Permit Fact Sheet

General Information

Permit Number	WI-0060470-10-0
Permittee Name and Address	Wisconsin Department of Corrections PO Box 147, Fox Lake, WI 53933
Permitted Facility Name and Address	WI DOC Fox Lake Correctional Institution W10050 Lake Emily Road, Fox Lake, WI 53933
Permit Term	October 01, 2025 to September 30, 2030
Discharge Location	E1/2 of the SWQ of Section 1, T13N, R13E
Receiving Water	Groundwater of the Upper Rock in Beaver Dam River of Rock River (upper) in Dodge County
Stream Flow (Q7, 10)	N/A
Stream Classification	N/A
Discharge Type	Existing seasonal spray irrigation discharge
Annual Average Design Flow (MGD)	0.378 MGD
Industrial or Commercial Contributors	N/A
Plant Classification	Facility is Basic with subclasses A1 – Suspended Growth Processes, B – Solids Separation, C – Biological Solids/Sludges, SS – Sanitary Sewage Collection System. One operator is certified.
Approved Pretreatment Program	N/A

Facility Description

The State of Wisconsin operates a correctional institution near Fox Lake. The WI DOC Fox Lake Correctional Institution WWTF is located outside the confines of the correctional institution. Approximately 1500 inmates are housed at this institution, and all the wastewater generated is directed to the treatment facility. Using available data from 2020 through 2024, the average influent flow is approximately 0.195 MGD and the current design flow is about 0.378 MGD. The wastewater is primarily domestic in nature. Three private wells provide the drinking water for the facility. The wastewater treatment facility utilizes an oxidation ditch (three ditches) followed by a final clarifier. The treated effluent is stored in three holding ponds operated in parallel until it can be spray irrigated. Approximately 124 acres receive irrigation wastewater from April through November. The permittee spray irrigates approximately 0.290 MGD during the irrigation season. No winter application occurs. The holding ponds are lined with PVC and were built/relined in 1999. Lagoon 1 is approximately 5-7 feet deep and holds approximately 25 million gallons. Lagoon 2 is about 10-12 feet deep and holds about 25 million gallons. Lagoon 3 is about 15 feet deep and holds about 25 million gallons. Biosolids are further treated by aerobic digestion and thickened prior to being land applied. Biosolids are stored on-site in two 750,000-

gallon aerated storage tanks. Land application occurs during the fall on DNR approved agricultural fields under this permit. Groundwater is sampled on a quarterly basis from a groundwater monitoring system, consisting of one upgradient (Background) well, and three downgradient wells, which surround the center pivot spray irrigation land treatment area.

Substantial Compliance Determination

Enforcement During Last Permit: No enforcement actions were taken during the previous permit term. Permittee has worked to comply with all previously requested actions to address identified noncompliance.

After a desktop review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on June 9, 2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Jordan Main, Compliance Engineer on 8/6/25.

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	76 MG/yr in 2024	Influent: 24-hr flow proportional composite sampler located after the bar screen in the influent lift station. A magnetic flow meter is located at the influent lift station.
001	68 MG/yr in 2024	Effluent: Representative grab samples shall be collected of the storage lagoon discharge prior to spray irrigation. The spray field is approximately 124 acres and is in the E1/2 of the SWQ of Section 1, T13N, R13E. Sampling is only required when spray irrigation is utilized. Spray irrigation only to occur April through November.
004	0.58 MG/yr in 2024	Aerobically digested, Liquid, Class B. Representative sludge samples shall be collected from the sludge storage tank. The sample collected shall be a grab composite of at least five grab samples collected at different depths. Permittee only needs to collect an annual sludge sample for laboratory analysis if land application of sludge occurs in that given year.
102	75.5 MG/yr in 2024	Representative in-plant grab samples shall be collected after the final clarifiers, prior to discharge to the storage lagoons.

Sample Point Designation For Groundwater Monitoring Systems			
System	**Sample Pt Number**	**Well Name**	**Comments**
Spray Irrigation Field	804	WT-02 (804)	Downgradient Non-point of standards
	805	WT-03 (805)	Downgradient Non-point of standards
	807	WT-01B (807)	Upgradient/Background Non-point of standards

Sample Point Designation For Groundwater Monitoring Systems			
System	**Sample Pt Number**	**Well Name**	**Comments**
	808	WT-04B (808)	Downgradient Non-point of standards

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
BOD5, Total		mg/L	2/Month	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Month	24-Hr Flow Prop Comp	
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Organic Total		mg/L	Quarterly	Calculated	

Changes from Previous Permit:

Monitoring frequency for total Kjeldahl nitrogen, total ammonia nitrogen and total organic nitrogen updated to quarterly from monthly with notes to sample quarterly.

Explanation of Limits and Monitoring Requirements

Sample frequency for total Kjeldahl nitrogen, total ammonia nitrogen and total organic nitrogen updated to quarterly from monthly with notes to sample quarterly for clarity.

2 Inplant - Monitoring and Limitations

2.1 Sample Point Number: 102- DISCHARGE TO STORAGE LAGOONS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
BOD5, Total		mg/L	2/Month	Grab	
Suspended Solids, Total		mg/L	2/Month	Grab	
Nitrogen, Total Kjeldahl		mg/L	2/Month	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	2/Month	Grab	
Nitrogen, Nitrite + Nitrate Total		mg/L	2/Month	Grab	

Changes from Previous Permit:

In-plant limitations and monitoring requirements were evaluated for this permit term and no changes were required in this permit section.

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.

3 Land Treatment – Monitoring and Limitations

3.1 Sample Point Number: 001- EFFLUENT, Spray Irrigation

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	No discharge authorized December through March.
Hydraulic Application Rate	Monthly Avg	0 gal/ac/day	Monthly	Calculated	December through March.
Hydraulic Application Rate	Monthly Avg	10,000 gal/ac/day	Monthly	Calculated	April through November.
BOD5, Total	Monthly Avg	50 mg/L	Weekly	Grab	
Suspended Solids, Total		mg/L	Monthly	Grab	
pH Field		su	Monthly	Grab	
Nitrogen, Total		mg/L	Monthly	Grab	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Kjeldahl					
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	Grab	
Nitrogen, Organic Total		mg/L	Monthly	Calculated	
Nitrogen, Nitrite + Nitrate Total		mg/L	Monthly	Grab	
Nitrogen, Total		mg/L	Monthly	Calculated	
Chloride		mg/L	Monthly	Grab	
Solids, Total Dissolved		mg/L	Monthly	Grab	
Nitrogen, Max Applied On Any Zone	Annual Total	300 lbs/ac/yr	Annual	Total Annual	

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.

Nitrogen, max applied on any zone limit of 300 lbs/ac/yr added to the monitoring requirements.

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(2), Wis. Adm. Code. More information on the limitations can be found in the groundwater evaluation dated July 29, 2025.

