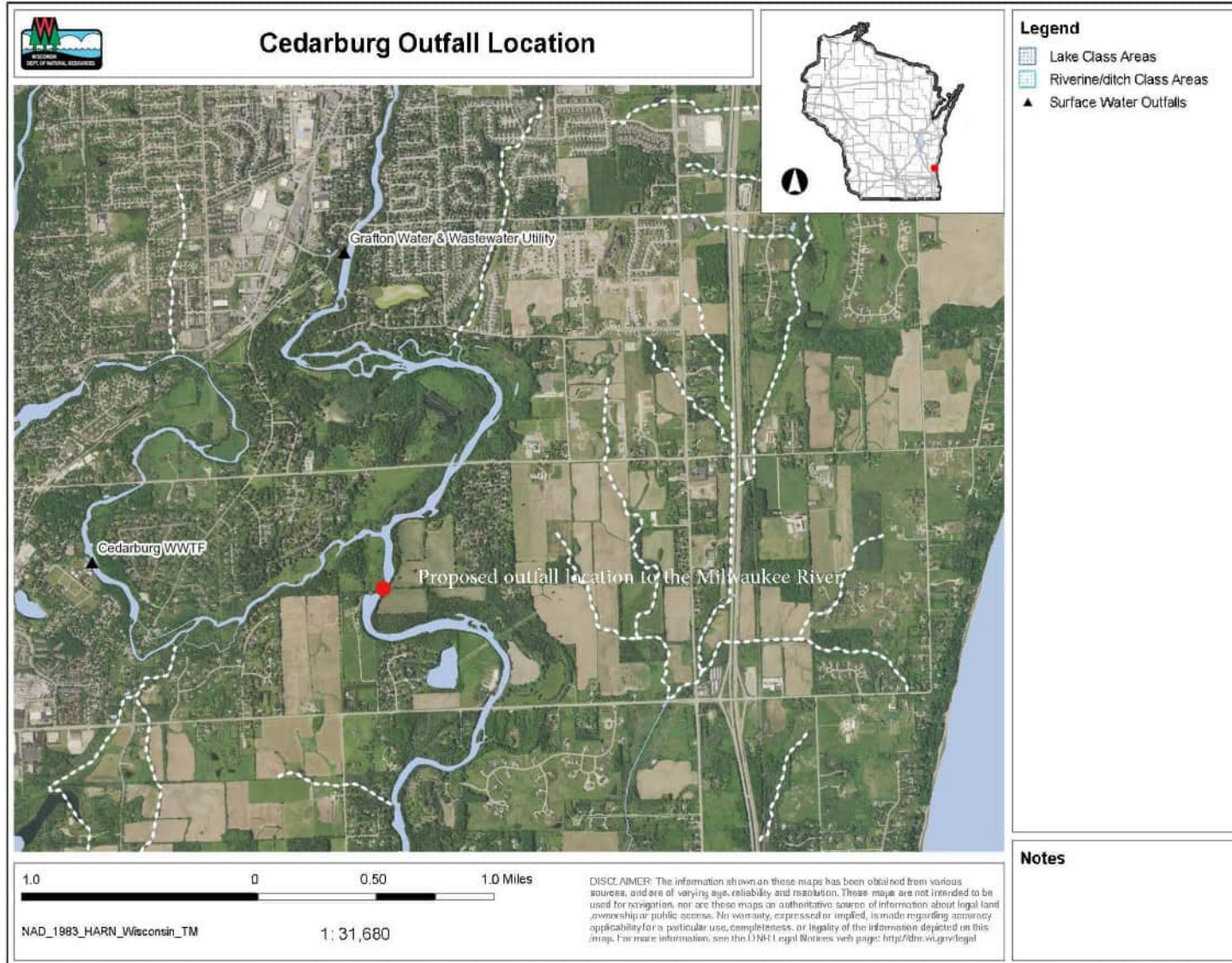
$$\text{Chronic WET limit} = [100/\text{IWC}] \text{ TU}_c \text{ expressed as a monthly average}$$

The current permit has a **chronic WET limit of 1.3 TU_c based on an IWC of 76%**.

A calculated limit for the current location would remain the same at 1.3 TU_c. A limit based on the IWC of 24% for the Milwaukee River would result in a chronic limit of 4.2 TU_c. If Cedarburg would like to request an increase to the existing permit limits an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limit of 1.3 TU_c must be continued in the reissued permit.

A minimum of annual acute and chronic monitoring is recommended because Cedarburg is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.

The need for WET testing was not evaluated for this planning limits memo. It will be evaluated in the next permit reissuance to determine if monitoring greater than annually is needed based on toxicity information.



Temperature limits for receiving waters with unidirectional flow - current discharge location

(calculation using default ambient temperature data)

Facility:	Cedarburg	7-Q₁₀:	5.30 cfs	Temp Dates		Flow Dates	
Outfall(s):	001	Dilution:	25%	Start:	01/01/20	07/01/18	
Date Prepared:	9/6/2023	f:	0	End:	12/31/20	07/31/23	
Design Flow (Q_e):	2.80 MGD	Stream type:	Small warm water sport or forage fish co				
Storm Sewer Dist.	0 ft	Qs:Q_e ratio:	0.3 :1				
		Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)		(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	11	7.4	10	0	51	52	53	84
FEB	34	50	76	13	7.4	10	0	50	51	55	85
MAR	38	52	77	23	7.4	10	0	50	51	59	91
APR	48	55	79	48	7.4	10	0	53	54	62	103
MAY	58	65	82	26	7.4	10	0	58	59	69	92
JUN	66	76	84	13	7.4	10	0	64	66	79	88
JUL	69	81	85	9.1	7.4	10	0	67	69	83	87
AUG	67	81	84	8.2	7.4	10	0	70	71	84	86
SEP	60	73	82	9.1	7.4	10	0	67	69	76	85
OCT	50	61	80	11	7.4	10	0	64	65	64	85
NOV	40	49	77	16	7.4	10	0	61	62	52	87
DEC	35	49	76	13	7.4	10	0	55	55	53	85

Temperature limits for receiving waters with unidirectional flow – alternative discharge location

(calculation using default ambient temperature data)

Facility:	Cedarburg	7-Q₁₀:	55.68 cfs	Temp Dates		Flow Dates	
Outfall(s):	001	Dilution:	25%	Start:	01/01/20		07/01/18
Date Prepared:	09/06/2023	f:	0	End:	12/31/20		07/31/23
Design Flow (Q_e):	2.80 MGD	Stream type:	Small warm water sport or forage fish co				
Storm Sewer Dist.	0 ft	Qs:Qe ratio:	3.2 :1				
		Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)		7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)		Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	33	49	76	56	7.4	10	0	51	52	68	115
FEB	34	50	76	56	7.4	10	0	50	51	69	114
MAR	38	52	77	56	7.4	10	0	50	51	69	112
APR	48	55	79	56	7.4	10	0	53	54	64	107
MAY	58	65	82	56	7.4	10	0	58	59	74	104
JUN	66	76	84	56	7.4	10	0	64	66	88	100
JUL	69	81	85	56	7.4	10	0	67	69	96	99
AUG	67	81	84	56	7.4	10	0	70	71	98	99
SEP	60	73	82	56	7.4	10	0	67	69	89	102
OCT	50	61	80	56	7.4	10	0	64	65	74	107
NOV	40	49	77	56	7.4	10	0	61	62	60	110
DEC	35	49	76	56	7.4	10	0	55	55	66	113

Appendix B

Site Investigation



State of Wisconsin / DEPARTMENT OF NATURAL RESOURCES

Tony Evers, Governor
Karen Hyun, Ph.D., Secretary
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April 7, 2025

Brittany Hess
Donohue & Associates
3311 Weeden Creek Rd
Sheboygan, WI 53081

SUBJECT: Endangered Resources Review (ERR Log # 25-146)

Proposed Cedarburg Facility Plan Phase II, Ozaukee County, WI (T10N R21E S35, T10N R21E S36, T09N R21E S02, T09N R21E S01)

Dear Brittany Hess,

The Bureau of Natural Heritage Conservation has reviewed the proposed project described in the Endangered Resources (ER) Review Request received March 5, 2025. The complete ER Review for this proposed project is attached and follow-up actions are summarized below:

Required Actions: 4 species

Recommended Actions: 1 species

No Follow-Up Actions: 0 species

Additional Recommendations Specified: Yes

This ER Review may contain Natural Heritage Inventory data (<http://dnr.wi.gov/topic/NHI>), including specific locations of endangered resources, which are considered sensitive and are not subject to Wisconsin's Open Records Law. Information contained in this ER Review may be shared with individuals who need this information in order to carry out specific roles in the planning, permitting, and implementation of the proposed project. **Specific locations of endangered resources may not be released or reproduced in any publicly disseminated documents.**

The attached ER Review is for informational purposes and only addresses endangered resources issues. **This ER Review does not constitute DNR authorization of the proposed project and does not exempt the project from securing necessary permits and approvals from the DNR and/or other permitting authorities.** Please contact the ER Review Program whenever the project plans change, new details become available, or more than a year has passed to confirm if results of this ER Review are still valid.

Please contact me at 608-419-2005 or via email at anna.rossler@wi.gov if you have any questions about this ER Review.

Sincerely,

Anna Rossler
Endangered Resources Review Program

cc:

**Endangered Resources Review for the Proposed Cedarburg Facility Plan Phase II, Ozaukee County
(ER Log # 25-146)**

Section A. Location and brief description of the proposed project

Based on information provided by the ER Review Request form and attached materials, the proposed project consists of the following:

Location	Ozaukee County - T10N R21E S35, T10N R21E S36, T09N R21E S02, T09N R21E S01
Project Description	The proposed project includes installation of sanitary sewers from the existing City of Cedarburg Water Recycling Facility to a future City owned property at 1838 Pioneer Rd. The sanitary sewer alignment will be within public right-of-way. The future City owned property is previously agricultural land. The City has not conducted any agricultural activities on the property since it was obtained in 2023. The parcel is 116 acres. Total disturbance is unknown at this time.
Project Timing	TBD
Current Habitat	In the 2025 City of Cedarburg Landuse Plan, the 1838 Pioneer Rd parcel is zoned for Utility Facilities. The current use of the site is former ag and open space.
Impacts to Wetlands or Waterbodies	The site is adjacent to Cedar Creek and within that watershed. The parcel also borders residential properties. Future development will consider appropriate offsets required.
Property Type	Public
Federal Nexus	Unknown

It is best to request ER Reviews early in the project planning process. However, some important project details may not be known at that time. Details related to project location, design, and timing of disturbance are important for determining both the endangered resources that may be impacted by the project and any necessary follow-up actions. Please contact the ER Review Program whenever the project plans change, new details become available, or more than a year has passed to confirm if results of this ER Review are still valid.

Section B. Endangered resources recorded from within the project area and surrounding area

	Group	State Status	Federal Status
Rusty Patched Bumble Bee Federal High Potential Zone	Bee	NA	HPZ
Longear Sunfish (<i>Lepomis megalotis</i>)	Fish~	THR	
Redfin Shiner (<i>Lythrurus umbratilis</i>)	Fish~	THR	
Hairy Beardtongue (<i>Penstemon hirsutus</i>)	Plant	SC	
Queensnake (<i>Regina septemvittata</i>)	Snake~	END	

For additional information on the rare species, high-quality natural communities, and other endangered resources listed above, please visit our Biodiversity (<http://dnr.wi.gov/topic/EndangeredResources/biodiversity.html>) page. For further definitions of state and federal statuses (END=Endangered, THR=Threatened, SC=Special Concern), please refer to the Natural Heritage Inventory (NHI) Working List (<http://dnr.wi.gov/topic/nhi/wlist.html>).

Section C. Follow-up actions

Actions that need to be taken to comply with state and/or federal endangered species laws:

• **Rusty Patched Bumble Bee Federal High Potential Zone - Bee**

State Status: NAFederal Status: HPZ

Impact Type	Impact possible
Required Measures	Other
Description of Required Measures	<p>Portions of the project overlap the Rusty Patched Bumble Bee High Potential Zone (RPBB HPZ) and suitable habitat may be present. To see where the project intersects, please visit the USFWS interactive map here https://www.fws.gov/midwest/endangered/insects/rpbb/rpbbmap.html.</p> <p>If this project has a federal nexus, the following actions are required. While take of the bee is prohibited per the federal Endangered Species Act, if this project does not have a federal nexus, follow-up actions are recommended and not required. If there is no federal involvement, it is recommended to follow the conservation measures where possible.</p> <p>Project proponents should follow the U.S. Fish and Wildlife Service S7 Guidance: https://www.fws.gov/media/esa-section-7a2-voluntary-implementation-guidance-rusty-patched-bumble-bee. This document provides information about the bee and has a determination key on page 23. The project should complete the determination key to determine impacts and what kind of consultation with USFWS will be needed. Please contact the USFWS Bloomington Field Office at (952) 252-0092 or TwinCities@fws.gov for further consultation, if needed.</p> <p>The Conservation Management Guidelines for the Rusty Patched Bumble Bee (<i>Bombus affinis</i>) document can be found at (https://www.fws.gov/midwest/endangered/insects/rpbb/pdf/ConservationGuidanceRPBBv1_27Feb2018.pdf).</p> <p>Follow-up actions for the Rusty patched bumble bee may include following one or more of the USFWS' recommended conservation measures below:</p> <p>For tree clearing/thinning, conservation measures include but are not limited to:</p> <ul style="list-style-type: none"> • Implement best management practices (BMPs), especially those that serve to minimize the spread of invasive species and to avoid or minimize soil compaction. Visit (https://www.stateforesters.org/newsroom/state-forestry-bmps/) for up to date information about BMP recommendations by state. • Avoid or minimize soil disturbance and heavy equipment operation during overwintering (mid October- mid March) • Avoid or minimize forest management that may destroy spring blooming flowers during their bloom periods. • Consider thinning or single tree selection and dense invasive shrub removal that may improve overwintering and spring foraging habitat. <p>For all other activities:</p> <ul style="list-style-type: none"> • use native trees, shrubs and flowering plants in landscaping, • provide plants that bloom from spring through fall (refer to the USFWS RPBB Midwest Plant Guide), • remove and control invasive plants in any habitat used for foraging, nesting, or overwintering

• **Longear Sunfish (*Lepomis megalotis*) - Fish~**

State Status: THR

Impact Type	Impact possible
Required Measures	Erosion Control
Description of Required Measures	<p>Because this project has the potential to impact Cedar Creek, when working within 300ft of the creek erosion and runoff prevention measures must be implemented to avoid take of the Longear Sunfish.</p> <p>Longear Sunfish (<i>Lepomis megalotis</i>), listed as Threatened in Wisconsin, prefers clear, shallow, moderately warm, still waters of streams and occasionally in lakes. Found in or near vegetation. Spawning occurs from late-May through mid-July, sporadically into August.</p>

• **Redfin Shiner (*Lythrurus umbratilis*) - Fish~**

State Status: THR

Impact Type	Impact possible
Required Measures	Erosion Control
Description of Required Measures	<p>Because this project has the potential to impact Cedar Creek, when working within 300ft of the creek erosion and runoff prevention measures must be implemented to avoid take of the Redfin Shiner.</p> <p>Redfin Shiner (<i>Lythrurus umbratilis</i>), listed as Threatened in Wisconsin, prefers turbid waters of pools in low-gradient streams over substrates of boulders, cobble, sand, silt, or detritus. Spawning occurs from early-June through mid-August in sunfish nests. They coexist with the sunfish in the nesting territory.</p>

• **Queensnake (*Regina septemvittata*) - Snake~**

State Status: END

Impact Type	Impact possible
Required Measures	Other
Description of Required Measures	<p>Queensnakes are typically found within 20ft of a suitable stream. If the project can avoid any disturbance (i.e. tree clearing, equipment operation, supply storage, grading, spoil placement, impacts to existing structures, etc.) within 20ft of Cedar Creek, it is unlikely that suitable habitat will be disturbed and no impacts would be anticipated.</p> <p>However, if habitat within 20ft of the creek will be disturbed, please contact me for guidance for habitat surveys and assessments.</p> <p>Queensnake (<i>Regina septemvittata</i>), listed as Endangered in Wisconsin, prefers clear warm-water streams and small rivers. This crayfish specialist is typically associated with moderate to fast water flows and rocky substrates. They also utilize shoreline habitats for basking. Queensnakes overwinter in crayfish burrows but also in artificial structures such as cracked bridge abutments, old dams, and seawalls. They are active from early-April through October and breed mid-May through mid-June. Live young are born in August or early-September. Queensnakes require small to medium-sized, clear, spring-fed streams that are permanent and relatively shallow (Vogt 1981). Queensnakes remain extremely close to the streams throughout the year, typically not venturing further than 6 m (20 ft) into the uplands.</p>

Actions recommended to help conserve Wisconsin's Endangered Resources:

• **Hairy Beardtongue (*Penstemon hirsutus*) - Plant**

State Status: SC

Impact Type	Impact possible
Recommended Measures	Surveys
Description of Recommended Measures	<p>Suitable habitat for the Hairy Beardtongue may be impacted by this project. Although not required because Special Concern species are not legally protected, we recommend that you avoid or minimize take. Avoidance and minimization efforts may include site surveys to confirm presence/absence of species and fencing off areas of occupied habitat. Survey results should be submitted to the Endangered Resources Review Program.</p> <p>Hairy Beardtongue (<i>Penstemon hirsutus</i>), a Wisconsin Special Concern plant, is found on dry gravelly and sandy prairies, or in hillside oak woodlands. It is also naturalized on roadsides. Blooming occurs late-May through late-June, fruiting late-July through late-August. The optimal identification period for this species is late-May through June.</p>

Remember that although these actions are not required by state or federal endangered species laws, they may be required by other laws, permits, granting programs, or policies of this or another agency. Examples include the federal Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, State Natural Areas law, DNR Chapter 30 Wetland and Waterway permits, DNR Stormwater permits, and Forest Certification.

Additional Recommendations

Please note that plastic or polypropylene netting associated with erosion matting (also known as an erosion control blankets or erosion mesh netting) without independent movement of strands can easily entrap snakes and other wildlife moving through the area, and cause dehydration, desiccation, and eventually mortality. Biodegradable jute/twine netting with the "leno" or "gauze" weave (contains strands that are able to move independently) has the least impact on snakes. If erosion matting will be used for this project, use the following matting (or something similar): American Excelsior "FibreNet" or "NetFree" products; East Coast Erosion biodegradable jute products; Erosion Tech biodegradable jute products; ErosionControlBlanket.com biodegradable leno weave products; North American Green S75BN, S150BN, SC150BN or C125BN; or Western Excelsior "All Natural" products.

No actions are required or recommended for the following endangered resources: None

Section D. Next Steps

1. Evaluate whether the '**Location and brief description of the proposed project**' is still accurate. All recommendations in this ER Review are based on the information supplied in the ER Review Request. If the proposed project has changed or more than a year has passed and you would like your letter renewed, please contact the ER Review Program to determine if the information in this ER Review is still valid.

2. Determine whether the project can incorporate and implement the **'Follow-up actions'** identified above:
- o 'Actions that need to be taken to comply with state and/or federal endangered species laws' represent the Department's best available guidance for complying with state and federal endangered species laws based on the project information that you provided and the endangered resources information and data available to us. If the proposed project has not changed from the description that you provided us and you are able to implement all of the 'Actions that need to be taken to comply with state and/or federal endangered species laws', your project should comply with state and federal endangered species laws. Please remember that if a violation occurs, the person responsible for the taking is the liable party. Generally this is the landowner or project proponent. For questions or concerns about individual responsibilities related to Wisconsin's Endangered Species Law, please contact the ER Review Program.
 - o If the project is unable to incorporate and implement one or more of the 'Actions that need to be taken to comply with state and/or federal endangered species laws' identified above, the project may potentially violate one or more of these laws. Please contact the ER Review Program immediately to assist in identifying potential options that may allow the project to proceed in compliance with state and federal endangered species laws.
 - o 'Actions recommended to help conserve Wisconsin's Endangered Resources' may be required by another law, a policy of this or another Department, agency or program; or as part of another permitting, approval or granting process. Please make sure to carefully read all permits and approvals for the project to determine whether these or other measures may be required. Even if these actions are not required by another program or entity for the proposed project to proceed, the Department strongly encourages the implementation of these conservation measures on a voluntary basis to help prevent future listings and protect Wisconsin's biodiversity for future generations.
3. If federally-protected species or habitats are involved and the project involves federal funds, technical assistance or authorization (e.g., permit) and there are likely to be any impacts (positive or negative) to them, consultation with USFWS will need to occur prior to the project being able to proceed. If no federal funding, assistance or authorization is involved with the project and there are likely to be adverse impacts to the species, contact the USFWS Twin Cities Ecological Services Field Office at 612-725-3548 (x2201) for further information and guidance.

Section E. Standard Information to help you better understand this ER Review

Endangered Resources (ER) Reviews are conducted according to the protocols in the guidance document Conducting Proposed Endangered Resources Reviews: A Step-by-Step Guide for Wisconsin DNR Staff.

How endangered resources searches are conducted for the proposed project area: An endangered resources search is performed as part of all ER Reviews. A search consists of querying the Wisconsin Natural Heritage Inventory (NHI) database for endangered resources records for the proposed project area. The project area evaluated consists of both the specific project site and a buffer area surrounding the site. A 1 mile buffer is considered for terrestrial and wetland species, and a 2 mile buffer for aquatic species. Endangered resources records from the buffer area are considered because most lands and waters in the state, especially private lands, have not been surveyed. Considering records from the entire project area (also sometimes referred to as the search area) provides the best picture of species and communities that may be present on your specific site if suitable habitat for those species or communities is present.

Categories of endangered resources considered in ER Reviews and protections for each: Endangered resources records from the NHI database fall into one of the following categories:

- o Federally-protected species include those federally listed as Endangered or Threatened and Designated Critical Habitats. Federally-protected animals are protected on all lands; federally-protected plants are protected only on federal lands and in the course of projects that include federal funding (see Federal Endangered Species Act of 1973 as amended).
- o Animals (vertebrate and invertebrate) listed as Endangered or Threatened in Wisconsin are protected by Wisconsin's Endangered Species Law on all lands and waters of the state (s. 29.604, Wis. Stats.).
- o Plants listed as Endangered or Threatened in Wisconsin are protected by Wisconsin's Endangered Species Law on public lands and on land that the person does not own or lease, except in the course of forestry, agriculture, utility, or bulk sampling actions (s. 29.604, Wis. Stats.).
- o Special Concern species, high-quality examples of natural communities (sometimes called High Conservation Value areas), and natural features (e.g., caves and animal aggregation sites) are also included in the NHI database. These endangered resources are not legally protected by state or federal endangered species laws. However, other laws, policies (e.g., related to Forest Certification), or granting/permitting processes may require or strongly encourage protection of these resources. The main purpose of the Special Concern classification is to focus attention on species about which some problem of abundance or distribution is suspected before they become endangered or threatened.
- o State Natural Areas (SNAs) are also included in the NHI database. SNAs protect outstanding examples of Wisconsin's native landscape of natural communities, significant geological formations, and archeological sites. Endangered species are often found within SNAs. SNAs are protected by law from any use that is inconsistent with or injurious to their natural values (s. 23.28, Wis. Stats.).

Please remember the following:

1. This ER Review is provided as information to comply with state and federal endangered species laws. By following the protocols and methodologies described above, the best information currently available about endangered resources that may be present in the proposed project area has been provided. However, the NHI database is not all inclusive; systematic surveys of most public lands have not been conducted, and the majority of private lands have not been surveyed. As a result, NHI data for the project area may be incomplete. Occurrences of endangered resources are only in the NHI database if the site has been previously surveyed for that species or group during the appropriate season, and an observation was reported to and entered into the NHI database. As such, absence of a record in the NHI database for a specific area should not be used to infer that no endangered resources are present in that area. Similarly, the presence of one species does not imply that surveys have been conducted for other species. Evaluations of the possible presence of rare species on the project site should always be based on whether suitable habitat exists on site for that species.
2. This ER Review provides an assessment of endangered resources that may be impacted by the project and measures that can be taken to avoid negatively impacting those resources based on the information that has been provided to ER Review Program at this time. Incomplete information, changes in the project, or subsequent survey results may affect our assessment and indicate the need for additional or different measures to avoid impacts to endangered resources.
3. This ER Review does not exempt the project from actions that may be required by Department permits or approvals for the project. Information contained in this ER Review may be shared with individuals who need this information in order to carry out specific roles in the planning, permitting/approvals, and implementation of the proposed project.

Primary Info

WHS Project #	06-0113
ARI #	16509
Report Title	WDOT Archaeological Survey Field Report: Pioneer Road, Green Bay Road to Klug Lane, Ozaukee County, Wisconsin
Author	Van Dyke, Allen
Report Location	Archives Box# 129

Location Info

County	Ozaukee																									
USGS 7.5' Quad Info	CEDARBURG																									
PLSS	<table border="1"> <thead> <tr> <th>Township</th> <th>Range</th> <th>Direction</th> <th>Section</th> <th>French Lot</th> </tr> </thead> <tbody> <tr> <td>9</td> <td>21</td> <td>E</td> <td>1</td> <td></td> </tr> <tr> <td>9</td> <td>21</td> <td>E</td> <td>2</td> <td></td> </tr> <tr> <td>10</td> <td>21</td> <td>E</td> <td>35</td> <td></td> </tr> <tr> <td>10</td> <td>21</td> <td>E</td> <td>36</td> <td></td> </tr> </tbody> </table>	Township	Range	Direction	Section	French Lot	9	21	E	1		9	21	E	2		10	21	E	35		10	21	E	36	
Township	Range	Direction	Section	French Lot																						
9	21	E	1																							
9	21	E	2																							
10	21	E	35																							
10	21	E	36																							

Investigation Info

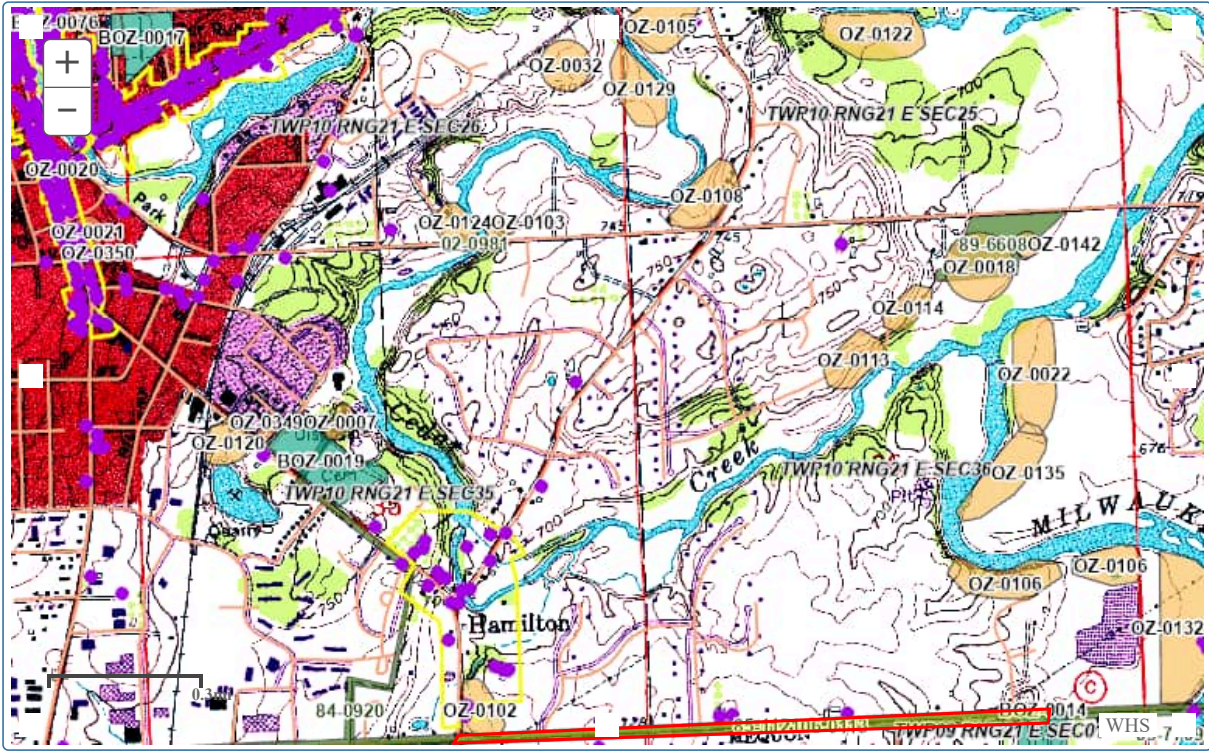
Investigation Type	Surface Survey, Shovel Testing/Probing
---------------------------	--

Reports

Report Type	ASFR Form
--------------------	-----------

Other Info

Abstract	In October of 2005 AVD conducted Phase I archaeological survey along portions of Pioneer Road/CTH 'C' in Ozaukee County, Wisconsin. The project corridor extended for 6.4 miles through areas of agricultural fields with good visibility. No archaeological materials or features were noted and no further fieldwork is recommended.
Series Type	
Series Number	2726-01-00
Series Investigator	AVD Archaeological Services Inc.
Sites Investigated	
Map Description	Map in Project Report
Acreage Covered	6.40
Place Published	Union Grove, WI
Month Published	November
Year Published	2005
Is Report On File	Yes
Date Filed	02/10/2006
Date Entered	03/15/2006
Date Modified	01/21/2010





Wisconsin Archaeological Site Inventory
State Historic Preservation Office

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Range = 21
Direction = East
Section = 36
County = Ozaukee
Municipality = Cedarburg

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County = Ozaukee
Municipality = Cedarburg
Town = Cedarburg

Refine Search

No Listings were found. [Search again](#)

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Hess, Brittany

From: DATCP Ag Impact Statements <datcpagimpactstatements@wisconsin.gov>
Sent: Tuesday, March 11, 2025 10:17 AM
To: Hess, Brittany
Cc: DATCP Ag Impact Statements
Subject: RE: Pioneer Rd Cedarburg Property

Hi Brittany,

Thank you for reaching out regarding this project and the potential for an Agricultural Impact Statement (AIS). As we discussed over the phone today, since the City of Cedarburg owns the parcel the project will be expanded upon, there is no potential to condemn and as such, it does not meet one of the requirements as set by State Statute Chapter 32.035(4)(a) for an AIS to be prepared.

