Permit Fact Sheet

General Information

Permit Number	WI-0060879-10-0
Permittee Name and Address	Northern Moraine Utility Commission BOX 217, Glenbeulah, WI 53023
Permitted Facility Name and Address	Northern Moraine Utility Commission N7025 County Trunk P
Permit Term	January 01, 2027 to December 31, 2031
Discharge Location	Groundwater Absorption Ponds located at – N7025 County Road P, Glenbeulah, WI (NE ¼, of SW ¼, of Section 6, T15N, R21E) in Sheboygan County.
Receiving Water	Groundwaters of the Mullet River Watershed (SH05), Sheboygan River Basin in Sheboygan County
Stream Flow ($Q_{7,10}$)	N/A – Groundwater Discharge
Stream Classification	N/A – Groundwater Discharge
Discharge Type	Existing and Continuous
Annual Average Design Flow (MGD)	0.476 MGD
Industrial or Commercial Contributors	None
Plant Classification	Basic; A2 - Attached Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; L - Laboratory; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

Northern Moraine Utility Commission (NMUC) is a regional wastewater treatment facility that serves the Villages of Elkhart Lake and Glenbeulah, the Towns of Rhine and Plymouth SD#1, and Greenbush SD with a combined total population of approximately 2,760. The annual average design flow of the treatment plant is 0.476 million gallons per day (MGD) with an actual annual average flow of 0.342 MGD over the past three years (2023 – 2025). The plant consists of a flow equalization tank, grit removal, fine belt screens, a Multi-Stage Activated Biological Process (MSABP), which is an attached growth step biological treatment process, and final clarification. The effluent is discharged to three absorption ponds surrounded by groundwater monitoring wells. Sludge is aerobically digested and stored in a storage tank before land application to Department approved agricultural fields. NMUC has approximately 475 days of sludge storage onsite.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, groundwater monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on July 7, 2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Curt Nickels, Compliance Engineer on August 12, 2025.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	0.366 MGD (2025)	24-Hr Composite samples shall be taken after the equalization tank before grit removal. Flow is measured in four individual lift stations via Magnetic flow meter bodies.
002	N/A Flow monitoring not required for this outfall in WI-0060879-09 permit.	24-Hr Composite samples shall be taken after the final clarifier drawdown weir at the end of the effluent tank prior to being discharged to seepage cells. Flow shall be monitored by an Ultrasonic flow meter over a straight edged weir in the chlorine contact tank.
003	14 U.S. Tons (2025 Permit Application)	Sludge composite samples shall be taken from the sludge storage tank as it is discharged into the tanker truck.

Sample Point Designation For Groundwater Monitoring Systems		
Sample Pt Number	**Well Name**	**Comments**
805	MW-205!	Non-point of standard well. Previously this monitoring well (MW) only measured groundwater elevation, it will now monitor groundwater chemistry as well.
806	MW-206!	Non-point of standard well. Previously this monitoring well (MW) only measured groundwater elevation, it will now monitor groundwater chemistry as well.
810	MW-210!	Non-point of standard well. Previously this monitoring well (MW) only measured groundwater elevation, it will now monitor groundwater chemistry as well.
812	MW- 212	Upgradient well used to measure unimpacted groundwater quality and to evaluate and calculate PALs and ACLs.
813	MW-213	Non-point of standard well.
814	MW-214	Non-point of standard well.
815	MW- 215	Non-point of standard well.
816	MW- 213 A	Non-point of standard well. Previously this MW only measured groundwater elevation, it will now monitor groundwater

Sample Point Designation For Groundwater Monitoring Systems		
Sample Pt Number	**Well Name**	**Comments**
		chemistry as well.
817	MW-217	Non-point of standard well.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	24-Hr Comp	
BOD5, Total		mg/L	Weekly	24-Hr Comp	
Suspended Solids, Total		mg/L	Weekly	24-Hr Comp	
Nitrogen, Total Kjeldahl		mg/L	Monthly	24-Hr Comp	
Nitrogen, Organic Total		mg/L	Monthly	Calculated	Organic nitrogen = total Kjeldahl nitrogen (mg/L) - ammonia nitrogen (mg/L)
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Comp	

Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit.

- **BOD5 and TSS –** Sample frequency reduced to match effluent.

Explanation of Limits and Monitoring Requirements

Influent monitoring is needed to assess loading to the facility and treatment performance. The required parameters and sampling frequency are appropriate for a land treatment system as outlined in ch NR 206, Wis. Adm. Code.

2 Land Treatment – Monitoring and Limitations

2.1 Sample Point Number: 002- Prior to Groundwater

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Monthly Avg	50 mg/L	Weekly	24-Hr Comp	
Suspended Solids, Total		mg/L	Weekly	24-Hr Comp	
pH Field		su	Weekly	Grab	
Solids, Total Dissolved		mg/L	Monthly	Grab	
Nitrogen, Total Kjeldahl		mg/L	Monthly	24-Hr Comp	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Comp	
Nitrogen, Organic Total		mg/L	Monthly	Calculated	Organic nitrogen = total Kjeldahl nitrogen (mg/L) - ammonia nitrogen (mg/L)
Nitrogen, Nitrite + Nitrate Total		mg/L	Monthly	24-Hr Comp	
Nitrogen, Total		mg/L	Monthly	Calculated	Total nitrogen = total Kjeldahl nitrogen (mg/L) + [NO2 + NO3] nitrogen (mg/L)
Chloride		mg/L	Monthly	24-Hr Comp	
Phosphorus, Total		mg/L	Monthly	24-Hr Comp	

Changes from Previous Permit:

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit.

- **Flow Rate –** Monitoring added to the permit to verify discharge volumes to the absorption ponds.
- **BOD5, TSS, pH –** Sample frequency reduced.
- **Phosphorus –** Monitoring added to the permit to assess the overall contribution to local groundwater and the Mullet River.

Explanation of Limits and Monitoring Requirements

All requirements for land treatment of municipal wastewater are determined in accordance with ch. NR 206, Wis. Adm. Code. All categorical limits are based on s. NR 206.08(1) Wis. Adm. Code. More information on the limitations can be found in the Groundwater Evaluation by Zach Watson dated September 1, 2026.

Monitoring Frequencies – The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type

of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Monitoring frequencies for BOD, TSS, and pH were decreased to weekly as the facility has been able to consistently prove they are able to stay within the limits of these parameters. Weekly reporting for these parameters is sufficient.

3 Groundwater – Monitoring and Limitations

3.1 Groundwater Monitoring System for Seepage Cell Monitoring System

Location of Monitoring system: Surrounding Absorption Ponds/

Groundwater Monitoring Well(s) to be Sampled: MW-205, MW-206, MW-210, MW- 212, MW-213, MW- 213 A, MW-214, MW- 215, MW-217

Groundwater Monitoring Well(s) Used to Evaluate Background Groundwater Quality: MW -212

Groundwater Monitoring Well(s) Used for Point of Standards Application:

Currently the facility does not have wells that fit this standard.

Parameter	Units	Preventative Action Limit	Enforcement Standard	Frequency
Depth To Groundwater	feet	N/A	N/A	Quarterly
Groundwater Elevation	feet MSL	N/A	N/A	Quarterly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	13.6	13.6	Quarterly
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Quarterly
Nitrogen, Organic Dissolved	mg/L	4.6	N/A	Quarterly
Chloride Dissolved	mg/L	125	250	Quarterly
Phosphorus, Total Dissolved	mg/L	N/A	N/A	Quarterly
Solids, Total Dissolved	mg/L	890	N/A	Quarterly
COD	mg/L	N/A	N/A	Quarterly
pH Field	su	8.3	N/A	Quarterly
Conductivity	umhos/cm	N/A	N/A	Quarterly

Changes from Previous Permit:

Groundwater limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

- **Nitrite + Nitrate, Organic Nitrogen, Chloride, Total Dissolved Solids –** Limits updated
- **COD –** Monitoring added to the permit.

- **Total Kjeldahl Nitrogen –** Monitoring removed from the permit.

Explanation of Limits and Monitoring Requirements

Groundwater limits and requirements are determined in accordance with ch. NR 140, Wis. Adm. Code. Indicator parameter Preventive Action Limits (PAL) are established per s. NR 140.20, Wis. Adm. Code. Alternative Concentration Limits as allowed under s. NR 140.28, Wis. Adm. Code, are established on a case-by-case basis.

For more information, please refer to the Groundwater Evaluation by Zach Watson dated September 1, 2026.

COD monitoring has been added to the permit to assess how the overall oxygen demand load discharged to the absorption ponds impacts shallow groundwater. This parameter has been added to assess how the BOD that is monitored in the discharge manifests in groundwater.

Total Kjeldahl nitrogen monitoring has been removed as reporting is required for organic nitrogen and ammonia nitrogen is already required.

4 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
003	B	Liquid	Fecal Coliform	Aerobic SOUR	Land Application	14 Dry U.S. Tons
Does sludge management demonstrate compliance? **Yes**						
Is additional sludge storage required? **No**						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No** If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? **No** Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

4.1 Sample Point Number: 003- Municipal Sludge

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2028
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2028
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Permit Sections for more information.

Changes from Previous Permit:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

PFAS –Monitoring is required annually pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

Explanation of Limits and Monitoring Requirements

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k). Radium requirements are addressed in s. NR 204.07(3)(n).