Nitrogen, max applied on any zone limit of 300 lbs/ac/yr added to the monitoring requirements to ensure the discharge does not exceed the land treatment system's capacity to treat the discharged nitrogen and for consistency with other permitted land disposal systems.

4 Groundwater – Monitoring and Limitations

4.1 Groundwater Monitoring System for Spray Irrigation Field

Location of Monitoring system: SWQ, SEC 1, & SEQ SEC 2, T13N, R13E, FOX LAKE TWP

Groundwater Monitoring Well(s) to be Sampled: WT-02 (804), WT-03 (805), WT-01B (807), WT-04B (808)

Groundwater Monitoring Well(s) Used to Evaluate Background Groundwater Quality: WT-01B (807)

Groundwater Monitoring Well(s) Used for Point of Standards Application: None

Parameter	Units	Preventative Action Limit	Enforcement Standard	Frequency
Depth To Groundwater	feet	N/A	N/A	Monthly (October 1, 2025 – September 30, 2027) Quarterly (October 1, 2027 – September 30, 2030)
Groundwater Elevation	feet MSL	N/A	N/A	Monthly (October 1, 2025 – September 30, 2027) Quarterly (October 1, 2027 – September 30, 2030)
Chloride Dissolved	mg/L	125	250	Quarterly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	2.0	10	Quarterly
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Quarterly
Nitrogen, Organic Dissolved	mg/L	6.5	N/A	Quarterly
pH Field	su	8.8	N/A	Quarterly
Solids, Total Dissolved	mg/L	900	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.

ACLs for chloride and nitrite+nitrate removed and replaced by NR 140 Wis. Adm. Code standards.

Indicator parameter PALs updated using results from July 1, 2020 – June 30, 2025.

Depth to water and Groundwater Elevation sample frequency updated to monthly for the first two years of 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 Limit (PAL) values 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.

ACLs for chloride and nitrite+nitrate removed and replaced by NR 140 Wis. Adm. Code standards because the background concentrations of these parameters do not meet the criteria for the inclusion of ACLs in the permit.

Indicator parameter PALs updated using results from July 1, 2020 – June 30, 2025.

Depth to water and Groundwater Elevation sample frequency updated to monthly for the first two years of the permit to provide greater resolution on the fluctuation of groundwater elevations at the individual monitoring wells and between the monitoring wells.

For more information, please refer to the Groundwater Evaluation by Zach Watson dated July 29, 2025.

5 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)**
004	B	Liquid	Aerobic Digestion	Injection	Land Application	25 (2024 Permit Application)

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 land applying sludge from this facility

Is a priority pollutant scan required? **No, design flow is less than 5 MGD.**

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.

5.1 Sample Point Number: 004- 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	
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	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
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, Ammonia (NH3-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 2026.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2026.
PFOA + PFOS		µg/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 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.

PCB: Monitoring once in 2026 has been included in the permit. Sampling year updated.

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).

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.

6 Schedules

6.1 Land Treatment Annual Report

Required Action	Due Date
Submit Annual Land Treatment Report #1: Submit the Annual Land Treatment Report by January 31st for the previous calendar year. This annual report shall contain the results from monthly monitoring of the depth to water and groundwater elevations at the groundwater monitoring system.	01/31/2026
Submit Annual Land Treatment Report #2: Submit the Annual Land Treatment Report by January 31st for the previous calendar year. This annual report shall contain the results from monthly monitoring of the depth to water and groundwater elevations at the groundwater monitoring system.	01/31/2027
Submit Annual Land Treatment Report #3: Submit the Annual Land Treatment Report by January 31st for the previous calendar year. This annual report shall contain the results from monthly monitoring of the depth to water and groundwater elevations at the groundwater monitoring system.	01/31/2028
Submit Annual Land Treatment Report #4: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2029
Submit Annual Land Treatment Report #5: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2030

Explanation of Schedule

The permittee is required to submit the results from monthly depth to water and groundwater elevation monitoring along with a summary of the annual discharge to the land treatment system.

6.2 Land Treatment Management Plan

Required Action	Due Date
Land Treatment Management Plan Submittal: Submit a 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.	10/01/2026

Explanation of Schedule

A management plan is required for the land treatment system.

6.3 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Land Application Management Plan Submittal:	10/1/2027

Explanation of Schedule

An up-to-date Land Application Management Plan is required that documents how the permittee will manage the land application of biosolids consistent with ch. NR 204, Wis. Adm. Code.

Attachments

NR 140 Groundwater Evaluation Report by Zach Watson Hydrogeologist July 29, 2025.

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance.

Prepared By: Zach Watson Hydrogeologist Date: 8/15/2025

CORRESPONDENCE/MEMORANDUM

DATE: July 29, 2025 FILE REF: FIN 7171

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for WI DOC Fox Lake Correctional Institution WI-0060470-09

General Information and Treatment System Description

The Wisconsin Department of Corrections Fox Lake operates a wastewater treatment facility. The WWTF consists of a 3-channel oxidation ditch, activated sludge, suspended growth, biological treatment plant with a design flow capacity of 0.378 MGD. The lift station and all treatment and storage units are located outside the fenced inmate area. All sanitary system wastewater flows to the lift station where it is screened, sampled, metered and pumped to the oxidation ditch. The mixed liquor wastewater goes to one of two final clarifiers inside a pole building. The clarified effluent flows to one of three effluent holding ponds from which it is pumped seasonally (April – November) to a center pivot spray irrigation system onto a 124-acre spray irrigation field that is grass covered and maintained by Waupun State Farm. Sludge is stored on site in two open-air 750,000-gallon storage tanks with submersible mixers. Sludge is hauled and injected into approved land spreading sites as needed by contractors. Influent, discharge water to the storage lagoons, and spray irrigated effluent is monitored as required, and the four groundwater monitoring wells are sampled quarterly to evaluate groundwater quality.

Table 1 – Monitoring Requirements and Limitations – Spray Irrigation (Outfall 001)

Parameter	Current and Proposed Permit WI-0060470-09 and WI-0060470-10		
	Limit Type	Limits and Units	Sample Frequency
Flow Rate		MGD	Daily
Hydraulic Application Rate	Monthly Average (April – November)	10,000 gal/ac/day	Monthly
Hydraulic Application Rate	Monthly Average (December - March)	0 gal/ac/day	Monthly
BOD5, Total	Monthly Average	50 mg/l	Weekly
Total Suspended Solids		mg/l	Monthly
pH Field		su	Monthly
Total Kjeldahl Nitrogen		mg/l	***Monthly**
Total Ammonia Nitrogen		mg/l	Monthly
Total Organic Nitrogen		mg/l	Monthly
Nitrite+Nitrate Nitrogen		mg/l	Monthly
Total Nitrogen		mg/l	Monthly
Chloride		mg/l	Monthly

Total Dissolved Solids		mg/l	Monthly
***Nitrogen, Max Applied on Any Zone**	**Annual Total**	**300 lbs/ac/yr**	**Annual**