If this project were to impact new land not already owned by the City, then the AIS program would need to be notified. Here is a reference guide on potential notification processes in case that were to happen:

[AINReference.pdf](#).

Let me know if you have questions regarding this or future projects.

Warm regards,
Kirsten

Kirsten Biefeld

Pronouns: She/her/hers

Agricultural Impact Statement (AIS) Program Manager and Land Conservation Specialist

Division of Agricultural Resource Management

Wisconsin Department of Agriculture, Trade & Consumer Protection

kirstenk.biefeld@wisconsin.gov

608-224-4650

Please fill out our [customer survey](#) to help us improve. Thank you!

From: Hess, Brittany <bhess@donohue-associates.com>
Sent: Monday, March 10, 2025 1:25 PM
To: DATCP Ag Impact Statements <datcpagimpactstatements@wisconsin.gov>
Subject: Pioneer Rd Cedarburg Property

**CAUTION: This email originated from outside the organization.
Do not click links or open attachments unless you recognize the sender and know the content is safe.**

Good Afternoon –

I left a voicemail to talk about a property in Cedarburg, Wisconsin. Here is some background - I am working with the City of Cedarburg on evaluating expansion of their water recycling facility. In 2000, the City purchase property at 1838 Pioneer road. It is approximately 115 ac parcel. The property was leased on and off for 20 years for

agricultural activities. All agricultural activities ceased in 2023. At that time the City planted native grasses which are existing today.

Does this property qualify for an impact statement?

Thank you!

Brittany Hess | Donohue & Associates, Inc.
3311 Weeden Creek Road, Sheboygan, WI 53081
(920) 803-7305

This e-mail and any files transmitted with it are confidential and are intended solely for the use of the individual or entity to whom they are addressed; access to anyone else is unauthorized. If you are not the intended recipient or the person responsible for delivering the e-mail to the intended recipient, please delete and be advised that you have received this e-mail in error and that any use, dissemination, forwarding, printing, or copying of this e-mail is strictly prohibited.

Appendix C

Geotechnical Report

February 7, 2025

Mr. Michael Stohl
Donohue & Associates, Inc.
3311 Weeden Creek Road
Sheboygan, Wisconsin 53081

SUBJECT: Geotechnical Exploration and Evaluation
Proposed Wastewater Treatment Facility and Utility Installation
Pioneer Road / Riverland Road
Cedarburg, Wisconsin
PSI Project No. 00942508

Dear Mr. Stohl,

The geotechnical exploration and evaluation for the referenced project has been completed. An electronic copy of the report is being provided via email. Paper copies can be issued upon request. After you have had the opportunity of reading the report, please call at any time with any questions or comments you may have. Professional Service Industries, Inc. (PSI) appreciates the opportunity to be of service on this project, and looks forward to continuing as your geotechnical consultant during the design and construction phases, as well as your upcoming projects.

Sincerely,

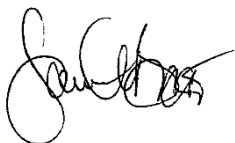
PROFESSIONAL SERVICE INDUSTRIES, INC.



Andrew Olson
Staff Geologist



Patrick Bray, E.I.T.
Branch Manager



James M. Becco, P.E.
Principal Consultant



The above Professional Engineering Seal and signature is an electronic production of the original seal and signature. Original hard copies can be provided upon request. This electronic reproduction shall not be construed as an original or certified document.

GEOTECHNICAL EXPLORATION AND EVALUATION

Proposed Wastewater Treatment Facility and Utility Installation

Cedarburg, Wisconsin

Prepared For:

Donohue & Associates, Inc.

3311 Weeden Creek Road

Sheboygan, Wisconsin 53081

PSI Project No. 00942508

February 7, 2025

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 Soil Boring Logs
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1 INTRODUCTION

1.1 GENERAL

This report presents the results of the geotechnical exploration and evaluation for the proposed Wastewater Treatment Facility and Utility Installation project in Cedarburg, Wisconsin. The work was performed for Donohue & Associates, Inc., at the request of Mr. Michael Stohl.

1.2 PURPOSE

The purpose of this study was to evaluate the subsurface conditions at specific boring locations on the site, and to establish parameters for use by the design engineers and architects in preparing the foundation, floor slab, and utility designs for the proposed project.

1.3 SCOPE

The scope of services included a site reconnaissance, the subsurface exploration, a determination of soil characteristics by field and laboratory testing, and an evaluation of the data obtained. The scope of the field work, including the number, depth, and locations of the borings was determined by the client. A settlement evaluation, and any necessary related field and laboratory testing, was not requested or performed.

1.4 AUTHORIZATION

The description of services and authorization to perform this subsurface exploration and evaluation were in the form of a signed Subconsultant Services Agreement between the client and PSI, dated November 6, 2024. The general conditions for the performance of the work were referenced in the proposal. This report has been prepared on behalf of, and exclusively for the use of Donohue & Associates, Inc. The information contained in this report may not be relied upon by any other parties without the express written consent of PSI, and acceptance by such parties of PSI's General Conditions.

2 SITE AND PROJECT DESCRIPTION

2.1 SITE FEATURES

The proposed WWTF project site is located just north of Pioneer Road, starting approximately 250 feet north of the intersection of Riverland Road and Pioneer Road in Cedarburg, Wisconsin. The project site extends west along Pioneer Road for approximately 1,250 feet; and to the north for approximately 2,600 feet. The proposed Utility Installation route extends west for approximately 4,600 feet along Pioneer Road, from about Riverland Road to the intersection with Green Bay Road. The route continues north for approximately 1,500 feet along Green Bay Road to the intersection with Hamilton Road; and continues northwest for approximately 2,500 feet along Hamilton Road to the intersection with Park Lane. Usage along the proposed utility project route consisted predominantly of residential and commercial properties along Hamilton



and Green Bay Road, and primarily residential properties and agricultural fields along Pioneer Road. At the time of the exploration, the proposed WWTF site was a vacant farm field. As an exception, one existing building with associated unpaved access drive and parking area was present just to the south of the proposed WWTF site near Pioneer Road.

The surrounding parcels consisted of vacant partially wooded land to the north, predominantly residential properties and agricultural fields to the east and south, and residential properties to the west. The Milwaukee River (and associated unnamed tributaries) was present just to the north and east of the proposed WWTF project site. A review of historical aerial photography available from Google Earth of various years between 2000 and 2023 of the area of the WWTF site indicates that at the time of the photo taken in 2000, a residential farm property with at least three (3) separate structures and a silo was present in the southern portion of the site near B-18. At the time of the photo taken in 2022, all but one of the structures in the southern portion of the site had been razed. The surface features of the site have remained relatively similar to those described above since the photo taken in 2022. The subject site is depicted on the enclosed Boring Location Plan (Figure 1).

The topography of the WWTF site is relatively hilly, with an elevation difference of approximately 29 feet between the boring locations. The site generally slopes down towards the north over most of the project area. The surface elevations of the boring locations ranged between about EL. 726.0 and EL. 697.0. At the time of the exploration, the surface of the site was relatively soft; therefore, an ATV mounted drill rig was utilized to access the boring locations.

2.2 PROJECT DESCRIPTION

Based on the information provided by the client, it is understood that the proposed project will consist of the construction of a new Wastewater Treatment Facility and associated Utility Installation. A new Lift Station is also planned (near B-39) as part of the utility portion of the project. It is understood that the WWTF will include nine (9) separate buildings, two (2) Clarifier Tanks, two (2) Aerobic Digester Tanks, one (1) Aeration Tank, and one (1) UV Disinfection/Post-Aeration Tank. Building and tank design details are described below. It should be noted that a grading map was not provided. In addition, planned first and basement floor elevations, mat elevations, tank bearing elevations, and final surface elevations were not known. Based on existing elevations at the borings in the area of the WWTF, which range between about EL. 726.0 and EL. 697.0, substantial cuts and fills of up to 10 feet or more may be necessary.

Proposed Wastewater Treatment Facility

Maintenance Building (B-21)

The Maintenance Building will be an approximately 160 feet by 50 feet in plan dimension, single-story structure, without a basement or any below grade levels. The structure is planned to be supported upon a conventional spread foundation with frost depth footings bearing at a depth of about 6 feet below existing grade. Structural loading details were not provided at the



time of report preparation. For the purpose of this report, it is estimated that maximum column and wall loads will not exceed 100 kips and 10 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Administration Building (B-22)

The Administration Building will be an approximately 100 feet by 50 feet in plan dimension, single-story structure, without a basement or any below grade levels. The structure is planned to be supported upon a conventional spread foundation with frost depth footings bearing at a depth of about 6 feet below existing grade. Structural loading details were not provided at the time of report preparation. For the purpose of this report, it is estimated that maximum column and wall loads will not exceed 100 kips and 10 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Headworks Building (B-24)

The Headworks Building will be an approximately 40 feet by 40 feet in plan dimension, single-story structure, with a basement throughout. The structure is planned to be supported by a mat foundation bearing at a depth of about 14 feet below existing grade. Structural loading details were not provided at the time of report preparation. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Generator and Switchgear Building (B-25)

The Generator and Switchgear Building will be an approximately 40 feet by 15 feet in plan dimension, single-story structure, without a basement or any below grade levels. The structure is planned to be supported upon a conventional spread foundation with frost depth footings bearing at a depth of about 6 feet below existing grade. Structural loading details were not provided at the time of report preparation. For the purpose of this report, it is estimated that maximum column and wall loads will not exceed 100 kips and 10 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Blower/Ferric Chlorite Building/RAS Pump Station (B-27)

The Blower/Ferric Chlorite Building and RAS Pump Station will be an approximately 105 feet by 30 feet in plan dimension, single-story structure. The Blower/Ferric Chlorite portion of the structure (75 feet by 30 feet) will have no below grade levels, and is planned to be supported upon a conventional spread foundation with frost depth footings bearing at a depth of about 6 feet below existing grade. The RAS Pump Station portion of the building (30 feet by 30 feet) will be single story with a basement throughout, and is planned to be supported by a mat foundation bearing at a depth of about 14 feet below existing grade. Structural loading details were not provided at the time of report preparation. For the purpose of this report, it is estimated



that maximum column and wall loads will not exceed 100 kips and 10 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Thickening and Dewatering Building (B-28)

The Thickening and Dewatering Building will be an approximately 60 feet by 60 feet in plan dimension, two-story structure, with a basement throughout. The structure is planned to be supported upon a mat foundation with bearing at a depth of about 10 feet below existing grade. Structural loading details were not provided at the time of report preparation. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Cake Storage Building (B-29)

The Cake Storage Building will be an approximately 180 feet by 60 feet in plan dimension, single-story structure, without a basement or any below grade levels. The structure is planned to be supported upon a conventional spread foundation with frost depth footings bearing at a depth of about 6 feet below existing grade. Structural loading details were not provided at the time of report preparation. For the purpose of this report, it is estimated that maximum column and wall loads will not exceed 100 kips and 10 kips per lineal foot, respectively. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Aeration Tank (B-30)

The Aeration Tank will be approximately 145 feet by 128 feet in plan dimension with 20 foot tall walls. The tank is planned to be supported by a mat foundation bearing at a depth of about 18 feet below existing grade.

Aerobic Digesters (B-31 and B-32)

The two (2) Aerobic Digesters will be approximately 50 feet in diameter with 20 foot tall walls, and are planned to be supported by mat foundations. The mats are planned to bear at a depth of about 10 feet below existing grade.

Secondary Clarifiers (B-33 and B-34)

The two (2) Secondary Clarifiers will be approximately 90 feet in diameter with 16 foot tall walls, and are planned to be supported by mat foundations. The mats are planned to bear at a depth of about 14 feet below existing grade.



Filter Building (B-35)

The Filter Building will be an approximately 90 feet by 50 feet in plan dimension, single-story structure, with a basement throughout. The structure is planned to be supported by a mat foundation bearing at a depth of about 10 feet below existing grade. Structural loading details were not provided at the time of report preparation. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

Recycle Pump Station (B-36)

The Recycle Pump Station will be an approximately 15 feet by 15 feet in plan dimension, single-story structure, with a basement throughout. The structure is planned to be supported by a mat foundation bearing at a depth of about 20 feet below existing grade. Structural loading details were not provided at the time of report preparation. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

UV Disinfection/Post Aeration Tank (B-38)

The UV Disinfection/Post Aeration Tank will be approximately 40 feet by 40 feet in plan dimension with 12 foot tall walls. The tank is planned to be supported by a mat foundation bearing at a depth of about 10 feet below existing grade.

Proposed Utility Installation and Lift Station

Based on the information provided by the client, the Utility Installation portion of the project will consist of a new 36-inch in diameter gravity sewer main, originating at the existing Cedarburg Wastewater Plant, located just northeast of the intersection of Hamilton Road and Park Lane. The sewer main will continue east and south for approximately 4,000 feet along Hamilton Road and Green Bay Road, respectively, to the proposed Lift Station area near the intersection with Pioneer Road (B-39). From the proposed pump station, a 24-inch force main will continue east to the relative high point along Pioneer Road (near B-14) and then gravity flow the remaining distance to the proposed WWTF (approximately 4,600 feet from the Lift Station). The utilities are planned to bear at elevations ranging between about EL. 732.0 and EL. 692.0. The planned utility bearing depth (provided by the client) for each boring location is outlined in Table 1:



Table 1. Planned Utility Bearing Elevations	
Boring No.	Planned Utility Bearing Elevation (feet)
B-1	732.0
B-2	732.0
B-3	732.0
B-4	732.0
B-5	725.0
B-6	705.0
B-7	705.0
B-8	692.0
B-9	692.0
B-10	702.0
B-11	704.0
B-12	715.0
B-13	718.0
B-14	722.0
B-15	714.0
B-16	711.0
B-17	708.0

Lift Station (B-39)

The proposed Lift Station will consist of a 20 foot-diameter, single-story, cast in place concrete structure. It will be located at the northwest corner of the intersection of Pioneer Road and Green Bay Road. The structure is planned to extend to a depth of about 25 feet and will be self-supported, acting as a mat foundation. Structural loading details were not provided at the time of report preparation. When structural loads are determined, PSI must be informed in order to determine if revisions to this report are necessary.

It is estimated that only nominal surface grade changes will occur in the area of the structure. Based on the existing grade near B-39 (EL. 711.0), the mat is estimated to bear at about EL. 686.0. However, this will also be dependent on the subgrade preparation criteria, to be discussed in a later section.

When additional information regarding the project becomes available (including structural loads and especially planned elevations), and/or if any of the information discussed herein differs from the current plans or changes as design progresses, PSI must be informed so that any necessary revisions to this report can be made.



3 EXPLORATION AND LABORATORY PROCEDURES

3.1 SCOPE SUMMARY

The field and laboratory data utilized in the evaluation and analysis of the subsurface materials was obtained by drilling exploratory test borings, securing soil samples by the split-spoon sampling method, and subjecting the samples to laboratory testing.

3.2 FIELD EXPLORATION

A total of thirty nine (39) soil test borings were planned to be performed to depths ranging from 20 to 42 feet below the existing ground surface. However, auger refusal on possible cobbles, boulders, or bedrock was encountered at B-1 through B-7 at depths ranging from about 4 to 16 feet (EL. 762.0 to EL. 689.0). Coring of the refusal materials was not requested or performed. Borings B-1 through B-17 were performed to depths ranging from about 4 to 26 feet within the area of proposed utilities; B-18 through B-38 were performed to depths ranging from about 20 to 40 feet with the proposed WWTF area; and B-39 was performed to a depth of about 26 feet in the area of the proposed Lift Station. The number, depths, and locations of the borings were determined by the client. The borings were located in the field by PSI utilizing a handheld GPS device. They are estimated to be accurate to within several feet. The surface elevations shown on the logs were estimated by interpolation of a 1-foot contour map of the property, provided by the client. The elevations are estimated to be accurate to within about 1 foot.

The soil test borings were performed with an ATV mounted rotary drilling rig utilizing continuous flight hollow stem augers to advance the holes. Representative samples were obtained by the Standard Penetration Test (SPT) method using split-spoon sampling procedures in general accordance with ASTM D-1586 procedures. Samples were collected at 2.5-foot intervals to 10 feet, and then at 5-foot intervals thereafter to the end of the borings. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty (30) inches, required to advance the split-spoon sampler one (1) foot into the soil. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three (3) successive increments of six (6) inches of penetration. The "N" value is obtained by adding the second and third incremental numbers. The SPT provides a means of estimating the relative density of granular soils and comparative consistency of cohesive soils, thereby providing a method of evaluating the relative strength and compressibility characteristics of the subsoils.

The SPT soil samples were transferred into clean glass jars immediately after retrieval and returned to the laboratory upon completion of the field operations. Samples will be discarded unless other instructions are received. All soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488-75). A description of the subsurface conditions encountered at each boring location is shown on the enclosed Soil Boring Logs. After completion of the borings the auger holes were backfilled to the ground surface with bentonite chips.

A copy of the Soil Boring Logs and Boring Location Plan (Figure 1) are enclosed in the Appendix. The soil stratification shown on the logs represents the approximate soil conditions



in the actual boring locations at the time of the exploration. The terms and symbols used on the logs are described in the General Notes found in the Appendix.

3.3 LABORATORY PHYSICAL TESTING

Soil samples obtained from the exploration were visually classified in the laboratory, and subjected to testing, which included moisture content determinations. Selected cohesive soil samples were tested in unconfined compression with an uncontrolled strain loading rate and/or with a calibrated hand penetrometer to aid in evaluating the soil strength characteristics. The values of strength tests performed on soil samples obtained by the Standard Penetration Test Method (SPT) are considered approximate, recognizing that the SPT method provides a representative but somewhat disturbed soil sample.

The laboratory testing was performed in general accordance with the respective ASTM methods, as applicable, and the results are shown on the boring logs and Laboratory Data Sheets in the Appendix.

4 DESCRIPTION OF SUBSURFACE CONDITIONS

4.1 GENERAL

A description of the subsurface conditions encountered at the test boring locations is shown on the Soil Boring Logs. The lines of demarcation shown on the logs represent approximate boundaries between the various soil classifications. It must be recognized that the soil descriptions are considered representative for the specific test boring location, but that variations may occur between and beyond the sampling intervals and boring locations. Soil depths, topsoil and layer thicknesses, and demarcation lines utilized for preconstruction planning should not be expected to yield exact and final quantities. A summary of the major soil profile components is described in the following paragraphs.

4.2 SUBSURFACE CONDITIONS

Proposed WWTF (B-18 through B-38)

The surface of the site at borings B-18 through B-38 consisted of 4 to 9 inches of topsoil, generally comprised of brown to dark brown clay with silt, and trace sand and root matter. Beneath the topsoil was brown to reddish brown clay with sand, and variable amounts of silt, gravel, and root matter to a depth of about 2 feet (EL. 724.0 to EL. 695.0). The underlying natural soils consisted of brown to reddish brown clay with variable amounts of sand, silt, and gravel; light brown fine to coarse sand with trace gravel and silt; brown to dark brown fine sand with silt, and trace clay and gravel; and brown to gray silt with clay, gravel and trace sand to the maximum depths explored by the borings.



Proposed Utilities and Lift Station (B-1 through B-17, B-39)

The surface of the site at utility borings B-1 through B-6, B-9, B-14, and B-39 consisted of about 2 to 10 inches of topsoil fill, generally comprised of dark brown to reddish brown clay with silt, and trace sand and root matter. The surface of the site at utility borings B-7, B-8, B-10, and B-11 consisted of about 6 to 9 inches of asphalt. The asphalt was underlain by about 4 inches of base course consisting of brown to dark brown fine to coarse sand with gravel and trace silt. The surface at the remaining utility borings (B-12, B-13, and B-15 through B-17) consisted of 4 to 6 inches of fill comprised light brown to dark brown fine to coarse sand with trace gravel, silt, and clay. Beneath the surface materials, fill, generally comprised of dark brown to light brown and reddish brown clay with silt and trace sand; brown to reddish brown fine to coarse sand with varying amounts of silt and gravel; and dark brown to reddish brown sandy clay with variable amounts of silt, gravel, and possible asphalt pieces, was present to depths ranging from about 2.5 feet to 7.5 feet (EL. 763.5 to EL. 697.5) below existing grade in the utility borings. Beneath the fill, the underlying natural soils consisted of brown clay with trace silt, sand, and gravel; light brown silt with trace clay and sand; light brown to gray fine to coarse sand with gravel; and light brown fine sand with silt and trace gravel to the maximum depths explored by the borings.

The fill soils were classified as such based on their varied visual characteristic and coloration. However, it must be recognized that in the absence of foreign substances and/or debris within the soil samples obtained, it is often difficult to distinguish between natural soils and clean soil fill.

The natural cohesive soils encountered in the borings were generally medium stiff to hard in comparative consistency, with Standard Penetration Resistances (N-values) ranging from about 6 to 30 blows per foot (bpf), and unconfined compressive strengths ranging from about 0.5 to 9.5 tons per square foot (tsf). The natural granular soils encountered in the borings were generally loose to very dense in relative density, with N-values ranging from about 5 bpf to 50 blows per 1-inch of initial sampling. The cohesive fill soils encountered in the borings were generally soft to stiff in comparative consistency, with N-values ranging from about 4 to 25 bpf, and unconfined compressive strengths ranging from about 0.2 to 1.4 tsf. The granular fill soils encountered in the borings were generally medium dense to dense in relative density, with N-values ranging from about 7 to 33 bpf.

Auger refusal on possible cobbles, boulders, or bedrock was encountered at borings B-1 through B-7 at depths ranging from about 4 to 16 feet (EL. 762.0 to EL. 689.0) below existing grade. Refusal depths are outlined in Table 2:



Table 2. Approximate Boring Refusal Depths			
Boring No.	Approximate Refusal Depth (Feet)	Approximate Refusal Elevation (Feet)	Planned Utility Bearing Elevation (feet)
B-1	6	736.0	732.0
B-2	11.5	739.5	732.0
B-3	4	762.0	732.0
B-4	7	746.0	732.0
B-5	7	728.0	725.0
B-6	6	702.0	705.0
B-7	16	689.0	705.0

The foregoing discussion of soil conditions on this site represents a generalized soil profile as determined at the test boring locations. A more detailed description and supporting data for each test location can be found on the individual Soil Boring Logs.

4.3 GROUNDWATER OBSERVATIONS

Groundwater observations were made during the drilling operations and in the open boreholes upon completion. Groundwater was encountered during auger advancement in borings B-8, B-9, B-30, B-32, and B-37 through B-39 at depths ranging from about 7 to 39 feet (EL. 700.0 to EL. 669.0) below the ground surface. Upon completion and removal of the augers, groundwater was present at borings B-8, B-30, B-32, B-37, and B-38 at depths of about 7 to 39 feet (EL. 698.0 to EL. 669.0). The borings caved at depths ranging from about 2 to 30 feet below existing grade; therefore, observations could not be made below the cave depths. A summary of the groundwater conditions encountered is summarized in Table 3:

Table 3. Groundwater Observation Summary		
Boring No.	During Auger Advancement (feet)	Upon Completion and Auger Removal (feet)
B-8	7 (EL. 698.0)	7 (EL. 698.0)
B-9	11 (EL. 700.0)	Not Present
B-30	34 (EL. 679.0)	34 (EL. 679.0)
B-32	18 (EL. 680.0)	18 (EL. 680.0)
B-37	19 (EL. 690.0)	19 (EL. 690.0)
B-38	39 (EL. 669.0)	39 (EL. 669.0)
B-39	23 (EL. 688.0)	Not Present

The groundwater observations reported herein are considered approximate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. Longer term monitoring would be required to further evaluate groundwater levels on this site. The water



level of the Milwaukee River (and associated unnamed tributaries) may have an impact on the groundwater level fluctuations in the project area.

5 CONSIDERATIONS AND RECOMMENDATIONS

5.1 GENERAL DEVELOPMENTAL CONSIDERATIONS – WWTF AND LIFT STATION

In view of the subsurface conditions encountered in the test borings, together with the structural loading criteria and development grades anticipated, the proposed structures can be supported by conventional spread footings and mat (or acting as mat) foundations. Undercutting of soft, loose, wet, or otherwise unsuitable natural soils may be necessary, at least on an isolated basis.

Substantial difficulty with groundwater and softening of subgrade soils may occur where excavations encroach upon or extend below the groundwater level or perched zones, especially in the area of the proposed Lift Station (B-39) and for deeper utility installation. Some difficulty may also be experienced in some areas of the WWTF, dependent upon bearing elevations. An adequate dewatering effort, possibly in conjunction with the overexcavation of unstable zones, and the use of a crushed stone working mat (or “mud mat”), is likely to be required. In addition, severe excavation instability may occur.

The existing soils can generally be utilized for support of the floor slabs after proper subgrade preparation. However, some overexcavation of unsuitable soils may be necessary. A discussion of the building foundation parameters, as well as the support conditions for the floor slab are included in later sections.

It should be noted that planned first and basement floor elevations, mat elevations, tank bearing elevations, and final surface elevations were not known. Based on existing elevations at the borings in the area of the WWTF, which range between about EL. 726.0 and EL. 697.0, substantial cuts and fills of up to 10 feet or more may be necessary. When final elevations are determined, PSI must be notified in order to determine if any revision to the recommendations contained herein are necessary. It may also be necessary to perform additional borings within the footprints of at least some of the structures.

5.2 GENERAL PIPING INSTALLATION AND CONSTRUCTION CONSIDERATIONS

Auger refusal on possible cobbles, boulders, or bedrock was encountered at borings B-1 through B-7 at depths ranging from about 4 to 16 feet (EL. 762.0 to EL. 689.0) below existing grade. Based on the proposed sanitary sewer bearing depths, the sewer main will extend about 3 to 30 feet below the refusal depths at B-1 through B-5. However, some variation is likely between and beyond the borings. Extremely difficult digging, longer excavation times, and excavation refusal or near refusal will be experienced. Specialized excavation techniques and/or blasting will likely be required. It is recommended that test pits be performed as part of design and construction planning to further evaluate the extent, type, and excavability of the refusal materials.



Some difficulty with groundwater and softening of subgrade soils may occur, especially where excavations encroach upon or extend below the groundwater level or perched zones, such as may occur in the area of B-8 and B-9. An adequate dewatering effort, possibly in conjunction with the overexcavation of unstable zones, and the use of a crushed stone working mat (or “mud mat”), may be required. In addition, substantial excavation instability may occur.

All pipes, manholes, and other subsurface structures must bear upon suitable and stable soils. It must be recognized that variations may occur between and beyond the sampling intervals and boring locations. Interpolation of conditions between and beyond the borings can assist in design; however, soils may vary substantially between the borings, and near or beneath manmade structures.

5.3 SITE PREPARATION

The presence of organic topsoil and vegetation within the subgrade can adversely affect the serviceability of structural fills, foundations, floor slabs, pavements, and other structures placed upon them. The surface at borings B-1 through B-6, B-9, B-14, and B-18 through B-39 was covered with about 2 to 10 inches of topsoil or topsoil fill. However, some variation should be expected, especially within areas of previous agricultural fields, where tilling and other related operations can result in thicker pockets of topsoil, or topsoil having become intermixed within underlying soils. All topsoil, topsoil fill, vegetation, trees, roots, organic matter, and other unsuitable materials encountered on the surface at the time of construction, must be removed from the areas of floor slabs, footings, pavements, and other structural areas.

The majority of the property was a farm field at some time in the past. If any remnant drain tiles are encountered during construction, it is generally recommended that they be tied into new drainage structures or otherwise be properly drained to a suitable area (in accordance with any applicable regulatory requirements or restrictions), since they may still actively drain areas of the subject site or adjacent properties.