PFAS- The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

5 Schedules

5.1 Chloride Source Reduction Measures (SRMs) for Groundwater Discharges

Required Action	Due Date
Chloride Reduction Plan: The permittee shall complete and submit for Department review and approval an updated chloride reduction plan (CRP). The CRP shall continue toward controlling chloride and ensuring compliance with chloride limits based on applicable groundwater standards. The CRP shall evaluate all applicable source reduction measures (SRMs) and establish appropriate implementation activities for the SRMs. The CRP shall include a schedule for implementing the selected SRMs.	06/30/2027
Annual Progress Report: Once the chloride reduction plan (CRP) is approved by the Department, the permittee shall submit an annual progress report, under the authority of s. NR 205.07(1)(h), Wis. Adm. Code. If a SRM implementation date of an approved CRP is not met, this may constitute a violation of the permit. Submittal of the first annual progress report is required by the Date Due.	01/31/2028
Second Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	01/31/2029

Third Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	01/31/2030
Final Annual Progress Report: Submit progress report in implementing the chloride reduction plan (CRP).	01/31/2031
Annual Chloride Progress Reports After Permit Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual chloride progress reports by January 31 each year in implementing the chloride reduction plan (CRP) during the previous calendar year.	

Explanation of Schedule

The downgradient monitoring wells are not currently exceeding chloride PALs; however, based on loading data, the Department has determined that an investigation into chloride source reduction measures (SRM) is needed to ensure compliance with chloride PALs. These SRMs will extend the life of the current spray irrigation system and reduce the potential need to install additional downgradient monitoring wells at the 250 feet Design Management Zone (DMZ). This is included as a separate report from the Land Treatment Management Plan to allow for annual reporting throughout the permit term on chloride source reduction measures.

5.2 Land Treatment Management Plan

A management plan is required for the land treatment system.

Required Action	Due Date
Land Treatment Management Plan Submittal: Submit an update to the management plan to optimize the land treatment system performance and demonstrate compliance with ch. NR 206, Wis. Adm. Code. The land treatment system shall be operated in accordance with the approved management plan.	12/31/2027

Explanation of Schedule

Accurate well information is needed to ensure the requirements of ch. NR 140, Wis. Adm. Code are met.

5.3 Groundwater Monitoring Well - Abandonment

Required Action	Due Date
Abandonment: Complete abandonment of monitoring wells MW-203 and MW-208. The wells shall be abandoned in accordance with s. NR 141.25, Wisconsin Administrative Code. (Note: Documentation of well abandonment must be submitted to the Department within 60 days of well abandonment.)	12/31/2027

Explanation of Schedule

Since monitoring is being discontinued at well 805 (MW-5) during the proposed permit term, it is appropriate to abandon well 805 (MW-5) in accordance with s. NR 141.25, Wis. Adm. Code.

5.4 Well Depth and Boring Log Information

Required Action	Due Date
Well Depth and Boring Log: Submit total depth measurements for all groundwater monitoring wells and any of the monitoring well boring logs and construction forms that are available.	12/31/2027

Explanation of Schedule

Accurate well information is needed to ensure the requirements of ch. NR 150, Wis. Adm. Code are met.

Attachments

Groundwater Evaluation dated September 1, 2026.

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance

Prepared By: Marissa Fleege Wastewater Specialist **Date:** 10/21/2026

CORRESPONDENCE/MEMORANDUM

DATE: September 1, 2026

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for Northern Moraine Utility Commission WI-0060879-09

General Information and Treatment System Description

Northern Moraine Utility Commission (NMUC) is a regional wastewater treatment facility that serves the Villages of Elkhart Lake and Glenbeulah, the Towns of Rhine and Plymouth SD#1, and Greenbush SD with a combined total population of approximately 2,760. The annual average design flow of the treatment plant is 0.476 million gallons per day (MGD) with an actual annual average flow of 0.342 MGD over the past three years (2023 – 2025). The plant consists of a flow equalization tank, grit removal, fine belt screens, a Multi-Stage Activated Biological Process (MSABP), which is an attached growth step biological treatment process, and final clarification. The effluent is discharged to three absorption ponds surrounded by groundwater monitoring wells. Sludge is aerobically digested and stored in a storage tank before being land applied to Department approved agricultural fields. NMUC has approximately 475 days of sludge storage onsite.

Table 1 – Monitoring Requirements and Limitations for Outfall 002 (Effluent to Absorption Pond System)

Parameter	Current and Proposed Permit WI-0060879-09 and WI-0060879-10		
	Limit Type	Limits and Units	Sample Frequency
***Flow Rate**		**MGD**	**Total Daily**
BOD5	Monthly Avg	50 mg/l	***Weekly**
Total Suspended Solids		mg/l	***Weekly**
pH Field		su	***Weekly**
Total Dissolved Solids		mg/l	Monthly
Total Kjeldahl Nitrogen		mg/l	Monthly
Ammonia Nitrogen		mg/l	Monthly
Total Organic Nitrogen		mg/l	Monthly
Nitrite + Nitrate Nitrogen		mg/l	Monthly
Total Nitrogen		mg/l	Monthly
Total Dissolved Solids		mg/l	Monthly
Chloride		mg/l	Monthly
***Total Phosphorus**		**mg/l**	**Monthly**

***Recommended changes for upcoming permit**

Table 2 – Groundwater Monitoring System for Absorption Ponds

Sample Point	Well Name	Current Permit and Proposed WI-0060879-09 and WI-0060879-10	
		Well Location	Well Designation
~~**803**~~	~~**MW-203**~~		~~**Non-Point of Standards**~~
805	MW-205		Non-Point of Standards
806	MW-206		Non-Point of Standards
~~**808**~~	~~**MW-208**~~		~~**Non-Point of Standards**~~
810	MW-210		Non-Point of Standards
812	MW-212	Upgradient	Background Non-Point of Standards
813	MW-213		Non-Point of Standards
814	MW-214		Non-Point of Standards
815	MW-215		Non-Point of Standards
816	MW-213A		Non-Point of Standards
817	MW-217		Non-Point of Standards

***Abandon monitoring wells MW-203 and MW-208**

Table 3 – Absorption Pond Groundwater Standards

Parameter	Current Permit WI-0060879-09		Proposed Permit WI-0060879-10	
	PAL	ES	PAL	ES
Depth to Groundwater	N/A	N/A	N/A	N/A
Groundwater Elevation	N/A	N/A	N/A	N/A
Nitrite + Nitrate	12.6 mg/l	12.6 mg/l	***13.6 mg/l**	***13.6 mg/l**
Ammonia Dissolved	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Organic Nitrogen Dissolved	4.0 mg/l	N/A	***4.6 mg/l**	N/A
Chloride	190 mg/l	250 mg/l	***125 mg/l**	250 mg/l
Dissolved Phosphorus	N/A	N/A	N/A	N/A
Total Dissolved Solids	740 mg/l	N/A	***890 mg/l**	N/A
***Chemical Oxygen Demand**	**N/A**	**N/A**	**N/A**	**N/A**
pH Field	6.3 – 8.3 su	N/A	***6.3 – 8.3 su**	N/A
Conductivity	N/A	N/A	N/A	N/A
~~***Total Kjeldahl Nitrogen**~~	~~**N/A**~~	~~**N/A**~~	~~**N/A**~~	~~**N/A**~~

***Recommended changes for upcoming permit**

Hydrogeology

Bedrock underlying the absorption pond system is the Silurian-aged Engadine Formation. This dolostone is light to medium gray, fine- to coarse-grained, burrowed and mottled dolostone with little to no chert. Depth to bedrock is expected to be greater than 150 feet. The surface soils are a combination of muck and silt loams. The monitoring well boring log for MW-217, which was installed on October 20, 2017, was reported as sand, gravel and cobbles to 6.5 feet and silty sand from 6.5 to 14 feet below ground surface. The absorption ponds are located adjacent to the Mullet River. The Mullet River wraps around the west, north and east sides of the absorption ponds. Flow in the Mullet River migrates from the west to the east eventually converging with the Sheboygan River. Depth to groundwater is 12 – 22 feet below ground surface at the monitoring wells adjacent to the absorption ponds. Depth to groundwater at the monitoring wells further outside of the absorption ponds is 0 – 11 feet below ground surface. Depth to groundwater at the MW-213/MW-213A well

nest is routinely at or just below the ground surface. Groundwater elevations at MW-213A are routinely higher than those observed at MW-213 indicating an upward hydraulic gradient typical of this environment. Groundwater elevation throughout the site is approximately 930 – 940 feet above mean sea level. Given the surface topography, surrounding surface water bodies, scale of the current groundwater monitoring system and lack of regional groundwater flow maps, determining the actual groundwater flow paths at this site is difficult to determine. Overall, groundwater is mounded at the absorption ponds and appears to flow radially outward in all directions. Groundwater flow that is unimpacted by the absorption ponds is assumed to be towards the Mullet River and to the east.