***Recommended changes for upcoming permit**

Table 2 –Spray Irrigation (Outfall 001) Groundwater Monitoring System

Sample Point	Well Name	Current Permit and Proposed WI-0060470-09 and WI-0060470-10	
		Well Location	Well Designation
804	WT-02	Downgradient	Non-point of Standards
805	WT-03	Downgradient	Non-point of Standards
807	WT-01B	Upgradient/Background	Non-point of Standards
808	WT-04B	Downgradient	Non-point of Standards

Table 3 – Spray Irrigation (Outfall 001) Groundwater Standards

Parameter	Current Permit WI-0060470-09		Proposed Permit WI-0060470-10	
	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
Chloride Dissolved	250 mg/l	250 mg/l	***125 mg/l**	250 mg/l
Nitrite+nitrate Dissolved	2.1 mg/l	10 mg/l	***2.0 mg/l**	10 mg/l
Ammonia Dissolved	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Organic Nitrogen Dissolved	2.4 mg/l	N/A	***6.5 mg/l**	N/A
pH Field	6.6 – 8.6 su	N/A	***6.8 – 8.8 su**	N/A
Total Dissolved Solids	850 mg/l	N/A	***900 mg/l**	N/A

***Recommended changes for upcoming permit**

Geology

The bedrock underlying the spray irrigation treatment system is Ordovician-aged Sinnipee Group consisting of the Galena, Decorah and Platteville Formations. These formations are primarily dolostones. The surface sediments are the Mendota and Plano silt loams. Depth to bedrock is 0 – 50 feet below ground surface in the area north of Fox Lake. The site-specific geology was thoroughly described in the October 1994 groundwater monitoring well installation report written by RUST Environment and Infrastructure. The following excerpt is from that report.

"*Based on observations noted during completion of the four boreholes (i.e., WT-01, WT-02, WT-03 and WT-04) silt and clay till blankets well graded gravel (GW) with silt and sand (outwash). The till is 12 feet thick at WT-01 and thins to the southwest, where it is two to six feet thick. Eight to 26 feet of outwash overlies dolomite bedrock. The outwash is thickest at WT-02, and thins to approximately eight feet at WT-04. Due to the mud rotary drilling technique, it was not possible to determine the exact rock/outwash interface depth. However, drilling was generally harder and slower once rock was encountered, and an estimate of this geologic contact is provided on each boring log. The top of bedrock is encountered between approximately 12 and 18 feet below ground surfac*e … *The dolomite bedrock and outwash are hydraulically connected as one unconfined aquifer."*

Hydrogeology

Regional groundwater flow is to the southwest towards Drew Creek and Fox Lake (**Figure 1**). Depth to groundwater is 15 – 45 feet below top of casing. Groundwater elevations are 930 – 960 feet above mean sea level (famsl) (**Figure 5**). An interpretation of the water table flow paths is presented as **Figure 2**. The groundwater elevations at the monitoring wells are variable. The groundwater elevation at WT-04B can change more than 10 feet between quarterly monitoring events. Fluctuations in groundwater elevation are consistent throughout the groundwater monitoring system.

The groundwater elevation at WT-03 has remained effectively stable during the past 25 years of monitoring (**Figure 5**). The operators for the facility have been measuring depth to water at the groundwater monitoring wells to the nearest tenth to half of a foot. Most often the measurements at WT-03 are to the nearest half of a foot. It is possible that groundwater elevation at WT-03 is very stable and that the fluctuations that do occur are not documented at that resolution (depth to water measurements should be made to the nearest hundredth of a foot). To verify the reported depth to water measurements at WT-03, WDNR hydrogeologist Zach Watson collected a depth to water measurement along with the WI DOC Fox Lake wastewater operator and WDNR compliance engineer during a site inspection on June 9, 2025 and the depth was 24.13' feet below top of casing. This depth to water measurement was consistent with the prior reported values of ~24 feet below top of casing. The hydraulic conductivity at WT-03 in the 1994 monitoring well installation report was 1.8×10^{-6} – 5.0×10^{-6} cm/sec. The hydraulic conductivity for monitoring well WT-04, which appears to have been replaced by WT-04B due to lack of water, was similar to slight lower at 3.5×10^{-7} – 1.1×10^{-6} cm/sec. WT-02, which exhibits a more typical fluctuation in groundwater elevation, had a reported hydraulic conductivity of 1.1×10^{-3} – 2.3×10^{-3} cm/sec.

The monitoring wells are constructed to depths of 33.6' (WT-02), 34.2' (WT-03), 66.7' (WT-01B), and 58.5' (WT-04B) below top of casing. The top of screen elevation at the monitoring wells are 941.5 famsl (WT-02), 947.3 famsl (WT-03), 933.8 famsl (WT-01B) and 930 famsl (WT-04B). Comparing these values with the reported groundwater elevations (**Figure 5**) indicate that the screen is routinely submerged by approximately 20 feet at WT-01B and almost always submerged at WT-02, WT-03 and WT-04B. The following is an excerpt from the prior groundwater evaluation dated August 4, 2020.

"Dolomite bedrock is present between 12-20 feet below ground surface at the site. Monitoring wells WT-02, WT-03 are screened just slightly below the water table elevations measured to date, while the well screens for monitoring wells WT-04B and WT-01B are approximately 10 ft. and 23 ft. below the average water table elevations measured to date. Thus, monitoring wells WT-04B and especially WT-01B could be considered piezometer sampling points instead of water table wells because they are screened below the water table like a piezometer. The data collected from piezometers are generally used to measure groundwater quality and elevations from a specific zone in the aquifer below the water table then wells screened at the water table. Furthermore, sampling results may be different if the well screens for WT-01B and WT-04B more closely intersected the water table like WT-2 and WT-03.

However, after reviewing the boring logs, well construction and development reports it appears as if WT-01B and WT-04B were installed in 1995 to replace WT-01 and WT-04 likely due to sample collection issues with being dry or purged dry during monitoring events due to the low porosity of the dolomite. Monitoring wells WT-01B and WT-04B were installed deeper and with a longer well screen (15ft) in order to avoid the water sample collection issue. Based on the reports it also appears as though all the wells in the monitoring system are intersecting the same unconfined dolomite bedrock formation which is ~80 ft. thick in this area. Therefore, monitoring wells WT-01B and WT-04B are appropriately screened and the groundwater data collected from

these are an accurate measure of elevations and groundwater quality of a water table observation well given the geological environment. Furthermore, the monitoring well system has appropriately located down gradient wells to capture any potential groundwater impacts from the land treatment system."