Site preparation may require removal of the existing structure(s) and remnants of former buildings, including foundations and underground utilities. Extensive areas of loose backfill material may be encountered within utility trenches, adjacent to the existing structures, and in former building and basement areas. These will also require removal. The areas, including basements, must then be properly backfilled with compacted structural fill. Prior to the backfilling, the areas must be observed by a PSI representative to evaluate the suitability of the subgrade for subsequent support of the new building, utilities, or other structures.

After stripping the topsoil and cutting high areas of the site to the planned finished grade, and prior to the placement of new fill which may be placed to raise grades, the exposed subgrade must be thoroughly proofrolled to detect unstable, yielding soils. This should consist of overlapping passes in a perpendicular grid pattern, with a fully-loaded tandem-axle dump truck, or other equipment of similar size and weight suitable for the surface conditions. Proofrolling should be performed in consultation with the geotechnical engineer at the time of construction. Some difficulty with subgrade preparation may be experienced, especially in wet or cold weather, or during thawing conditions. Additionally, instability can become more severe



and widespread in silty and clayey materials (such as were encountered in the borings), which are considered to be moderately to highly moisture sensitive. It is generally recommended that earthwork be carried out during relatively warm, dry weather. Any soft, wet, or otherwise unstable zones which cannot be improved by scarification and aeration, must be removed and replaced with compacted structural fill, such as clean crushed stone, possibly in conjunction with the use of a geotextile fabric. Lime, lime kiln dust, fly ash, or Portland cement modification are additional remedial measures which can be considered for clayey and some silty soils. However, this must only be performed at the direction and under the supervision of the geotechnical engineer. A proper mix design must be performed prior to the performance of any modification. Substantial delays and difficulty with subgrade stabilization may be experienced if the soils become wet during construction. Consideration should be given to installing construction roads to reduce disturbance to the sensitive subgrade soils.

Every effort must be made to keep excavations dry. If construction proceeds during wet weather, some additional overexcavation may be necessary. If weather permits, the soil could be dried and recompacted. A crushed stone working mat, possibly in conjunction with a geotextile fabric may also be feasible to help stabilize subgrades. Site grading runoff should be directed to catch basins, or other appropriate areas of the site, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

If site grades are raised in excess of 2 feet, the first lift of new fill must be placed so as to extend a minimum lateral distance of 5 feet beyond the planned top building pad dimension (for fills less than 5 feet in thickness), or for a distance equal to at least 1 foot laterally beyond the top pad dimension for every foot of fill thickness (for fills greater than 5 feet in depth). Subsequent lifts can then be placed on an approximate 1H:1V slope back up to the planned top perimeter dimension of the pad. Similarly, where undercutting of unsuitable soils is performed beneath foundations, floor slabs, or other structural areas, it is recommended that the removal extend laterally beyond the perimeter of the structure at least 1 foot for every foot of removal below the planned bearing depth. Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities.

When a firm and stable subgrade is established, low areas may be raised to planned grades with properly compacted structural fill. Any new fill should be a clean granular soil, such as those materials meeting the gradations outlined in Section 209 or 305 of the State of Wisconsin Standard Specification for Highway and Structure Construction. If fine-grained soils, such as those with high silt or clay content are used, they should generally be placed over large open areas, where conditions are more favorable for the proper placement and compaction of such materials. It must be recognized that high silt or clay content materials are difficult to compact when placed at moisture contents beyond a few percent of the optimum moisture content. In addition, the near surface soils across the site are considered to be highly moisture sensitive; therefore, some difficulty with subgrade preparation should be expected, especially if they become wet during construction. Fill must be placed in layers of not more than nine (9) inches in thickness, at moisture contents at or near optimum, and be compacted to a minimum density of 95 percent of the maximum dry density as determined by ASTM designation D-698 (Standard Proctor). Portions of the on-site soils can generally be used as new fill to raise grades over



large, open areas. However, some sorting or moisture conditioning will likely be required. Silt, clay, and wet granular soils are not suitable for reuse as fill in trenches, or adjacent to foundation stem walls or retaining walls. Substantial importing of suitable granular backfill soils is likely to be necessary.

Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities. This is especially true of clayey soils, where scarification and aeration may be required to achieve near - optimum moisture levels prior to compaction. A sheepsfoot roller is generally required for compaction of clayey soils, whereas a vibratory smooth drum roller is preferred for granular material. Small hand-operated compactors should be used in confined areas; granular fills are generally more readily compacted to the required densities in such applications.

It is recommended that well-graded granular soils be utilized as backfill in new utility trenches and along side below grade walls to reduce the potential for consolidation and settlement of the fill. All fill soils must be placed and compacted under engineering controlled conditions, to provide suitable support for overlaying structures and roadways. Additional guidance can be provided at the time of construction in the selection process for grade-raising fill and trench backfill.

The selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the evaluation of the subgrade and placement and compaction of fill for structural applications should be monitored and tested by a qualified representative of the soils engineer.

5.4 PRELIMINARY FOUNDATION EVALUATION – WWTF STRUCTURES

The following is a general overview of the subsurface conditions for the site, as it relates to the foundation evaluation, and is intended only for use in preliminary planning. Additionally, the bearing pressures provided are not intended to be applied to any specific structure without the provision of final elevations, and subsequent confirmation by PSI.

The proposed WWTF structures can be supported by conventional spread footings and mat foundations. Elevations at the borings in this area ranged between about EL. 726.0 and EL. 697.0, and substantial cuts and fills of up to 10 feet or more may be necessary. Based on this and the borings, it is generally estimated that the structures will bear upon very stiff to hard natural clay soils or compacted structural fill used to raise grades. For preliminary planning, conventional spread footings and mat foundations bearing upon suitable natural soils, or structural fill (or lean concrete mix) can be designed to exert net allowable soil bearing pressures of 2,000 to 4,000 psf, dependent upon location and bearing elevation. However, some undercutting of soft, loose, wet, or otherwise unsuitable soils may be required. All foundations must bear upon suitable and stable soils of sufficient strength. Undercutting of soft, loose, wet, or otherwise unsuitable natural soils may be necessary, at least on an isolated basis.



5.5 FOUNDATION EVALUATION – LIFT STATION (B-39)

The proposed Lift Station may be supported by a mat foundation bearing at a depth of about 25 feet below existing grade. Based on the existing elevation at B-39 (EL. 711.0), the mat is estimated to bear at about EL. 686.0. Medium dense natural granular soils were present at this approximate elevation in B-39. For preliminary planning, a mat foundation bearing upon suitable natural soils, or structural fill (or lean concrete mix) can be designed to exert a net allowable soil bearing pressure of 2,000 psf. Undercutting of soft, loose, wet, or otherwise unsuitable natural soils may be necessary, at least on an isolated basis.

General Foundation Recommendations

The suitability of the existing soils for support of the proposed foundation must be determined by testing by a qualified geotechnical engineer during construction, utilizing static cone penetrometer tests or dynamic cone penetrometer tests for cohesive and granular soils, respectively. Soft, loose, wet, or otherwise unsuitable materials not disclosed by the borings, may be encountered in the foundation excavations at the bearing elevation. If unsuitable existing soil is present, it must be removed throughout a zone extending one foot laterally for each foot removed below the foundation, on either side of the planned footing. The over-excavated area must be backfilled with structural compacted fill.

Wet soils, and groundwater or perched zones may be encountered within foundation excavations in at least some areas. A substantial loss in strength along with an extremely soft, loose, unstable or otherwise unsuitable subgrade may develop when the confining effect of the overburden is removed. This may require undercutting and the use of a crushed stone working mat or a “mud mat” to achieve a stable bearing grade. Substantial sloughing and caving may also occur, and dewatering may be required.

Where foundations are planned adjacent to existing foundations or to each other, the effects of overlapping soil stresses must be considered. The net allowable soil bearing pressure recommended above must not be exceeded. It should be noted that backfill materials may be encountered within existing utility trenches and adjacent to existing foundation walls. Overexcavation of unsuitable trench backfill and replacement with structural fill may be necessary for proper foundation support. All foundations must bear upon suitable natural soils or properly placed and compacted structural fill.

All foundations must be placed at a depth of 4 feet (or deeper if in accordance with local requirements or customary practice) below the finish grade for frost protection. In addition, all foundations must be protected from the effects of frost if construction is carried out during winter months.

It is recommended that the footings supporting individual columns have a minimum dimension of 24 inches, and continuous footings have a minimum width of 18 inches, even if the maximum recommended allowable bearing pressure is not fully utilized. In order to minimize the effects of any slight differential movement that may occur due to variations in the character of the



supporting soils and any variations in seasonal moisture contents, it is recommended that all foundations be suitably reinforced to make them as rigid as needed.

In general, the performance of the foundation system on this site is dependent on the various factors discussed herein. The excavation, preparation, and concreting of foundations should be monitored and tested by a representative of the soils engineer.

5.6 OPEN CUT UTILITY CONSTRUCTION

The use of shoring, bracing, or trench boxes will be required. Additionally, excavations encroaching upon or extending below the groundwater or perched zones can become substantially unstable when the confining effect of the overburden is removed. An adequate dewatering effort and bracing of sidewalls will be required. Utility construction should be performed in accordance with "The Standard Specifications for Sewer and Water Line Construction" for the State of Wisconsin.

It is recommended that well graded granular soils such as those specified in Tables 37 and 39 of the Standard Specification for Sewer and Water Construction be utilized as backfill in utility trenches to reduce the potential for consolidation and settlement of the backfill. All fill soils must be properly placed and compacted under engineering controlled conditions to provide suitable support for overlaying structures and roadways. Silty and clayey soils, organic soils, and wet granular materials are not recommended for use as backfill within utility trenches due to the substantial difficulty of obtaining proper compaction in confined areas. Some importing of suitable fill will likely be required.

Placement of bedding and cover material must be sufficient to protect the type of pipe selected as specified by the pipe manufacturer. Trench backfill should be placed in layers not more than 12 inches in loose thickness before compaction, except that the first lift of backfill placed over the pipe can be increased to 24 inches if necessary to protect the pipe from compaction equipment. Subsequently thinner lifts may be required depending on the type and size of compaction equipment available.

Each lift of backfill above the pipe bedding and cover must be compacted to a density of at least 95 percent of the maximum dry density as determined by the Standard Proctor method (ASTM D698).

As with all excavation work, all open cut trenches must be properly shored and braced as required by applicable federal and state OSHA codes, and as necessary to protect life and property.

The proposed utilities will bear at an elevation range of about EL. 732.0 to EL. 692.0, as provided by the client. Manholes and other structures supported on suitable soils, suitable and stable refusal materials, or newly placed and compacted structural fill (or lean concrete mix) used to replace unsuitable materials, may be designed for a net allowable soil bearing pressure of 1,000 to 4,000 psf, dependent upon location and bearing elevation.



5.7 FLOOR SLAB SUBGRADES

Prior to constructing the floor slabs or pavements, and prior to the placement of any fill used to raise grades, the exposed subgrade must be prepared utilizing the proofrolling procedures described previously. In areas that exhibit soft, yielding or unstable soil conditions, the following remedial measures are recommended to provide a stable subgrade. It must be recognized that the high silt and clay content soils are highly sensitive to increases in moisture and construction disturbance. It will therefore be necessary to maintain these materials in a relatively dry condition to allow for proper subgrade preparation. It is recommended that the proofrolling operations be monitored by a representative of the geotechnical engineer so that a firm, suitable subgrade is present prior to placement of new fills, or to construction of floor slabs and pavements.

Localized wet, soft or unstable areas should be undercut to such depths determined necessary in the field to reach stable material. The overexcavations should then be backfilled with imported crushed stone, such as a 1¼-inch dense graded base specified in Section 305 of the WisDOT Standard Specifications, placed and compacted as recommended in the *Site Preparation* section of this report. If relatively thick zones or areas of extensive yielding (*such as in fill zones or encroaching upon wetland areas*) are observed that cannot be stabilized by normal discing, aeration and recompaction procedures, undercutting and replacement with crushed stone and geotextile fabric (if needed) may also be required in these areas.

The floor slab(s) may be designed utilizing an estimated modulus of subgrade reaction of 125 pci based on the presence of a suitable and stable subgrade, prepared as discussed in this report. However, this is based on common range values obtained from 1 ft. x 1 ft. plate load tests on specific soil types. Depending on how the slab load is applied, the value may need to be modified for larger areas using the following:

Modulus of Subgrade Reaction $k_s = \left(\frac{k}{B}\right)$ for cohesive soil

$$k_s = k \left(\frac{B+1}{2B}\right)^2 \text{ for cohesionless soil}$$

where: k_s = coefficient of vertical subgrade reaction for loaded area
 k = coefficient of vertical subgrade reaction for a 1x1 foot square area
 B = width of area loaded, in feet

The final design and detailing should be performed by a qualified structural engineer based on the intended slab use, loading conditions and anticipated subgrade conditions.

A granular mat, which can be designed as a drainage layer, should be provided below the floor slab. This must be a minimum of six (6) inches in thickness and properly compacted. In moisture sensitive areas, a vapor barrier may be placed beneath the floor slab or base course; however, it is recommended that the architect be consulted in this regard. The proper use of a vapor barrier may not completely prevent moisture beneath or on top of slabs. If the base course contains sharp particles, a cushion layer of sand approximately 2 inches in thickness may be required to provide protection from puncture.



The floor slabs must be suitably reinforced to make them as rigid as necessary and proper joints provided at the junction of slabs and the foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas must be provided with joints at frequent intervals (maximum spacing of 30 times the slab thickness, per ACI) to compensate for concrete volume changes (shrinkage). Where the slab will be supporting live loads, such as from moving vehicles, joints must be keyed or dowelled to permit proper load transfer. It is recommended that appropriate construction methods and curing procedures be used to minimize shrinkage and curling of the floor slabs.

5.8 EXTERIOR/UNHEATED AREA SLABS

Based on the borings, entry slabs, sidewalks, aprons, and other slabs in exterior or unheated areas may bear upon silty or clayey soils. Such materials are highly frost susceptible and poorly drained. Slabs placed directly upon such soils are subject to heaving and subsequent settlement due to freeze/thaw cycles. This can result in cracking, misalignment, and other related effects (especially at joints). It is recommended that consideration be given to limited undercutting of the frost susceptible materials to a depth of 1 to 2 feet below the slab, and replacement with well graded, properly placed and compacted granular soils. A properly designed underdrain system connected to the municipal sewer (if permissible) or directed to on-site stormwater management areas should also be incorporated to reduce the potential effects of freeze/thaw cycles.

5.9 BELOW GRADE WALLS

Based on the depth and anticipated design of the below grade structures, the use of a conventional drainage system may not be feasible for some. All structures be appropriately designed to adequately resist lateral pressures, and hydrostatic uplift.

It is recommended that a drainage course be placed beneath the floor slab or foundation, and alongside the below grade walls to alleviate hydrostatic uplift pressure beneath the slab and excessive lateral pressure on walls. The below grade walls must be backfilled for a lateral distance of 3 to 4 feet with a well-graded, free draining granular material. This should be placed in lifts not exceeding 12 inches in thickness and be compacted to at least 95 percent of the Standard Proctor density. Based upon the use of a clean, crushed stone fill, an equivalent fluid pressure of 95 psf (not including any traffic or other surcharge loads) may be used as the horizontal component of earth pressure at rest for a submerged condition. However, when a proposed fill material has been selected, a representative sample must be submitted to PSI for testing to verify the above values and associated recommendations. Silt and clay soils, organic soils, and wet granular materials are not suitable for use as backfill alongside basement walls.

If some of the below grade structures are planned to include a drainage system, it must be connected to adequate sumps for drainage, and be properly discharged in accordance with all state and local discharge requirements. Drain tile should have a minimum diameter of four (4) inches and should be wrapped with an appropriate filter fabric. Drainage pipes should be surrounded by clean gravel and extend up to the near ground surface in window well areas. At



least six (6) inches of clean $\frac{3}{4}$ inch stone should be utilized for the free draining layer beneath the floor areas. Based upon the use of a clean, crushed stone fill, and a constantly maintained fully drained condition (and exclusive of any surcharge loads), an equivalent fluid pressure of 65 psf may be used as the horizontal component of earth pressure at rest.

Uplift force can be resisted by the dead weight of the structure and the weight of the soil above the horizontal projection of the foundation edge. A moist unit weight of 130 pounds per cubic foot, and a buoyant unit weight of soil of 75 pounds per cubic foot may be used, above and below the groundwater, respectively, when calculating the weight available to resist uplift force, based upon the use of well-graded granular backfill. The soil mass may be estimated by a line extending from the base of the footing to the surface, rotated outward from the footing, and 20° from vertical. All soil within the “wedge” shaped geometry may be used to resist uplift. The effect of hydrostatic uplift may also be reduced with the incorporation of a properly designed drainage system, placed around and beneath the structure, or with a suitably designed anchoring system.

6 CONSTRUCTION CONSIDERATIONS

6.1 GROUNDWATER CONTROL

Groundwater was encountered during auger advancement in borings B-8, B-9, B-30, B-32, and B-37 through B-39 at depths ranging from about 7 to 39 feet (EL. 700.0 to EL. 669.0) below the ground surface. Upon completion and removal of the augers, groundwater was present at borings B-8, B-30, B-32, B-37, and B-38 at depths of about 7 to 39 feet (EL. 698.0 to EL. 669.0). On the basis of the observations, some difficulty with groundwater may be experienced with increasing depth in some areas. In addition, major difficulty may be encountered in the area of the proposed Lift Station (B-39), and for utility installation in at least the area of B-8 and B-9. If excavations extend only a few inches or so below the groundwater, or for low volume perched zones, a filtered sump pump may suffice to control the groundwater. However, for excavations encroaching upon or extending below the groundwater or larger volume perched zones, or for rising groundwater levels, prolonged dewatering with series of high capacity sump pumps (with sufficient lifting capacity), may be necessary to facilitate construction.

Since the foundation materials are subject to softening when exposed to free moisture, every effort should be made to keep excavations dry. Discharge water from roof drains should be directed away from the building, and the site grading direct runoff to catch basins or other appropriate areas of the site, so that the potential for the softening of the foundation and pavement subgrade soils is reduced.

The groundwater observations reported herein are considered approximate. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics. The water level of the Milwaukee River (and associated unnamed tributaries) may have an impact on the groundwater level fluctuations in the project area.



6.2 EXCAVATIONS AND SITE DRAINAGE

Sloping, shoring or bracing of the excavation sidewalls will be necessary to facilitate construction and to protect life and property. Sloughing and caving, and subgrade instability may occur within unprotected excavations. The degree of excavation instability problems is dependent upon the depth and length of time that excavations remain open, excavation bank slopes, water levels and the effectiveness of any dewatering systems. All excavation work must be performed in accordance with OSHA and local building code requirements.

Where excavations encroach upon or extend below the groundwater or perched zones and into granular or soft clay soils, a substantially unstable subgrade may develop when the confining effect of the overburden is removed. Significant sloughing or caving of sidewalls may also occur. Some overexcavation of softened or loosened soils, in conjunction with the use of a crushed stone working mat, may be necessary to establish a stable bearing subgrade. Additionally, significantly widened excavations may result, or be required to maintain or achieve sidewall stability. Major difficulty with groundwater and with excavation stability may be experienced in at least some areas of the project, such as for the Lift Station and near B-8 and B-9 (where utilities will be installed).

All excavations must be performed with caution and utilize methods which will prevent undermining or destabilization of buildings, utilities, pavements, sidewalks or other structures. The use of a properly designed shoring and bracing, sheet piling, or underpinning system must be utilized as necessary to adequately protect buildings, utilities, pavements, and other structures. This must be performed by an experienced specialty contractor. Additionally, extreme care must be used during the installation of any bracing system, especially those using driven or vibratory methods, in order to avoid damaging existing buildings, utilities, and other structures. Consideration should be given to the performance of video and/or photographic documentation of the condition of nearby buildings, utilities, and other structures prior to installation.

Auger refusal on possible cobbles, boulders, or bedrock was encountered at utility borings B-1 through B-7 at depths ranging from about 4 to 16 feet (EL. 762.0 to EL. 689.0) below existing grade. Based on the proposed sanitary sewer bearing depths, the sewer main will extend about 3 to 30 feet below the refusal depths at B-1 through B-5. Extremely difficult digging, longer excavation times, and refusal or near refusal conditions will be experienced. It is recommended that test pits be performed as part of design and construction planning to further evaluate the extent, type, and excavability of the refusal materials.

Specialized removal techniques, such as ripping and/or blasting, will be required to establish the invert elevations for utilities in some areas. If blasting is performed, it is recommended that a specialty contractor be utilized to perform the blasting operations. Blasting can cause noise and vibration disturbance to neighboring structures, and must be performed using extreme caution. Consideration should be given to the performance of video and/or photographic documentation of the condition of nearby buildings, utilities, and other structures prior to any blasting. Following the blasting, the exposed subgrade should be observed by the geotechnical engineer so that disturbance of the overburden is not excessive, and that the blasted rock is



sufficiently stable for piping or foundation support. It is likely that at least some compaction of the blasted rock will be required. In addition, some overexcavation of larger stone may be required.

Since the subgrade soils are generally sensitive to moisture, every effort should be made to provide adequate drainage across the site during construction, and to prevent ponding of runoff on the subgrade. These soils are also subject to erosion caused by runoff, and erosion control measures should be implemented where needed or required by local ordinances.

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

6.3 SEISMIC DESIGN CONSIDERATIONS

The soils encountered in the borings are considered to meet the criteria for Site Class D in accordance with 1613.2.5.2 of the International Building Code-2018 (which directs to the simplified design procedure outlined in ASCE 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures).

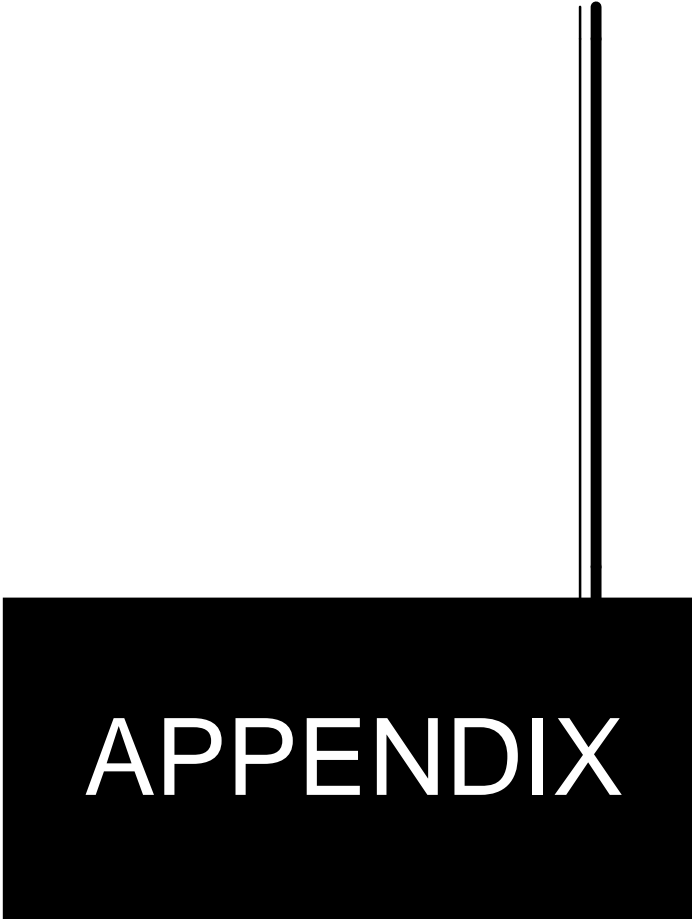
7 GENERAL COMMENTS

This geotechnical exploration and foundation evaluation has been prepared to aid in the evaluation of the foundation conditions on this site. The recommendations presented herein are based on the available soil information and the design information provided. Any changes in the design information or building locations should be brought to the attention of the soils engineer to determine if modifications in the recommendations are required. The final design plans and specifications should also be reviewed by the soils engineer to determine that the recommendations presented herein have been interpreted and implemented as intended.



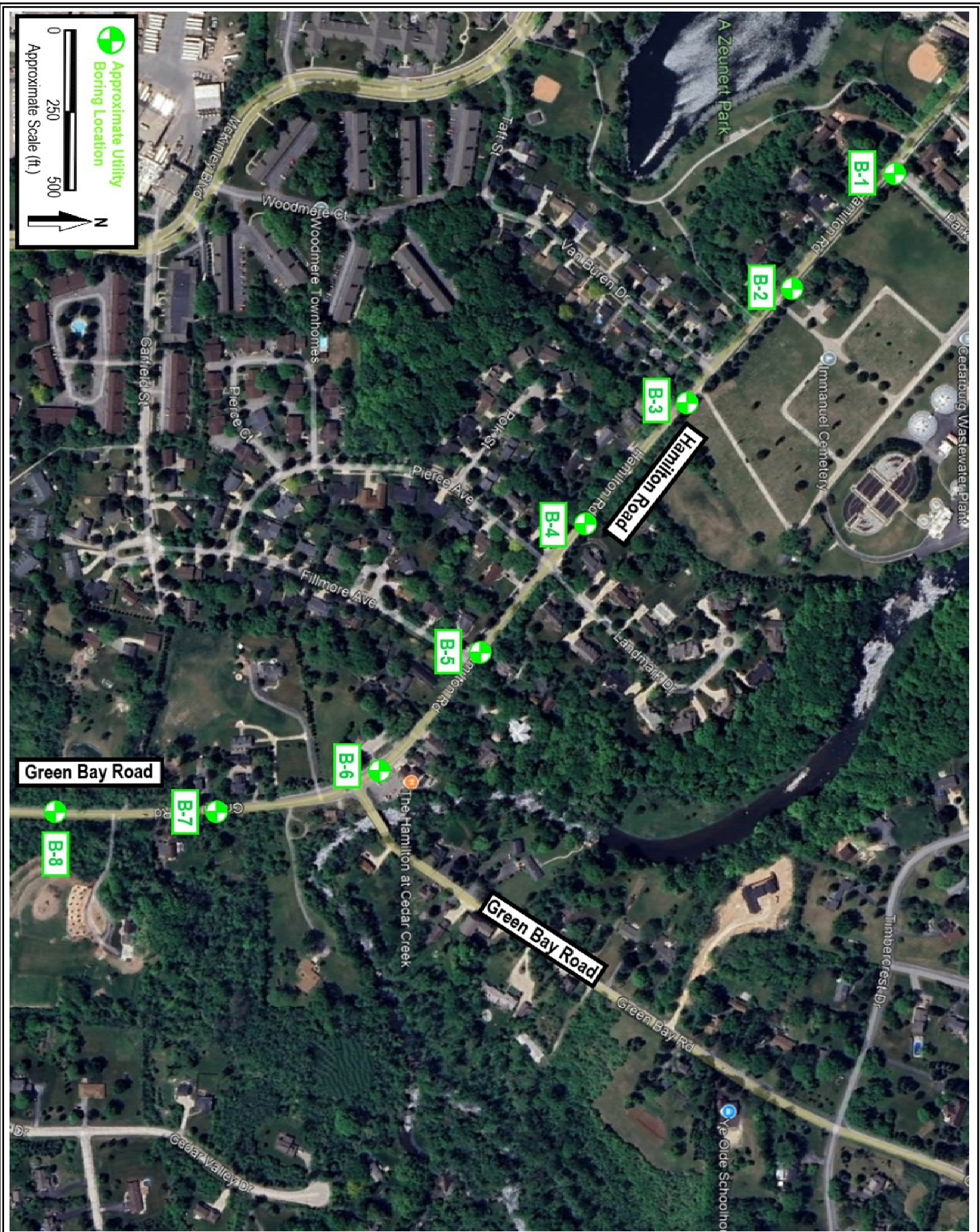
This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology. No other representations, expressed or implied, and no warranty or guarantee is included or intended in this report.

It is recommended that the earthwork and foundation operations be monitored by the soils engineer, to test and evaluate the bearing capacities, and the selection, placement and compaction of controlled fills.