Land Treatment Effluent Quality and Loading Rates

Flow to the absorption pond system is not monitored at the discharge but is at the influent. The reported flow rates at the influent are assumed to be representative of the discharge to the absorption pond system. Discharge to the absorption pond system ranged between 101 – 136 MG/yr. The concentration of chloride is elevated and had average concentrations range from 416 – 507 mg/l during the past five years. The annual chloride load to the absorption pond system ranged between 418,818 – 471,844 lbs/yr. Nitrogen is primarily in the form of nitrite + nitrate and annual average concentrations fell between 8.5 – 11.5 mg/l. Ammonia nitrogen was mostly non-detect in the samples collected in the effluent. Organic nitrogen is generally low ranging from non-detect to 4 mg/l. The annual amount of nitrogen discharged to the absorption pond system ranged 9,204 – 13,414 lbs/yr. BOD is generally low with periodic high concentrations of 15 – 20 mg/l. Phosphorus is not monitored in the discharge to the absorption ponds.

Table 4 – Annual Average Effluent Results (mg/l)

Year	Chloride	Ammonia Nitrogen	Nitrite + Nitrate	Organic Nitrogen	Total Nitrogen
2021	476	0.5	11.5	3.6	14.7
2022	507	0.9	11.4	3.7	15.8
2023	493	0.7	8.5	1.4	10.5
2024	416	0.1	9.4	1.4	10.8
2025	379	0.2	9.4	1.3	10.8

Table 5 – Annual Absorption Pond Loading Rates

Year	Annual Discharge (MG/yr)	Total Nitrogen (lbs/yr)	Chloride (lbs/yr)
2021	105.5	12,934	418,818
2022	101.8	13,414	430,449
2023	105.1	9,204	432,131
2024	136.0	12,250	471,844
2025	133.7	12,043	422,607

Background Groundwater Quality

Background groundwater quality is defined by the results from samples collected at MW-212. The results for chloride at MW-212 are low and most often below 40 mg/l. The results for total dissolved solids are variable ranging between 50 – 747 mg/l. Nitrite + nitrate is variable ranging between non-detect to 15 mg/l. The results for ammonia, organic nitrogen, and dissolved phosphorus are mostly non-detect.

Downgradient Groundwater Quality

The results for chloride at the downgradient monitoring wells are elevated and variable ranging from approximately 100 – 450 mg/l. The highest chloride results are most often observed at MW-217. The results for chloride at MW-213 are stable and most often around 50 mg/l. Like the results for chloride, the results for nitrite + nitrate are elevated and variable at the downgradient monitoring wells. The highest results for nitrite + nitrate are observed at monitoring wells MW-214 and MW-215 where they are typically between 5 – 13 mg/l. The results for nitrite + nitrate are lower and more stable at MW-217 and lowest and most stable at MW-213 where they are consistently at about 2 mg/l. The results for ammonia and organic nitrogen are mostly non-detect. The results for dissolved phosphorus exhibit similar trends compared to the other downgradient monitoring wells. The highest results for dissolved phosphorus are observed at MW-214 and MW-215 where they reach concentrations of 0.3 – 0.4 mg/l. The results at MW-213 and MW-217 are mostly non-detect for dissolved phosphorus. Total dissolved solids are lowest at MW-213 around 400 mg/l and higher and more variable at MW-214, MW-215 and MW-217 where concentrations range 500 – 1,300 mg/l.

Treatment System Impact to Groundwater Quality

The absorption pond and groundwater monitoring system are in an area that makes a clear assessment of the groundwater flow paths difficult to determine. The discharge to the absorption ponds has resulted in a mounding effect where groundwater appears to flow radially outward in all directions. While MW-212 is at a lower elevation relative to many downgradient monitoring wells, its position, distance from the absorption ponds and results from samples collected appear to confirm that it is representative of unimpacted groundwater quality. The interpretation of the discharge's impact on groundwater quality is based upon the chemistry data collected from the wells and effluent and not necessarily groundwater flow paths.

The impact from the discharge to the absorption ponds on local groundwater quality is most apparent when reviewing the results at monitoring wells MW-214, MW-215 and MW-217. MW-217 is likely the most representative of downgradient groundwater quality. The discharge of approximately 400,000 lbs/yr of chloride at concentrations of 400 – 600 mg/l has resulted in routine exceedances of the NR 140 PAL and ES at these downgradient monitoring wells. Northern Moraine Utility Commission routinely nitrifies the incoming ammonia at approximately 15 – 45 mg/l in the influent to non-detect in the effluent. Therefore, the resulting nitrogen is primarily in the form of nitrite + nitrate and some organic nitrogen. The discharge of 10,000 – 13,000 lbs/yr of nitrogen that is primarily in the form nitrite + nitrate has resulted in routine exceedances of the NR 140 PAL and ES for nitrite + nitrate. Given that some of this discharge enters Mullet River, it is likely better for aquatic life that the nitrogen entering the river is nitrite + nitrate and not ammonia. The amount of phosphorus discharged to the absorption ponds is unknown as this parameter is not monitored in the effluent. However, the results at the downgradient monitoring wells are relatively low (i.e., < 0.4 mg/l) and are unlikely to be of significant concern on the impact to Mullet River. To further assess the overall contribution of phosphorus to local groundwater and the Mullet River, routine monitoring of total phosphorus should be added to Outfall 002.

Indicator Parameter PALs

Indicator Parameter PALs are developed following the procedures described in s. NR 140.20(2), Wis. Adm. Code and "Calculating Preventive Action Limits and Evaluating Groundwater Quality Exemptions for Groundwater Dischargers". Indicator parameters do not have Enforcement Standards. The PAL for an indicator parameter is a benchmark for evaluating site specific trends. When significant increases in the trends are observed, the facility and the department's response action under s. NR 140.24 Wis. Adm. Code should be to investigate the source of the compound. The indicator PALs for this facility were calculated using whichever of the two following methods provides a greater PAL.

- ∑ [Background groundwater quality + (Standard Deviation of results x 3)]

- ∑ [Background groundwater quality + Minimum Increase (NR 140.20 Table 3)]

Indicator parameter PALs for the current permit term were calculated using monitoring data from MW-212 during the prior permit term. The indicator parameter PALs for use in the upcoming permit WI-0060879-10 are presented in **Table 3** and were calculated using results MW-212 (September 1, 2021 – August 31, 2026).

Alternative Concentration Limits

Alternative concentration Limits (ACLs) can be developed and provided for a groundwater monitoring system to replace the PAL or ES (s. NR 140.28, Wis. Adm. Code). ACLs are provided if the conditions at the background monitoring well(s) indicate that it is appropriate. The methodology and considerations for developing and providing ACLs are outlined in the guidance document "Calculating Preventive Action Limits and Evaluating Groundwater Quality Exemptions for Groundwater Dischargers". ACLs were calculated and provided in **Table 3** for nitrite+nitrate using results from MW-212 (September 1, 2021 – August 31, 2026). The data used in the calculation of the nitrite + nitrate ACL is provided below in **Table 6**.

Table 6 – Alternative Concentration Limit Data and Calculation

MW-212 (812)	
Date	**Nitrite+Nitrate (mg/l)**
9/7/21	4.2
12/14/21	2.2
3/22/22	0.0
6/21/22	7.5
9/15/22	6.6
12/13/22	4.6
3/20/23	0.6
6/13/23	15.0
9/12/23	9.3
12/7/23	7.4
3/26/24	0.3
6/18/24	10.0
9/10/24	12.0
12/17/24	3.5
3/11/25	0.4
6/17/25	4.2
9/23/25	2.0
12/16/25	4.4
3/24/26	0.8
6/9/26	8.7