Land Treatment Effluent Quality and Loading Rates

As calculated from certified eDMR reporting, the total annual discharge to the spray irrigation field ranged between 63 – 78 MG/yr during the past five years (**Table 4**). Nitrogen is mostly in the form of organic nitrogen and then to a lesser extent ammonia and nitrite+nitrate nitrogen (**Figure 3**). Total Kjeldahl nitrogen concentrations averaged 1.4 – 4.3 mg/l (**Table 5**). Nitrite+nitrate concentrations are typically low but there was a spike in concentrations in 2022 and 2023 (**Figure 3**). The overall loading of nitrogen to the spray irrigation field is low and ranged 10.2 – 67.2 lbs/ac/yr (**Table 4**). The concentration of chloride in the effluent was lower at the beginning of the permit term and has increased to an average of almost 200 mg/l in 2024 (**Figure 4**). The loading of chloride to the spray irrigation fields averaged 359.8 – 901.6 lbs/ac/yr (**Table 4**). The concentration of BOD is very low and ranged an average of 3.5 – 7.7 mg/l (**Table 5**). Total dissolved solids are generally low and averaged between 288 – 605 mg/l.

Table 4 – Spray Irrigation (Outfall 001) Hydraulic Loading

Year	Annual Total Discharge (MG/yr)	Annual Total Nitrogen Load (lbs/ac/yr)	Annual Total Chloride Load (lbs/ac/yr)
2020	72.3	10.2	359.8
2021	74.8	16.6	472.9
2022	63.0	33.5	745.8
2023	78.1	67.2	830.0
2024	67.7	15.0	901.6

Table 5 – Spray Irrigation (Outfall 001) Annual Average Concentrations

Year	TDS (mg/l)	Total Kjeldahl Nitrogen (mg/l)	Nitrite+Nitrate (mg/l)	BOD (mg/l)	Chloride (mg/l)
2020	288	2.0	0.1	3.5	74
2021	351	2.8	0.5	3.7	94
2022	588	1.4	6.5	3.9	176
2023	584	4.3	8.5	7.7	158
2024	605	2.3	1.0	5.7	198

Background Groundwater Quality

Background groundwater quality is defined by the results from samples collected at WT-01B. WT-01B is located at the northeast corner of the 124-acre spray irrigation field. The results for chloride are elevated at WT-01B and relatively stable between quarterly monitoring events (**Figure 7**). Chloride was most often 95 mg/l in samples collected at WT-01B. The concentration of nitrite+nitrate was non-detect except for two anomalous sample results of 0.78 mg/l and 18 mg/l (June 2024) (**Figure 8**). The concentration of ammonia was non-detect in all samples (**Figure 9**). The concentration of organic nitrogen is typically less than 1 mg/l except for an anomalous result of 8.7 mg/l in September 2024. The results for total dissolved solids are like chloride in stability over time and were often around 600 mg/l (**Figure 6**).

Downgradient Groundwater Quality

Downgradient groundwater quality is characterized by the results from samples collected at WT-02, WT-03 and WT-04B. The results for chloride are relatively consistent between the monitoring wells where they appear to change and vary in relative unity. The results for total dissolved solids were similar in that the change in concentration was mostly consistent between monitoring wells. The concentration of total dissolved solids was around 400 mg/l during recent sampling events. The results for nitrite+nitrate are variable at WT-02 and WT-03 and fell between 2 – 5 mg/l in 2024. Nitrite+nitrate is non-detect at WT-04B. The concentration of ammonia was non-detect in all samples at all wells. Organic nitrogen was typically less than 1 mg/l at the downgradient monitoring wells except for a slight increase to around 1 – 2 mg/l in 2021 and an anomalous result at WT-03 of 4 mg/l in 2022.

Treatment System Impact to Groundwater Quality

The loading of chloride to the spray irrigation field is high enough to expect to see some impact to local groundwater quality. Curiously, over the period of 2022 – 2024, the concentration of chloride at downgradient monitoring wells decreased while the concentration of chloride in the effluent increased. Additionally, while the effluent concentrations of chloride have been higher than those observed at the background well (WT-01B), the concentration of chloride is consistently lower at all downgradient monitoring wells. Given the depth of WT-01B relative to the water table, and the difference in fluctuation and concentration of chloride, this monitoring well appears to be capturing a different zone.

The loading of nitrogen to the spray irrigation fields (10 – 70 lbs/ac/yr) is low enough that the cover crop itself should be able to process all of the nitrogen discharged. Additionally, because most of the nitrogen is organic nitrogen, it should have a lower potential to leach from the soil into the water table. The concentration of BOD is very low and not expected to have any meaningful impact. Overall, there is no distinct negative impact on local groundwater quality due to the discharge of treated wastewater to the spray irrigation field.

The geologic setting underlying the spray irrigation field makes appropriate groundwater monitoring well installation difficult as the fracture networks in dolostone bedrock are difficult to predict. Therefore, this current groundwater monitoring system is generally acceptable as it could take multiple iterations to install a monitoring well that intersects the water table and has an adequate water supply (as evidenced by WT-01 and WT-04 being abandoned and replaced for this reason). Because the concentration of chloride and the fluctuation in chloride is very similar at WT-02, WT-03 and WT-04B, and similarly with total dissolved solids, it is interpreted that these monitoring wells are monitoring the same portion of groundwater surrounding the spray irrigation field. The significant differences in the fluctuation of groundwater elevation between the wells are interpreted to be due to the different dolostone bedrock fracture networks that these individual wells encountered during installation. The effectively stable groundwater elevation at WT-03 is interpreted to be a result of the unique fracture network at this monitoring well. It is expected that once the operator monitors groundwater elevation at WT-03 down to the nearest hundredth of a foot that the fluctuation in groundwater elevation will become apparent and is likely to fluctuate in unison, but not in magnitude, with the other monitoring wells.

Indicator Parameter PALs

Indicator Parameter Preventive Action Limits (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 WT-01B during the prior permit term. The indicator parameter PALs for use in the upcoming permit WI-0060470-10 are presented in **Table 3** and were calculated using results from WT-01B (July 1, 2020 - June 30, 2025).