APPENDIX

Figure 1 - Boring Location Plan
Soil Boring Logs
General Notes



Proposed WWTP Facility and Utility Installation
 Pioneer Road / Riverland Road
 Cedarburg, Wisconsin

SCALE: SHOWN ABOVE
PROJECT NO: 00942508

FIGURE 1: Boring Location Plan

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Proposed WWTP Facility and Utility Installation
 Pioneer Road / Riverland Road
 Cedarburg, Wisconsin

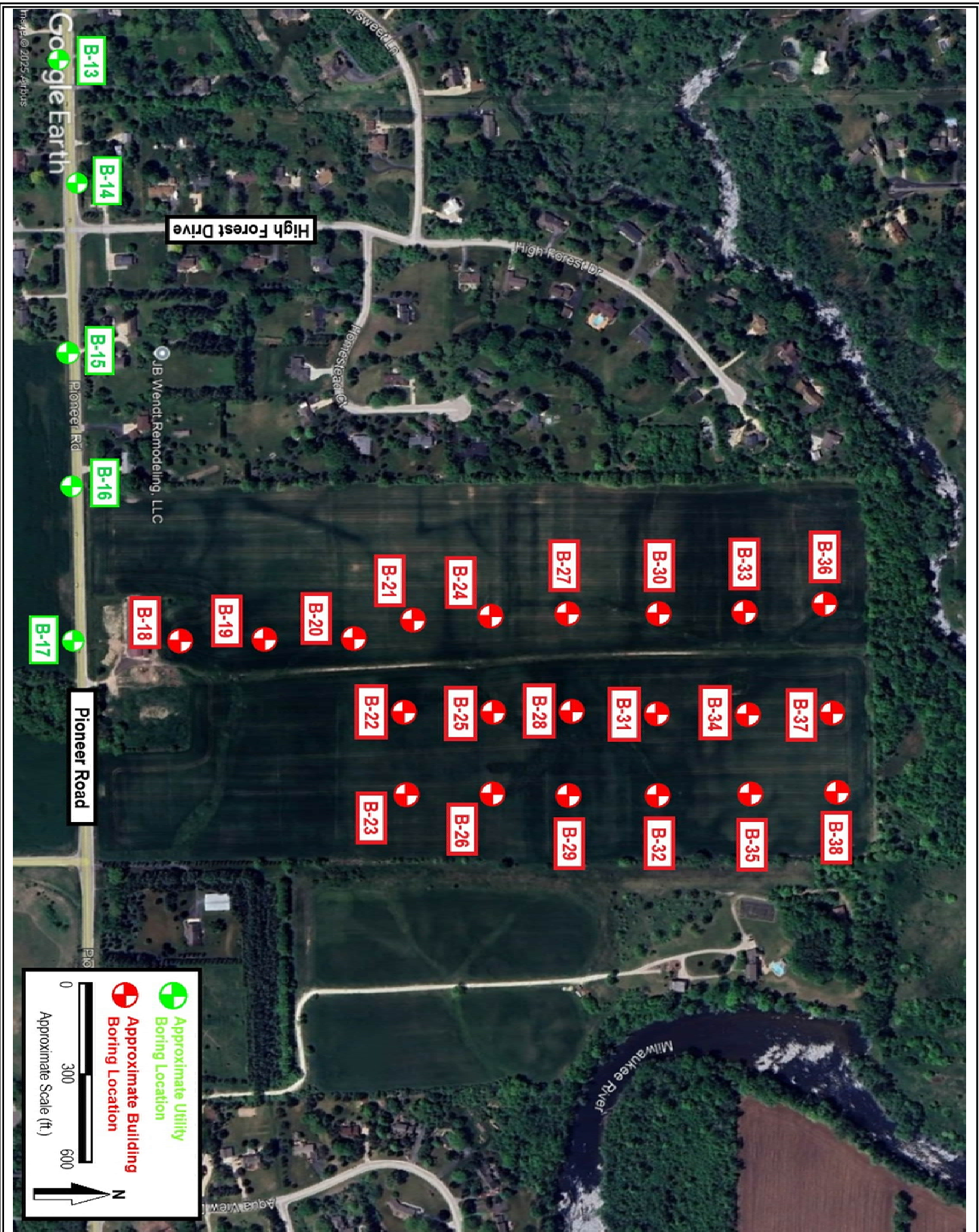
SCALE: SHOWN ABOVE

PROJECT NO: 00942508

FIGURE 2: Boring Location Plan

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Proposed WWTP Facility and Utility Installation
 Pioneer Road / Riverland Road
 Cedarburg, Wisconsin

SCALE: SHOWN ABOVE

PROJECT NO: 00942508

FIGURE 3: Boring Location Plan

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2/7/2025



SOIL BORING LOG: B - 1

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 742.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-10": Dark brown CLAY, with root matter and trace sand, moist (TOPSOIL FILL)	1-SS	10	-	-	17	
2	Dark brown to light brown CLAY, with silt, and trace sand and gravel, moist (FILL)			1.5	-	13	
3	Light brown to gray GRAVEL, with sand, moist	2-SS	56/S7"	-	-	3	
4							
5							
6		3-SS*	50/S2"	-	-	2	
7	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 6± FEET END OF BORING @ 6± FEET						
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered ∇
 Water Level upon completion: Not Present ∇
 Caved at upon completion: 4± feet below ground surface (EL. 738.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ∇
 Caved at delayed: N/A ∇

ADDITIONAL COMMENTS:

* Poor sample recovery

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 2

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS	
	GROUND SURFACE ELEVATION: 751.0							
1	750.0	1-SS	13	-	-	17		
2	749.0			1.5	-	14		
3	748.0	2-SS	8	-	-	19		
4	747.0							
5	746.0							
6	745.0	3-SS	9	2.0	2.6	16		
7	744.0							
8	743.0	4-SS	28	-	-	10		
9	742.0							
10	741.0							
11	740.0	5-SS	68/10"	-	-	8		
12	739.0	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 11.5± FEET						
13	738.0	END OF BORING @ 11.5± FEET						
14	737.0							
15	736.0							
16	735.0							
17	734.0							
18	733.0							
19	732.0							
20	731.0							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered ∇
 Water Level upon completion: Not Present ∇
 Caved at upon completion: 8± feet below ground surface (EL. 743.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ¥
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 3

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	GROUND SURFACE ELEVATION: 766.0						
1	765.0 0-4": Dark brown CLAY, with root matter, and trace silt and sand, moist (TOPSOIL FILL)			-	-	37	
2	764.0 Brown to reddish brown Fine to Coarse SAND, with gravel and trace root matter, moist (FILL)	1-SS	13	-	-	9	
3	763.0 Brown to gray Fine to Coarse SAND, with gravel, moist						
4	762.0	2-SS	46	-	-	7	
5	761.0 AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 4± FEET END OF BORING @ 4± FEET						
6	760.0						
7	759.0						
8	758.0						
9	757.0						
10	756.0						
11	755.0						
12	754.0						
13	753.0						
14	752.0						
15	751.0						
16	750.0						
17	749.0						
18	748.0						
19	747.0						
20	746.0						

FIELD OBSERVATIONS: Water Level <small>during drilling</small> : Not Encountered ∇ Water Level <small>upon completion</small> : Not Present ∇ Caved at <small>upon completion</small> : N/A ↓ Delay Time: N/A Water Level <small>delayed</small> : N/A ⚡ Caved at <small>delayed</small> : N/A	ADDITIONAL COMMENTS:
---	-------------------------------------

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 4

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 753.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-4": Dark brown CLAY, with root matter, and trace silt and sand, moist (TOPSOIL FILL)			-	-	31	
2	Light brown to dark brown Fine to Coarse SAND, with gravel, and trace root matter, silt, and clay, moist (FILL)	1-SS	7	-	-	11	
3	Reddish brown to dark brown CLAY, with silt, and trace root matter and sand, moist (FILL)	2-SS	5	1.5	1.2	24	
5	Brown CLAY, with sand and trace gravel, moist						
6		3-SS	19	0.75	-	16	↓
8	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 7± FEET END OF BORING @ 7± FEET						
10							
15							
20							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered ∇

Water Level upon completion: Not Present ∇

Caved at upon completion: 6± feet below ground surface (EL. 747.0±) ↓

Delay Time: N/A

Water Level delayed: N/A ⚡

Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 5

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 735.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-5": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL FILL)	1-SS	7	0.5	-	15	
2	Light brown to dark brown Fine SAND, with silt and trace gravel, moist (FILL)			-	-	14	
3	Brown to reddish brown Sandy CLAY, with trace silt and gravel, moist (FILL)	2-SS	11	1.0	-	11	
5	Light brown to gray Fine to Coarse SAND, with gravel and trace silt, moist	3-SS	14	-	-	3	
6							
8	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 7± FEET END OF BORING @ 7± FEET						
10							
12							
14							
16							
18							
20							

FIELD OBSERVATIONS:

Water Level _{during drilling}: Not Encountered ∇
 Water Level _{upon completion}: Not Present ∇
 Caved at _{upon completion}: 5± feet below ground surface (EL. 730.0±) ↓
 Delay Time: N/A
 Water Level _{delayed}: N/A ¥
 Caved at _{delayed}: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 11, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 708.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-2": Dark brown CLAY, with root matter, silt, and sand, moist (TOPSOIL FILL) Brown to reddish brown Sandy CLAY, with gravel and trace silt, moist (FILL)	1-SS	69/10"	-	-	7	
2				-	-	3	
3	Light brown Fine to Coarse SAND, with gravel and trace silt, moist	2-SS*	50/S1"	-	-	6	
4							
5							
6		3-SS*	50/S2"	-	-	6	
7	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 6± FEET END OF BORING @ 6± FEET						
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered v

Water Level upon completion: Not Present v

Caved at upon completion: 4± feet below ground surface (EL. 704.0±) ↓

Delay Time: N/A

Water Level delayed: N/A ¥

Caved at delayed: N/A

ADDITIONAL COMMENTS:

* Poor sample recovery

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 7

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 10, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 706.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-8": ASPHALT					2	
1	8-12": Dark brown Fine to Coarse SAND, with gravel and trace silt, moist (BASE COURSE)	1-SS	9	-	-	7	
2	Brown to very dark brown CLAY, with silt, sand, and trace root matter, moist (FILL)						
3		2-SS	8	0.25	-	24	
4							
5							
5	Brown Fine SAND, with silt, moist to very moist						
6		3-SS	9	-	-	18	
7							
8	Brown to gray SILT, with trace clay, sand, and gravel, moist to very moist						
8		4-SS	16	-	-	11	
9							
10							
11		5-SS	16	-	-	9	
12							
13							
14							
14		6-SS	55	-	-	10	
15							
16							
16	AUGER REFUSAL ON POSSIBLE COBBLES, BOULDERS, OR BEDROCK @ 16± FEET						
17	END OF BORING @ 16± FEET						
18							
19							
20							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered v
 Water Level upon completion: Not Present v
 Caved at upon completion: 12± feet below ground surface (EL. 693.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ¥
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 8

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 10, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	GROUND SURFACE ELEVATION: 705.0						
1	0-7": ASPHALT					2	
	7-11": Brown Fine to Coarse SAND, with trace gravel, moist (BASE COURSE)	1-SS	33	-	-	5	
2	Brown Fine to Coarse SAND, with silt, gravel and trace clay, moist (FILL)						
3							
4		2-SS	14	-	-	7	
5							
	700.0						
6	Brown to gray Sandy CLAY, with silt and trace gravel, moist of very moist (FILL)	3-SS	7	-	-	9	
7							∇ ∇
8	Light brown to gray Fine SAND, with silt and trace gravel, very moist to wet	4-SS	8	-	-	22	
9							
10							
	695.0						
11		5-SS	9	-	-	18	
12							↓
13							
14							
15		6-SS	14	-	-	23	
16							
17							
18							
19							
20		7-SS	9	-	-	20	
21							
22							
23							
		END OF BORING @ 23± FEET					
24							
25							
	680.0						
26							
27							
	678.0						
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level during drilling: 7± feet below ground surface (EL. 698.0±) ∇							
Water Level upon completion: 7± feet below ground surface (EL. 698.0±) ∇							
Caved at upon completion: 12± feet below ground surface (EL. 693.0±) ↓							
Delay Time: N/A							
Water Level delayed: N/A ∇							
Caved at delayed: N/A							

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 10

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 710.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-9": ASPHALT			-	-	3	
2	9-13": Dark brown Fine to Coarse SAND, with gravel, moist (BASE COURSE)	1-SS	39	-	-	4	
3	Brown to dark brown Sandy CLAY, with trace silt, and possible asphalt pieces, moist (FILL)						
4		2-SS	7	0.5	-	10	
5							
6	Brown to very dark brown CLAY, with silt and trace sand, moist (FILL)	3-SS	4	0.5	0.2	19	
7							
8	Brown CLAY, with trace silt and sand, moist	4-SS	8	1.5	1.4	24	
9							
10							
11		5-SS	11	3.5	3.1	19	↓
12							
13							
14		6-SS	14	3.75	2.6	19	
15							
16							
17							
18							
19		7-SS	8	2.5	1.7	23	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level _{during drilling}: Not Encountered ∇
 Water Level _{upon completion}: Not Present ∇
 Caved at _{upon completion}: 11± feet below ground surface (EL. 699.0±) ↓
 Delay Time: N/A
 Water Level _{delayed}: N/A ∇
 Caved at _{delayed}: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 11

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 714.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": ASPHALT					3	
1	6-10": Brown Fine to Coarse SAND, with trace silt and gravel, moist (BASE COURSE)	1-SS	17	-	-	3	
2	Brown to dark brown Sandy CLAY, with trace gravel, silt, and possible asphalt pieces, moist (FILL)			1.5	-	7	
3							
3		2-SS	11	1.25	-	19	
4							
5	709.0						
6	Brown CLAY, with trace silt and gravel, moist	3-SS	16	2.75	-	14	
7							
8		4-SS	19	4.5	4.7	18	
9							
10	704.0						
11		5-SS	19	3.75	4.1	19	
12							
13							
14		6-SS	8	3.75	3.1	19	
15	699.0						
16							
17							
18							
19		7-SS	9	3.25	3.3	21	
20	694.0						
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS: Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 7± feet below ground surface (EL. 707.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				ADDITIONAL COMMENTS:			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 12

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 723.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Light brown to dark brown Fine to Coarse SAND, with trace silt and gravel, moist (FILL)			-	-	5	
2	Brown to dark brown Fine to Coarse SAND, with trace silt, gravel, and intermixed clay, moist (FILL)	1-SS	15	-	-	5	
3	Brown to dark brown CLAY, with silt, and trace gravel and sand, moist (FILL)	2-SS	6	0.75	-	16	
5	Brown CLAY, with trace silt, sand, and gravel, moist						
6		3-SS	13	4.5	4.7	19	
8		4-SS	12	4.5	4.0	16	
11		5-SS	15	3.5	3.9	19	
14		6-SS	13	2.0	2.3	18	
19		7-SS	10	1.75	2.2	22	
20	END OF BORING @ 20± FEET						
FIELD OBSERVATIONS: Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 12± feet below ground surface (EL. 711.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A		ADDITIONAL COMMENTS:					

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 13

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 726.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-5": Dark brown Fine to Coarse SAND, with trace gravel, silt, and clay, moist (FILL)			-	-	3	
2	Dark brown to reddish brown Sandy CLAY, with trace silt and gravel, moist (FILL)	1-SS	19	-	-	4	
3							
4		2-SS	7	1.5	-	22	
5							
6	Brown CLAY, with trace sand, silt, and gravel, moist	3-SS	10	4.0	4.0	19	
7							
8		4-SS	13	4.25	3.8	12	
9							
10							
11		5-SS	13	4.5	5.8	19	
12							
13							
14		6-SS	12	2.5	1.5	20	
15							
16							
17							
18							
19		7-SS	10	2.0	2.7	16	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level _{during drilling}: Not Encountered ∇
 Water Level _{upon completion}: Not Present ∇
 Caved at _{upon completion}: 12± feet below ground surface (EL. 714.0±) ↓
 Delay Time: N/A
 Water Level _{delayed}: N/A ∇
 Caved at _{delayed}: N/A ∇

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 14

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 730.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-4": Dark brown CLAY, with root matter, and trace sand, silt, and gravel, moist (TOPSOIL FILL)			-	-	23	
	Brown to reddish brown Sandy CLAY, with trace silt and gravel, moist (FILL)	1-SS	5	-	-	15	
2							
3	Dark brown to reddish brown CLAY, with silt, and trace sand, gravel, and root matter, moist (FILL)	2-SS	4	-	0.4	26	
4							
5							
6		3-SS	25	-	-	21	
7							
8	Brown CLAY, with trace silt and gravel, moist	4-SS	24	4.5+	4.7	18	
9							
10							
11		5-SS	16	4.5	5.0	20	
12							
13							
14		6-SS	23	3.0	2.3	23	
15							
16							
17							
18							
19		7-SS	14	2.0	1.7	18	
20							
	END OF BORING @ 20± FEET						
FIELD OBSERVATIONS: Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 10± feet below ground surface (EL. 720.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				ADDITIONAL COMMENTS:			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 15

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 727.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS	
1	726.0	1-SS	18	-	-	4		
2	725.0			-	-	6		
3	724.0	2-SS	7	2.5	1.4	28		
4	723.0							
5	722.0	3-SS	15	4.5+	5.4	17		
6	721.0							
7	720.0							
8	719.0							
9	718.0							
10	717.0							
11	716.0							
12	715.0							
13	714.0	4-SS	16	4.0	3.9	19		
14	713.0							
15	712.0	5-SS	11	4.25	3.7	19		
16	711.0							
17	710.0	6-SS	12	3.25	2.2	20		
18	709.0							
19	708.0	7-SS	14	2.0	2.7	24		
20	707.0							
21	706.0	8-SS	20	4.0	3.7	22		
22	705.0							
23	704.0	END OF BORING @ 23± FEET						
24	703.0							
25	702.0							
26	701.0							
27	700.0							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered v
 Water Level upon completion: Not Present v
 Caved at upon completion: 14± feet below ground surface (EL. 713.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ¥
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 16

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 724.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-4": Brown Fine to Coarse SAND, with trace silt and gravel, moist (FILL)	1-SS	19	-	-	6	
2	Dark brown to reddish brown CLAY, with sand, silt, and trace gravel, moist (FILL)			-	-	11	
3							
4		2-SS	4	-	0.4	16	
5	719.0						
6	Brown CLAY, with trace silt, sand, and gravel, moist	3-SS	6	-	1.4	24	
7							
8		4-SS	15	4.5+	5.6	19	
9							
10	714.0						
11		5-SS	12	3.75	3.5	20	
12							
13							
14		6-SS	17	2.5	2.6	20	
15	709.0						
16							
17							
18							
19		7-SS	13	2.75	2.6	22	
20	704.0						
21		8-SS	12	2.25	2.5	19	
22							
23	END OF BORING @ 22± FEET						
24							
25	699.0						
26							
27							

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered
 Water Level upon completion: Not Present
 Caved at upon completion: 9± feet below ground surface (EL. 715.0±)
 Delay Time: N/A
 Water Level delayed: N/A
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
	GROUND SURFACE ELEVATION: 717.0						
1	0-6": Brown to dark brown Fine to Coarse SAND, with root matter, and trace silt, gravel, and clay, moist (FILL)	1-SS	16	-	-	19	
2	Dark brown to reddish brown CLAY, with sand, and trace silt and gravel, moist (FILL)			3.5	-	13	
3	Brown CLAY, with trace silt, sand, and gravel, moist	2-SS	12	4.5	-	16	
4							
5							
6		3-SS	9	3.0	1.7	17	
7							
8		4-SS	11	2.25	2.0	16	
9							
10							
11		5-SS	12	4.5+	3.5	21	
12							
13							
14		6-SS	12	3.0	2.9	19	
15							
16							
17							
18							
19		7-SS	11	2.5	2.2	21	
20							
21							
22							
23							
24		8-SS	12	2.0	2.4	23	
25							
26		9-SS	13	2.5	3.0	21	
27	END OF BORING @ 26± FEET						

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered
 Water Level upon completion: Not Present
 Caved at upon completion: 17± feet below ground surface (EL. 700.0±)
 Delay Time: N/A
 Water Level delayed: N/A
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 18

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 3, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 718.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	33	
1	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	14	4.5+	-	17	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	21	4.5+	-	14	
5							
6							
7		3-SS	14	2.75	2.6	13	
8							
9							
10		4-SS	10	1.25	0.5	15	
11							
12							
13							
14		5-SS	12	3.25	2.6	21	
15							
16							
17							
18							
19		6-SS	13	3.25	-	19	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered ∇

Water Level upon completion: Not Present ∇

Caved at upon completion: 4± feet below ground surface (EL. 714.0±) ↓

Delay Time: N/A

Water Level delayed: N/A ✖

Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 19

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 719.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	28	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	16	4.25	-	17	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4		2-SS	25	4.5+	-	16	
5							
6							
7		3-SS	30	3.25	-	15	
8							
9							
10		4-SS	24	3.25	-	18	
11							
12							
13							
14							
15		5-SS	19	4.5+	5.2	19	
16							
17							
18							
19							
20		6-SS	14	3.5	3.3	20	
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level <small>during drilling</small> : Not Encountered Water Level <small>upon completion</small> : Not Present Caved at <small>upon completion</small> : 4± feet below ground surface (EL. 715.0±) Delay Time: N/A Water Level <small>delayed</small> : N/A Caved at <small>delayed</small> : N/A				↓ ↓ ↓ ✖			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 20

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 4, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 721.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	22	
1	Brown to reddish brown CLAY, with sand, and trace silt, gravel, and root matter, moist	1-SS	9	4.5	-	18	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	26	4.5+	-	13	
5							
6							
7		3-SS	21	4.5+	5.8	14	
8							
9							
10		4-SS	17	4.5	3.0	16	
11							
12							
13							
14							
15		5-SS	13	3.5	2.6	18	
16							
17							
18							
19							
20		6-SS	13	3.0	3.1	21	
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS: Water Level <small>during drilling</small> : Not Encountered Water Level <small>upon completion</small> : Not Present Caved at <small>upon completion</small> : 4± feet below ground surface (EL. 717.0±) Delay Time: N/A Water Level <small>delayed</small> : N/A Caved at <small>delayed</small> : N/A				ADDITIONAL COMMENTS:			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 21

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 6, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 723.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	24	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	10	3.5	-	15	
3	Brown CLAY, with trace sand, silt, and gravel, moist						↓
4							
5		2-SS	25	4.5+	6.8	11	
6							
7		3-SS	21	2.5	2.1	17	
8							
9							
10		4-SS	17	3.0	-	9	
11							
12							
13							
14							
15		5-SS	13	2.75	2.8	21	
16							
17							
18							
19							
20		6-SS	13	2.25	2.2	20	
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 3± feet below ground surface (EL. 720.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				↓ ↓ ↓ ✖			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 22

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 722.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-9": Dark brown to reddish brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	6	3.0	-	20	↓
2	Brown to reddish brown CLAY, with sand, and trace silt, gravel, and root matter, moist			3.25	-	20	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4							
5		2-SS	20	4.5+	-	16	
6							
7		3-SS	18	4.5+	-	18	
8							
9							
10		4-SS	13	4.0	2.2	15	
11							
12							
13							
14							
15		5-SS	9	2.5	2.3	23	
16							
17							
18							
19							
20		6-SS	14	3.5	3.5	20	
END OF BORING @ 20± FEET							

<p>FIELD OBSERVATIONS:</p> <p>Water Level <small>during drilling</small>: Not Encountered ∇</p> <p>Water Level <small>upon completion</small>: Not Present ∇</p> <p>Caved at <small>upon completion</small>: 3± feet below ground surface (EL. 719.0±) ↓</p> <p>Delay Time: N/A</p> <p>Water Level <small>delayed</small>: N/A ✖</p> <p>Caved at <small>delayed</small>: N/A</p>	<p>ADDITIONAL COMMENTS:</p>
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 23

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
GROUND SURFACE ELEVATION: 726.0							
1 725.0	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	9	2.0	-	22	
2 724.0	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			4.5	3.8	15	
3 723.0							
4 722.0	Brown CLAY, with trace sand, silt, and gravel, moist						
5 721.0		2-SS	25	4.5+	-	15	
6 720.0							
7 719.0		3-SS	24	4.5+	-	16	
8 718.0							
9 717.0							
10 716.0		4-SS	13	4.5	3.7	20	
11 715.0							
12 714.0							
13 713.0							
14 712.0							
15 711.0		5-SS	10	3.25	3.1	19	
16 710.0							
17 709.0							
18 708.0							
19 707.0							
20 706.0		6-SS	12	4.25	2.9	10	
21 705.0							
22 704.0							
23 703.0							
24 702.0							
25 701.0		7-SS	13	4.5	3.1	19	
26 700.0							
27 699.0							
28 698.0							
29 697.0	Light brown Fine to Coarse SAND, with trace gravel, moist						
30 696.0		8-SS	21	-	-	2	
31 695.0							
32 694.0							
33 693.0							
34 692.0							
35 691.0		9-SS	15	-	-	2	
36 690.0							
37 689.0							
38 688.0							
39 687.0							
40 686.0		10-SS	24	-	-	2	
END OF BORING @ 40± FEET							
WATER LEVEL OBSERVATIONS: Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 24± feet below ground surface (EL. 702.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				ADDITIONAL COMMENTS:			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 24

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 6, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 719.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-7": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	8	3.0	-	20	
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			2.0	-	16	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	18	4.5+	-	18	
5							
6							
7		3-SS	18	4.0	4.0	19	
8							
9							
10		4-SS	17	4.5	3.5	22	
11							
12							
13							
14							
15		5-SS	12	3.0	3.5	21	
16							
17							
18							
19							
20		6-SS	13	3.0	2.3	21	
END OF BORING @ 20± FEET							

<p>FIELD OBSERVATIONS:</p> <p>Water Level during drilling: Not Encountered ∇</p> <p>Water Level upon completion: Not Present ∇</p> <p>Caved at upon completion: 4± feet below ground surface (EL. 715.0±) ↓</p> <p>Delay Time: N/A</p> <p>Water Level delayed: N/A ✖</p> <p>Caved at delayed: N/A</p>	<p>ADDITIONAL COMMENTS:</p>
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 25

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 710.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			1.25	-	20	
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	9	2.0	-	23	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	17	4.5+	6.4	18	
5							
6							
7		3-SS	17	4.5+	5.6	19	
8							
9		4-SS	16	4.5	3.9	17	
10							
11							
12							
13							
14	Brown Fine to Coarse SAND, with gravel and trace silt, moist	5-SS	10	-	-	6	↓
15							
16							
17							
18							
19		6-SS	16	-	-	5	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS: Water Level <small>during drilling</small> : Not Encountered Water Level <small>upon completion</small> : Not Present Caved at <small>upon completion</small> : 14± feet below ground surface (EL. 696.0±) Delay Time: N/A Water Level <small>delayed</small> : N/A Caved at <small>delayed</small> : N/A	ADDITIONAL COMMENTS:
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 26

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 715.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-7": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	8	2.5	-	24	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			3.5	-	20	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4							
5		2-SS	19	4.5+	-	17	
6							
7		3-SS	14	4.5+	4.7	18	
8							
9							
10		4-SS	15	4.5+	3.3	12	
11							
12							
13							
14							
15		5-SS	14	4.25	4.1	20	
16							
17							
18							
19							
20		6-SS	11	2.5	2.3	14	
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 4± feet below ground surface (EL. 711.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				↓ ↓ ↓ ✖			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 27

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 6, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 718.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	29	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	6	3.0	-	22	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4		2-SS	21	4.5	5.8	16	
5							
6							
7		3-SS	17	4.5	5.8	18	
8							
9							
10		4-SS	14	4.5	4.3	19	
11							
12							
13							
14		5-SS	12	3.25	3.7	18	
15							
16							
17							
18							
19		6-SS	11	3.5	3.5	19	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered

Water Level upon completion: Not Present

Caved at upon completion: 4± feet below ground surface (EL. 714.0±)

Delay Time: N/A

Water Level delayed: N/A

Caved at delayed: N/A



ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 28

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 708.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-8": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	12	3.0	-	22	
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			3.5	-	19	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	14	4.5+	-	13	
5							
6							
7		3-SS	11	4.0	3.8	21	
8							
9							
10		4-SS	7	3.25	2.6	25	
11							
12							
13							
14		5-SS	10	-	2.7	19	
15							
16							
17							
18							
19	Brown SILT, with clay, gravel, and trace sand, moist	6-SS	6	-	-	26	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered
 Water Level upon completion: Not Present
 Caved at upon completion: 2± feet below ground surface (EL. 706.0±)
 Delay Time: N/A
 Water Level delayed: N/A
 Caved at delayed: N/A



ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 29

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 710.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-7": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	11	3.5	-	22	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			4.5	-	21	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4							
5							
6		2-SS	19	4.5+	-	11	
7							
8		3-SS	19	4.5+	-	17	
9							
10		4-SS	14	4.5	4.1	20	
11							
12							
13							
14	Light brown to gray Fine to Coarse SAND, with gravel and trace silt, moist	5-SS	51	-	-	2	
15							
16							
17							
18							
19		6-SS	23	-	-	1	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS: Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 13± feet below ground surface (EL. 697.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A	ADDITIONAL COMMENTS:
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 30

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 16, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 713.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 712.0	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	11	-	-	23	
2 711.0				4.25	-	18	
3 710.0	Brown to reddish brown CLAY, with trace silt, sand, and root matter, moist						
4 709.0							
5 708.0		2-SS	24	-	5.0	14	
6 707.0							
7 706.0	Brown CLAY, with trace sand, silt, and gravel, moist	3-SS	17	-	4.7	16	
8 705.0							
9 704.0							
10 703.0		4-SS	12	4.5+	-	14	
11 702.0							
12 701.0							
13 700.0	Brown to gray Fine SAND, with silt, and trace clay and gravel, very moist to wet						
14 699.0							
15 698.0		5-SS	9	3.75	3.5	21	
16 697.0							
17 696.0							
18 695.0							
19 694.0							
20 693.0		6-SS	10	4.25	3.1	21	
21 692.0							
22 691.0							
23 690.0	Gray SILT, with trace sand, clay, and gravel, very moist to wet						
24 689.0							
25 688.0		7-SS	12	2.25	1.8	22	
26 687.0							
27 686.0							
28 685.0							
29 684.0							
30 683.0		8-SS	15	-	-	11	↓
31 682.0	Gray SILT, with trace sand, clay, and gravel, very moist to wet						
32 681.0							
33 680.0							
34 679.0		9-SS	42	-	-	12	∇ ∇
35 678.0							
36 677.0							
37 676.0	Gray SILT, with trace sand, clay, and gravel, very moist to wet						
38 675.0							
39 674.0							
40 673.0		10-SS	52	-	-	14	
END OF BORING @ 40± FEET							