Average (mg/l)	5.2
Standard Deviation (mg/l)	4.2
ACL (mg/l)	**13.6**

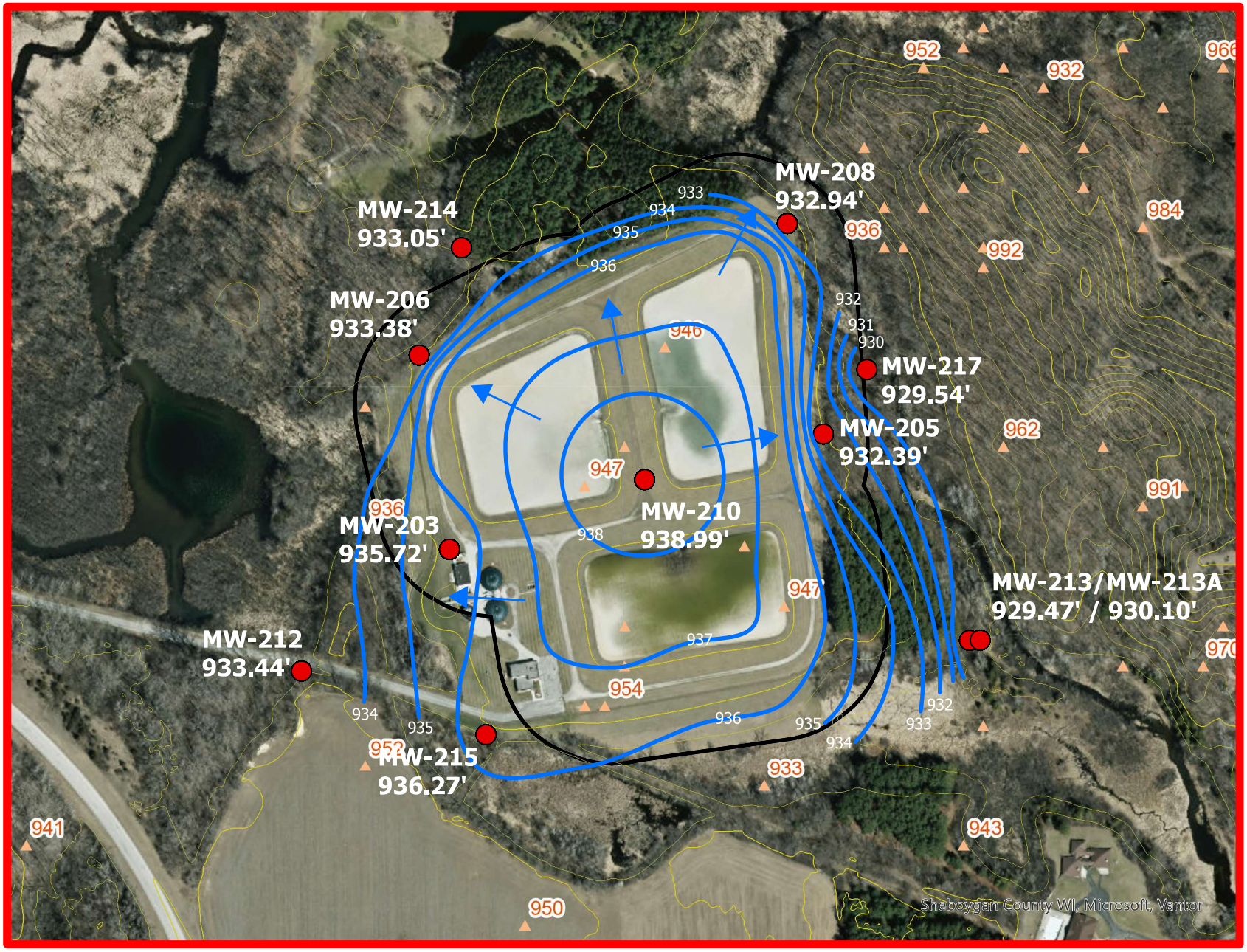
***ACL is calculated by adding two standard deviations to the average result**

Conclusions, Recommendations and Schedule Requirements

- Add Total Phosphorus and Flow Rate to Outfall 002.
- Reduce monitoring of BOD5 at Outfall 002 from 3/week to weekly.
- Add Chemical Oxygen Demand and remove Total Kjeldahl Nitrogen from the monitoring requirements for the Groundwater Monitoring System.
- Northern Moraine Utility Commission has made progress over the past five years in lowering the concentration of chloride in their effluent. However, average concentrations of 400 mg/l are still well above the NR 140 ES. Northern Moraine Utility Commission should continue to submit routine annual chloride source reduction reports that outline how they will work towards bringing the concentration of chloride below the NR 140 ES.
- Northern Moraine Utility Commission should submit a Land Treatment Management Plan within the first year of the next permit term.
- The routine monitoring of just groundwater elevation at monitoring wells MW-203, MW-205, MW-206, MW-208, MW-210 and MW-213A provides minimal value. Collecting groundwater chemistry data at a few of these monitoring wells would be helpful in better assessing how the discharge to the absorption ponds impacts local groundwater and changes over space and time. Monitoring wells MW-205, MW-206, MW-210, and MW-213A should be added to the list of groundwater monitoring wells sampled for groundwater chemistry as outlined in **Table 3**. Monitoring wells MW-203 and MW-208 should be abandoned.
- Sampling the Mullet River upgradient, adjacent to and downgradient of the absorption ponds for chloride, ammonia, nitrite + nitrate, and dissolved phosphorus should occur on some routine basis during the next permit term to allow for a further assessment of how the discharge to the absorption ponds impacts local surface water quality. WDNR staff should coordinate to collect this data so that it can be utilized for the development of the next groundwater evaluation.
- Northern Moraine Utility Commission should submit total depth measurements for all groundwater monitoring wells and any of the monitoring well boring logs and construction forms that are available.

Water Table Flow Map June 9, 2026
Northern Moraine Utility Commission (WI-0060879-09)

WISCONSIN DEPT. OF NATURAL RESOURCES



Site Location

N7025 Co Rd P
Glenbeulah, WI 53023

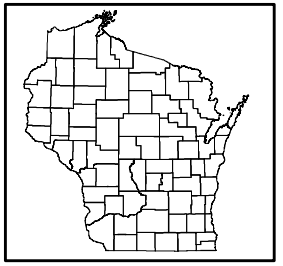
Legend

- Water Table Contour (6/9/2026 - 1' FAMSL)
- Groundwater Flow Direction
- Design Management Zone (DMZ)

Notes

Water table contours are hand drawn using the reported elevations in feet above mean sea level collected on June 9, 2026.