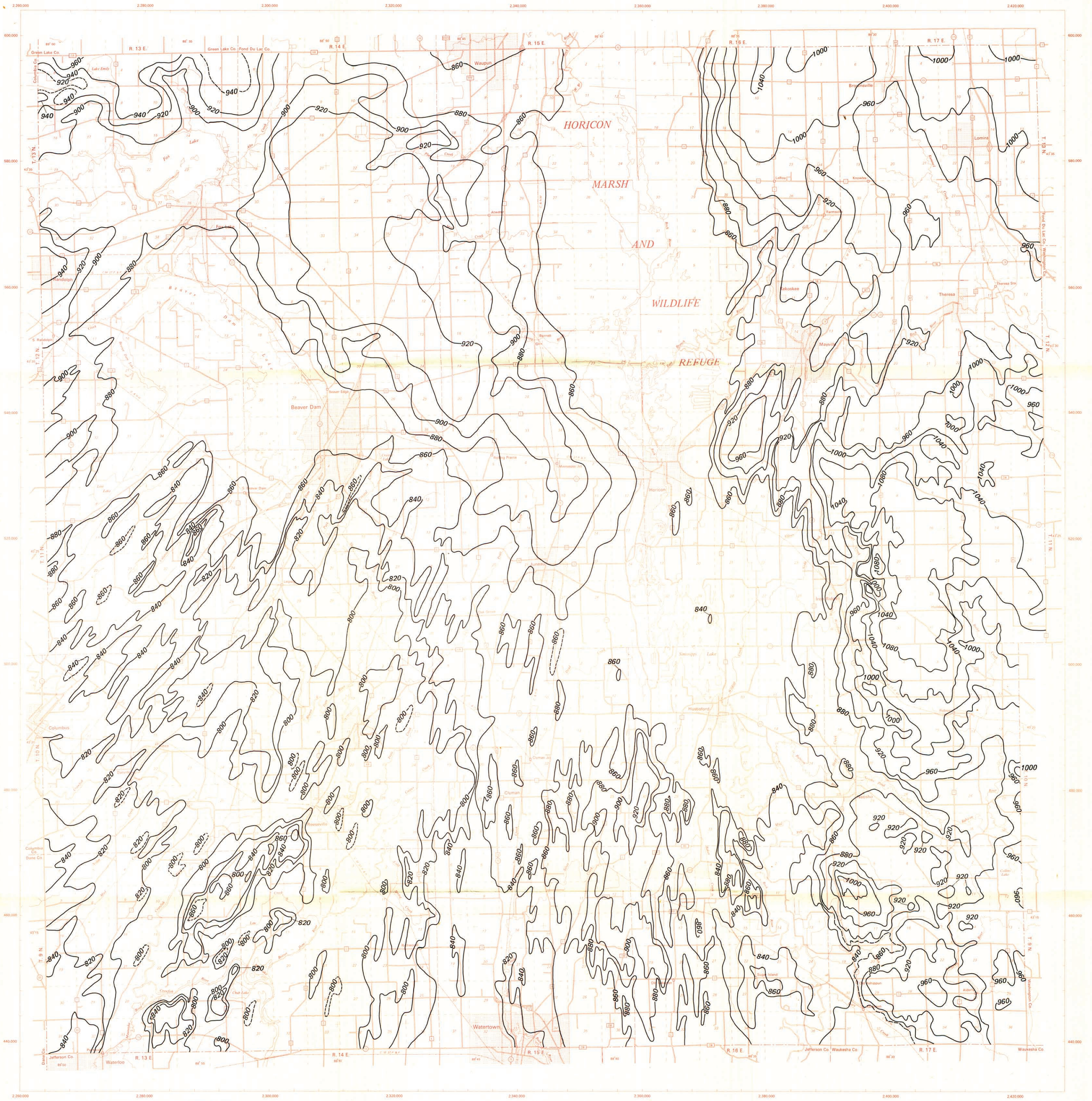
Alternative Concentration Limits

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". Individual ACLs for chloride and nitrite+nitrate are not provided in the upcoming permit term as the background concentrations are low.

Conclusions, Recommendations and Schedule Requirements

- Measurements of depth to water at the groundwater monitoring wells as collected by the operator are most often to the nearest half of a foot. Depth to water must be measured to the nearest hundredth of a foot to more accurately characterize the change in groundwater elevation over time. These measurements are especially important at WT-03 where it appears that the fluctuations occurring are very small.
- WI DOC Fox Lake shall monitor depth to water at all monitoring wells monthly for the first two years of the permit term to develop a dataset that allows for a more thorough review of groundwater elevation variation at this groundwater monitoring system. This data can be reported annually along with the Land Treatment Annual Report.
- While the annual loading of nitrogen to the spray irrigation field is low and is expected to remain so, an annual maximum nitrogen loading limit of 300 lbs/ac/yr should be placed on the spray irrigation field for consistency with all other permitted spray irrigation fields in WPDES permits.
- Given the recent increases in the concentration of chloride in the spray irrigation effluent, WI DOC Fox Lake should work to reduce their chloride concentrations generated at the correctional facility to below the NR 140 preventive action limit of 125 mg/l to ensure that they continue to protect groundwater quality in terms of chloride into the future.
- WI DOC Fox Lake should develop a Land Treatment Management Plan and submit this within one year of permit reissuance.

Figure 1 – Water Table Map of Dodge County, Wisconsin, 1977



Base from Wisconsin Geological and Natural History Survey

Lambert Conformal Projection 4000 foot grid based on Wisconsin Coordinate System, Southern Zone

Water-table contour ——— 820 ———

Shows altitude of water-table. Contour interval 20 feet west of the Rock River, 40 feet east of the Rock River. Datum is sea level