WATER LEVEL OBSERVATIONS:

Water Level during drilling: 34± feet below ground surface (EL. 679.0±) ∇
 Water Level upon completion: 34± feet below ground surface (EL. 679.0±) ∇
 Caved at upon completion: 30± feet below ground surface (EL. 683.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ¥
 Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 31

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 708.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-5": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			2.25	-	25	
2	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	12	4.5	-	20	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4		2-SS	21	-	7.4	14	
5							
6							
7		3-SS	22	4.5+	6.6	18	
8							
9		4-SS	13	4.25	3.8	20	
10							
11							
12							
13							
14		5-SS	12	4.5+	3.6	21	
15							
16							
17							
18							
19		6-SS	12	4.0	3.5	21	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level _{during drilling}: Not Encountered ∇

Water Level _{upon completion}: Not Present ∇

Caved at _{upon completion}: 2± feet below ground surface (EL. 706.0±) ↓

Delay Time: N/A

Water Level _{delayed}: N/A ∇

Caved at _{delayed}: N/A ∇

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 32

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 698.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS	
1	0-5": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	6	1.25	-	22		
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist			2.25	-	19		
2	Brown CLAY, with trace sand, silt, and gravel, moist	2-SS	11	-	3.1	21		
3								
4								
5	Dark brown Fine SAND, with silt, and trace clay and gravel, moist	3-SS	10	-	3.1	21		
6								
7								
8								
9	Dark brown Fine SAND, with silt, and trace clay and gravel, moist to very moist	4-SS	5	-	-	20		
10								
11	Dark brown Fine SAND, with silt, and trace clay and gravel, moist to very moist	5-SS	21	-	-	12		
12								
13								
14	Gray SILT, with trace sand and clay, very moist to wet	6-SS	27	-	-	6		
15								
16	END OF BORING @ 20± FEET							
17	FIELD OBSERVATIONS:		ADDITIONAL COMMENTS:					
18	Water Level during drilling: 18± feet below ground surface (EL. 680.0±) v							
19	Water Level upon completion: 18± feet below ground surface (EL. 680.0±) v							
20	Caved at upon completion: 4± feet below ground surface (EL. 694.0±) ↓							
	Delay Time: N/A							
	Water Level delayed: N/A ¥							
	Caved at delayed: N/A							

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 33

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 710.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-5": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	19	
1	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	11	1.25	-	10	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4							
5		2-SS	26	4.5+	-	15	
6							
7		3-SS	26	4.5+	9.5	17	
8							
9							
10		4-SS	15	4.5+	5.6	16	
11							
12							
13							
14		5-SS	11	2.75	2.6	21	↓
15							
16							
17							
18							
19							
20		6-SS	10	-	-	16	
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level during drilling: Not Encountered							
Water Level upon completion: Not Present							
Caved at upon completion: 14± feet below ground surface (EL. 696.0±)							
Delay Time: N/A							
Water Level delayed: N/A							
Caved at delayed: N/A							

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 34

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 17, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 707.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	8	2.0	-	21	↓
2	Brown to reddish brown CLAY, with silt, and trace root matter and sand, moist			2.0	-	21	
3	Brown CLAY, with trace sand, silt, and gravel, moist						
4		2-SS	14	4.5+	-	18	
5							
6							
7		3-SS	13	4.5+	5.6	20	
8							
9		4-SS	14	-	3.5	18	
10							
11							
12							
13							
14		5-SS	8	2.0	1.9	23	
15							
16							
17							
18							
19		6-SS	12	3.75	3.1	20	
20	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level during drilling: Not Encountered ∇
 Water Level upon completion: Not Present ∇
 Caved at upon completion: 3± feet below ground surface (EL. 704.0±) ↓
 Delay Time: N/A
 Water Level delayed: N/A ∇
 Caved at delayed: N/A ∇

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 35

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 16, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 711.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-4": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			0.75	-	25	
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	11	4.5+	-	23	
2							
	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4							
		2-SS	24	4.5+	6.8	15	
5							
6							
7							
		3-SS	23	4.5+	8.2	17	
8							
9							
		4-SS	14	4.5+	3.7	18	
10							
11							
12							
13							
14							
		5-SS	12	4.5+	5.0	19	
15							
16							
17							
18							
19							
		6-SS	12	4.25	3.0	20	
20							
	END OF BORING @ 20± FEET						

FIELD OBSERVATIONS:

Water Level _{during drilling}: Not Encountered ∇
 Water Level _{upon completion}: Not Present ∇
 Caved at _{upon completion}: 4± feet below ground surface (EL. 707.0±) ⊥
 Delay Time: N/A
 Water Level _{delayed}: N/A ✳
 Caved at _{delayed}: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 36

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 697.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-7": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	-	18	
1	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	7	3.0	-	17	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	13	-	4.5	18	
5							
6							
7		3-SS	12	4.5	-	20	
8							
9	Light brown to gray GRAVEL, with sand, moist						
9		4-SS	20	-	-	-	
10							
11							
12							
13							
14		5-SS	18	-	-	-	
15							
16							
17							
18							
19		6-SS	42	-	-	7	
20							
END OF BORING @ 20± FEET							
FIELD OBSERVATIONS:				ADDITIONAL COMMENTS:			
Water Level during drilling: Not Encountered Water Level upon completion: Not Present Caved at upon completion: 3± feet below ground surface (EL. 694.0±) Delay Time: N/A Water Level delayed: N/A Caved at delayed: N/A				↓ ↓ ↓ ✖			

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 37

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 9, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 709.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1	0-6": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)			-	1.3	20	
	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist	1-SS	11	4.5+	-	20	
2	Brown CLAY, with trace sand, silt, and gravel, moist						
3							
4		2-SS	26	4.5+	-	16	
5							
6							
7		3-SS	26	4.5+	-	16	↓
8							
9							
10		4-SS	15	4.0	3.3	20	
11							
12							
13							
14							
15		5-SS	11	3.0	2.5	18	
16							
17							
18							
19	Brown Fine SAND, with silt and trace clay, wet	6-SS	10	-	-	16	↓ ↓
20	END OF BORING @ 20± FEET						

<p>FIELD OBSERVATIONS:</p> <p>Water Level during drilling: 19± feet below ground surface (EL. 690.0±) ↓</p> <p>Water Level upon completion: 19± feet below ground surface (EL. 690.0±) ↓</p> <p>Caved at upon completion: 7± feet below ground surface (EL. 702.0±) ↓</p> <p>Delay Time: N/A</p> <p>Water Level delayed: N/A ✖</p> <p>Caved at delayed: N/A</p>	<p>ADDITIONAL COMMENTS:</p>
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 38

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 16, 2024
Drilled By: Point of Beginning, Inc.

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 708.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS
1 707.0	0-7": Brown to dark brown CLAY, with silt, and trace sand and root matter, moist (TOPSOIL)	1-SS	8	1.5	-	23	↓
2 706.0				4.0	-	19	
3 705.0	Brown to reddish brown CLAY, with sand, and trace silt and root matter, moist						
4 704.0							
5 703.0		2-SS	17	4.5+	-	17	
6 702.0	Brown CLAY, with trace sand, silt, and gravel, moist						
7 701.0		3-SS	22	4.5+	7.2	16	
8 700.0							
9 699.0							
10 698.0		4-SS	11	3.5	3.5	21	
11 697.0	Brown CLAY, moist						
12 696.0							
13 695.0							
14 694.0							
15 693.0		5-SS	10	3.0	1.9	21	
16 692.0							
17 691.0							
18 690.0							
19 689.0	Brown CLAY, moist						
20 688.0		6-SS	7	2.5	1.4	21	
21 687.0							
22 686.0							
23 685.0							
24 684.0	Brown CLAY, with trace sand, silt, and gravel, moist						
25 683.0		7-SS	10	3.25	2.2	21	
26 682.0							
27 681.0							
28 680.0							
29 679.0							
30 678.0	Brown CLAY, moist						
31 677.0		8-SS	12	2.5	2.5	20	
32 676.0							
33 675.0							
34 674.0							
35 673.0	Brown CLAY, moist						
36 672.0		9-SS	11	3.0	2.0	15	
37 671.0							
38 670.0							
39 669.0	Brown to gray SILT, with trace sand and clay, very moist to wet						
40 668.0		10-SS	12	-	-	14	
END OF BORING @ 40± FEET							

WATER LEVEL OBSERVATIONS:

Water Level during drilling: 39± feet below ground surface (EL. 669.0±) ↓

Water Level upon completion: 39± feet below ground surface (EL.669.0 ±) ↓

Caved at upon completion: 3± feet below ground surface (EL. 705.0±) ↓

Delay Time: N/A

Water Level delayed: N/A ⚡

Caved at delayed: N/A

ADDITIONAL COMMENTS:

Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.



SOIL BORING LOG: B - 39

Project: Proposed Wastewater Treatment Facility and Utility Installation

Project No.: 00942508

Location: Pioneer Road / Riverland Road
Cedarburg, Wisconsin

Drill Date: December 10, 2024
Drilled By: KD/KH/TP

DEPTH/EL. (feet)	VISUAL SOIL CLASSIFICATION GROUND SURFACE ELEVATION: 711.0	SAMPLE NO.	N (bpf)	Qp (tsf)	Qu (tsf)	MC (%)	REMARKS	
1	710.0	1-SS	15	-	-	18		
2	709.0			-	-	19		
3	708.0	2-SS	5	-	-	10		
4	707.0			-	-			
5	706.0	3-SS	12	3.5	3.8	20		
6	705.0							
7	704.0							
8	703.0							
9	702.0							
10	701.0	4-SS	14	4.5+	4.1	19		
11	700.0							
12	699.0	5-SS	17	-	-	13		
13	698.0							
14	697.0	6-SS	11	2.25	1.9	22		
15	696.0							
16	695.0	7-SS	9	-	-	19		
17	694.0							
18	693.0							
19	692.0							
20	691.0	8-SS	11	-	-	17		
21	690.0							
22	689.0	9-SS	10	-	-	21		
23	688.0							
24	687.0	END OF BORING @ 26± FEET						
25	686.0							
26	685.0							
27	684.0							

<p>FIELD OBSERVATIONS:</p> <p>Water Level during drilling: 23± feet below ground surface (EL. 688.0±) v</p> <p>Water Level upon completion: Not Present v</p> <p>Caved at upon completion: 7± feet below ground surface (EL. 704.0±) ↓</p> <p>Delay Time: N/A</p> <p>Water Level delayed: N/A ¥</p> <p>Caved at delayed: N/A</p>	<p>ADDITIONAL COMMENTS:</p>
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Note: Lines of stratification represent an approximate boundary between soil types. Variations may occur between sampling intervals and/or boring locations. Transitions may also be gradual.

GENERAL NOTES

SAMPLE IDENTIFICATION

- Information on each log is a compilation of subsurface conditions, based on visual soil classifications of soil samples obtained from the field as assigned by a soils engineer, as well as from laboratory testing of samples, if performed. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those observed at the times and locations indicated, and may vary with time, geologic condition and construction activity.
- Unified Soil Classification System (USCS) designations are based on visual soil classification estimates on the basis of textural and particle size categorization and various soil behavior characteristics. If laboratory tests were performed to classify the soil, the USCS designation is shown in parenthesis.

USCS SOIL PARTICLE SIZE CLASSES

U.S. Std. Sieve		#200	#40	#10	#4	¾"	3"	12"	
Soil Type	Clay	Silt	Sand			Gravel		Cobbles	Boulders
			Fine	Medium	Coarse	Fine	Coarse		
Millimeters	0.002	0.074	0.42	2	4.8	19	76	300	

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487-00)

Criteria for assigning group symbols and group names using laboratory tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean gravels w/ < 5% fines ^E	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^C	GW	Well-graded gravel ^D
			$Cu < 4$ and/or $1 > Cc > 3$ ^C	GP	Poorly graded gravel ^D
		Gravels w/ > 12% fines ^E	Fines classify as ML or MH	GM	Silty gravel ^{D,F,G}
			Fines classify as CL or CH	GC	Clayey gravel ^{D,F,G}
	Sands (More than 50% of coarse fraction passes the No. 4 sieve)	Clean sands w/ < 5% fines ^I	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^C	SW	Well-graded sand ^H
			$Cu < 6$ and/or $1 > Cc > 3$ ^C	SP	Poorly graded sand ^H
		Sands w/ > 12% fines ^I	Fines classify as ML or MH	SM	Silty sand ^{F,G,H}
			Fines classify as CL or CH	SC	Clayey sand ^{F,G,H}
FINE-GRAINED SOILS (More than 50% passes the No. 200 sieve)	Silt and clays w/ liquid limit (LL) < 50	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}
			PI < 4 and plots below "A" line ^J	ML	Silt ^{K,L,M}
		Organic	LL (Oven dried) / LL (Not dried) < 0.75	OL	Organic clay ^{K,L,M,N}
				OL	Organic silt ^{K,L,M,O}
	Silt and clays w/ liquid limit (LL) ≥ 50	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{K,L,M}
			PI plots below "A" line	MH	Elastic silt ^{K,L,M}
		Organic	LL (Oven dried) / LL (Not dried) < 0.75	OH	Organic clay ^{K,L,M,P}
				OH	Organic silt ^{K,L,M,Q}
HIGHLY ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT	Peat	

^A Based on the material passing the 3-inch (75 mm) sieve

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name

^C $Cu = D_{60}/D_{10}$; $Cc = (D_{30})^2 / D_{10} \times D_{60}$

^D If soil contains ≥ 15% sand, add "with sand" to group name

^E Gravels with 5 to 12% fines require dual symbols:

- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

^F If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM

^G If fines are organic, add "with organic fines" to group name

^H If soil contains ≥ 15% gravel, add "with gravel" to group name

^I Sands with 5 - 12% fines require dual symbols:

- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

^J If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay

^K If soil contains 15 - 29% plus No. 200, add "with sand" or "with gravel"

^L If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name

^M If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name

^N PI ≥ 4 and plots on or above "A" line

^O PI < 4 or plots below "A" line

^P PI plots on or above "A" line

^Q PI below "A" line

RELATIVE SOIL COMPOSITION

- Trace - 0 - 15% of sample
- With - 15 - 35% of sample
- Soil modifier - > 35% of sample (i.e. sandy, silty, clayey, gravelly)

DRILLING & SAMPLING SYMBOLS

- | | |
|---------------------------------|---|
| AU - Auger sample from cuttings | SS - Split spoon sample (2" O.D. by 1½" I.D.) |
| BS - Bag sample | ST - Shelby Tube sample (2" or 3" O.D.) |
| HA - Hand auger sample | WS - Wash sample from wash water return |

SOIL PROPERTY SYMBOLS

- N - N-value (blow count) is the standard penetration resistance based on the total number of blows required to advance a split spoon sampler one (1) foot, using a 140 lb. hammer with a 30 inch free fall. To avoid damage to sampling tools, driving is typically limited to 50 blows during any 6 inch interval. Additional description is provided below:

<u>N-value (bpf)</u>	<u>Description</u>
HW	Sampler penetrated soil under weight of hammer and rods; no driving required
25	25 blows to advance sampler 12 inches after initial 6 inches of seating
75/10"	75 blows to advance sampler 10 inches after initial 6 inches of seating
50/S3"	50 blows to advance sampler 3 inches during initial 6 inch seating interval

- | | |
|--|---|
| MC - Moisture content, % | LL - Liquid limit, % (ASTM D4318) |
| Qu - Unconfined compressive strength, tons per square foot (tsf) | PL - Plastic limit, % (ASTM D4318) |
| Qp - Calibrated hand penetrometer resistance, tsf | PI - Plasticity index, % (ASTM D4318) |
| γ _d - Dry density, pounds per cubic foot (pcf) | %P200 - Percent of sample passing the No. 200 sieve |
| RQD - Rock quality designation of NX-size core sample | |
| RMR - Rock mass rating, as developed by Z.T. Bieniawski | |
| PID - Photoionization detector (Hnu meter) volatile vapor level, ppm | |

SOIL RELATIVE DENSITY & CONSISTENCY CLASSIFICATION

NON-COHESIVE SOILS		COHESIVE SOILS		
Density	N-Value Range	Consistency	Qu Range (tsf)	Approximate N-value Range
Very loose	0 - 3	Very soft	0 - 0.25	0 - 2
Loose	3 - 7	Soft	0.25 - 0.5	2 - 5
Medium dense	7 - 15	Medium stiff	0.5 - 1.0	5 - 10
Dense	15 - 38	Stiff	1.0 - 2.0	10 - 14
Very dense	38+	Very Stiff	2.0 - 4.0	14 - 32
		Hard	4.0+	32+

SOIL STRUCTURE TERMINOLOGY

- | | |
|---|---|
| Interlayered - Alternating layers of different soil types | Intermixed - Pockets of different soil types, no layering |
| Layer - Inclusion greater than 3 inches thick | Pocket - Inclusion of material of different texture |
| Seam - Inclusion ¼ to 3 inches thick | Varved - Alternating layers or seams of sand, silt, and/or clay |
| Laminated - Alternating seams of different soil type | |

GROUNDWATER & MOISTURE CONDITIONS

- | | |
|--|--|
| ∇ - Approximate groundwater level as noted during drilling and sampling | Dry - Absence of moisture, dry to the touch |
| ▼ - Groundwater level as noted within the open borehole upon removal of the augers | Moist - Damp, but no visible water |
| ¥ - Delayed groundwater level within open borehole | Wet - Visible free water, saturated, usually below water table |

NOTE: General Notes have been adapted from and incorporate portions of ASTM D2487 "Classification of Soils for Engineering Purposes (Unified Soil Classification System)" and ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)."

Appendix D

Boring Locations with Auger Refusal

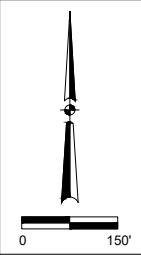


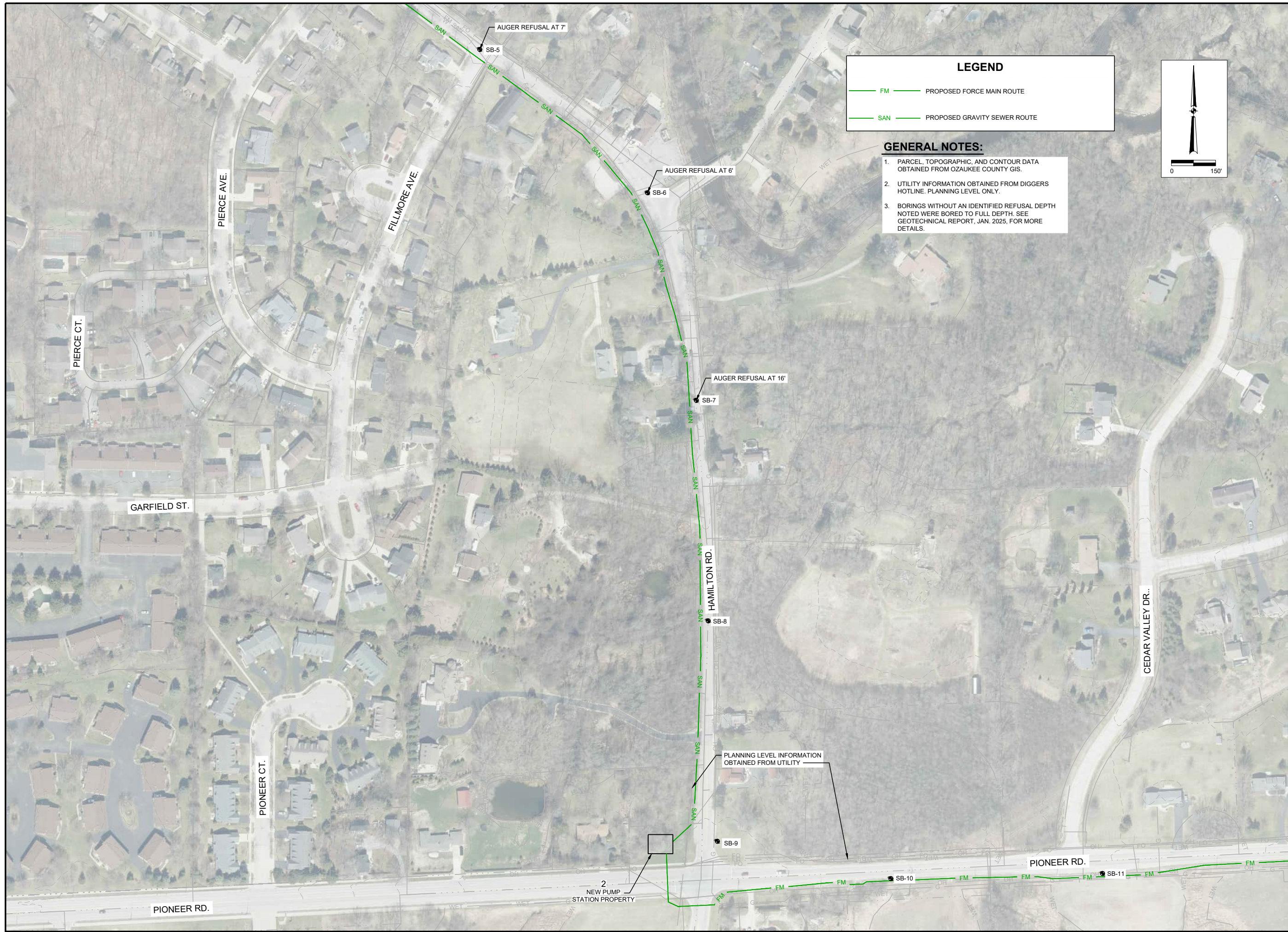
LEGEND

FM — PROPOSED FORCE MAIN ROUTE

SAN — PROPOSED GRAVITY SEWER ROUTE

- GENERAL NOTES:**
1. PARCEL, TOPOGRAPHIC, AND CONTOUR DATA OBTAINED FROM OZAUKEE COUNTY GIS.
 2. UTILITY INFORMATION OBTAINED FROM DIGGERS HOTLINE. PLANNING LEVEL ONLY.
 3. BORINGS WITHOUT AN IDENTIFIED REFUSAL DEPTH NOTED WERE BORED TO FULL DEPTH. SEE GEOTECHNICAL REPORT, JAN. 2025, FOR MORE DETAILS.



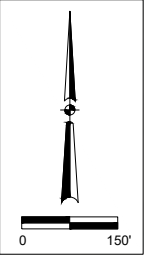


LEGEND

FM PROPOSED FORCE MAIN ROUTE

SAN PROPOSED GRAVITY SEWER ROUTE

- GENERAL NOTES:**
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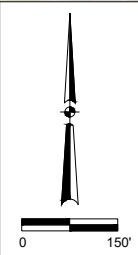
LEGEND

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3. BORINGS WITHOUT AN IDENTIFIED REFUSAL DEPTH NOTED WERE BORED TO FULL DEPTH. SEE GEOTECHNICAL REPORT, JAN. 2025, FOR MORE DETAILS.



3
NEW WRC PROPERTY

PLANNING LEVEL INFORMATION
OBTAINED FROM UTILITY

FM TO GRAVITY FLOW TRANSITION

Appendix E

Opinion of Probable Construction Costs

**City of Cedarburg
Facility Plan
Cedarburg, WI**

SUMMARY

INITIAL COST ESTIMATE

General Description

ITEM	Initial Cost (\$)	Change in Annual Cost (\$)	TPW (\$)
Alternative 1 Upgrades and Expansion of Existing WRC	83,369,000	295,091	85,547,319
Alternative 2 Upgrade of Existing WRC to MBR	88,468,000	496,278	96,182,887
Alternative 3 New WRC off Pioneer Road	134,518,000	230,550	130,884,914
Alternative 4 Treatment at MMSD	109,152,000	-1,158,900	85,289,924

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Alternative 1 Upgrades and Expansion of Existing WRC

INITIAL COST ESTIMATE

General Description

Rehabilitation and expansion of the existing Water Recycling Center (WRC).

Summary of Project Cost

Estimated Construction Cost Without Contingency or Markup		\$44,612,000
Contingency	30%	\$13,383,600
Estimated Construction Cost Without Markup		\$57,995,600
Contractor Overhead & Profit Markup	25%	\$14,499,000
Estimated Construction Cost		\$72,494,600
Engineering	15%	\$10,874,000
Total Initial Cost		\$83,369,000

Summary of Annual Costs and Salvage Values

Additional Annual Costs (initial year)		
O&M		\$174,240
Additional Personnel		\$107,500
Disposal Costs		-\$175,000
Electricity		\$83,231
Natural Gas		\$0
Chemicals		\$105,120
Present Worth of Cumulative Annual Cost		\$6,001,162
Present Worth Salvage Value from Piping and Structures		-\$3,822,843

Total Present Worth **\$85,547,319**

City of Cedarburg
 Facility Plan
 Cedarburg, WI

INITIAL COST ESTIMATE 1

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Structure 050 - Garfield Lift Station				\$ 1,838,000
Structure 100 - WRC Site				\$ 3,401,500
Structure 200 - Bar Screen Building				\$ 656,200
Structure 250 - New Administration Building				\$ 1,200,000
Structure 300 - Control Building				\$ 2,790,000
Structure 350 - Oxidation Ditch				\$ 2,468,275
Structure 400 - Clarifiers				\$ 1,338,000
Structure 450 - RAS Building				\$ 346,000
Structure 500 - New Tertiary Filter Building				\$ 3,906,300
Structure 550 - UV Disinfection and Vehicle Storage				\$ 1,719,500
Structure 600 - Gravity Thickener				\$ 374,000
Structure 650 - Aerobic Sludge Holding Tanks				\$ 605,000
Structure 700 - Sludge Pumping and Force mains				\$ 3,452,500
Structure 750 - New WRC Site				\$ 1,257,100
Structure 800 - Aerobic Digesters				\$ 1,723,508
Structure 850 - Thickening and Dewatering Building				\$ 4,041,313
Structure 900 - Biosolids Cake Storage				\$ 1,685,500
Bonds, insurance & mobilization	%		4%	\$ 1,312,107.82
Civil % Not Listed Above	%		4%	\$ 1,312,107.82
Process & Yard Piping % Not Listed Above	%		8%	\$ 2,624,215.64
Electrical % Not Listed Above	%		8%	\$ 2,624,215.64
Instrumentation and Control % Not Listed Above	%		6%	\$ 1,968,161.73
Plumbing % Not Listed Above	%		3%	\$ 984,080.86
HVAC % Not Listed Above	%		3%	\$ 984,080.86
Subtotal				\$ 44,611,666

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 050

Garfield Lift Station

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Lift station pump replacements	EA	3	195,000	585,000
Valve replacements	EA	9	6,000	54,000
Piping replacement and modifications	LS	1	80,000	80,000
Mechanical bar screen	EA	1	299,000	299,000
Backup bar rack	EA	1	25,000	25,000
Gates	EA	4	15,000	60,000
HVAC Replacement	LS	1	70,000	70,000
Bypass pumping during construction	LS	1	100,000	100,000
Equipment				1,273,000
<u>Construction</u>				
Structure addition for screening and dumpster	SF	400	400	160,000
Concrete Rehabilitation	LS	1	75,000	75,000
Coatings	LS	1	30,000	30,000
Construction				265,000
<u>Electrical</u>				
PLC panel	EA	1	50,000	50,000
MCC and VFD Replacement	EA	1	100,000	100,000
Generator and Automatic Transfer Switch Upgrade	EA	1	150,000	150,000
Electrical				300,000
				1,838,000

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 100				
WRC Site				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Equipment				
Buried site piping replacement - 6 inch	LF	600	250	150,000
Buried site piping replacement - 18 inch	LF	750	350	262,500
Buried site piping replacement - 20-24 inch	LF	850	400	340,000
Buried site piping replacement - 30 inch	LF	500	600	300,000
Plant effluent washwater hydrant system	LS	1	200,000	200,000
Equipment				1,252,500
Construction				
Septage receiving station	LS	1	100,000	100,000
Sludge loadout station	LS	1	100,000	100,000
1970 tankage demolition and restoration	cuyd	9,000	16	144,000
Mill and overlay of site roads	sqyd	2,000	50	100,000
Sidewalk replacements	sqft	5,000	15	75,000
Retainage wall replacements	LF	400	1,200	480,000
Pavement and aprons for storage building addition	LS	1	50,000	50,000
Entrance gate replacement	LS	1	20,000	20,000
Construction				1,069,000
Electrical				
Site electrical duct banks, conduit, and cables	LF	1,200	900	1,080,000
Electrical				1,080,000
				3,401,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 200 Bar Screen Building				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Equipment				
Gate Replacements	EA	6	18,000	108,000
Grit Mechanism	EA	1	169,000	169,000
Grit Pump	EA	1	39,000	39,000
Grit Washer	EA	1	135,200	135,200
HVAC Equipment Replacement	LS	1	50,000	50,000
Equipment				501,200
Construction				
Concrete Rehabilitation	LS	1	75,000	75,000
Coatings	LS	1	30,000	30,000
Construction				105,000
Electrical				
MCC Replacement	EA	1	50,000	50,000
Electrical				50,000
				656,200