Created By: watsoz
Date: 8/31/2026

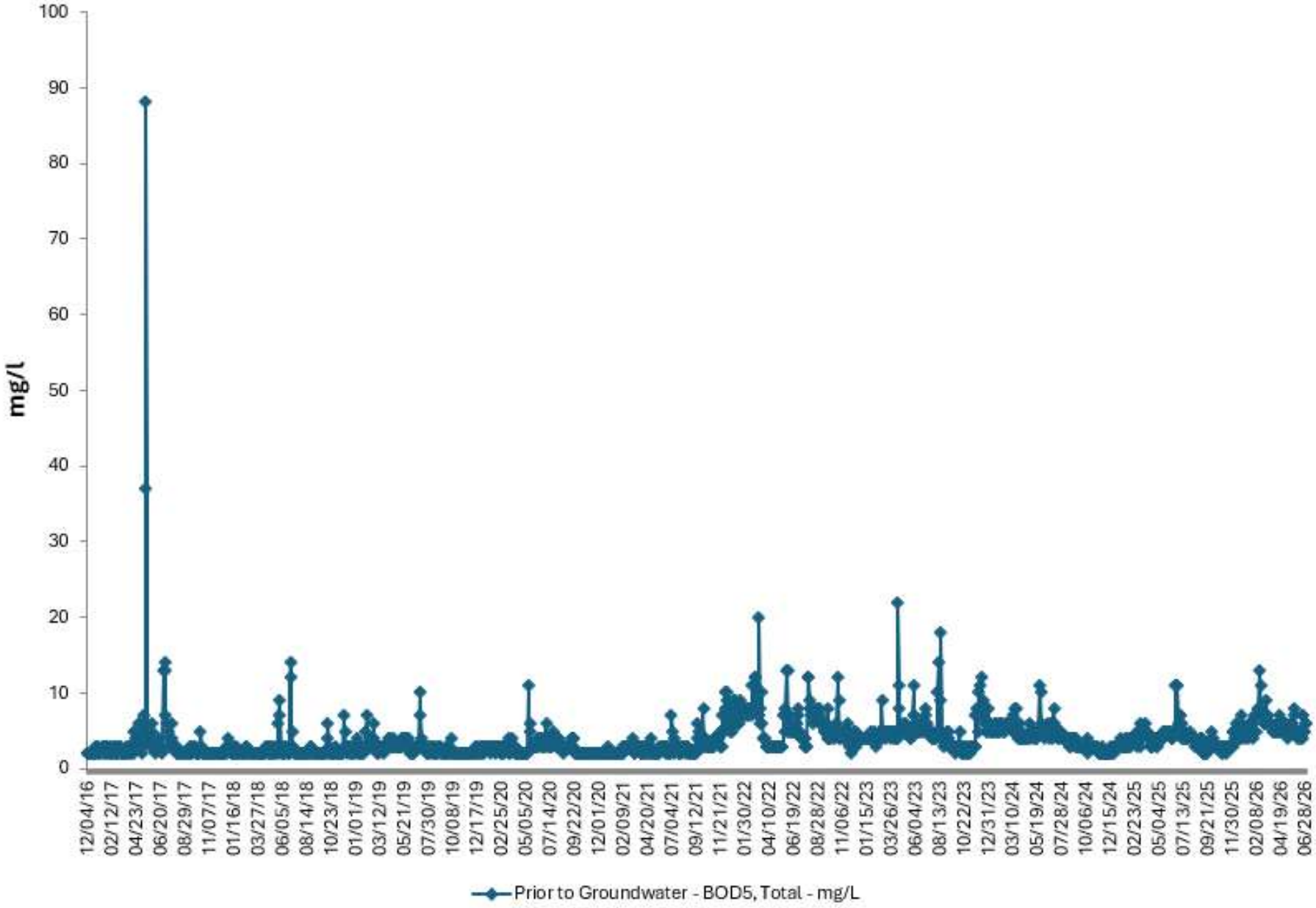


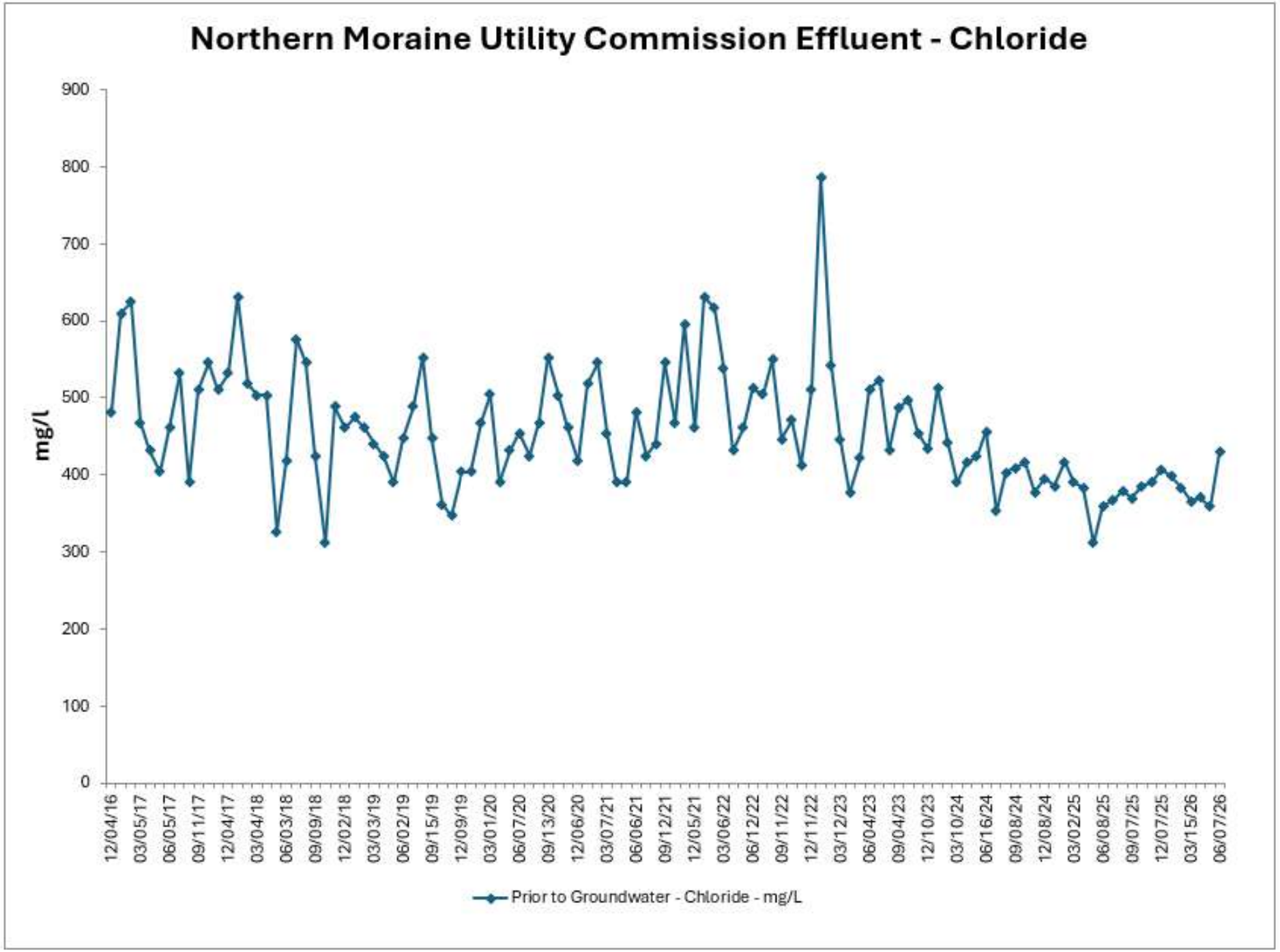
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1:4,196

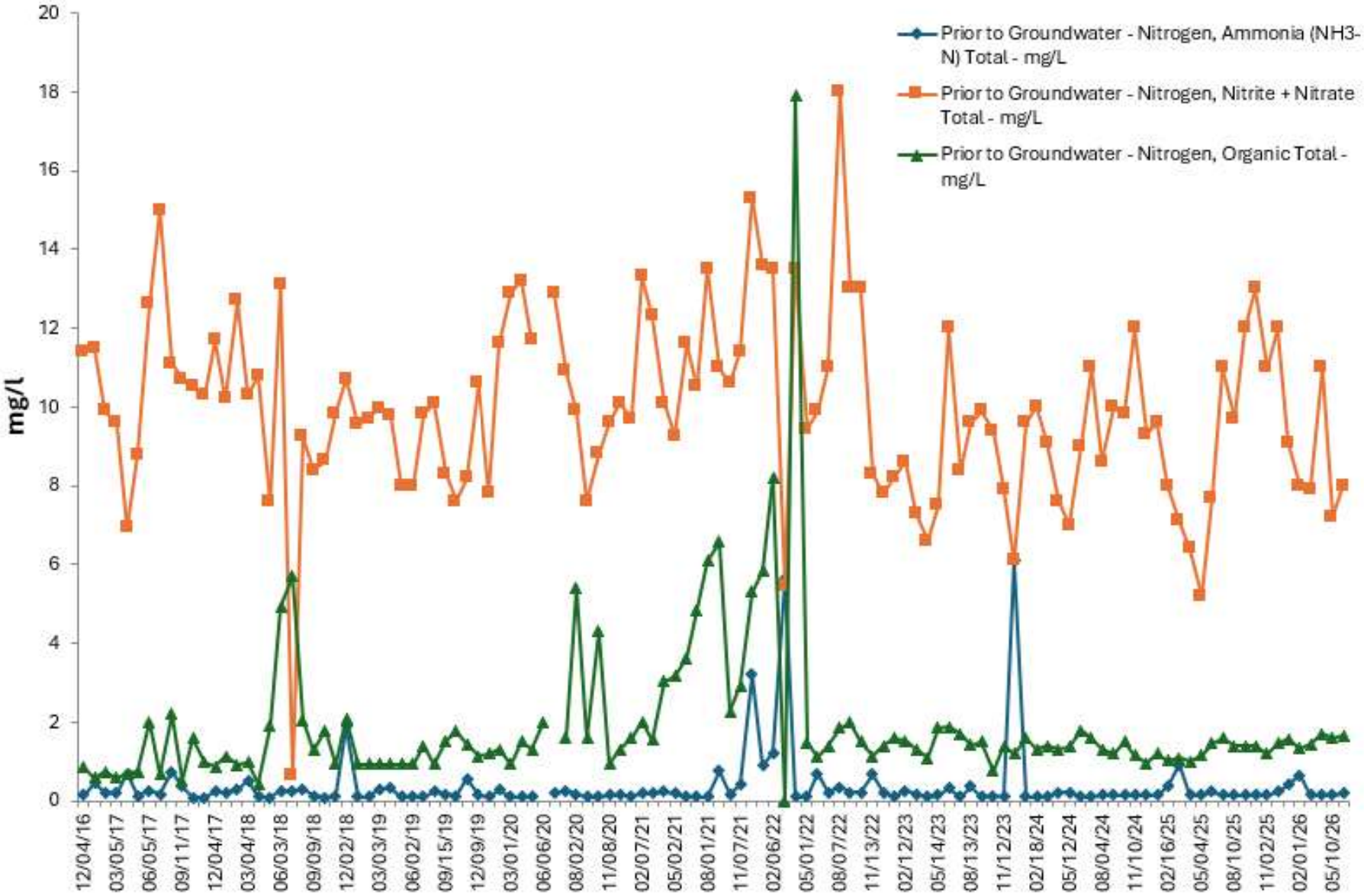
DISCLAIMER: This map is a user generated static output from the Wisconsin Department of Natural Resources. The contents herein are for reference purposes only and may or may not be accurate, current, or otherwise reliable. No liability is assumed for the data delineated herein either expressed or implied by the Wisconsin DNR or its employees. All land application must meet NR 113, NR 204, and NR 214 Wis. Adm. Code.

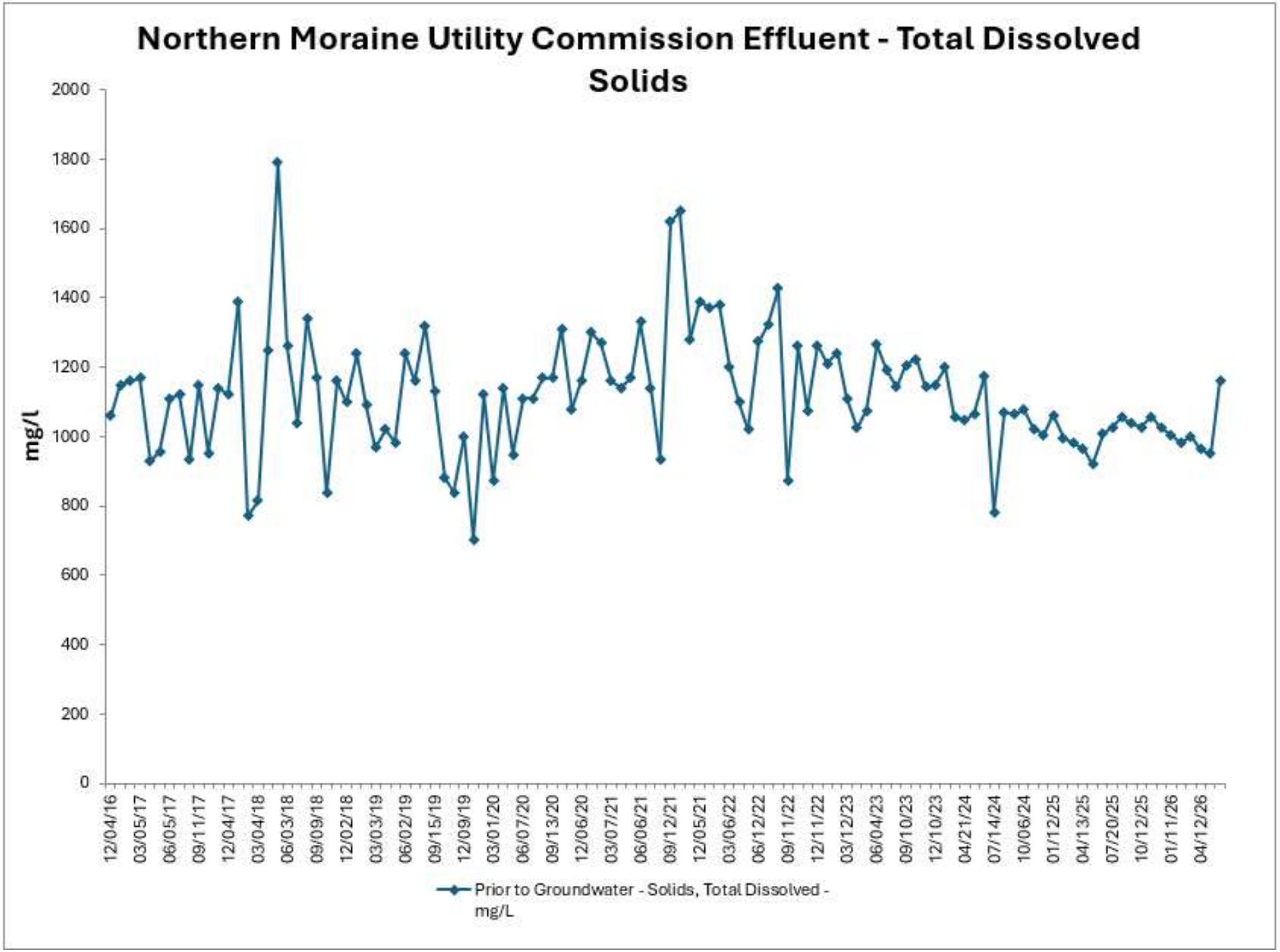
Northern Moraine Utility Commission Effluent - BOD



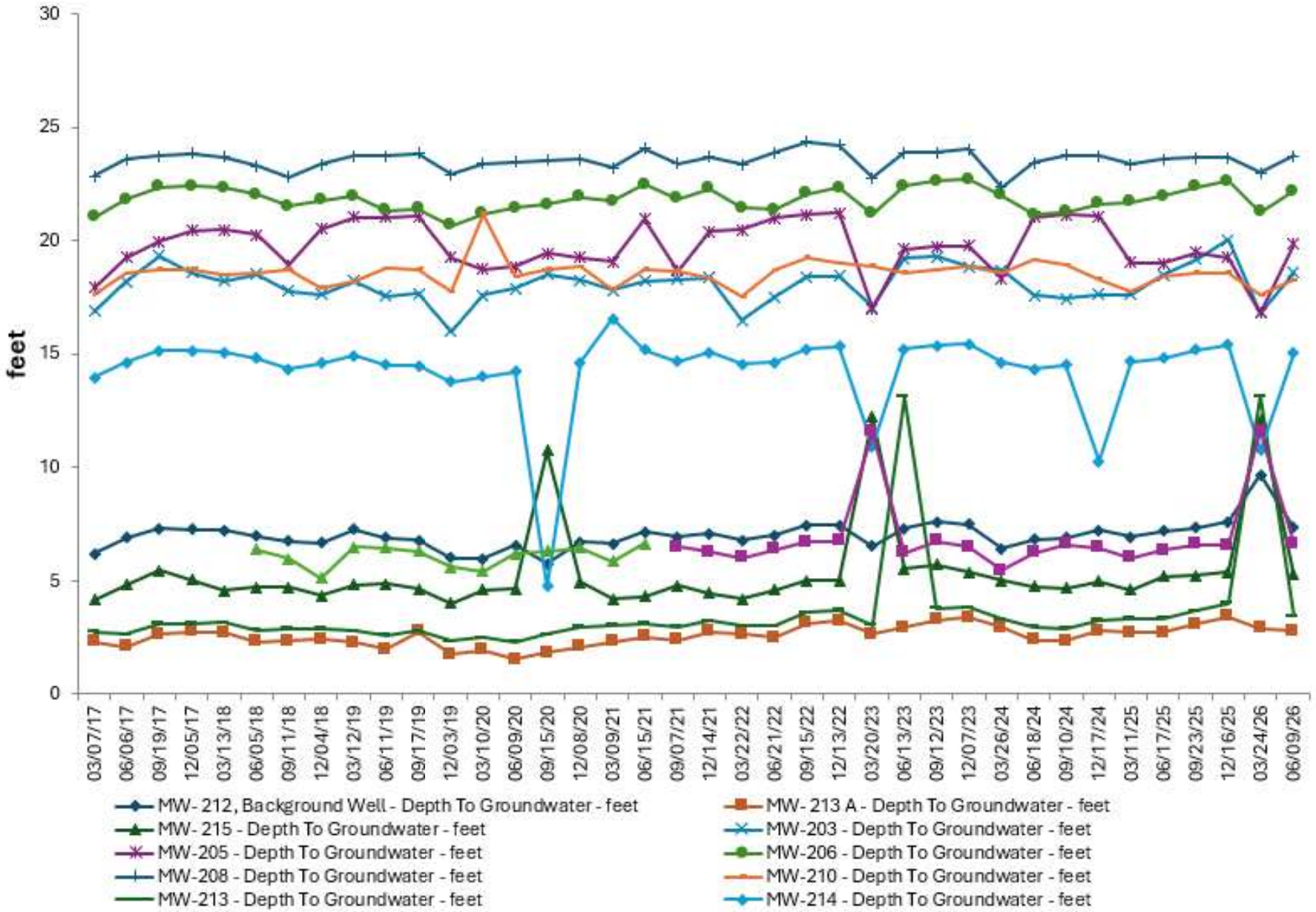

Northern Moraine Utility Commission Effluent - Chloride
mg/l
900
800
700
600
500
400
300
200
100
0
12/04/16
03/05/17
06/05/17
09/11/17
12/04/17
03/04/18
06/03/18
09/09/18
12/02/18
03/03/19
06/02/19
09/15/19
12/09/19
03/01/20
06/07/20
09/13/20
12/06/20
03/07/21
06/06/21
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12/05/21
03/06/22
06/12/22
09/11/22
12/11/22
03/12/23
06/04/23
09/04/23
12/10/23
03/10/24
06/16/24
09/08/24
12/08/24
03/02/25
06/08/25
09/07/25
12/07/25
03/15/26
06/07/26
Prior to Groundwater - Chloride - mg/L

Northern Moraine Utility Commission Effluent - Nitrogen

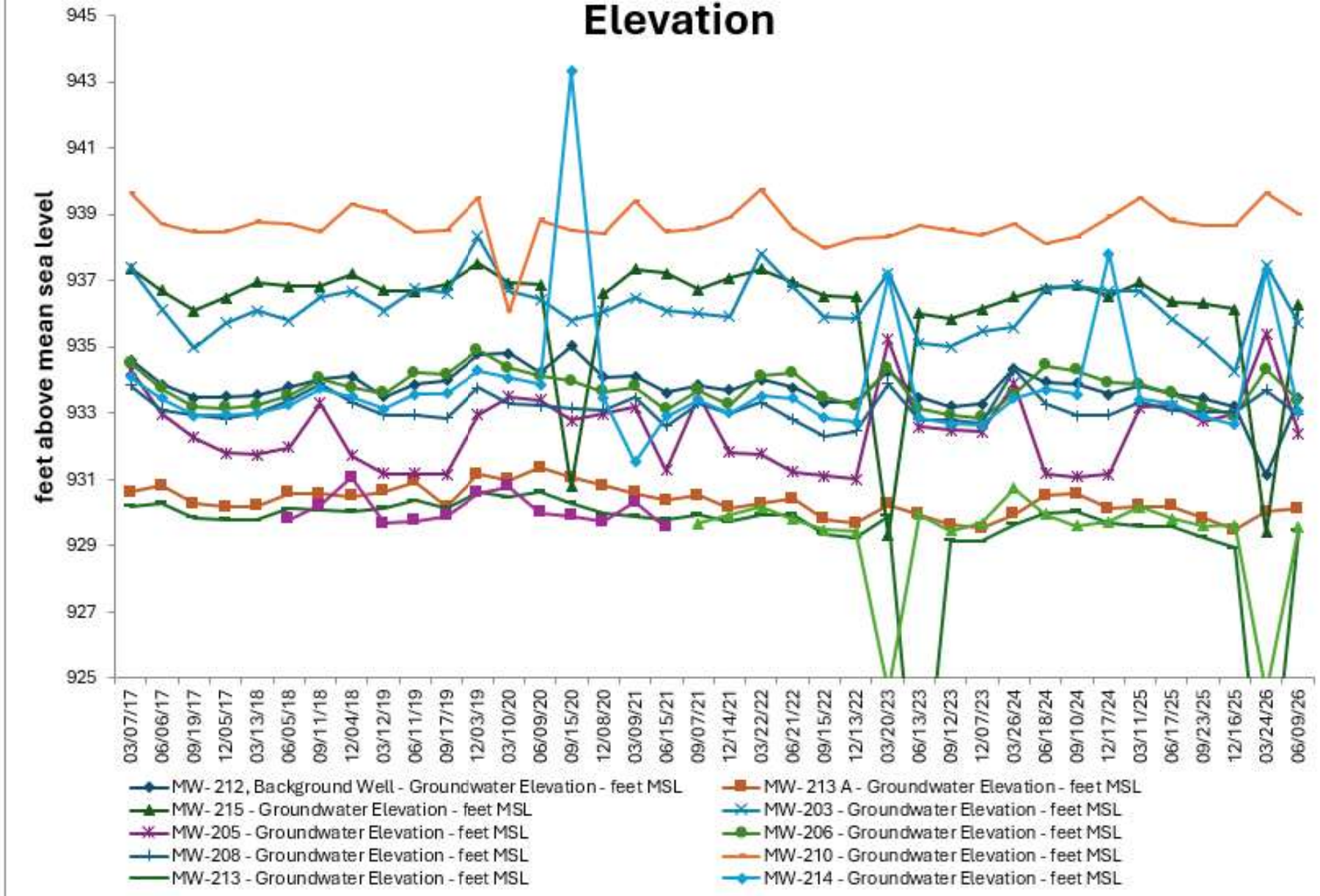



Northern Moraine Utility Commission Effluent - Total Dissolved Solids
mg/l
2000
1800
1600
1400
1200
1000
800
600
400
200
0
12/04/16
03/05/17
06/05/17
09/11/17
12/04/17
03/04/18
06/03/18
09/09/18
12/02/18
03/03/19
06/02/19
09/15/19
12/09/19
03/01/20
06/07/20
09/13/20
12/06/20
03/07/21
06/06/21
09/12/21
12/05/21
03/06/22
06/12/22
09/11/22
12/11/22
03/12/23
06/04/23
09/10/23
12/10/23
04/21/24
07/14/24
10/06/24
01/12/25
04/13/25
07/20/25
10/12/25
01/11/26
04/12/26
Prior to Groundwater - Solids, Total Dissolved - mg/L

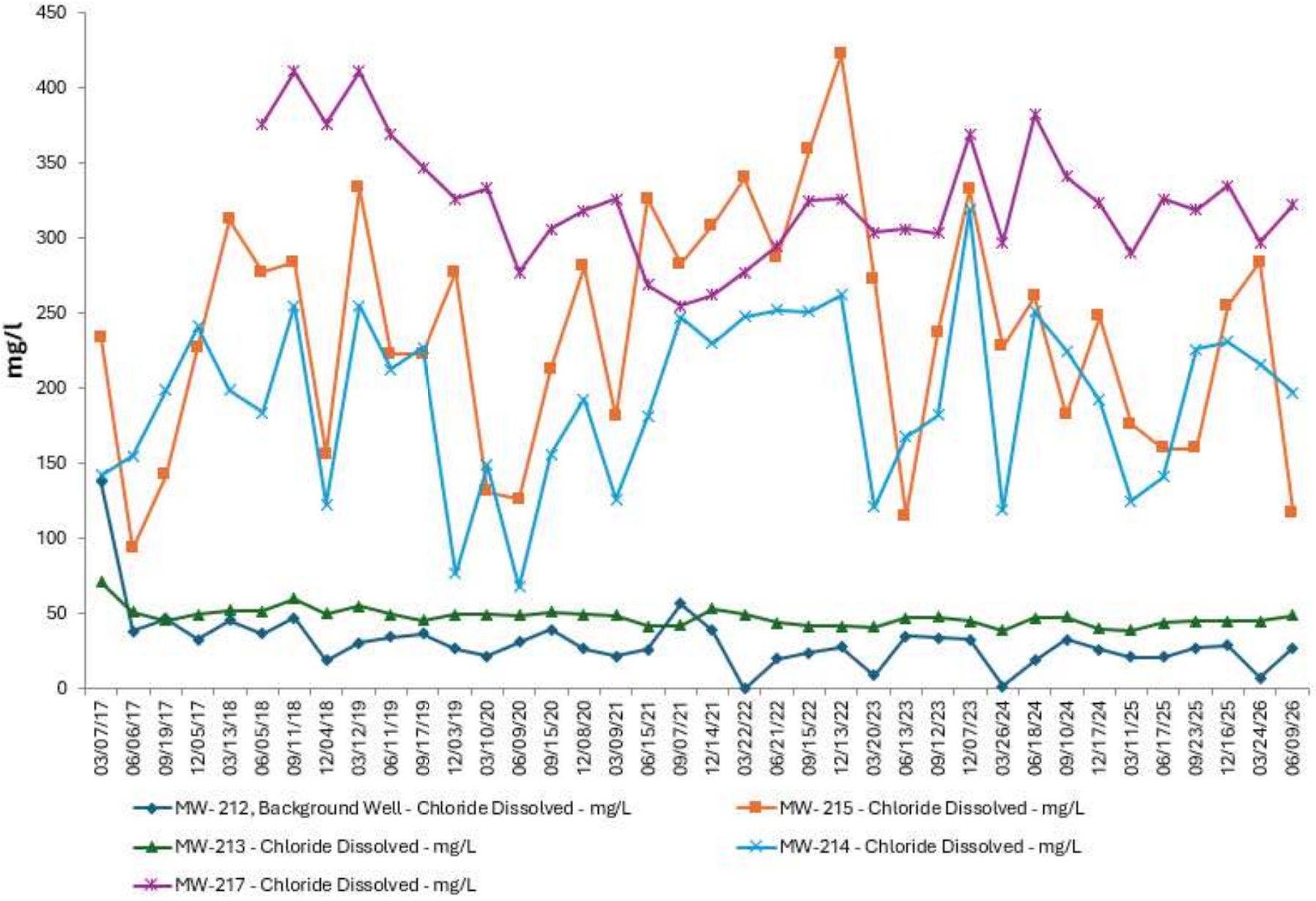
Groundwater Monitoring System - Depth to Water



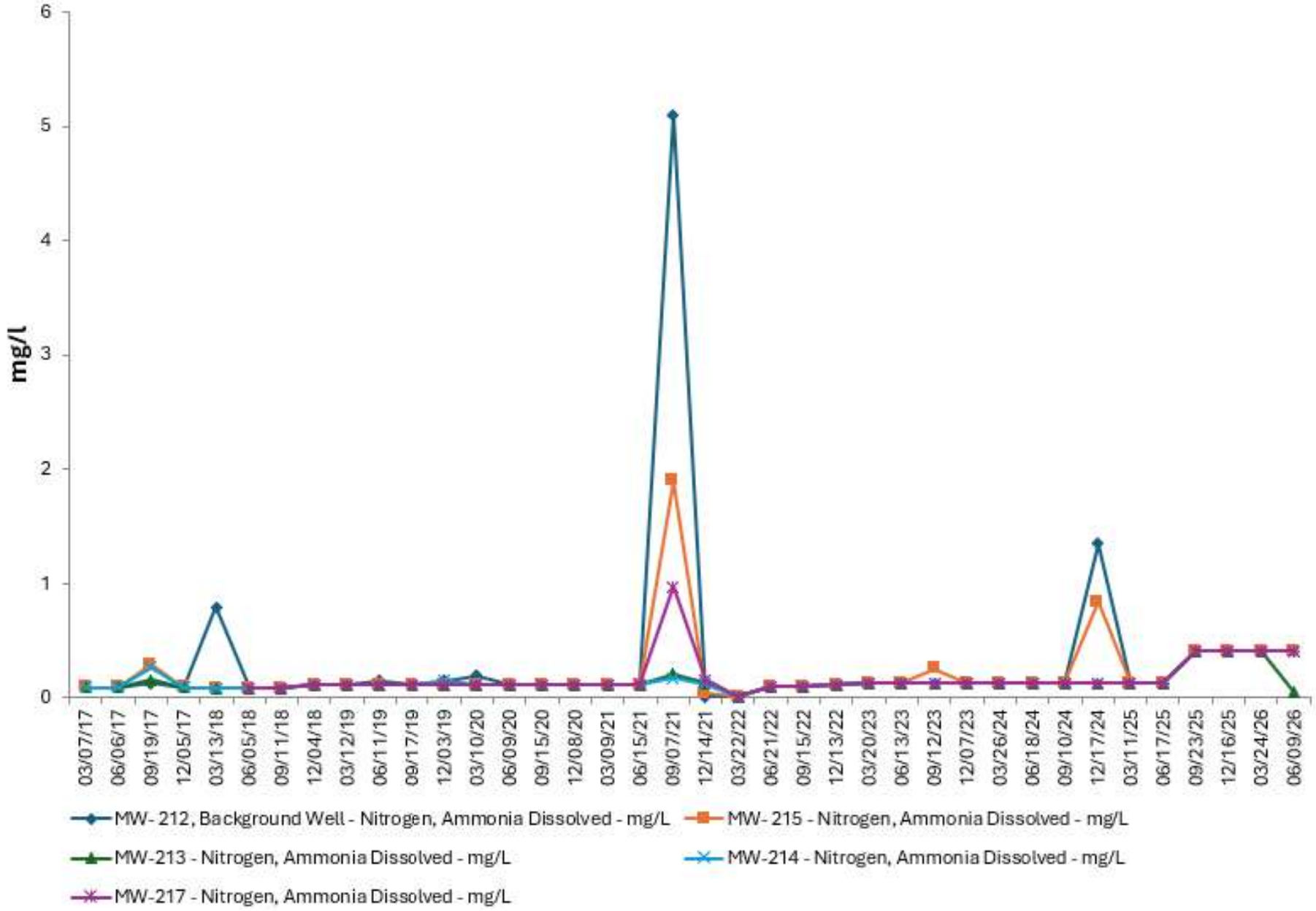
Groundwater Monitoring System - Groundwater Elevation