SCALE 1:125 000

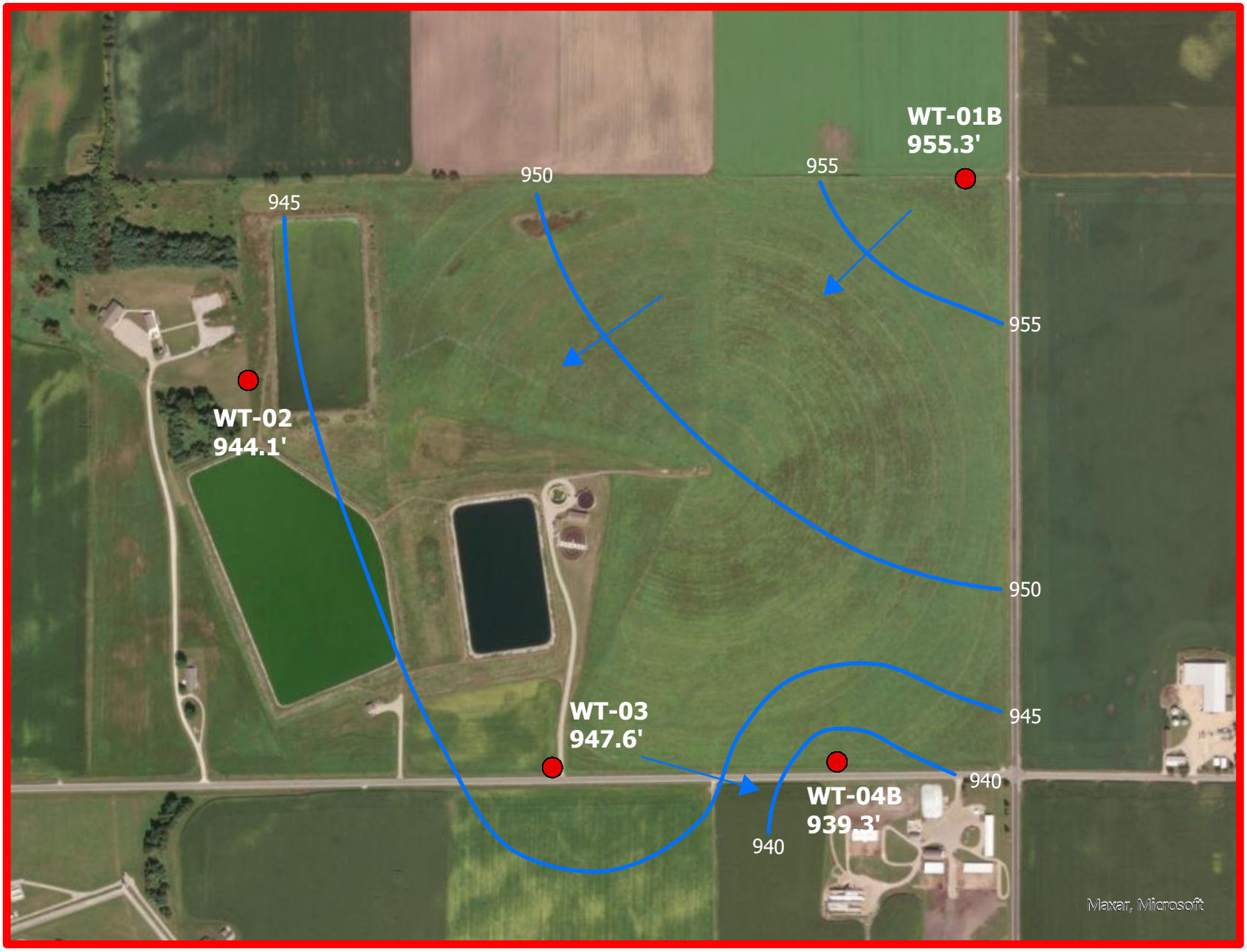
5 4 3 2 1 0 5 MILES

5 4 3 2 1 0 5 10 KILOMETERS

Plate 1. Water-table map of Dodge County, Wisconsin, 1977.

Figure 2 – Water Table Flow Map – April 16, 2025

Water Table Elevations April 16th, 2025 - WI DOC Fox Lake



Site Location

W10237 Lake Emily Rd,
Fox Lake, WI 53933

Legend

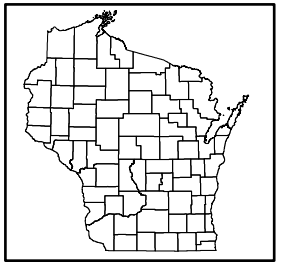
Water Table Contour (4/16/2025 - 5' FAMSL)

Groundwater Flow Direction

Notes

Water table contours are hand drawn using the reported elevations in feet above mean sea level collected on April 16, 2025.