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 250

New Administration Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Office furnishings and equipment	LS	1	100,000	100,000
HVAC	LS	1	100,000	100,000
Plumbing Fixtures	LS	1	50,000	50,000
Equipment				250,000
<u>Construction</u>				
Building: One Story Brick and Block	sq. ft	3,000	300	900,000
Construction				900,000
<u>Electrical</u>				
Electrical and Lighting	LS	1	50,000	50,000
Electrical				50,000
				1,200,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 300 Control Building				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
HVAC Replacements	LS	1	70,000	70,000
Sump pump discharge piping	LS	1	15,000	15,000
Floor drain rehabilitation	LS	1	40,000	40,000
Influent pump replacements	EA	3	221,000	663,000
Influent valve replacements	EA	9	6,000	54,000
Sludge loadout pump replacements	EA	2	39,000	78,000
Sludge pump - piping and valve replacments	LS	1	45,000	45,000
Equipment				965,000
<u>Construction</u>				
Partial building renovation	SF	2,000	200	400,000
Concrete rehabilitation and crack sealing	LS	1	75,000	75,000
Pump removal beams and hoists	EA	2	25,000	50,000
Coatings	LS	1	50,000	50,000
Construction				575,000
<u>Electrical</u>				
Electrical Switch Gear Replacement	LS	1	400,000	400,000
MCC Replacements	EA	3	50,000	150,000
Backup Generator Replacement	EA	1	300,000	300,000
SCADA Updates	LS	1	400,000	400,000
Electrical				1,250,000
				2,790,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 350 Oxidaiton Ditch				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Equipment				
Oxidation Ditch Aerator Replacements	LS	1	1,588,275	1,588,275
Gate replacements	EA	6	25,000	150,000
Piping and valve replacements	LS	1	400,000	400,000
Level control gate - electrically actuated and automated	LS	1	40,000	40,000
Equipment				2,178,275
Construction				
Concrete rehabilitation and crack injection	LS	1	250,000	250,000
Construction				250,000
Electrical				
Automation and control of aerators and gate level	LS	1	40,000	40,000
Electrical				40,000
				2,468,275

City of Cedarburg Facility Plan Cedarburg, WI Structure 400 Clarifiers				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Clarifier mechanisms, bridges, weirs, baffles	EA	2	520,000	1,040,000
HVAC replacements	LS	1	20,000	20,000
Washdown piping and valves	LS	1	20,000	20,000
Equipment				1,080,000
Construction				
Coatings	LS	1	50,000	50,000
Door replacements	EA	2	4,000	8,000
Concrete rehabilitation and crack injection	LS	1	200,000	200,000
Construction				258,000
Electrical				
Electrical				0
				0
				1,338,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 450 RAS Building				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
HVAC replacements	LS	1	50,000	50,000
RAS pump replacements	EA	3	52,000	156,000
RAS valve replacements	EA	9	5,000	45,000
Equipment				251,000
<u>Construction</u>				
Coatings	LS	1	20,000	20,000
Pump removal beams and hoists	EA	1	25,000	25,000
Construction				45,000
<u>Electrical</u>				
MCC replacement	LS	1	50,000	50,000
Electrical				50,000
				346,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 500

New Tertiary Filter Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Disc Filters	EA	2	634,400	1,268,800
Channel gates	EA	6	25,000	150,000
Filter influent and effluent piping and valves	LS	1	250,000	250,000
Influent and effluent Ortho-P analyzers	EA	2	25,000	50,000
Ferric storage and pumping system	EA	1	50,000	50,000
Polymer storage and feed system	EA	1	150,000	150,000
Rapid mix, coagulation, flocculation mixers	EA	3	25,000	75,000
Equipment				1,993,800
<u>Construction</u>				
Filter Building	SF	4,300	375	1,612,500
Removal beams and hoists	EA	2	25,000	50,000
Construction				1,662,500
<u>Electrical</u>				
Instrumentation and Control Panels	LS	1	200,000	200,000
MCC Equipment	LS	1	50,000	50,000
Electrical				250,000
				3,906,300

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 550

UV Disinfection and Vehicle Storage

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Gates	EA	4	18,000	72,000
UV system	EA	1	422,500	422,500
Weir system	EA	1	20,000	20,000
HVAC replacements	LS	1	100,000	100,000
Washdown water service	LS	1	20,000	20,000
				634,500
<u>Construction</u>				
Overhead sectional doors	EA	4	15,000	60,000
Storage building addition	sq ft	4,100	250	1,025,000
Construction				1,085,000
<u>Electrical</u>				
Electrical				0
				0
				1,719,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 600 Gravity Thickener				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Gravity thickener mechanism, bridge, weir replacement	EA	1	275,000	275,000
HVAC replacements	LS	1	10,000	10,000
Washdown piping and valves	LS	1	10,000	10,000
Equipment				295,000
<u>Construction</u>				
Door replacement	EA	1	4,000	4,000
Concrete rehabilitation and crack injection	LS	1	75,000	75,000
Construction				79,000
<u>Electrical</u>				
Electrical				0
				0
				374,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 650

Aerobic Sludge Holding Tanks

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Aeration blower replacements	EA	3	75,000	225,000
Aeration equipment replacements	EA	2	75,000	150,000
HVAC replacement	LS	1	30,000	30,000
Equipment				405,000
<u>Construction</u>				
Coatings	LS	1	100,000	100,000
Concrete rehabilitation and crack injection	LS	1	100,000	100,000
Construction				200,000
<u>Electrical</u>				
Electrical				0
				0
				605,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 700 Sludge Pumping and Forcemains				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Sludge pumps	EA	3	75,000	225,000
Sludge forcemain	LF	9,300	150	1,395,000
Filtrate forcemain	LF	9,300	150	1,395,000
HVAC	LS	1	30,000	30,000
Equipment				3,045,000
<u>Construction</u>				
Pump building	SF	625	300	187,500
Air release and piging structures	EA	3	30,000	90,000
Construction				277,500
<u>Electrical</u>				
Instrumentation and Control Panels	LS	1	200,000	100,000
Electrical and lighting	LS	1	30,000	30,000
Electrical				130,000
				3,452,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 750 New WRC Site				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Buried site piping - 6 inch	LF	200	200	40,000
Natural gas service	LS	1	30,000	30,000
Storm sewer	LS	1	100,000	100,000
Equipment				170,000
<u>Construction</u>				
Site development, grading, and seeding	LS	1	300,000	300,000
Dewatering during construction	LS	1	30,000	30,000
Pavement - roads and aprons	sqyd	1,200	75	90,000
Sidewalks	sqft	1,340	15	20,100
Site fence	LF	2,700	60	162,000
Entrance sign	EA	1	5,000	5,000
Entrance gate	LS	1	40,000	40,000
Construction				647,100
<u>Electrical</u>				
Electrical service	LS	1	50,000	50,000
Site lighting	EA	6	5,000	30,000
Site electrical duct banks, conduit, and cables	LF	400	900	360,000
Electrical				440,000
				1,257,100

City of Cedarburg Facility Plan Cedarburg, WI Structure 800 Aerobic Digesters				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Membrane diffuser systems	EA	2	50,000	100,000
DO probes	EA	2	5,000	10,000
Digester aeration blowers	EA	3	75,000	225,000
ALP piping and valves	LS	1	50,000	50,000
Dome covers with ventilation and door	EA	2	142,000	284,000
Decant piping and valves	EA	2	15,000	30,000
Equipment				699,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	6,593	15	98,894
Site Construction: Backfill	CY	3,200	15	48,000
Site Construction: Haul Excess Excavation stay on site	CY	3,393	6	20,358
Site Construction				167,251
Concrete: Base Slab	CY	339	800	271,434
Concrete: 18" Walls	CY	314	1,400	439,823
Concrete: walkways	CY	20	1,800	36,000
Concrete				747,257
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
Equipment removal beams and hoists	EA	0	5,000	0
Coatings	LS	1	20,000	20,000
Misc Construction				50,000
Structural				964,508
<u>Electrical</u>				
Electrical and lighting	LS	1	30,000	30,000
PLC and programing	LS	1	30,000	30,000
Electrical				60,000
				1,723,508

City of Cedarburg
Facility Plan
Cedarburg, WI

Structure 850

Thickening and Dewatering Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Gravity belt thickener	EA	1	397,800	397,800
Thickener feed pump	EA	1	39,000	39,000
Thickener polymer system	EA	1	65,000	65,000
Thickened sludge pump	EA	1	45,500	45,500
Belt filter press	EA	1	702,000	702,000
Belt press feed pump	EA	1	39,000	39,000
Belt press polymer system	EA	1	65,000	65,000
Cake conveyor	EA	1	45,500	45,500
Piping and valves	LS	1	200,000	200,000
HVAC	LS	1	150,000	150,000
Equipment				1,748,800
<u>Construction</u>				
Site Construction: Structure Excavation	CY	3,342	15	50,133
Site Construction: Backfill	CY	1,067	15	16,000
Site Construction: Haul Excess Excavation stay on site	CY	2,276	6	13,653
Site Construction				79,787
<u>Concrete</u>				
Concrete: Base Slab	CY	303	800	242,726
Concrete: 18" Walls	CY	200	1,400	280,000
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	3,600	25	90,000
Concrete				642,726
Block and brick two story building	SF	3,600	300	1,080,000
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
EPDM roofing and insulation	SF	3,600	25	90,000
Equipment removal beams and hoists	EA	2	15,000	30,000
Doors	EA	10	4,000	40,000
Coatings	LS	1	50,000	50,000
Misc Construction				1,320,000
Structural				2,042,513
<u>Electrical</u>				
MCC, control panels, and lighting	LS	1	150,000	150,000
PLC and programming	LS	1	100,000	100,000
Electrical				250,000
				4,041,313

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 900

Biosolids Cake Storage

<u>ITEM</u>	<u>Units</u>	<u>Quantity</u>	<u>Unit Cost (\$)</u>	<u>Initial Cost (\$)</u>
<u>Equipment</u>				
Cake conveyor	EA	1	45,500	45,500
				45,500
<u>Construction</u>				
Pre-engineered metal building (open walls)	sq ft	10,800	150	1,620,000
Construction				1,620,000
<u>Electrical</u>				
Lighting	LS	1	20,000	20,000
Electrical				20,000
				1,685,500

City of Cedarburg
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ANNUAL O&M COST ESTIMATE

General O&M

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Tertiary Filter Building Maintenance and Repair	LS	1	54,000	54,000
Biosolids Handling Maintenance and Repair	LS	1	120,240	120,240

Additional Personnel

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Tertiary Filter Building Staffing	person/yr	0.25	86,000	21,500
Biosolids Handling Staffing	person/yr	1	86,000	86,000

Disposal

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Contract Hauling Credit	per year	0.5	350,000	-175,000

Electricity

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Mixers	kWhr/yr	98,550	0.11	10,841
Filters	kWhr/yr	6,570	0.11	723
Backwash Pumps	kWhr/yr	32,850	0.11	3,614
FM Pumps	kWhr/yr	98,550	0.11	10,841
Digester Blowers	kWhr/yr	438,000	0.11	48,180
GBT and Pumps	kWhr/yr	32,850	0.11	3,614
BFP and pumps	kWhr/yr	49,275	0.11	5,420

Natural Gas

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
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Chemicals

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Ferric Chloride	gal/yr	20,440	3	61,320
Polymer Chemical	lb/yr	6,935	2	13,870
Thickening Polymer	lb/yr	5,110	2.00	10,220
Dewatering Polymer	lb/yr	9,855	2.00	19,710

Revenue

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
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**City of Cedarburg
Facility Plan
Cedarburg, WI**

Alternative 1 Upgrades and Expansion of Existing WRC

Present Worth Analysis Factors

Discount Rate	2.6%	DNR established
Inflation Rate	2.2%	2012 to 2021 average
Escalation Rate (Above Inflation)		
Electricity (0-5 years)	0.5%	
Electricity (6-20 years)	1.0%	
Natural Gas	1.5%	
Chemicals	0.0%	

Comments

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Life Cycle Cost Analysis

Initial Cost		83,369,000											
Year (n)	Periodic Costs		Annual Operational Costs and Revenue							Total Annual Cost	PW	PW	PW
	Replace	Salvage	General O&M	Additional Personnel	Disposal Costs	Electricity	Natural Gas	Chemical	Revenue	Periodic	Annual	Cumulative	
0	0	0	174,240	107,500	-175,000	83,231	0	105,120	0	295,091	0	295,091	83,664,091
1	0	0	177,986	109,811	-178,763	85,437	0	107,380	0	301,852	0	294,131	83,958,222
2	0	0	181,813	112,172	-182,606	87,701	0	109,689	0	308,769	0	293,175	84,251,396
3	0	0	185,722	114,584	-186,532	90,025	0	112,047	0	315,846	0	292,224	84,543,620
4	0	0	189,715	117,047	-190,542	92,410	0	114,456	0	323,086	0	291,277	84,834,897
5	0	0	193,794	119,564	-194,639	94,859	0	116,917	0	330,495	0	290,335	85,125,231
6	0	0	197,960	122,135	-198,824	97,373	0	119,431	0	338,075	0	289,397	85,414,628
7	0	0	202,216	124,760	-203,098	99,953	0	121,998	0	345,830	0	288,463	85,703,092
8	0	0	206,564	127,443	-207,465	102,602	0	124,621	0	353,765	0	287,534	85,990,626
9	0	0	211,005	130,183	-211,926	105,321	0	127,301	0	361,884	0	286,610	86,277,236
10	0	0	215,542	132,982	-216,482	108,112	0	130,038	0	370,191	0	285,690	86,562,926
11	0	0	220,176	135,841	-221,136	110,977	0	132,833	0	378,691	0	284,774	86,847,700
12	0	0	224,910	138,761	-225,891	113,918	0	135,689	0	387,388	0	283,862	87,131,562
13	0	0	229,745	141,745	-230,747	116,937	0	138,607	0	396,286	0	282,955	87,414,517
14	0	0	234,685	144,792	-235,708	120,036	0	141,587	0	405,391	0	282,052	87,696,570
15	0	0	239,731	147,905	-240,776	123,217	0	144,631	0	414,707	0	281,154	87,977,724
16	0	0	244,885	151,085	-245,953	126,482	0	147,740	0	424,239	0	280,259	88,257,983
17	0	0	250,150	154,334	-251,241	129,834	0	150,917	0	433,993	0	279,369	88,537,352
18	0	0	255,528	157,652	-256,643	133,274	0	154,162	0	443,973	0	278,484	88,815,836
19	0	0	261,022	161,041	-262,160	136,806	0	157,476	0	454,185	0	277,602	89,093,438
20	0	-6,418,741	266,634	164,504	-267,797	140,431	0	160,862	0	464,634	-3,822,843	276,724	85,547,319
20-Year Present Worth												85,547,319	
Alternative 1 Upgrades and Expansion of Existing WRC													
Initial Cost												83,369,000	
20-Year Present Worth												85,547,319	
Average Annual Cost												377,664	

Notes

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City of Cedarburg
 Facility Plan
 Cedarburg, WI

Alternative 2 Upgrade of Existing WRC to MBR

INITIAL COST ESTIMATE

General Description

Upgrade existing systems and construct new MBR system and biosolids handling system at current site.

Summary of Project Cost

Estimated Construction Cost Without Contingency or Markup		\$47,341,000
Contingency	30%	\$14,202,300
Estimated Construction Cost Without Markup		\$61,543,300
Contractor Overhead & Profit Markup	25%	\$15,386,000
Estimated Construction Cost		\$76,929,300
Engineering	15%	\$11,539,000
Total Initial Cost		\$88,468,000

Summary of Annual Costs and Salvage Values

Additional Annual Costs (initial year)		
O&M		\$220,240
Additional Personnel		\$114,380
Disposal Costs		-\$175,000
Electricity		\$216,208
Natural Gas		\$0
Chemicals		\$120,450
Present Worth of Cumulative Annual Cost		\$10,168,503
Present Worth Salvage Value from Piping and Structures		-\$2,453,616

Total Present Worth **\$96,182,887**

City of Cedarburg
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INITIAL COST ESTIMATE 1

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Structure 050 - Garfield Lift Station				\$ 1,838,000
Structure 100 - WRC Site				\$ 3,257,500
Structure 200 - Bar Screen Building				\$ 656,200
Structure 250 - New Administration Building				\$ 1,200,000
Structure 300 - Control Building				\$ 2,790,000
Structure 350 - Membrane Bioreactor				\$ 14,227,308
Structure 400 - Demolition of Oxidaton Ditch				\$ 950,000
Structure 450 - Demolition of Clarifiers				\$ 363,000
Structure 500 - Demolition of RAS Building				\$ 90,000
Structure 550 - UV Disinfection and Vehicle Storage				\$ 1,719,500
Structure 600 - Demolition of Gravity Thickener				\$ 68,000
Structure 650 - Aerobic Sludge Holding Tanks				\$ 200,000
Structure 700 - Aerobic Digesters				\$ 1,723,508
Structure 750 - Thickening and Dewatering Building				\$ 4,041,313
Structure 800 - Biosolids Cake Storage				\$ 1,685,500
Bonds, insurance & mobilization	%		4%	\$ 1,392,393.13
Civil % Not Listed Above	%		4%	\$ 1,392,393.13
Process & Yard Piping % Not Listed Above	%		8%	\$ 2,784,786.26
Electrical % Not Listed Above	%		8%	\$ 2,784,786.26
Instrumentation and Control % Not Listed Above	%		6%	\$ 2,088,589.69
Plumbing % Not Listed Above	%		3%	\$ 1,044,294.85
HVAC % Not Listed Above	%		3%	\$ 1,044,294.85
Subtotal				\$ 47,341,366

City of Cedarburg
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 Cedarburg, WI

Structure 050

Garfield Lift Station

<u>ITEM</u>	<u>Units</u>	<u>Quantity</u>	<u>Unit Cost (\$)</u>	<u>Initial Cost (\$)</u>
<u>Equipment</u>				
Lift station pump replacements	EA	3	195,000	585,000
Valve replacements	EA	9	6,000	54,000
Piping replacement and modifications	LS	1	80,000	80,000
Mechanical bar screen	EA	1	299,000	299,000
Backup bar rack	EA	1	25,000	25,000
Gates	EA	4	15,000	60,000
HVAC Replacement	LS	1	70,000	70,000
Bypass pumping during construction	LS	1	100,000	100,000
Equipment				1,273,000
<u>Construction</u>				
Structure addition for screening and dumpster	SF	400	400	160,000
Concrete Rehabilitation	LS	1	75,000	75,000
Coatings	LS	1	30,000	30,000
Construction				265,000
<u>Electrical</u>				
PLC panel	EA	1	50,000	50,000
MCC and VFD Replacement	EA	1	100,000	100,000
Generator and Automatic Transfer Switch Upgrade	EA	1	150,000	150,000
Electrical				300,000
				1,838,000

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 100				
WRC Site				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Buried site piping replacement - 6 inch	LF	600	250	150,000
Buried site piping replacement - 18 inch	LF	750	350	262,500
Buried site piping for MBR - 20-24 inch	LF	400	400	160,000
Buried site piping to/from MBR - 30 inch	LF	500	600	300,000
Plant effluent washwater hydrant system	LS	1	200,000	200,000
Equipment				1,072,500
<u>Construction</u>				
Septage receiving station	LS	1	100,000	100,000
Sludge loadout station	LS	1	100,000	100,000
1970 tankage demolition and restoration	cuyd	9,000	20	180,000
Mill and overlay of site roads	sqyd	2,000	50	100,000
Sidewalk replacements	sqft	5,000	15	75,000
Retainage wall replacements	LF	400	1,200	480,000
Pavement and aprons for storage building addition	LS	1	50,000	50,000
Entrance gate replacement	LS	1	20,000	20,000
Construction				1,105,000
<u>Electrical</u>				
Site electrical duct banks, conduit, and cables	LF	1,200	900	1,080,000
Electrical				1,080,000
				3,257,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 200 Bar Screen Building				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Gate Replacements	EA	6	18,000	108,000
Grit Mechanism	EA	1	169,000	169,000
Grit Pump	EA	1	39,000	39,000
Grit Washer	EA	1	135,200	135,200
HVAC Equipment Replacement	LS	1	50,000	50,000
Equipment				501,200
<u>Construction</u>				
Concrete Rehabilitation	LS	1	75,000	75,000
Coatings	LS	1	30,000	30,000
Construction				105,000
<u>Electrical</u>				
MCC Replacement	EA	1	50,000	50,000
Electrical				50,000
				656,200

City of Cedarburg
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 Cedarburg, WI

Structure 250

New Administration Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Office furnishings and equipment	LS	1	100,000	100,000
HVAC	LS	1	100,000	100,000
Plumbing Fixtures	LS	1	50,000	50,000
Equipment				250,000
<u>Construction</u>				
Building: One Story Brick and Block	sq. ft	3,000	300	900,000
Construction				900,000
<u>Electrical</u>				
Electrical and Lighting	LS	1	50,000	50,000
Electrical				50,000
				1,200,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 300 Control Building				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
HVAC Replacements	LS	1	70,000	70,000
Sump pump discharge piping	LS	1	15,000	15,000
Floor drain rehabilitation	LS	1	40,000	40,000
Influent pump replacements	EA	3	221,000	663,000
Influent valve replacements	EA	9	6,000	54,000
Sludge loadout pump replacements	EA	2	39,000	78,000
Sludge pump - piping and valve replacments	LS	1	45,000	45,000
Equipment				965,000
Construction				
Partial building renovation	SF	2,000	200	400,000
Concrete rehabilitation and crack sealing	LS	1	75,000	75,000
Pump removal beams and hoists	EA	2	25,000	50,000
Coatings	LS	1	50,000	50,000
Construction				575,000
Electrical				
Electrical Switch Gear Replacement	LS	1	400,000	400,000
MCC Replacements	EA	3	50,000	150,000
Backup Generator Replacement	EA	1	300,000	300,000
SCADA Updates	LS	1	400,000	400,000
Electrical				1,250,000
				2,790,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 350 Membrane Bioreactor				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Fine Screen System	LS	1	1,000,000	1,000,000
MBR System	LS	1	8,450,000	8,450,000
Equipment				9,450,000
Construction				
Site Construction: Structure Excavation	CY	19,838	15	297,569
Site Construction: Backfill	CY	10,085	15	151,276
Site Construction: Haul Excess Excavation stay on site	CY	9,753	6	58,517
Concrete: Base Slab	CY	1,047	800	837,570
Concrete: 18" Walls	CY	1,348	1,400	1,886,500
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	3,668	25	91,688
Retaining Wall	LS	1	5,000	5,000
Block and brick building	SF	3,668	200	733,500
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
EPDM roofing and insulation	SF	3,668	25	91,688
Equipment removal beams and hoists	EA	2	15,000	30,000
Doors	EA	6	4,000	24,000
Coatings	LS	1	25,000	25,000
Construction				4,277,308
Electrical				
Electrical and lighting	LS	1	300,000	300,000
PLC and programing	LS	1	200,000	200,000
Electrical				500,000
				14,227,308

City of Cedarburg Facility Plan Cedarburg, WI Structure 400 Demolition of Oxidaton Ditch				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Equipment Removal	LS	1	50,000	50,000
Equipment				50,000
<u>Construction</u>				
Concrete removal and disposal	CF	75,000	12	900,000
Backfill	LS	1	0	0
Site Restoration	LS	1	0	0
Construction				900,000
<u>Electrical</u>				
None	LS	1	0	0
Electrical				0
				950,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 450 Demolition of Clarifiers				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Equipment and Dome Removal	LS	1	50,000	50,000
Equipment				50,000
<u>Construction</u>				
Concrete removal and disposal	CF	24,000	12	288,000
Dome removals	LS	2	12,500	25,000
Backfill	LS	1	0	0
Site Restoration	LS	1	0	0
Construction				313,000
<u>Electrical</u>				
None	LS	1	0	0
Electrical				0
				363,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 500 Demolition of RAS Building				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Equipment Removal	LS	1	30,000	30,000
Equipment				30,000
Construction				
Building/Concrete removal and disposal	CF	5,000	12	60,000
Backfill	LS	1	0	0
Construction				60,000
Electrical				
None	LS	1	0	0
Electrical				0
				90,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 550

UV Disinfection and Vehicle Storage

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Gates	EA	4	18,000	72,000
UV system	EA	1	422,500	422,500
Weir system	EA	1	20,000	20,000
HVAC replacements	LS	1	100,000	100,000
Washdown water service	LS	1	20,000	20,000
				634,500
<u>Construction</u>				
Overhead sectional doors	EA	4	15,000	60,000
Storage building addition	sq ft	4,100	250	1,025,000
Construction				1,085,000
<u>Electrical</u>				
Electrical				0
				0
				1,719,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 600 Demolition of Gravity Thickener				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Equipment and Dome Removal	LS	1	20,000	20,000
Equipment				20,000
<u>Construction</u>				
Concrete removal and disposal	CF	4,000	12	48,000
Backfill	LS	1	0	0
Construction				48,000
<u>Electrical</u>				
None	LS	1	0	0
Electrical				0
				68,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 650

Aerobic Sludge Holding Tanks

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Equipment				0
<u>Construction</u>				
Coatings	LS	1	100,000	100,000
Concrete rehabilitation and crack injection	LS	1	100,000	100,000
Construction				200,000
<u>Electrical</u>				
Electrical				0
				0
				200,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 700 Aerobic Digesters				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Membrane diffuser systems	EA	2	50,000	100,000
DO probes	EA	2	5,000	10,000
Digester aeration blowers	EA	3	75,000	225,000
ALP piping and valves	LS	1	50,000	50,000
Dome covers with ventilation and door	EA	2	142,000	284,000
Decant piping and valves	EA	2	15,000	30,000
Equipment				699,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	6,593	15	98,894
Site Construction: Backfill	CY	3,200	15	48,000
Site Construction: Haul Excess Excavation stay on site	CY	3,393	6	20,358
Site Construction				167,251
Concrete: Base Slab	CY	339	800	271,434
Concrete: 18" Walls	CY	314	1,400	439,823
Concrete: walkways	CY	20	1,800	36,000
Concrete				747,257
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
Equipment removal beams and hoists	EA	0	5,000	0
Coatings	LS	1	20,000	20,000
Misc Construction				50,000
Structural				964,508
<u>Electrical</u>				
Electrical and lighting	LS	1	30,000	30,000
PLC and programing	LS	1	30,000	30,000
Electrical				60,000
				1,723,508

City of Cedarburg
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Structure 750

Thickening and Dewatering Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Gravity belt thickener	EA	1	397,800	397,800
Thickener feed pump	EA	1	39,000	39,000
Thickener polymer system	EA	1	65,000	65,000
Thickened sludge pump	EA	1	45,500	45,500
Belt filter press	EA	1	702,000	702,000
Belt press feed pump	EA	1	39,000	39,000
Belt press polymer system	EA	1	65,000	65,000
Cake conveyor	EA	1	45,500	45,500
Piping and valves	LS	1	200,000	200,000
HVAC	LS	1	150,000	150,000
Equipment				1,748,800
<u>Construction</u>				
Site Construction: Structure Excavation	CY	3,342	15	50,133
Site Construction: Backfill	CY	1,067	15	16,000
Site Construction: Haul Excess Excavation stay on site	CY	2,276	6	13,653
Site Construction				79,787
<u>Concrete</u>				
Concrete: Base Slab	CY	303	800	242,726
Concrete: 18" Walls	CY	200	1,400	280,000
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	3,600	25	90,000
Concrete				642,726
Block and brick two story building	SF	3,600	300	1,080,000
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
EPDM roofing and insulation	SF	3,600	25	90,000
Equipment removal beams and hoists	EA	2	15,000	30,000
Doors	EA	10	4,000	40,000
Coatings	LS	1	50,000	50,000
Misc Construction				1,320,000
Structural				2,042,513
<u>Electrical</u>				
MCC, control panels, and lighting	LS	1	150,000	150,000
PLC and programming	LS	1	100,000	100,000
Electrical				250,000
				4,041,313

City of Cedarburg Facility Plan Cedarburg, WI Structure 800 Biosolids Cake Storage				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Cake conveyor	EA	1	45,500	45,500
				45,500
<u>Construction</u>				
Pre-engineered metal building (open walls)	sq ft	10,800	150	1,620,000
Construction				1,620,000
<u>Electrical</u>				
Lighting	LS	1	20,000	20,000
Electrical				20,000
				1,685,500

City of Cedarburg
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ANNUAL O&M COST ESTIMATE

General O&M

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
MBR Maintenance and Repair	LS	1	100,000	100,000
Biosolids Handling Maintenance and Repair	LS	1	120,240	120,240

Additional Personnel

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
MBR Staffing	person/yr	0.33	86,000	28,380
Biosolids Handling Staffing	person/yr	1	86,000	86,000