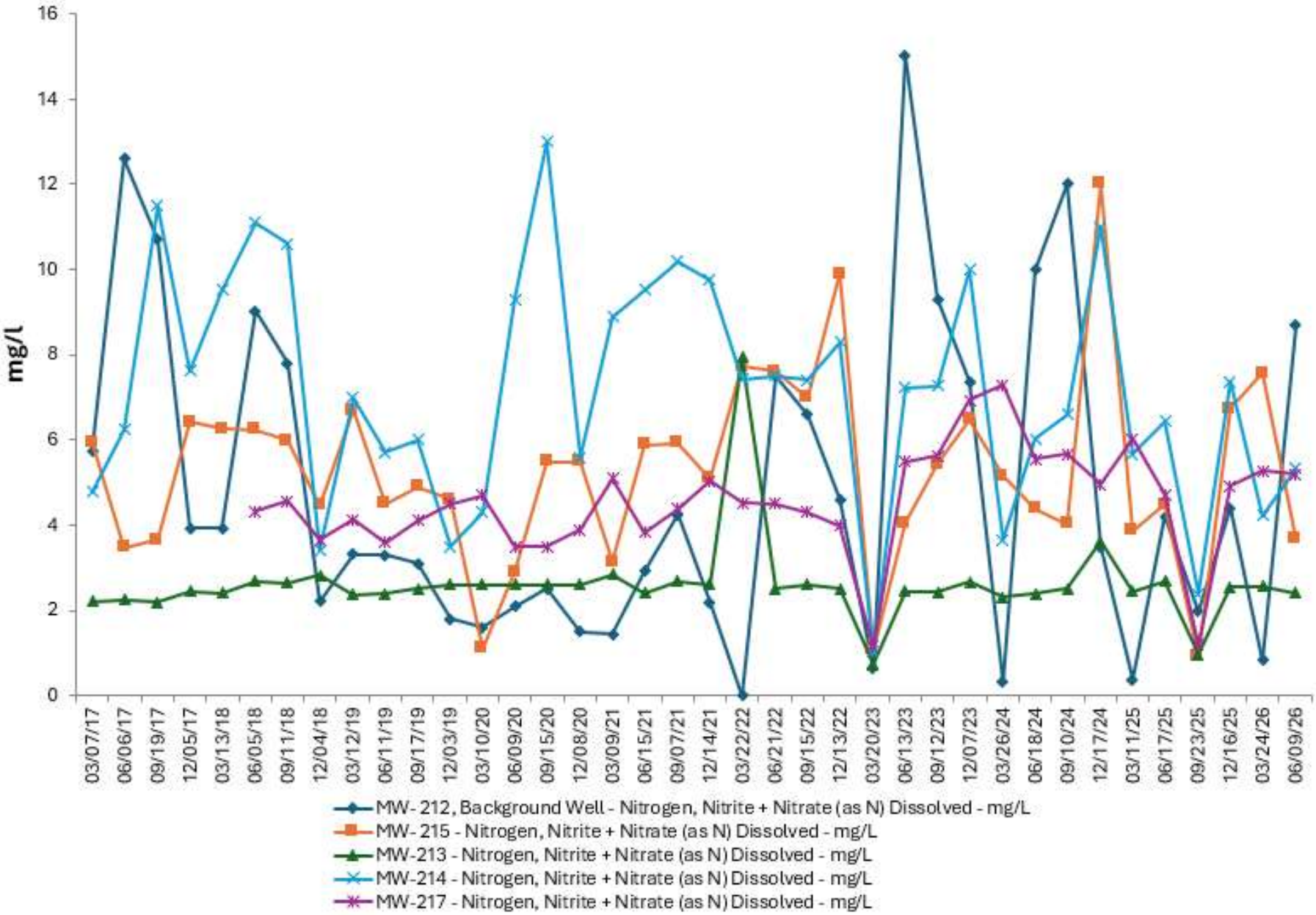
Groundwater Monitoring System - Chloride

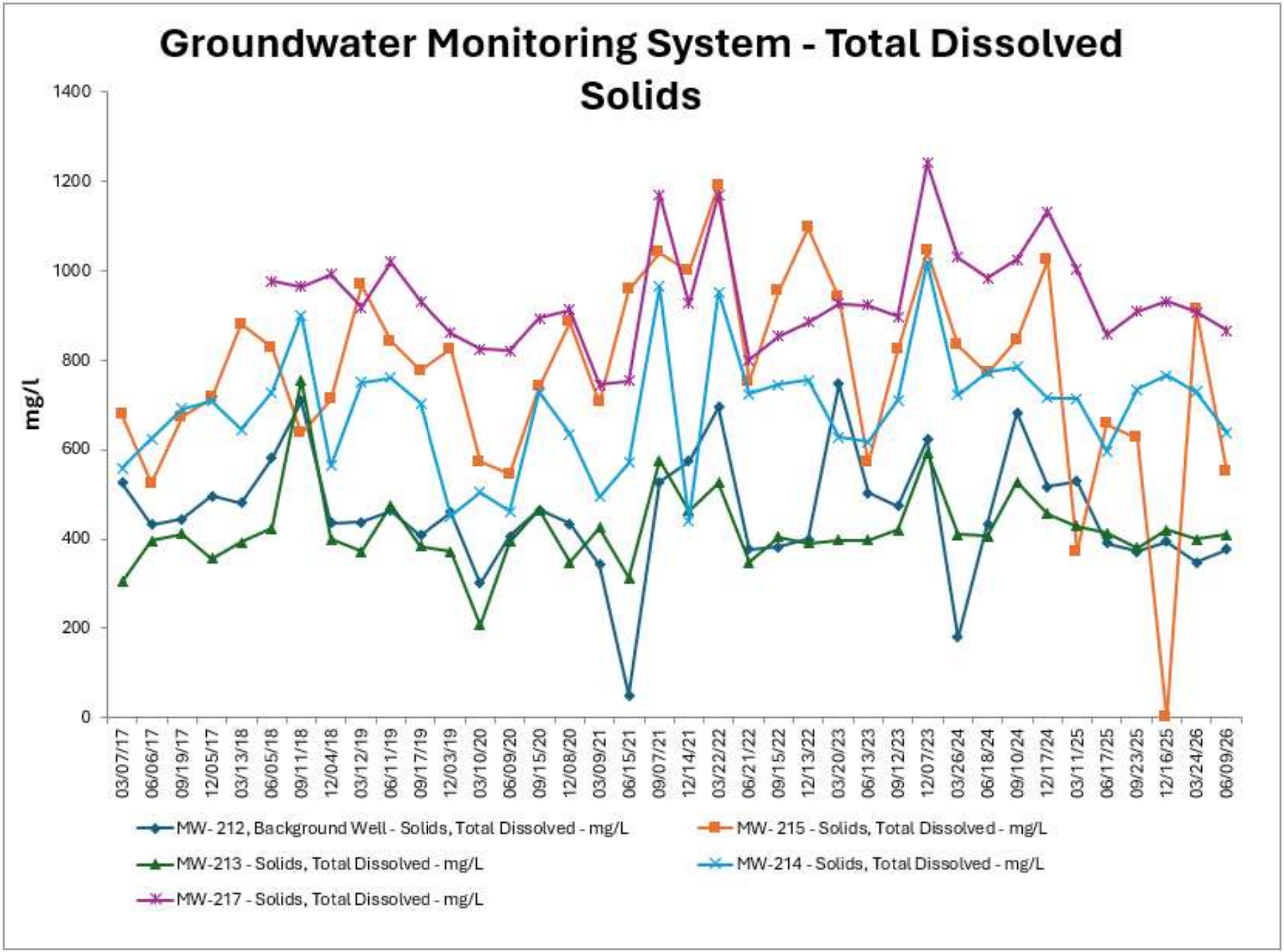


Groundwater Monitoring System - Ammonia



Groundwater Monitoring System - Nitrite + Nitrate




Groundwater Monitoring System - Total Dissolved Solids
mg/l
1400
1200
1000
800
600
400
200
0
03/07/17
06/06/17
09/19/17
12/05/17
03/13/18
06/05/18
09/11/18
12/04/18
03/12/19
06/11/19
09/17/19
12/03/19
03/10/20
06/09/20
09/15/20
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12/14/21
03/22/22
06/21/22
09/15/22
12/13/22
03/20/23
06/13/23
09/12/23
12/07/23
03/26/24
06/18/24
09/10/24
12/17/24
03/11/25
06/17/25
09/23/25
12/16/25
03/24/26
06/09/26
MW- 212, Background Well - Solids, Total Dissolved - mg/L
MW- 215 - Solids, Total Dissolved - mg/L
MW-213 - Solids, Total Dissolved - mg/L
MW-214 - Solids, Total Dissolved - mg/L
MW-217 - Solids, Total Dissolved - mg/L

Groundwater Monitoring System - Dissolved Phosphorus