Created By: watsoz
Date: 7/21/2025



0 210 420 630 840 1,050 1,260 Feet

1:7,500

Figure 3 – Effluent Nitrogen Species

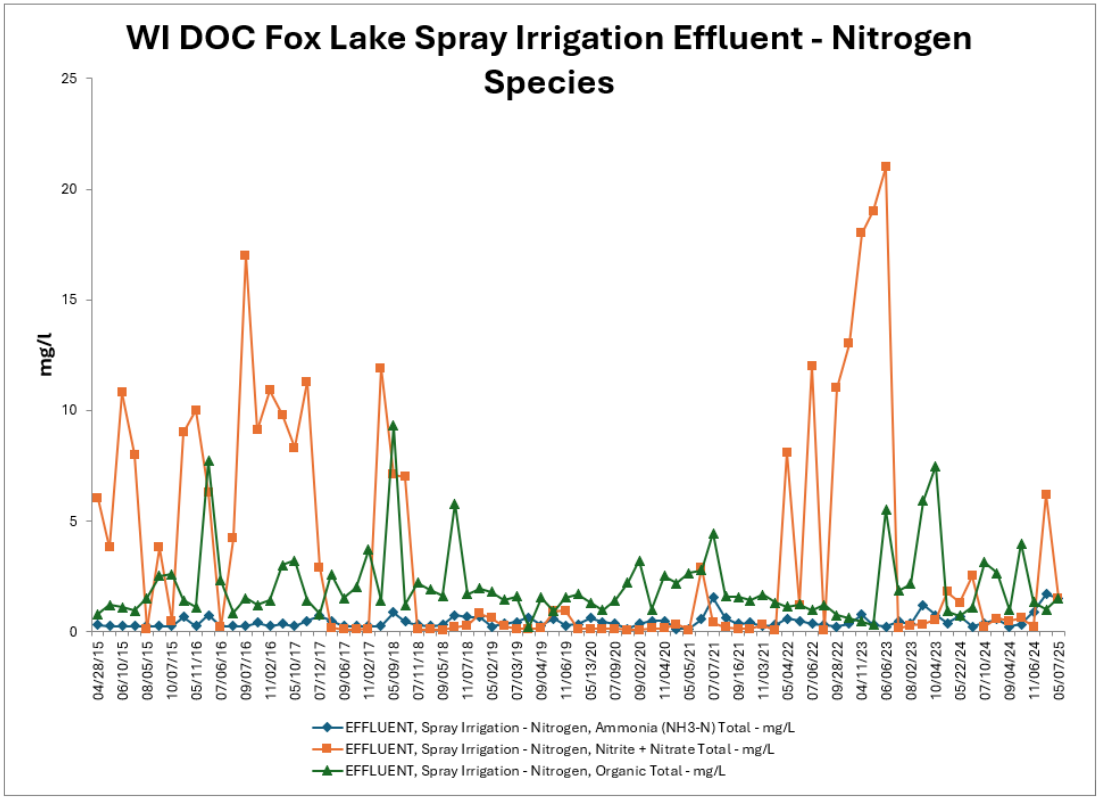


Figure 4 – Effluent Chloride

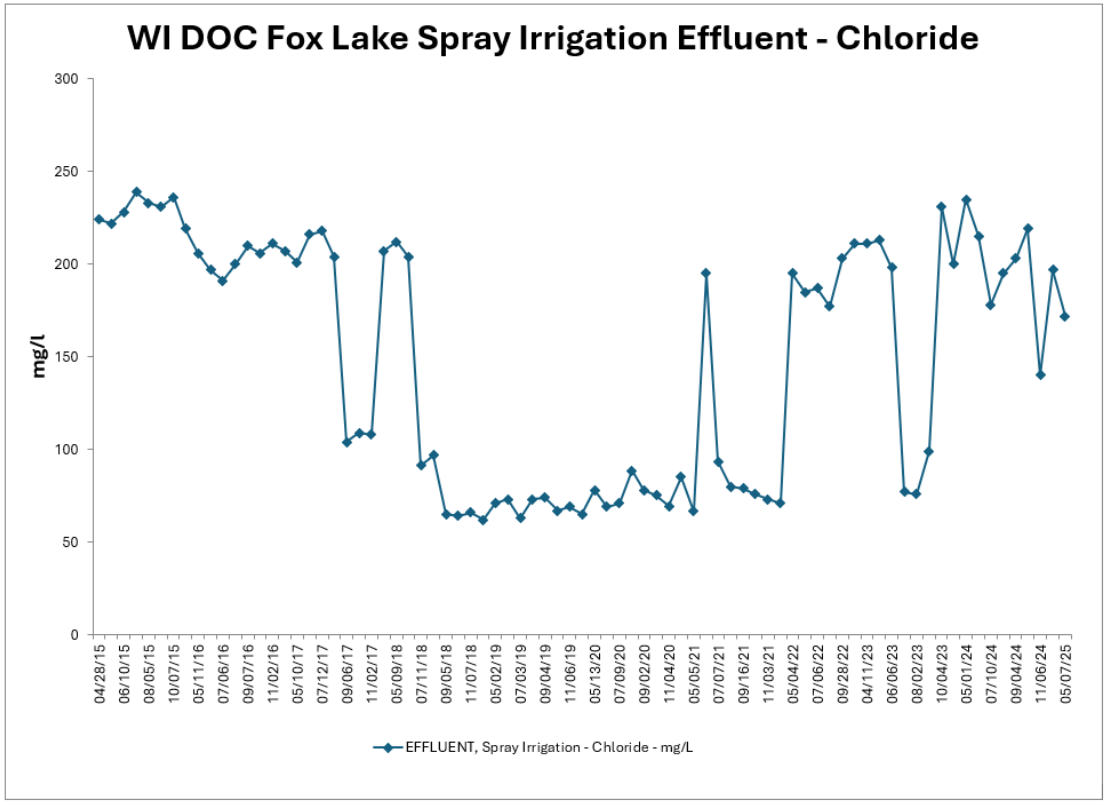


Figure 5 – Groundwater Monitoring Wells Groundwater Elevation

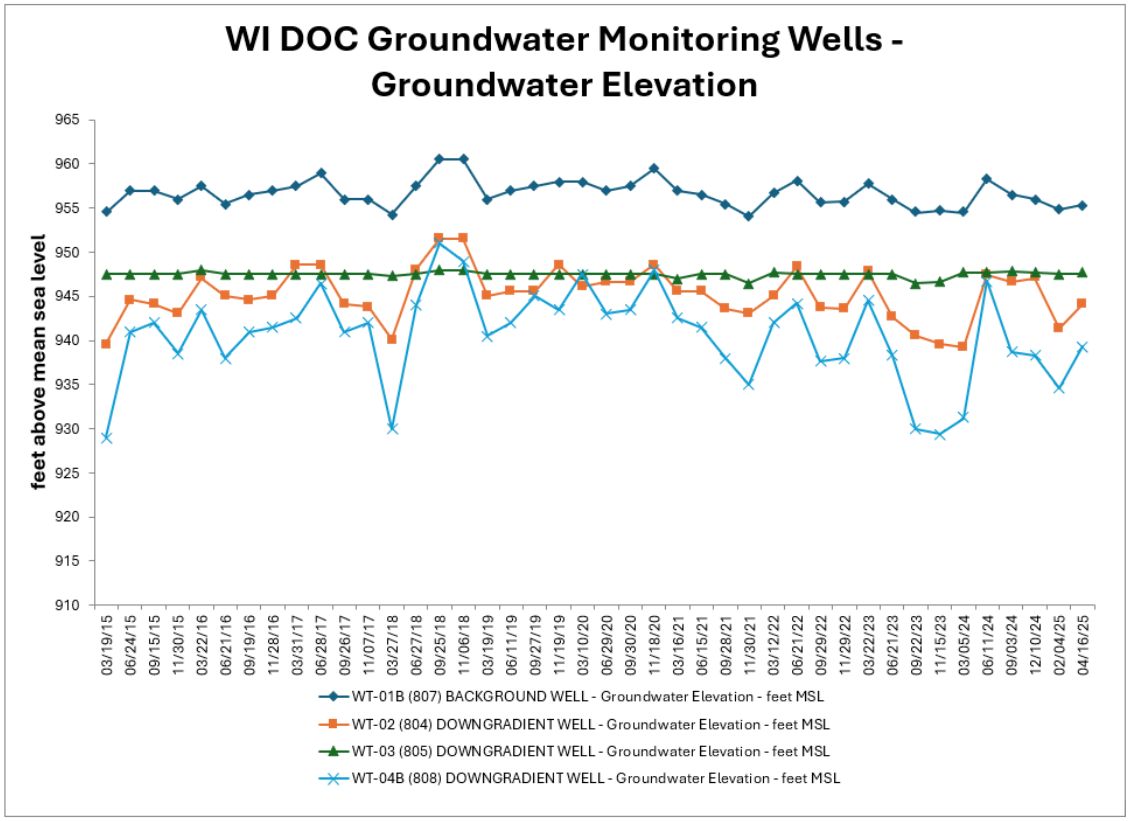


Figure 6 – Groundwater Monitoring Wells Total Dissolved Solids

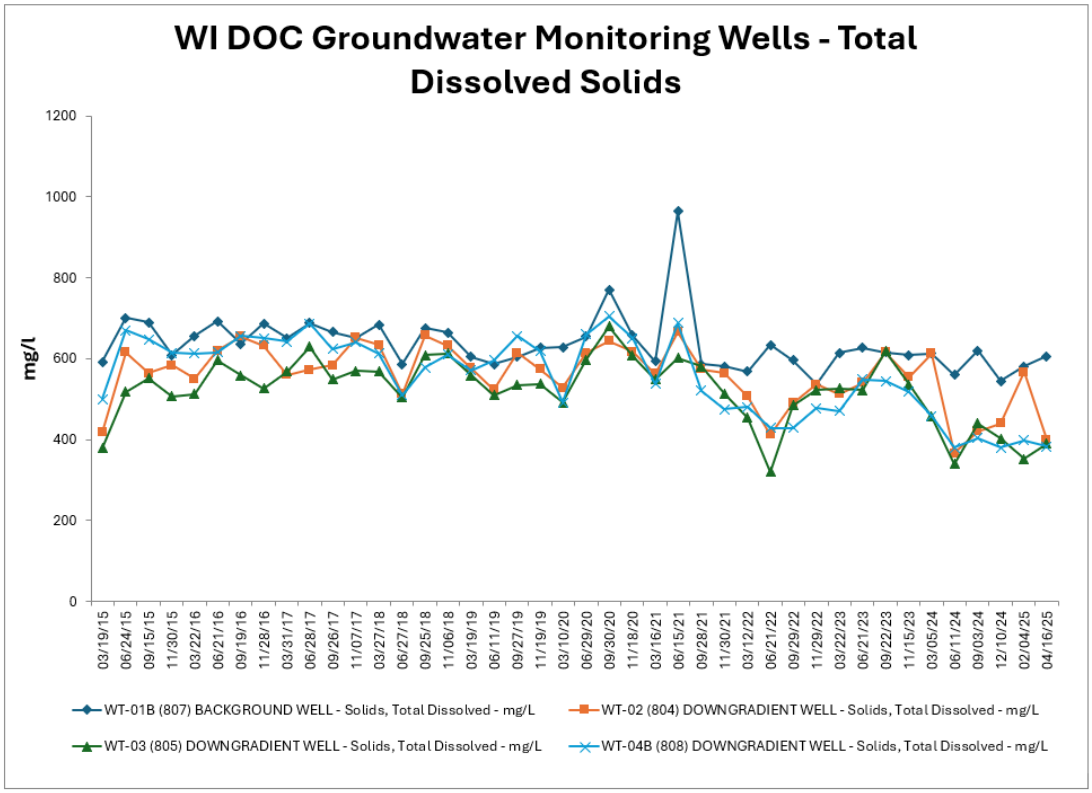


Figure 7 – Groundwater Monitoring Wells Chloride

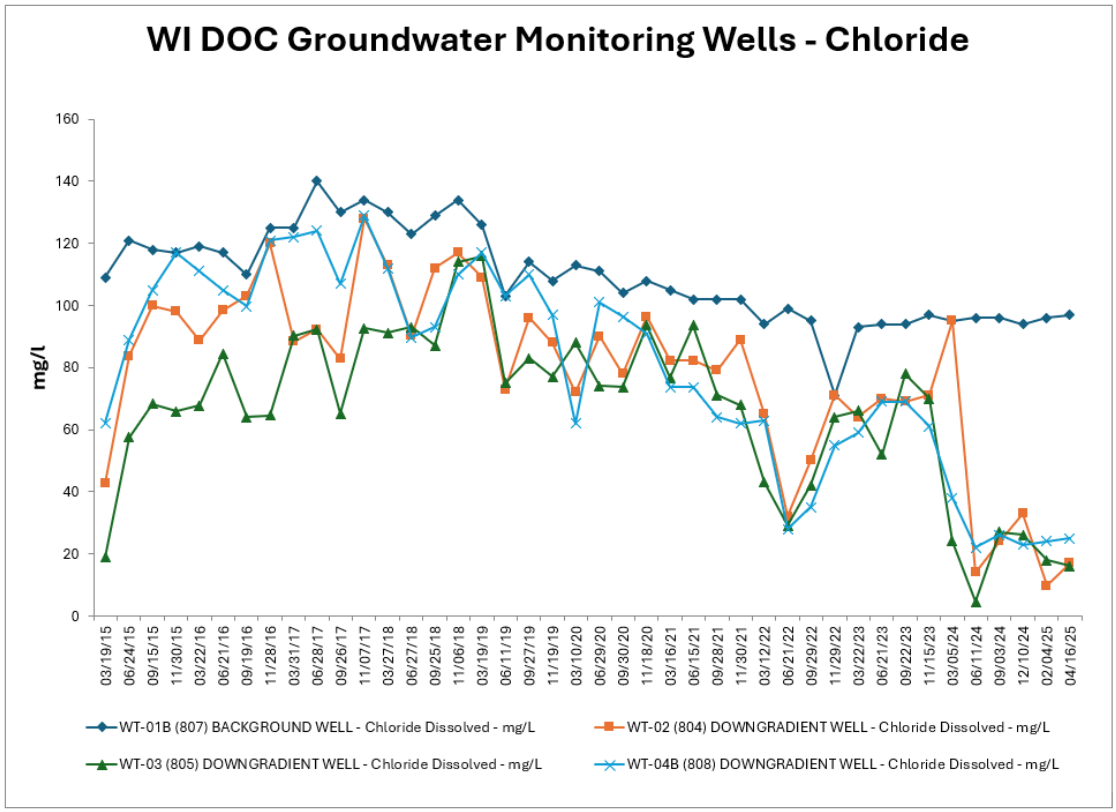


Figure 8 – Groundwater Monitoring Wells Nitrite+nitrate

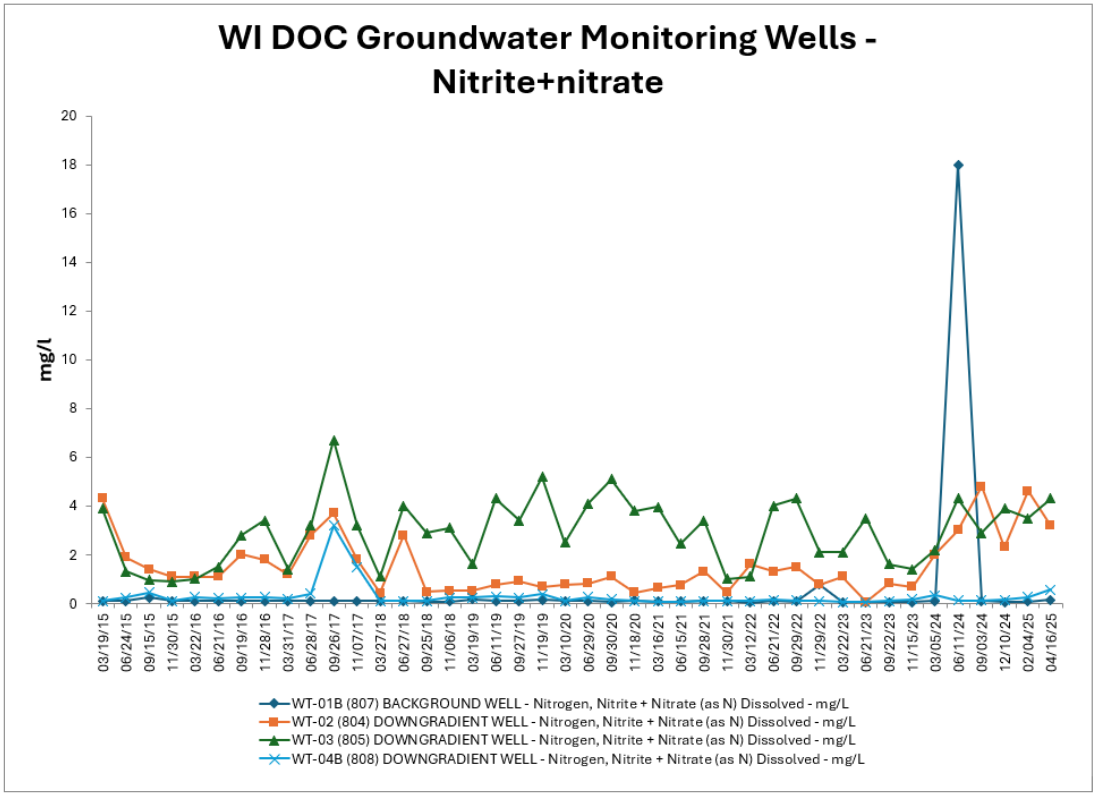


Figure 9 – Groundwater Monitoring Wells Ammonia