Disposal

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Contract Hauling Credit	per year	0.5	350,000	-175,000

Electricity

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Mixers	kWhr/yr	262,800	0.11	28,908
Blowers	kWhr/yr	657,000	0.11	72,270
Return Pumps	kWhr/yr	262,800	0.11	28,908
Permeate Pumps	kWhr/yr	262,800	0.11	28,908
Digester Blowers	kWhr/yr	438,000	0.11	48,180
GBT and Pumps	kWhr/yr	32,850	0.11	3,614
BFP and pumps	kWhr/yr	49,275	0.11	5,420

Natural Gas

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
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Chemicals

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Ferric Chloride	gal/yr	20,440	3	61,320
MBR Cleaning Chemical	gal/yr	7,300	4	29,200
Thickening Polymer	lb/yr	5,110	2.00	10,220
Dewatering Polymer	lb/yr	9,855	2.00	19,710

Revenue

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
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**City of Cedarburg
Facility Plan
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Alternative 2 Upgrade of Existing WRC to MBR

Present Worth Analysis Factors

Discount Rate	2.6%	DNR established
Inflation Rate	2.2%	2012 to 2021 average
Escalation Rate (Above Inflation)		
Electricity (0-5 years)	0.5%	
Electricity (6-20 years)	1.0%	
Natural Gas	1.5%	
Chemicals	0.0%	

Comments

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Life Cycle Cost Analysis

Initial Cost		88,468,000											
Year (n)	Periodic Costs		Annual Operational Costs and Revenue							Total Annual Cost	PW	PW	PW
	Replace	Salvage	General O&M	Additional Personnel	Disposal Costs	Electricity	Natural Gas	Chemical	Revenue	Periodic	Annual	Cumulative	
0	0	0	220,240	114,380	-175,000	216,208	0	120,450	0	496,278	0	496,278	88,964,278
1	0	0	224,975	116,839	-178,763	221,937	0	123,040	0	508,029	0	495,034	89,459,312
2	0	0	229,812	119,351	-182,606	227,819	0	125,685	0	520,061	0	493,796	89,953,108
3	0	0	234,753	121,917	-186,532	233,856	0	128,387	0	532,381	0	492,565	90,445,673
4	0	0	239,800	124,538	-190,542	240,053	0	131,148	0	544,997	0	491,339	90,937,012
5	0	0	244,956	127,216	-194,639	246,414	0	133,967	0	557,915	0	490,119	91,427,132
6	0	0	250,223	129,951	-198,824	252,944	0	136,848	0	571,142	0	488,906	91,916,037
7	0	0	255,602	132,745	-203,098	259,647	0	139,790	0	584,686	0	487,698	92,403,735
8	0	0	261,098	135,599	-207,465	266,528	0	142,795	0	598,555	0	486,495	92,890,230
9	0	0	266,711	138,515	-211,926	273,591	0	145,865	0	612,757	0	485,299	93,375,530
10	0	0	272,446	141,493	-216,482	280,841	0	149,001	0	627,299	0	484,109	93,859,638
11	0	0	278,303	144,535	-221,136	288,283	0	152,205	0	642,190	0	482,924	94,342,562
12	0	0	284,287	147,642	-225,891	295,923	0	155,477	0	657,439	0	481,745	94,824,307
13	0	0	290,399	150,817	-230,747	303,765	0	158,820	0	673,053	0	480,572	95,304,879
14	0	0	296,643	154,059	-235,708	311,815	0	162,235	0	689,043	0	479,404	95,784,283
15	0	0	303,020	157,371	-240,776	320,078	0	165,723	0	705,416	0	478,242	96,262,525
16	0	0	309,535	160,755	-245,953	328,560	0	169,286	0	722,183	0	477,086	96,739,611
17	0	0	316,190	164,211	-251,241	337,267	0	172,926	0	739,353	0	475,935	97,215,546
18	0	0	322,988	167,742	-256,643	346,204	0	176,643	0	756,935	0	474,790	97,690,336
19	0	0	329,933	171,348	-262,160	355,379	0	180,441	0	774,940	0	473,650	98,163,986
20		-4,119,742	337,026	175,032	-267,797	364,796	0	184,321	0	793,378	-2,453,616	472,516	96,182,887
20-Year Present Worth												96,182,887	
Alternative 2 Upgrade of Existing WRC to MBR													
Initial Cost												88,468,000	
20-Year Present Worth												96,182,887	
Average Annual Cost												640,588	

Notes

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City of Cedarburg
 Facility Plan
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Alternative 3 New WRC off Pioneer Road

INITIAL COST ESTIMATE

General Description

Construction of a new water recycling center (WRC) at the City owned property off Pioneer Road. Collection system work would include gravity interceptors, a new pump station, and a forcemain to convey the wastewater to the new site. Forward flow unit processes would include screening, pumping, grit removal, aeration tanks, aeration blowers, secondary clarifiers, RAS and WAS pumping, ferric chloride storage and dosing for phosphorus removal, tertiary filtration, recycle pumping, UV disinfection, and post aeration. Biosolids handling unit processes would include gravity belt thickening, aerobic digesters, digester blowers, belt filter press dewatering, and cake storage. Ancillary facilities would include administration building, maintenance building, and primary switchgear and generator building. The existing WRC would be demolished and the site would be restored for development.

Summary of WWTF Costs

Estimated Construction Cost Without Contingency or Markup		\$71,983,000
Contingency	30%	\$21,594,900
Estimated Construction Cost Without Markup		\$93,577,900
Contractor Overhead & Profit Markup	25%	\$23,394,000
Estimated Construction Cost		\$116,971,900
Engineering	15%	\$17,546,000
Total Initial Cost		\$134,518,000

Summary of Annual Costs and Salvage Values

Additional Annual Costs (initial year)		
O&M		\$174,240
Additional Personnel		\$64,500
Disposal		-\$175,000
Electricity		\$61,690
Natural Gas		\$0
Chemicals		\$105,120
Present Worth of Cumulative Annual Cost		\$4,685,303
Present Worth Salvage Value from Piping and Structures		-\$13,073,736

Total Present Worth **\$130,884,914**

City of Cedarburg
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INITIAL COST ESTIMATE 1

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Structure 020 - Interceptor, Lift Station, and Forcemain to New WRC				\$ 7,885,950
Structure 030 - Demolition of and Reclamation of Existing WRC				\$ 4,085,300
Structure 050 - WRC Site				\$ 5,296,000
Structure 100 - Administration Building				\$ 2,400,000
Structure 150 - Process Drain Pump Station				\$ 300,000
Structure 200 - Headworks (Pumping, and Grit)				\$ 2,777,356
Structure 250 - Ferric Chloride Building				\$ 510,273
Structure 300 - Aeration Splitter Box				\$ 140,880
Structure 350 - Aeration Basins				\$ 5,319,276
Structure 400 - Blower Building				\$ 1,937,666
Structure 450 - Clarifier Splitter Box				\$ 94,880
Structure 500 - Secondary Clarifiers				\$ 4,069,189
Structure 550 - RAS/WAS Pump Building				\$ 1,449,990
Structure 600 - New Tertiary Filter Building				\$ 3,906,300
Structure 650 - UV Disinfection				\$ 1,162,151
Structure 700 - Post Aeration and Gravity Outfall				\$ 1,036,277
Structure 750 - Aerobic Digesters				\$ 1,723,508
Structure 800 - Thickening and Dewatering Building				\$ 4,041,313
Structure 850 - Biosolids Cake Storage				\$ 1,685,500
Structure 900 - Maintenance Garage				\$ 2,340,000
Bonds, insurance & mobilization	%		4%	\$ 2,086,472
Civil % Not Listed Above	%		4%	\$ 2,086,472
Process & Yard Piping % Not Listed Above	%		8%	\$ 4,172,945
Electrical % Not Listed Above	%		8%	\$ 4,172,945
Instrumentation and Control % Not Listed Above	%		6%	\$ 3,129,708
Plumbing % Not Listed Above	%		4%	\$ 2,086,472
HVAC % Not Listed Above	%		4%	\$ 2,086,472
Subtotal				\$ 71,983,295

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 020

Interceptor, Lift Station, and Forcemain to New WRC

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Gravity sewer from Garfield to Pioneer - 16 Inch	LF	2,000	300	600,000
Garfield LS Demolition	LS	1	80,000	80,000
Gravity sewer from Hamilton to Pioneer - 36 inch	LF	3,800	550	2,090,000
Pioneer Road Pump Station Pumps	EA	3	221,000	663,000
Pioneer Road Pump Station Screens	EA	2	237,250	474,500
Pioneer Road Pump Station Washer Compactors	EA	2	85,475	170,950
Pioneer Pump Station Gates	EA	4	18,000	72,000
HVAC for Pump Station	LS	1	30,000	30,000
Forcemain from Pioneer to high point - 24 inch	LF	2,600	400	1,040,000
Gravity sewer from Pioneer to WRC site - 36 inch	LF	3,000	550	1,650,000
Equipment				6,870,450
<u>Construction</u>				
New Pioneer Road Pump Station	SF	1,500	400	600,000
Site development, grading, and seeding	LS	1	50,000	50,000
Dewatering during construction	LS	1	20,000	20,000
Pavement - roads and aprons	sqyd	300	75	22,500
Pump Station fencing	LF	300	60	18,000
Pump Station gate	LS	1	10,000	10,000
Construction				720,500
<u>Electrical</u>				
Electrical service for new pump station	LS	1	40,000	40,000
Generator and Automatic Transfer Switch	EA	1	150,000	150,000
Site lighting	EA	1	5,000	5,000
PLC and programing	LS	1	100,000	100,000
Electrical				295,000
				7,885,950

City of Cedarburg
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 Cedarburg, WI

Structure 030

Demolition of and Reclamation of Existing WRC

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Demolition and Removals</u>				
Buried site piping	LF	2,700	50	135,000
Buried duct banks, conduit, and cables	LF	1,200	50	60,000
Pavement, curb, and sidewalk	sqyd	3,000	50	150,000
Cascade aeration/outfall/sludge loadout	CF	1,500	12	18,000
Bar Screen Building - Concrete removal	CF	5,000	12	60,000
Bar Screen Building - Building removal	CF	2,000	12	24,000
Control Building and Digester Tanks - Concrete removal	CF	20,000	12	240,000
Control Building and Digester Tanks - Building removal	CF	4,000	12	48,000
Sludge Storage Tank	CF	2,000	12	24,000
UV/Vehicle Storage/Aeration/Clarifier Tankage - concrete	CF	42,000	12	504,000
UV/Vehicle Storage/Aeration/Clarifier Tankage - building	CF	5,500	12	66,000
Garage	CF	400	12	4,800
Gravity Thickener - concrete removal	CF	4,000	12	48,000
Gravity Thickener - dome removal	LS	1	10,000	10,000
Oxidation Ditch	CF	75,000	12	900,000
Final Clarifiers - concrete removal	CF	24,000	12	288,000
Final Clarifiers - dome removal	LS	2	12,500	25,000
RAS Pump Station - concrete removal	CF	4,000	12	48,000
RAS Pump Station - building removal	CF	1,000	12	12,000
Retaining walls/push walls	LS	1	10,000	10,000
Equipment				2,674,800
<u>Construction</u>				
Haul and backfill - cascade aeration/outfall	CY	100	30	3,000
Haul and backfill - bar screen building	CY	500	30	15,000
Haul and backfill - control building/digester tanks	CY	3,000	30	90,000
Haul and backfill - sludge storage tank	CY	400	30	12,000
Haul and backfill - UV/Vehicle storage/aeration/tankage	CY	8,500	30	255,000
Haul and backfill - gravity thickener	CY	750	30	22,500
Haul and backfill - oxidation ditch	CY	16,000	30	480,000
Haul and backfill - final clarifiers	CY	10,000	30	300,000
Haul and backfill - RAS pump station	CY	600	30	18,000
Haul and backfill - misc	CY	500	30	15,000
Site restoration, grading, and seeding	LS	1	200,000	200,000
Construction				1,410,500
				4,085,300

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 050				
WRC Site				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Equipment				
Buried site piping - 6 inch	LF	800	200	160,000
Buried site piping - 12 inch	LF	1,000	300	300,000
Buried site piping - 20 inch	LF	1,000	400	400,000
Buried site piping - 30 inch	LF	800	550	440,000
Natural gas service	LS	1	30,000	30,000
Storm sewer	LS	1	200,000	200,000
Well for potable water service	LS	1	60,000	60,000
Plant effluent washwater hydrant system	LS	1	200,000	200,000
Equipment				1,790,000
Construction				
Septage receiving station	LS	1	100,000	100,000
Site development, grading, and seeding	LS	1	700,000	700,000
Dewatering during construction	LS	1	100,000	100,000
Pavement - roads and aprons	sqyd	3,000	75	225,000
Sidewalks	sqft	8,000	15	120,000
Site fence	LF	3,600	60	216,000
Entrance sign	EA	1	5,000	5,000
Entrance gate	LS	1	40,000	40,000
Construction				1,506,000
Electrical				
Electrical service	LS	1	50,000	50,000
Site lighting	EA	30	5,000	150,000
Site electrical duct banks, conduit, and cables	LF	2,000	900	1,800,000
Electrical				2,000,000
				5,296,000

City of Cedarburg Facility Plan Cedarburg, WI Structure 100 Administration Building				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
Equipment				
Laboratory furnishings and equipment	LS	1	200,000	200,000
Office furnishings and equipment	LS	1	100,000	100,000
HVAC	LS	1	150,000	150,000
Plumbing Fixtures	LS	1	50,000	50,000
Equipment				500,000
Construction				
Building: One Story Brick and Block	sq. ft	5,000	300	1,500,000
Construction				1,500,000
Electrical				
Electrical and lighting	LS	1	100,000	100,000
PLC and SCADA control system	LS	1	300,000	300,000
Electrical				400,000
				2,400,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 150

Process Drain Pump Station

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Drain pumps	each	2	25,000	50,000
				50,000
<u>Construction</u>				
Drain wetwell structure and hatches	LS	1	250,000	250,000
Construction				250,000
<u>Electrical</u>				
Electrical				0
				0
				300,000

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 200				
Headworks (Pumping, and Grit)				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Gates	EA	4	18,000	72,000
Influent pumps	EA	3	221,000	663,000
Piping and valves	LS	1	250,000	250,000
Grit Mechanism	EA	1	169,000	169,000
Grit Pump	EA	1	39,000	39,000
Grit Washer	EA	1	135,200	135,200
Grit piping and valves	LS	1	60,000	60,000
Parshall flume	EA	1	10,000	10,000
HVAC System	LS	1	100,000	100,000
Equipment				1,498,200
Construction				
Site Construction: Structure Excavation	CY	1,643	15	24,640
Site Construction: Backfill	CY	639	15	9,582
Site Construction: Haul Excess Excavation stay on site	CY	1,004	6	6,023
Site Construction				40,245
Concrete: Base Slab	CY	143	800	114,726
Concrete: 12" Walls	CY	104	1,400	145,185
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	1,600	25	40,000
Concrete				329,911
Block and brick building	SF	1,600	200	320,000
Metals: grating, railing, stairs, ladder	LS	1	50,000	50,000
EPDM roofing and insulation	SF	1,600	25	40,000
Equipment removal beams and hoists	EA	2	25,000	50,000
Equipment removal skylight	EA	1	25,000	25,000
Doors	EA	6	4,000	24,000
Coatings	LS	1	50,000	50,000
Misc Construction				559,000
Structural				929,156
Electrical				
MCC, control panels, and lighting	LS	1	200,000	200,000
PLC and programming	LS	1	150,000	150,000
Electrical				350,000
				2,777,356

City of Cedarburg
Facility Plan
Cedarburg, WI

Structure 250

Ferric Chloride Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
HVAC System	LS	1	30,000	30,000
Storage tank	EA	1	30,000	30,000
Chemical pumping system	EA	1	30,000	30,000
Tempered water eyewash/shower system	EA	1	10,000	10,000
Chemical piping and valves	LS	1	10,000	10,000
Equipment				110,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	303	15	4,547
Site Construction: Backfill	CY	84	15	1,260
Site Construction: Haul Excess Excavation stay on site	CY	219	6	1,315
Site Construction				7,121
Concrete: Base Slab	CY	73	800	58,430
Concrete: 12" Walls	CY	24	1,400	34,222
Concrete: columns and beams	LS	0		0
Concrete: 8" Precast Hollow-Core Plank	SF	750	25	18,750
Concrete				111,402
Block and brick building	SF	750	200	150,000
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
EPDM roofing and insulation	SF	750	25	18,750
Equipment removal beams and hoists	EA	0		0
Doors	EA	2	4,000	8,000
Coatings	LS	1	20,000	20,000
Misc Construction				211,750
Structural				330,273
<u>Electrical</u>				
Electrical, control panel, and lighting	LS	1	50,000	50,000
PLC and programing	LS	1	20,000	20,000
Electrical				70,000
				510,273

City of Cedarburg Facility Plan Cedarburg, WI Structure 300 Aeration Splitter Box				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Slide Gates	EA	4	18,000	72,000
Weirs	EA	4	5,000	20,000
Equipment				92,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	103	15	1,547
Site Construction: Backfill	CY	44	15	660
Site Construction: Haul Excess Excavation stay on site	CY	59	6	355
Site Construction				2,561
Concrete: Base Slab	CY	20	800	15,763
Concrete: 12" Walls	CY	11	1,400	15,556
Concrete: columns and beams	LS	0		0
Concrete				31,319
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
Equipment removal beams and hoists	EA	0		0
Coatings	LS	0	20,000	0
Misc Construction				15,000
Structural				48,880
<u>Electrical</u>				
Electrical, control panel, and lighting	LS	0		0
PLC and programing	LS	0		0
Electrical				0
				140,880

City of Cedarburg Facility Plan Cedarburg, WI Structure 350 Aeration Basins				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Slide Gates	EA	12	18,000	216,000
Membrane diffuser systems	EA	4	97,500	390,000
DO and ORP probes	EA	8	5,000	40,000
Mixers	EA	8	25,000	200,000
ALP piping and valves	LS	1	160,000	160,000
Modulating aeration control valves	EA	12	10,000	120,000
RAS piping and valves	LS	1	80,000	80,000
Weirs	EA	4	5,000	20,000
Equipment				1,226,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	18,732	15	280,978
Site Construction: Backfill	CY	4,163	15	62,444
Site Construction: Haul Excess Excavation stay on site	CY	14,569	6	87,413
Site Construction				430,836
Concrete: Base Slab	CY	2,185	800	1,748,267
Concrete: 18" Walls	CY	981	1,400	1,373,400
Concrete: walkways	CY	107	1,800	193,333
Concrete				3,315,000
Metals: grating, railing, stairs, ladder	LF	1,416	90	127,440
Equipment removal beams and hoists	EA	8	5,000	40,000
Coatings	LS	1	30,000	30,000
Misc Construction				197,440
Structural				3,943,276
<u>Electrical</u>				
Electrical and lighting	LS	1	50,000	50,000
PLC and programing	LS	1	100,000	100,000
Electrical				150,000
				5,319,276

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 400				
Blower Building				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
HVAC System	LS	1	50,000	50,000
Aeration blowers	EA	4	117,000	468,000
Digester blowers	EA	3	75,000	225,000
ALP piping and valves	LS	1	250,000	250,000
Equipment				993,000
Construction				
Site Construction: Structure Excavation	CY	525	15	7,880
Site Construction: Backfill	CY	117	15	1,760
Site Construction: Haul Excess Excavation stay on site	CY	408	6	2,448
Site Construction				12,088
Concrete: Base Slab	CY	136	800	108,800
Concrete: 12" Walls	CY	36	1,400	49,778
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	1,500	25	37,500
Concrete				226,078
Block and brick building	SF	1,500	200	300,000
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
EPDM roofing and insulation	SF	1,500	25	37,500
Equipment removal beams and hoists	EA	2	25,000	50,000
Doors	EA	6	4,000	24,000
Coatings	LS	1	30,000	30,000
Misc Construction				456,500
Structural				694,666
Electrical				
MCC, control panels, and lighting	LS	1	150,000	150,000
PLC and programing	LS	1	100,000	100,000
Electrical				250,000
				1,937,666

City of Cedarburg Facility Plan Cedarburg, WI Structure 450 Clarifier Splitter Box				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Slide Gates	EA	2	18,000	36,000
Weirs	EA	2	5,000	10,000
Equipment				46,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	103	15	1,547
Site Construction: Backfill	CY	44	15	660
Site Construction: Haul Excess Excavation stay on site	CY	59	6	355
Site Construction				2,561
Concrete: Base Slab	CY	20	800	15,763
Concrete: 12" Walls	CY	11	1,400	15,556
Concrete: columns and beams	LS	0		0
Concrete				31,319
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
Equipment removal beams and hoists	EA	0		0
Coatings	LS	0	20,000	0
Misc Construction				15,000
Structural				48,880
<u>Electrical</u>				
Electrical, control panel, and lighting	LS	0		0
PLC and programing	LS	0		0
Electrical				0
				94,880

City of Cedarburg Facility Plan Cedarburg, WI Structure 500 Secondary Clarifiers				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Clarifier mechanisms, bridges, weirs, baffles	EA	2	520,000	1,040,000
Dome covers with ventilation and door	EA	2	461,000	922,000
Washdown piping and valves	EA	2	10,000	20,000
Equipment				1,982,000
Construction				
Site Construction: Structure Excavation	CY	15,852	15	237,773
Site Construction: Backfill	CY	5,570	15	83,556
Site Construction: Haul Excess Excavation stay on site	CY	10,281	6	61,687
Site Construction				383,015
Concrete: Base Slab	CY	1,028	800	822,492
Concrete: 18" Walls	CY	565	1,400	791,681
Concrete: walkways	CY	0	1,800	0
Concrete				1,614,174
Metals: grating, railing, stairs, ladder	LS	1	20,000	20,000
Equipment removal beams and hoists	EA	0	5,000	0
Coatings	LS	1	50,000	50,000
Misc Construction				70,000
Structural				2,067,189
Electrical				
Electrical and lighting	LS	1	20,000	20,000
PLC and programing	LS	0		0
Electrical				20,000
				4,069,189

City of Cedarburg
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Structure 550

RAS/WAS Pump Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
RAS Pumps	EA	3	52,000	156,000
WAS Pumps	EA	2	39,000	78,000
Scum Pumps	EA	2	39,000	78,000
HVAC	LS	1	50,000	50,000
Piping and valves	LS	1	250,000	250,000
Equipment				612,000
<u>Construction</u>				
Site Construction: Structure Excavation	CY	1,209	15	18,133
Site Construction: Backfill	CY	567	15	8,500
Site Construction: Haul Excess Excavation stay on site	CY	642	6	3,853
Site Construction				30,487
Concrete: Base Slab	CY	86	800	68,504
Concrete: 18" Walls	CY	100	1,400	140,000
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	900	25	22,500
Concrete				261,004
Block and brick building	SF	900	200	180,000
Metals: grating, railing, stairs, ladder	LS	1	15,000	15,000
EPDM roofing and insulation	SF	900	25	22,500
Equipment removal beams and hoists	EA	2	15,000	30,000
Doors	EA	6	4,000	24,000
Coatings	LS	1	25,000	25,000
Misc Construction				296,500
Structural				587,990
<u>Electrical</u>				
MCC, control panels, and lighting	LS	1	150,000	150,000
PLC and programing	LS	1	100,000	100,000
Electrical				250,000
				1,449,990

City of Cedarburg
 Facility Plan
 Cedarburg, WI

Structure 600

New Tertiary Filter Building

<u>ITEM</u>	<u>Units</u>	<u>Quantity</u>	<u>Unit Cost (\$)</u>	<u>Cost (\$)</u>
<u>Equipment</u>				
Disc Filters	EA	2	634,400	1,268,800
Channel gates	EA	6	25,000	150,000
Filter influent and effluent piping and valves	LS	1	250,000	250,000
Influent and effluent Ortho-P analyzers	EA	2	25,000	50,000
Ferric storage and pumping system	EA	1	50,000	50,000
Polymer storage and feed system	EA	1	150,000	150,000
Rapid mix, coagulation, flocculation mixers	EA	3	25,000	75,000
Equipment				1,993,800
<u>Construction</u>				
Filter Building	SF	4,300	375	1,612,500
Removal beams and hoists	EA	2	25,000	50,000
Construction				1,662,500
<u>Electrical</u>				
Instrumentation and Control Panels	LS	1	200,000	200,000
MCC Equipment	LS	1	50,000	50,000
Electrical				250,000
				3,906,300

City of Cedarburg Facility Plan Cedarburg, WI				
Structure 650				
UV Disinfection				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Gates	EA	4	18,000	72,000
UV system	EA	1	422,500	422,500
Weir system	EA	1	20,000	20,000
HVAC system	LS	1	50,000	50,000
Equipment				564,500
<u>Construction</u>				
Site Construction: Structure Excavation	CY	474	15	7,111
Site Construction: Backfill	CY	161	15	2,418
Site Construction: Haul Excess Excavation stay on site	CY	313	6	1,877
Site Construction				11,406
Concrete: Base Slab	CY	78	800	62,578
Concrete: 12" Walls	CY	53	1,400	74,667
Concrete: columns and beams	LS	0	30,000	0
Concrete: 8" Precast Hollow-Core Plank	SF	800	25	20,000
Concrete				157,244
Block and brick building	SF	800	200	160,000
Metals: grating, railing, stairs, ladder	LS	1	25,000	25,000
EPDM roofing and insulation	SF	800	25	20,000
Equipment removal beams and hoists	EA	1	25,000	25,000
Equipment removal skylight	EA	0	25,000	0
Doors	EA	6	4,000	24,000
Coatings	LS	1	25,000	25,000
Misc Construction				279,000
Structural				447,651
<u>Electrical</u>				
MCC, control panels, and lighting	LS	1	100,000	100,000
PLC and programing	LS	1	50,000	50,000
Electrical				150,000
				1,162,151

City of Cedarburg
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Structure 700

Post Aeration and Gravity Outfall

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Slide Gates	EA	4	18,000	72,000
Membrane diffuser systems	EA	2	25,000	50,000
DO probes	EA	2	5,000	10,000
Post aeration blowers	EA	2	50,000	100,000
ALP piping and valves	LS	1	30,000	30,000
Weirs	EA	2	5,000	10,000
30-inch outfall piping	LF	800	600	480,000
Equipment				752,000
Construction				
Site Construction: Structure Excavation	CY	832	15	12,480
Site Construction: Backfill	CY	363	15	5,440
Site Construction: Haul Excess Excavation stay on site	CY	469	6	2,816
Site Construction				20,736
Concrete: Base Slab	CY	78	800	62,578
Concrete: 12" Walls	CY	59	1,400	82,963
Concrete: walkways	CY	22	1,800	40,000
Concrete				185,541
Metals: grating, railing, stairs, ladder	LF	200	90	18,000
Equipment removal beams and hoists	EA	0	5,000	0
Coatings	LS	0	10,000	0
Misc Construction				18,000
Structural				224,277
Electrical				
Electrical and lighting	LS	1	30,000	30,000
PLC and programing	LS	1	30,000	30,000
Electrical				60,000
				1,036,277

City of Cedarburg Facility Plan Cedarburg, WI Structure 750 Aerobic Digesters				
ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
Equipment				
Membrane diffuser systems	EA	2	50,000	100,000
DO probes	EA	2	5,000	10,000
Digester aeration blowers	EA	3	75,000	225,000
ALP piping and valves	LS	1	50,000	50,000
Dome covers with ventilation and door	EA	2	142,000	284,000
Decant piping and valves	EA	2	15,000	30,000
Equipment				699,000
Construction				
Site Construction: Structure Excavation	CY	6,593	15	98,894
Site Construction: Backfill	CY	3,200	15	48,000
Site Construction: Haul Excess Excavation stay on site	CY	3,393	6	20,358
Site Construction				167,251
Concrete: Base Slab	CY	339	800	271,434
Concrete: 18" Walls	CY	314	1,400	439,823
Concrete: walkways	CY	20	1,800	36,000
Concrete				747,257
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
Equipment removal beams and hoists	EA	0	5,000	0
Coatings	LS	1	20,000	20,000
Misc Construction				50,000
Structural				964,508
Electrical				
Electrical and lighting	LS	1	30,000	30,000
PLC and programing	LS	1	30,000	30,000
Electrical				60,000
				1,723,508

City of Cedarburg
Facility Plan
Cedarburg, WI

Structure 800

Thickening and Dewatering Building

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Gravity belt thickener	EA	1	397,800	397,800
Thickener feed pump	EA	1	39,000	39,000
Thickener polymer system	EA	1	65,000	65,000
Thickened sludge pump	EA	1	45,500	45,500
Belt filter press	EA	1	702,000	702,000
Belt press feed pump	EA	1	39,000	39,000
Belt press polymer system	EA	1	65,000	65,000
Cake conveyor	EA	1	45,500	45,500
Piping and valves	LS	1	200,000	200,000
HVAC	LS	1	150,000	150,000
Equipment				1,748,800
<u>Construction</u>				
Site Construction: Structure Excavation	CY	3,342	15	50,133
Site Construction: Backfill	CY	1,067	15	16,000
Site Construction: Haul Excess Excavation stay on site	CY	2,276	6	13,653
Site Construction				79,787
<u>Concrete</u>				
Concrete: Base Slab	CY	303	800	242,726
Concrete: 18" Walls	CY	200	1,400	280,000
Concrete: columns and beams	LS	1	30,000	30,000
Concrete: 8" Precast Hollow-Core Plank	SF	3,600	25	90,000
Concrete				642,726
Block and brick two story building	SF	3,600	300	1,080,000
Metals: grating, railing, stairs, ladder	LS	1	30,000	30,000
EPDM roofing and insulation	SF	3,600	25	90,000
Equipment removal beams and hoists	EA	2	15,000	30,000
Doors	EA	10	4,000	40,000
Coatings	LS	1	50,000	50,000
Misc Construction				1,320,000
Structural				2,042,513
<u>Electrical</u>				
MCC, control panels, and lighting	LS	1	150,000	150,000
PLC and programing	LS	1	100,000	100,000
Electrical				250,000
				4,041,313

City of Cedarburg
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Structure 850

Biosolids Cake Storage

<u>ITEM</u>	<u>Units</u>	<u>Quantity</u>	<u>Unit Cost (\$)</u>	<u>Initial Cost (\$)</u>
<u>Equipment</u>				
Cake conveyor	EA	1	45,500	45,500
				45,500
<u>Construction</u>				
Pre-engineered metal building (open walls)	sq ft	10,800	150	1,620,000
Construction				1,620,000
<u>Electrical</u>				
Lighting	LS	1	20,000	20,000
Electrical				20,000
				1,685,500

City of Cedarburg Facility Plan Cedarburg, WI Structure 900 Maintenance Garage				
ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
HVAC	LS	1	150,000	150,000
Washdown water service	LS	1	20,000	20,000
				170,000
<u>Construction</u>				
Overhead sectional doors	EA	8	15,000	120,000
Pre-engineered metal building	sq ft	8,000	250	2,000,000
Construction				2,120,000
<u>Electrical</u>				
Electrical and lighting	LS	1	50,000	50,000
Electrical				50,000
				2,340,000

City of Cedarburg
Facility Plan
Cedarburg, WI

ANNUAL O&M COST ESTIMATE

General O&M

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Tertiary Filter Building Maintenance and Repair	LS	1	54,000	54,000
Biosolids Handling Maintenance and Repair	LS	1	120,240	120,240

Additional Personnel

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Tertiary Filter Building Staffing	person/yr	0	86,000	21,500
Biosolids Handling Staffing	person/yr	0.50	86,000	43,000

Disposal

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Contract Hauling Credit	per year	0.5	350,000	-175,000

Electricity

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Mixers	kWhr/yr	98,550	0.11	10,841
Filters	kWhr/yr	6,570	0.11	723
Backwash Pumps	kWhr/yr	32,850	0.11	3,614
Digester Blowers	kWhr/yr	438,000	0.11	48,180
GBT and Pumps	kWhr/yr	32,850	0.11	3,614
BFP and pupmps	kWhr/yr	49,275	0.11	5,420
Electricity Efficiency Credit	per year	0.1	107,000.00	-10,700

Natural Gas

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
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Chemicals

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Ferric Chloride Chemical	gal/yr	20,440	3	61,320
Polymer Chemical	lb/yr	6,935	2	13,870
Thickening Polymer	lb/yr	5,110	2.00	10,220
Dewatering Polymer	lb/yr	9,855	2.00	19,710

Revenue

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Sale of Existing WRC Site	LS	1	575,000	-575,000

**City of Cedarburg
Facility Plan
Cedarburg, WI**

Alternative 3 New WRC off Pioneer Road

Present Worth Analysis Factors

Discount Rate	2.6%	DNR established 2012 to 2021 average
Inflation Rate	2.2%	
Escalation Rate (Above Inflation)		
Electricity (0-5 years)	0.5%	
Electricity (6-20 years)	1.0%	
Natural Gas	1.5%	
Chemicals	0.0%	

Comments

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Life Cycle Cost Analysis

Initial Cost		134,518,000											
Year (n)	Periodic Costs		Annual Operational Costs and Revenue							Total Annual Cost	PW Periodic	PW Annual	PW Cumulative
	Replace	Salvage	General O&M	Additional Personnel	Disposal Costs	Electricity	Natural Gas	Chemical					
0	0	0	174,240	64,500	-175,000	61,690	0	105,120	230,550	0	230,550	134,748,550	
1		0	177,986	65,887	-178,763	63,325	0	107,380	235,816	0	229,784	134,978,334	
2		0	181,813	67,303	-182,606	65,003	0	109,689	241,202	0	229,021	135,207,355	
3	-575,000	0	185,722	68,750	-186,532	66,726	0	112,047	246,713	-531,996	228,262	134,903,621	
4		0	189,715	70,228	-190,542	68,494	0	114,456	252,351	0	227,506	135,131,127	
5		0	193,794	71,738	-194,639	70,309	0	116,917	258,119	0	226,754	135,357,881	
6		0	197,960	73,281	-198,824	72,172	0	119,431	264,020	0	226,005	135,583,886	
7		0	202,216	74,856	-203,098	74,085	0	121,998	270,058	0	225,260	135,809,146	
8		0	206,564	76,466	-207,465	76,048	0	124,621	276,234	0	224,519	136,033,665	
9		0	211,005	78,110	-211,926	78,064	0	127,301	282,554	0	223,781	136,257,445	
10		0	215,542	79,789	-216,482	80,132	0	130,038	289,019	0	223,046	136,480,491	
11		0	220,176	81,505	-221,136	82,256	0	132,833	295,633	0	222,315	136,702,806	
12		0	224,910	83,257	-225,891	84,436	0	135,689	302,401	0	221,587	136,924,393	
13		0	229,745	85,047	-230,747	86,673	0	138,607	309,325	0	220,863	137,145,257	
14		0	234,685	86,875	-235,708	88,970	0	141,587	316,408	0	220,142	137,365,399	
15		0	239,731	88,743	-240,776	91,328	0	144,631	323,656	0	219,425	137,584,824	
16		0	244,885	90,651	-245,953	93,748	0	147,740	331,071	0	218,711	137,803,535	
17		0	250,150	92,600	-251,241	96,232	0	150,917	338,658	0	218,001	138,021,536	
18		0	255,528	94,591	-256,643	98,782	0	154,162	346,420	0	217,293	138,238,829	
19		0	261,022	96,625	-262,160	101,400	0	157,476	354,362	0	216,589	138,455,418	
20		-13,073,736	266,634	98,702	-267,797	104,087	0	160,862	362,488	-7,786,393	215,889	130,884,914	

20-Year Present Worth **130,884,914**

Alternative 3 New WRC off Pioneer Road	
Initial Cost	134,518,000
20-Year Present Worth	130,884,914
Average Annual Cost	266,076

Notes

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Alternative 4 Treatment at MMSD

INITIAL COST ESTIMATE

General Description

Send all treatment to MMSD and decommission existing plant. Construct lift station and forcemain to convey wastewater to MMSD. Construct new administration and maintenance building.

Summary of Project Cost

Estimated Construction Cost Without Contingency or Markup		58,409,100
Contingency	30%	\$17,522,730
Estimated Construction Cost Without Markup		\$75,931,830
Contractor Overhead & Profit Markup	25%	\$18,983,000
Estimated Construction Cost		\$94,914,830
Engineering	15%	\$14,237,000
Total Initial Cost		\$109,152,000

Summary of Annual Costs and Salvage Values

Additional Annual Costs (initial year)

O&M		-\$284,000
Additional Personnel		-\$430,000
Disposal		-\$350,000
Electricity		-\$74,900
Natural Gas		-\$4,000
Chemicals		-\$16,000
Present Worth of Cumulative Annual Cost		-\$23,330,080
Present Worth Salvage Value from Piping and Structures		\$0

Total Present Worth **\$85,289,924**

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Alternative 4 Treatment at MMSD

INITIAL COST ESTIMATE 1

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
STRUCTURE 030 - DEMOLITION OF AND RECLAMATION OF EXISTING WRC				4,085,300
STRUCTURE 110 - SOUTH PIGGING STATION AND UPSTREAM FORCEMAIN				7,240,000
STRUCTURE 130 - NORTH PIGGING STATION AND UPSTREAM FORCEMAIN				14,375,000
STRUCTURE 150 - PIONEER ROAD LIFT STATION AND DOWNSTREAM FORCEMAIN				19,373,950
STRUCTURE 170 - NEW ADMINISTRATION AND MAINTENANCE BUILDING				3,600,000
Bonds, insurance & mobilization	%		4%	\$ 1,946,970
Civil/Restoration % Not Listed Above	%		8%	\$ 3,893,940
Process & Yard Piping % Not Listed Above	%		4%	\$ 1,946,970
Electrical % Not Listed Above	%		2%	\$ 973,485
Instrumentation and Control % Not Listed Above	%		2%	\$ 973,485
Plumbing % Not Listed Above	%		0%	\$ -
HVAC % Not Listed Above	%		0%	\$ -
<i>Subtotal</i>				58,409,100

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STRUCTURE 030

DEMOLITION OF AND RECLAMATION OF EXISTING WRC

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Demolition and Removals</u>				
Buried site piping	LF	2,700	50	135,000
Buried duct banks, conduit, and cables	LF	1,200	50	60,000
Pavement, curb, and sidewalk	sqyd	3,000	50	150,000
Cascade aeration/outfall/sludge loadout	CF	1,500	12	18,000
Bar Screen Building - Concrete removal	CF	5,000	12	60,000
Bar Screen Building - Building removal	CF	2,000	12	24,000
Control Building and Digester Tanks - Concrete removal	CF	20,000	12	240,000
Control Building and Digester Tanks - Building removal	CF	4,000	12	48,000
Sludge Storage Tank	CF	2,000	12	24,000
UV/Vehicle Storage/Aeration/Clarifier Tankage - concrete	CF	42,000	12	504,000
UV/Vehicle Storage/Aeration/Clarifier Tankage - building	CF	5,500	12	66,000
Garage	CF	400	12	4,800
Gravity Thickener - concrete removal	CF	4,000	12	48,000
Gravity Thickener - dome removal	LS	1	10,000	10,000
Oxidation Ditch	CF	75,000	12	900,000
Final Clarifiers - concrete removal	CF	24,000	12	288,000
Final Clarifiers - dome removal	LS	2	12,500	25,000
RAS Pump Station - concrete removal	CF	4,000	12	48,000
RAS Pump Station - building removal	CF	1,000	12	12,000
Retaining walls/push walls	LS	1	10,000	10,000
Equipment				2,674,800
<u>Construction</u>				
Haul and backfill - cascade aeration/outfall	CY	100	30	3,000
Haul and backfill - bar screen building	CY	500	30	15,000
Haul and backfill - control building/digester tanks	CY	3,000	30	90,000
Haul and backfill - sludge storage tank	CY	400	30	12,000
Haul and backfill - UV/Vehicle storage/aeration/tankage	CY	8,500	30	255,000
Haul and backfill - gravity thickener	CY	750	30	22,500
Haul and backfill - oxidation ditch	CY	16,000	30	480,000
Haul and backfill - final clarifiers	CY	10,000	30	300,000
Haul and backfill - RAS pump station	CY	600	30	18,000
Haul and backfill - misc	CY	500	30	15,000
Site restoration, grading, and seeding	LS	1	200,000	200,000
Construction				1,410,500
				4,085,300

City of Cedarburg
 Facility Plan
 Cedarburg, WI

STRUCTURE 110

SOUTH PIGGING STATION AND UPSTREAM FORCEMAIN

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Below grade vault for PIG	1	1	25,000	25,000
Air Release Valves (every 3000')	EA	6	50,000	300,000
				0
				0
				0
				0
				0
				0
				0
Equipment				325,000
<u>Construction</u>				
2-20" HDPE Forcemains to North Pigging Station				
OPEN CUT	LF	9,000	650	5,850,000
Easement	LS	1	50,000	50,000
2-20" HDPE Forcemain HDD (assume 10%)	LF	1,000	1,000	1,000,000
Construction				6,900,000
<u>Electrical</u>				
Electrical service	LS	1	15,000	15,000
Electrical				15,000
				7,240,000

City of Cedarburg
 Facility Plan
 Cedarburg, WI

STRUCTURE 130

NORTH PIGGING STATION AND UPSTREAM FORCEMAIN

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Below Grade Vault	EA	1	25,000	25,000
Air Release Valves (every 3000')	EA	12	50,000	600,000
Equipment				625,000
<u>Construction</u>				
2-20" HDPE Forcemains to North Pigging Station	LF	18,000	650	11,700,000
2-20" HDPE Forcemain HDD (assume 10%)	LF	2,000	1,000	2,000,000
Easement	LS	1	50,000	50,000
Construction				13,750,000
<u>Electrical</u>				
Electrical	LS	1	0	0
Electrical				0
				14,375,000

City of Cedarburg
Facility Plan
Cedarburg, WI

STRUCTURE 150

PIONEER ROAD LIFT STATION AND DOWNSTREAM FORCEMAIN

ITEM	Units	Quantity	Unit Cost (\$)	Initial Cost (\$)
<u>Equipment</u>				
Gravity sewer from Garfield to Pioneer - 16 Inch	LF	2,000	300	600,000
Garfield LS Demolition	LS	1	80,000	80,000
Gravity sewer from Hamilton to Pioneer - 36 inch	LF	3,800	550	2,090,000
Pioneer Road Pump Station Pumps	EA	3	221,000	663,000
Pioneer Road Pump Station Screens	EA	2	237,250	474,500
Pioneer Road Pump Station Washer Compactors	EA	2	85,475	170,950
Pioneer Pump Station Gates	EA	4	18,000	72,000
Ozone System for Septicity	EA	1	51,000	51,000
Ozone Generator for System	EA	1	57,000	57,000
HVAC for Pump Station	LS	1	30,000	30,000
Air Release Valves (every 3000')	EA	13	25,000	325,000
Equipment				4,613,450
<u>Construction</u>				
New Pioneer Road Pump Station	SF	1,500	400	600,000
Site development, grading, and seeding	LS	1	50,000	50,000
Dewatering during construction	LS	1	20,000	20,000
Pavement - roads and aprons	sqyd	300	75	22,500
Pump Station fencing	LF	300	60	18,000
Pump Station gate	LS	1	10,000	10,000
2-20" HDPE Forcemains to North Pigging Station	LF	18,300	650	11,895,000
2-20" HDPE Forcemain HDD (assume 10%)	LF	2,000	1,000	2,000,000
Construction				14,615,500
<u>Electrical</u>				
Electrical service for new pump station	LS	1	40,000	40,000
Site lighting	EA	1	5,000	5,000
PLC and programing	LS	1	100,000	100,000
Electrical				145,000
				19,373,950

City of Cedarburg
 Facility Plan
 Cedarburg, WI

STRUCTURE 170

NEW ADMINISTRATION AND MAINTENANCE BUILDING

ITEM	Units	Quantity	Unit Cost (\$)	Cost (\$)
<u>Equipment</u>				
Admin Office furnishings and equipment	LS	1	100,000	100,000
Admin HVAC	LS	1	100,000	100,000
Admin Plumbing Fixtures	LS	1	50,000	50,000
Maintenance Garage HVAC	LS	1	150,000	150,000
				0
Equipment				400,000
<u>Construction</u>				
Administration Building Portion	sq. ft	3,000	300	900,000
Maintenance Building Portion	sq ft	8,000	250	2,000,000
				0
Construction				2,900,000
<u>Electrical</u>				
Electrical and Lighting	LS	1	200,000	200,000
SCADA Equipment	LS	1	100,000	100,000
				0
Electrical				300,000
				3,600,000

City of Cedarburg
Facility Plan
Cedarburg, WI

Alternative 4 Treatment at MMSD

ANNUAL O&M COST ESTIMATE

General O&M

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
General O&M Credits	LS	1	284,000	-284,000

Additional Personnel

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Operation and Maintenance Staff	LS	1	430,000	-430,000

Disposal

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Biosolids hauling and disposal credit	LS	1	350,000.00	-350,000

Electricity

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
WRC electrical credit	LS	1	74,900.00	-74,900

Natural Gas

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
WRC NG credit	LS	1	4,000.00	-4,000

Chemicals

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
WRC Chemicals credit	LS	1	16,000	-16,000

Revenue

ITEM	Units	Annual Quantity	Unit Cost (\$)	Annual Cost (\$)
Sale of Existing WRC Site	LS	1	575,000	-575,000

**City of Cedarburg
Facility Plan
Cedarburg, WI**

Alternative 4 Treatment at MMSD

Present Worth Analysis Factors

Discount Rate	2.6%	DNR established
Inflation Rate	2.2%	2012 to 2021 average
Escalation Rate (Above Inflation)		
Electricity (0-5 years)	0.5%	
Electricity (6-20 years)	1.0%	
Natural Gas	1.5%	
Chemicals	0.0%	

Comments

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Life Cycle Cost Analysis

Initial Cost		109,152,000										
Year (n)	Periodic Costs		Annual Operational Costs and Revenue							PW	PW	PW
	Revenue	Salvage	General O&M	Additional Personnel	Disposal Costs	Electricity	Natural Gas	Chemical	Total Annual Cost	Periodic	Annual	Cumulative
0	0	0	-284,000	-430,000	-350,000	-74,900	-4,000	-16,000	-1,158,900	0	-1,158,900	107,993,100
1		0	-290,106	-439,245	-357,525	-76,885	-4,146	-16,344	-1,184,251	0	-1,153,959	106,839,141
2		0	-296,343	-448,689	-365,212	-78,922	-4,297	-16,695	-1,210,159	0	-1,149,042	105,690,098
3	-575,000	0	-302,715	-458,336	-373,064	-81,014	-4,454	-17,054	-1,236,636	-531,996	-1,144,149	104,013,953
4		0	-309,223	-468,190	-381,085	-83,161	-4,617	-17,421	-1,263,696	0	-1,139,278	102,874,675
5		0	-315,871	-478,256	-389,278	-85,364	-4,785	-17,796	-1,291,350	0	-1,134,431	101,740,244
6		0	-322,663	-488,538	-397,648	-87,627	-4,960	-18,178	-1,319,613	0	-1,129,608	100,610,636
7		0	-329,600	-499,042	-406,197	-89,949	-5,141	-18,569	-1,348,497	0	-1,124,807	99,485,829
8		0	-336,686	-509,771	-414,930	-92,332	-5,329	-18,968	-1,378,017	0	-1,120,029	98,365,801
9		0	-343,925	-520,731	-423,851	-94,779	-5,523	-19,376	-1,408,186	0	-1,115,274	97,250,527
10		0	-351,319	-531,927	-432,964	-97,291	-5,725	-19,793	-1,439,019	0	-1,110,541	96,139,986
11		0	-358,873	-543,364	-442,273	-99,869	-5,934	-20,218	-1,470,530	0	-1,105,831	95,034,154
12		0	-366,588	-555,046	-451,782	-102,515	-6,150	-20,653	-1,502,734	0	-1,101,144	93,933,010
13		0	-374,470	-566,979	-461,495	-105,232	-6,375	-21,097	-1,535,648	0	-1,096,479	92,836,531
14		0	-382,521	-579,169	-471,417	-108,021	-6,607	-21,550	-1,569,286	0	-1,091,837	91,744,694
15		0	-390,745	-591,622	-481,552	-110,883	-6,849	-22,014	-1,603,665	0	-1,087,217	90,657,477
16		0	-399,146	-604,341	-491,906	-113,822	-7,099	-22,487	-1,638,801	0	-1,082,619	89,574,858
17		0	-407,728	-617,335	-502,482	-116,838	-7,358	-22,971	-1,674,711	0	-1,078,043	88,496,816
18		0	-416,494	-630,608	-513,285	-119,934	-7,626	-23,464	-1,711,412	0	-1,073,489	87,423,327
19		0	-425,449	-644,166	-524,321	-123,112	-7,905	-23,969	-1,748,921	0	-1,068,956	86,354,370
20		0	-434,596	-658,015	-535,594	-126,375	-8,193	-24,484	-1,787,257	0	-1,064,446	85,289,924

20-Year Present Worth **85,289,924**

Alternative 4 Treatment at MMSD	
Initial Cost	109,152,000
20-Year Present Worth	85,289,924
Average Annual Cost	-1,494,869

Notes

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CITY OF CEDARBURG

MEETING DATE: December 3, 2025

ITEM NO: B.

TITLE:

Discussion and possible action on repairs to oxidation ditch aeration trains at the existing Water Recycling Center.

ISSUE SUMMARY:

City staff request authorization to replace two aeration trains at the Water Recycling Center (WRC). The oxidation ditch at the WRC contains six aeration trains, two of which were successfully replaced earlier this year and are performing well. However, two of the remaining trains continue to experience operational issues. In light of the facility's upgrade timeline, staff have obtained price quotes to replace these two problematic units. The total cost for replacement is \$331,906.37, and staff recommend proceeding with this work to ensure reliable plant performance as part of continued improvements to the plant.

STAFF RECOMMENDATION:

Approve

BOARD, COMMISSION OR COMMITTEE RECOMMENDATION:

None

BUDGETARY IMPACT:

\$331,906.37

ATTACHMENTS:

1. Sabel Proposal
2. Evoqua Proposal

INITIATED/REQUESTED BY:

Dennis Grulkowski, Mike Wieser

FOR MORE INFORMATION CONTACT:

Dennis Grulkowski, Superintendent
Mike Wieser, Engineer/Public Works Director



Quote No. Q11972
Date: Oct 8, 2025

W 3150 Co Rd H, Fond du Lac, WI 54937
920-581-5810
www.sabelmechanical.com
Sabel Contact: Brad Parkhurst
Email: bparkhurst@sabelmechanical.com

Sabel Mechanical LLC

Customer Billing Information	Job Site Information	Contact and Other Information
CEDARBURG WWTP W54 N370 PARK LANE, PO BOX 49, CEDARBURG, WI 53012	Cedarburg WWTP W54 N370 PARK LANE, PO BOX 49, CEDARBURG, WI 53012	Contact: Dennis Grulkowski Phone: Email: dgrulkowski@cityofcedarbu rg.wi.gov

Sabel Mechanical is pleased to submit this proposal for:

Scope of Work

BUDGET 2026 Install-Aerator Replacement \$117,894.96

Labor, Equipment, and Materials to perform the following:

Work to be completed for two aerator trains. Each consist of three shafts

- Remove existing sprockets off of shaft to be re-used
- Remove existing shafts, bearings, couplings, and disc's.
- Install new gear boxes, shafts, bearings, couplings, and discs supplied by others
- Re-use existing sprockets
- Includes crane to perform the work

- Excludes trimming trees if needed to fit crane on backside of the ditch
- Excludes new components that will be provided by others
- Excludes new hardware for disc mounting

Quote Total: \$117,894.96
Estimate valid until: Nov 7, 2025
Terms of Payment: 30 days

Customer Signature: _____ Date _____

Customer Name (Print) _____

P.O. #: _____

Due to the fluctuating material pricing and availability, quote is valid thru end of today's business day, Pricing may have to be adjusted at time of purchase and will be reflected when project is invoiced



Evoqua Products and Services Proposal

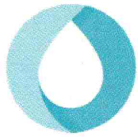
Prepared For:

City of Cedarburg, WI

W63N645 Washington Avenue
CEDARBURG, WI 53012

Quote #: 02510681

Transforming Water. Enriching Life.®



Proposal For: City of Cedarburg, WI
Dennis Grulkowski
W63N645 Washington Avenue
CEDARBURG, WI 53012
Phone: 262-375-7900
dgrulkowski@cityofcedarburg.wi.gov

Dean Wentz
Evoqua Water Technologies
N19W23993 Ridgeview Pkwy, Suite 200
Waukesha, WI 53188
+12625218333
dean.wentz@xylem.com

Item Pricing Summary

Shafts

Item	Part No Description	Qty	Net Price	Ext Price
1	W3T619356 SHAFT-ORBAL,6.00"DIA X 265.44", 1045 T&P; H120315-309-100	2 EA	\$13,420.46	\$26,840.92
2	W3T619526 SHAFT-ORBAL,6.00"DIA X 251.50", 1045 T&P; H120315-309-101	2 EA	\$15,238.70	\$30,477.40
3	W3T619527 SHAFT-ORBAL,6.00"DIA X 255.75", 1045 T&P; H120315-309-102	2 EA	\$14,950.70	\$29,901.40

Currency: USD

Net Price: \$ 87,219.72

Bearing Base Plates

Item	Part No Description	Qty	Net Price	Ext Price
1	W3T354360 BASE PLATE, BRG SGL 3.44"D, A36; 503-83523-81 <u>Additional Comments:</u> Estimated ship lead time: 14-16 weeks	2 EA	\$416.16	\$832.32
2	W3T354543 BASE PLATE, BRG SGL 4.94"D, A36; 503-83523-84 <u>Additional Comments:</u> Estimated ship lead time: 14-16 weeks	2 EA	\$526.59	\$1,053.18
3	W3T354355 BASE PLATE, BRG DBL W/ADJ SCR 3.44"D,A36; 503-83522-80 <u>Additional Comments:</u> Estimated ship lead time: 14-16 weeks	2 EA	\$1,143.57	\$2,287.14
4	W3T354357 BASE PLATE, BRG DBL W/ADJ SCR 3.94"D,A36; 503-83522-81 <u>Additional Comments:</u> Estimated ship lead time: 14-16 weeks	2 EA	\$1,591.89	\$3,183.78

Currency: USD

Net Price: \$ 7,356.42



Bearings

Item	Part No Description	Qty	Net Price	Ext Price
1	W2T822366 BEARING, PLLW BLC 3.437" B SOLID HSG FXD; 303-80487-03 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$1,989.19	\$3,978.38
2	W2T822367 BEARING, PLLW BLC 3.437" B SOLID HSG EXP; 303-80487-04 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	4 EA	\$1,989.19	\$7,956.76
3	W2T822368 BEARING, PLLW BLC 3.937" B SOLID HSG FXD; 303-80487-06 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$2,668.43	\$5,336.86
4	W2T822369 BEARING, PLLW BLC 3.937" B SOLID HSG EXP; 303-80487-06 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$2,668.43	\$5,336.86
5	W2T822371 BEARING, PLLW BLC 4.937" B SOLID HSG FXD; 303-80487-09 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$5,072.06	\$10,144.12

Currency: USD

Net Price: \$ 32,752.98

Couplings

Item	Part No Description	Qty	Net Price	Ext Price
1	W2T870152 COUPLING, 3-7/16, RAPTOR E70 TAPER LOCK; 303-80536-1 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$4,204.14	\$8,408.28
2	W2T870155 COUPLING, 3-15/16, RAPTOR E80 TAPER LOCK; 303-80537-2 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	2 EA	\$5,352.70	\$10,705.40

Currency: USD

Net Price: \$ 19,113.68

Spanner Wrenches

Item	Part No Description	Qty	Net Price	Ext Price
1	W2T856093 SPANNER WRENCH,BEARING REX 3.44" DIA; 105-90425-51 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	1 EA	\$212.46	\$212.46
2	W2T856094 SPANNER WRENCH,BEARING REX 3.94" DIA; 105-90425-61 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	1 EA	\$219.65	\$219.65
3	W2T856095 SPANNER WRENCH,BEARING REX. 4.94" DIA; 105-90425-81 <u>Additional Comments:</u> Estimated ship lead time: 4-6 weeks	1 EA	\$283.78	\$283.78

Currency: USD

Net Price: \$ 715.89

Gear Box for 75HP Drive

Item	Part No Description	Qty	Net Price	Ext Price
1	GEARBOX - 75HP DRIVE Nomenclature: 2070FZ2B11.080 <u>Additional Comments:</u> Gearbox only. Without Motor. Estimated ship lead time: 3-4 weeks	2 EA	\$25,626.36	\$51,252.72

Currency: USD

Net Price: \$ 51,252.72

Quote Totals

Item(s) Subtotal: \$ 198,411.41
Freight: \$ 15,600.00
Total Net Price: \$ 214,011.41

Proposal Notes

Contract No. H120315-03 - two (2) 75HP Aerator Shafts

Minimum Order Requirement is \$1,200.00 USD. An Order Processing Fee of \$295.00 USD to be charged on all orders under \$10,000.00 USD. Estimated ship lead times are estimates only and are subject to change based on current Engineering schedules, current Manufacturing schedules and components availability at time of Accepted order.

Pricing does not include any engineering hours for drawings, or submittals. Requests for drawings or submittals at time



eVOQUA
WATER TECHNOLOGIES

Quote Number: 02510681
Project Name: H120315-03

of order will require approval and will incur extra fees. Restocking fees will apply to any items returned.

Please provide tax exempt certificate with purchase order. Additionally, please include SHIP TO and BILL TO addresses at the time of purchase order or signed agreement.

Our Manufacturing Rep in your area is:

Representative: Ronald Kau
Company: PETERSON AND MATZ INC
Address: 133 W MAIN ST STE 231
Northville, MI, 48167-1547
Phone: (847) 644-1475
Email: