

Permit Fact Sheet

General Information

Permit Number:	WI-0060534-10-0	
Permittee Name:	SAUK PRAIRIE SEWERAGE COMMISSION	
Address:	335 Galena Street	
City/State/Zip:	Prairie du Sac WI 53578	
Discharge Location:	SE ¼ of NE ¼, Section 14 & NW ¼ & SW ¼ of NW ¼, Section 13, T9N R6E	
Receiving Water:	Groundwater of the Lower Wisconsin River Basin (Honey Creek Watershed, LW16 – Lower Wisconsin River Basin) and the Wisconsin River in Sauk County	
Discharge Type:	Existing, Continuous	
Design Flow(s)	Annual Average	0.822 MGD
Significant Industrial Loading?	McFarlane Manufacturing Co., Milwaukee Valve Corporation, Vintage Brewing Co.	
Operator at Proper Grade?	Facility is Basic with subclasses A4 – Ponds, Lagoons, & Natural Systems, SS – Sanitary Sewage Collection System. One operator is certified.	
Approved Pretreatment Program?	N/A	

Facility Description

The Sauk Prairie Sewerage Commission serves the Villages of Sauk City and Prairie du Sac with a combined population of approximately 8,300 residents with three industrial contributors. Treatment consists of two aerated lagoons, using both surface and subsurface aerators, followed by an effluent holding/settling pond. Treated effluent is discharged to one of seven seepage cells. The facility is designed to treat an average of 822,000 gallons per day of domestic, commercial, and industrial wastewater. It presently receives 520,000 gallons per day and discharges 550,000 gallons per day. Four groundwater monitoring wells are sampled quarterly to evaluate groundwater quality. The seepage cells are located approximately 200 – 800 feet north of the Wisconsin River. Lagoon sludge was removed from the settling pond and aeration pond 1 in 2018, and from aeration pond 2 in 2019.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, land application reports, compliance schedule items, and a site visit on December 15, 2023, this facility has been found to be in substantial compliance with their current permit.

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	0.52 MGD (Average 2023)	Influent: 24-hr flow proportional composite samples shall be collected from the force main between the control building and the

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
		first pond. A magnetic flow meter is in the same location.
001	0.55 MGD (Average Sept. 2019 -Nov. 2023)	Effluent: Representative grab samples shall be collected at the splitter box of the discharge from the settling pond prior to the seepage cells. Flow is monitored by a Transit Time Flow Meter on the discharge pipe from the settling pond.
004	380 Dry US Tons (2023 Permit Application)	Liquid, Class B. Representative lagoon sludge sample.

Sample Point Designation For Groundwater Monitoring Systems			
System	Sample Pt Number	Well Name	Comments
Absorption Pond (Seepage Cell)	801	MW-1 (801) BACKGROUND WELL	Non-point of Standards
	803	MW-3 (803) DOWNGRAIENT WELL	Non-point of Standards
	804	MW-4 (804) DOWNGRAIENT WELL	Non-point of Standards
	806	MW-5 (806) DOWNGRAIENT WELL	Non-point of Standards

1 Influent – Monitoring Requirements

Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	2/Month	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Month	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Total Kjeldahl		mg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Organic Total		mg/L	Monthly	Calculated	

Changes from Previous Permit:

Flow: The sample frequency has changed to ‘Daily’ for eDMR reporting purposes.

Explanation of Limits and Monitoring Requirements

Requirements for land treatment of municipal wastewater are determined in accordance with ch. NR 206, Wis. Adm. Code.

2 Land Treatment – Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Total Daily	
CBOD5	Monthly Avg	45 mg/L	Weekly	Grab	
Suspended Solids, Total		mg/L	2/Month	Grab	
Solids, Total Dissolved		mg/L	Monthly	Grab	
pH Field		su	Weekly	Grab	
Dissolved Oxygen		mg/L	Monthly	Grab	
Nitrogen, Total Kjeldahl		mg/L	Monthly	Grab	
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	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total		mg/L	Monthly	Grab	
Chloride		mg/L	Monthly	Grab	

Changes from Previous Permit:

Flow: The sample frequency and type have been updated for eDMR reporting purposes.

CBOD5: The sample frequency has been updated.

Dissolved Oxygen: Monitoring has been included.

Phosphorus: Monitoring has been included.

Explanation of Limits and Monitoring Requirements

Requirements for land treatment of municipal wastewater are determined in accordance with ch. NR 206 Wis. Adm. Code. More information on the limitations can be found in the Groundwater Evaluation for Sauk Prairie Sewerage Commission WI-0060534-09 memo dated October 14, 2024, prepared by Zach Watson, Hydrogeologist and used for this reissuance.

Dissolved Oxygen and Phosphorus monitoring has been included to evaluate potential impact to surface water quality.

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 fairness and 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.

3 Groundwater – Monitoring and Limitations

3.1 Groundwater Monitoring System for Absorption Pond (Seepage Cell)

Location of Monitoring system: NWQ & SWQ, NWQ, S13 & SEQ, NEQ, S14, T9N, R6E

Groundwater Monitoring Well(s) to be Sampled: MW-1 (801) BACKGROUND WELL, MW-3 (803) DOWNGRADIENT WELL, MW-4 (804) DOWNGRADIENT WELL, MW-5 (806) DOWNGRADIENT WELL

Groundwater Monitoring Well(s) Used to Evaluate Background Groundwater Quality: MW-1 (801) BACKGROUND WELL

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

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

Parameter	Units	Preventative Action Limit	Enforcement Standard	Frequency
BOD5, Total	mg/L	N/A	N/A	Quarterly
Suspended Solids, Total	mg/L	N/A	N/A	Quarterly
pH Field	su	7.1	N/A	Quarterly
Dissolved Oxygen	mg/L	N/A	N/A	Quarterly
Chloride Dissolved	mg/L	125	250	Quarterly
Nitrogen, Nitrite + Nitrate (as N) Dissolved	mg/L	27.2	27.2	Quarterly
Nitrogen, Total Kjeldahl Dissolved	mg/L	N/A	N/A	Quarterly
Nitrogen, Ammonia Dissolved	mg/L	0.97	9.7	Quarterly
Nitrogen, Organic Dissolved	mg/L	2.7	N/A	Quarterly
Solids, Total Dissolved	mg/L	820	N/A	Quarterly
Phosphorus, Total	mg/L	N/A	N/A	Quarterly

Changes from Previous Permit:

BOD5, Total Suspended Solids, & DO: Monitoring for these parameters is included in the permit.

Nitrite + Nitrate, Nitrogen, Chloride, pH, Organic Nitrogen, and Total Dissolved Solids: The PALs, ES and/or ACL have been updated using data from the prior permit term.

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. More information on the limitations can be found in the Groundwater Evaluation for Sauk Prairie Sewerage Commission WI-0060534-09 memo dated October 14, 2024, prepared by Zach Watson, Hydrogeologist and used for this reissuance.

BOD5, TSS, and DO monitoring have been included to evaluate potential impacts to surface water quality.

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)
004	B	Liquid	Fecal Coliform	Injection	Land Application	380
Does sludge management demonstrate compliance? Yes.						
Is additional sludge storage required? No.						

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)
<p>Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? Yes.</p> <p>Sauk City Waterworks, Well #CN884, Result 2.4 pCi/l, May 2020 Prairie Du Sac Waterworks, Well #WQ168, Result 2 pCi/l, April 2020</p> <p>If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility</p>						
<p>Is a priority pollutant scan required? No, design flow is less than 5 MGD.</p> <p>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.</p>						

Sample Point Number: 004- LAGOON SLUDGE

Monitoring Requirements and Limitations

Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Solids, Total		Percent	Once	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Once	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Once	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Once	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Once	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Once	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Once	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Once	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Once	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Once	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Once	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Once	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Once	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Once	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Once	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Once	Composite	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Total Kjeldahl		Percent	Once	Composite	Once when land application occurs.
Nitrogen, Ammonium (NH4-N) Total		Percent	Once	Composite	Once when land application occurs.
Phosphorus, Total		Percent	Once	Composite	Once when land application occurs.
Phosphorus, Water Extractable		% of Tot P	Once	Composite	Once when land application occurs.
Potassium, Total Recoverable		Percent	Once	Composite	Once when land application occurs.
Radium 226 Dry Wt		pCi/g	Once	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	
PFOA + PFOS		ug/kg	Once	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Once	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

List 2 Nutrients: Monitoring has been added should land application occur and for planning purposes.

Radium-226: Monitoring is included in the permit.

PFAS: Monitoring in 2026 is included in the permit pursuant s. NR 204.06(2)(b)9, Wis. Adm. Code.

Explanation of Limits and Monitoring Requirements

Requirements for 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), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07(7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis Adm. Code. Radium requirements are addressed in s. NR 204.07(3)(n), Wis. Adm. Code.

List 2 Nutrients: Monitoring for List 2 (nutrients) is highly recommended at the same time as the monitoring of List 1 (metals) in year 2 of the permit term (2026). Results will assist in the determination of the acres needed for land application of sludge should it be necessary. The number of acres needed is also required for the Land Application Management Plan Schedule (see schedules for more information). List 2 nutrient sampling is required when land application occurs.

Water Extractable Phosphorus: Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that “tie-up” phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin’s nutrient management plan (NMP) requirements, the accounting of all fertilizers must be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

Radium-226: Wells from each water supply contain levels of Radium-226 greater than or equal to 2 pCi/liter.

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and expects to release this risk assessment by the end of 2024. In the interim, the department has developed the “Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS”.

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 the proposed WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

Change in form submittal: In prior permit reissuances when it has been noted in the application that sludge would not be removed during the permit term, the department required sampling during the second year of the permit term and the sludge characteristic report (3400-049) would be generated only during that year. Due to moving to electronic submittal of forms via Switchboard, forms 3400-049 (“Characteristics Report”), 3400-052 (“Other Methods of Disposal”) and 3400-055 (“Annual Land Application”) will now be generated by the department and the permittee will be required to submit all three reports each year of the permit term. This change was adopted to provide the permittee flexibility because many lagoon desludging projects can be unexpected, are delayed or staggered over multiple years. Additionally, it is used to officially report that no land application of sludge has occurred, and annual submittal of the forms is required per the standard requirements section.

5 Schedules

5.1 Chloride Reduction Progress Reports

Required Action	Due Date
Chloride Reduction Progress Report: Submit a chloride reduction progress report to the department. The report shall include a detailed discussion of steps taken to reduce chloride loading to the treatment plant.	12/31/2025
Chloride Reduction Progress Report: Submit a chloride reduction progress report to the department. The report shall include a detailed discussion of steps taken to reduce chloride loading to the treatment plant.	12/31/2026
Chloride Reduction Progress Report: Submit a chloride reduction progress report to the department. The report shall include a detailed discussion of steps taken to reduce chloride loading to the treatment plant.	12/31/2027
Chloride Reduction Progress Report: Submit a chloride reduction progress report to the department. The report shall include a detailed discussion of steps taken to reduce chloride loading to the treatment plant.	12/31/2028

Chloride Reduction Progress Report: Submit a chloride reduction progress report to the department. The report shall include a detailed discussion of steps taken to reduce chloride loading to the treatment plant.	12/31/2029
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Explanation of Schedule

The permittee has been implementing a chloride reduction program to address elevated chloride levels in the effluent from the plant and in the groundwater downgradient from the land treatment system. The permittee should continue to submit annual Chloride Reduction Progress Reports and continue their efforts towards identifying the primary sources of chloride in their influent.

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 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.	12/31/2025

Explanation of Schedule

A land treatment management plan shall be submitted to the department for approval in the first year of the permit term.

5.3 Desludging Management Plan

Required Action	Due Date
Desludging Management Plan Submittal: The permittee shall submit a management plan for approval if removal of the sludge will occur during this permit term. At a minimum, the plan shall address how the sludge will be sampled, removed, transported, and disposed of. No desludging may occur unless approval by the Department is obtained. Daily logs shall be kept that record where the sludge has been disposed. The plan is due sixty (60) days prior to desludging.	

Explanation of Schedule

If desludging of the lagoons is proposed, a plan needs to be developed that clearly explains how the sludge will be removed, what contingencies are in place, and the type of equipment to be used. Since earthen lined lagoons are in place, proper procedures need to be taken to not injure the liners. If the lagoons are to be de-sludged during this permit term, a management plan needs to be submitted sixty (60) days prior to desludging. At minimum, this plan should address how the sludge will be sampled, removed, transported, and disposed of. An outline is available to assist in plan development.

5.4 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Land Application Management Plan Submittal: If the permittee proposes to land apply sludge, a management plan shall be submitted and approved by the Department. The management plan shall be consistent with the requirements of this permit, and s. NR 204.07, Wis. Adm. Code. At a minimum, the plan shall describe how the application rate has been calculated as well as how the sludge will be land applied and incorporated. Record keeping and tracking of site loadings shall also be described.	

Requests for land application site approvals shall also be included. The plan is due sixty (60) days prior to land applying.	
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Explanation of Schedule

If the permittee wishes to land apply sludge from the lagoons during the permit term, they must submit a plan detailing how the sludge will be handled and where it will be applied for the department to approve. The plan must be submitted at least sixty (60) day prior to sludge being applied.

Special Reporting Requirements

None.

Other Comments:

None.

Attachments:

NR 140 Groundwater Evaluation Report, date October 14, 2024

Expiration Date:

December 31, 2029

Justification Of Any Waivers From Permit Application Requirements

No waivers were requested or given from permit application requirements.

Prepared By: BetsyJo Howe, Wastewater Specialist

Date: 8//20/2024; 9/19/2024

Updated (based on fact check comments): Editorial changes for clarity. 10/18/2024

Updated (based on public notice comments):

CORRESPONDENCE/MEMORANDUM

DATE: October 14, 2024

FILE REF: FIN 7324

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for Sauk Prairie Sewerage Commission WI-0060534-09

General Information and Treatment System Description

The Sauk Prairie Sewerage Commission serves the Villages of Sauk City and Prairie du Sac with a combined population of approximately 7,400 residents with three industrial contributors. Treatment consists of two aerated lagoons, using both surface and subsurface aerators, followed by an effluent holding/settling pond. Treated effluent is discharged to one of seven seepage cells. The facility is designed to treat an average of 822,000 gallons per day of domestic, commercial, and industrial wastewater. It presently receives 544,000 gallons per day and discharges 587,000 gallons per day. Four groundwater monitoring wells are sampled quarterly to evaluate groundwater quality. The seepage cells are located approximately 200 – 800 feet north of the Wisconsin River.

Table 1 – Monitoring Requirements and Limitations – Seepage Cells (Outfall 001)

Parameter	Current and Proposed Permit WI-0060534-09 and WI-0060534-10		
	Limit Type	Limits and Units	Sample Frequency
Flow Rate		MGD	Continuous
CBOD5	Monthly Avg	45 mg/l	2/Month
Total Suspended Solids		mg/l	2/Month
pH Field		su	Weekly
Total Kjeldahl Nitrogen		mg/l	Monthly
Ammonia, Nitrogen		mg/l	Monthly
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
*Phosphorus		mg/l	Monthly
*Total Suspended Solids		mg/l	Monthly
*Dissolved Oxygen		mg/l	Monthly

*Recommended changes for upcoming permit

Table 2 – Seepage Cell Groundwater Monitoring System

Sample Point	Well Name	Current Permit and Proposed WI-0060534-09 and WI-0060534-10	
		Well Location	Well Designation
801	MW-1	Background	Non-Point of Standards
803	MW-3	Downgradient	Non-Point of Standards
804	MW-4	Downgradient	Non-Point of Standards
806	MW-5	Downgradient	Non-Point of Standards

Table 3 – Seepage Cell Monitoring Wells Groundwater Standards

Parameter	Current Permit WI-0060534-09		Proposed Permit WI-0060534-10	
	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, Nitrogen	30.6 mg/l (ACL)	30.6 mg/l (ACL)	*27.2 mg/l (ACL)	*27.2 mg/l (ACL)
Chloride	180 mg/l	250 mg/l	*125 mg/l	250 mg/l
pH Field	6.2 – 8.2 su	N/A	*5.1 – 7.1 su	N/A
Total Kjeldahl Nitrogen	N/A	N/A	N/A	N/A
Ammonia, Nitrogen	0.97 mg/l	9.7 mg/l	0.97 mg/l	9.7 mg/l
Organic Nitrogen	2.8 mg/l	N/A	*2.7 mg/l	N/A
Total Dissolved Solids	770 mg/l	N/A	*820 mg/l	N/A
*Phosphorus	N/A	N/A	N/A	N/A
*Total Suspended Solids	N/A	N/A	N/A	N/A
*Dissolved Oxygen	N/A	N/A	N/A	N/A
*BOD5	N/A	N/A	N/A	N/A

***Recommended changes for upcoming permit**

Geology

The bedrock underlying the treatment system is the undivided Cambrian-aged Trempealeau, Tunnel City and Elk Mound Groups. The Trempealeau Group includes the Jordan and St. Lawrence Formations, the Tunnel City Group includes the Lone Rock Formation and the Elk Mound Group includes the Wonewoc, Eau Claire and Mount Simon Formations (Bedrock Geologic Formations of Wisconsin 1982). These groups are comprised of sandstone with minor occurrences of dolomite. The overburden is mostly modern stream sediment composed of primarily sand (Geology of Sauk County, Wisconsin 1990). Depth to bedrock is expected to be 100 – 150 feet below ground surface (Depth to Bedrock Map of Sauk County, Wisconsin 2002). Surface soils are loamy sands (NRCS Soil Map). The boring logs for monitoring wells MW-4 and MW-5 indicate the wells are screened in fine to coarse sand with trace gravel (MW-4) and silt with fine and medium grained sands (MW-5).

Hydrogeology

Regional groundwater flow is to the southeast towards the Wisconsin River (Water-Table Elevation Map of Sauk County, Wisconsin 2002). The site has been characterized as a “short flow path to surface water” or an “indirect discharge to surface water” in prior groundwater evaluations. **Figure 1** is an interpretation of groundwater flow using kriging in ArcGIS Pro and **Figure 2** is a hand-drawn interpretation. It is assumed that **Figure 2** is likely more representative of the actual overall groundwater flow path but both interpretations are provided. Groundwater elevation at the site is relatively consistent varying between 728 – 736 feet above mean sea level over the past two decades of monitoring (**Figure 5**). Groundwater elevations exhibited a decline during the current permit term. Depth to water is approximately 6 – 16 feet below top of casing. A gauge operated by Alliant Energy below the Prairie Du Sac Dam located approximately 4.2 miles upstream of the Sauk Prairie WWTF records the height of the Wisconsin River on an hourly basis. The daily average height of the Wisconsin River at this gauge is plotted on **Figure 6** along with the groundwater elevations recorded at the monitoring wells on the same day. **Figure 6** highlights the correlation between the groundwater elevations at monitoring wells and the height of the Wisconsin River. The groundwater elevation at MW-1 has a subdued response to changes in the Wisconsin River level relative to the monitoring wells that are downgradient and closer to the river’s edge. The level of the Wisconsin River is estimated to decrease

approximately 5 – 6 feet as it migrates from below the Prairie Du Sac Dam to the Sauk Prairie WWTF (USGS StreamStats Elevation Profile Tool). Therefore, the elevation of the Wisconsin River as plotted on Figure 6 is likely 5 – 6 feet higher than it would be as it migrates past the Sauk Prairie WWTF.

Land Treatment Effluent Quality and Loading Rates

Total annual discharge to the seepage cells remained mostly consistent through the permit term ranging 197 – 213 MG/yr. Chloride concentrations have exhibited an increase during the permit term to an average concentration of approximately 489 mg/l (Figure 3). The concentration of total nitrogen discharged to the seepage cells was seasonal where the lowest concentrations (< 10 mg/l) were in the fall and the highest concentrations (50 – 60 mg/l) were observed in the spring (Figure 4). There was no meaningful change beyond seasonality in the concentration of total nitrogen over the permit term. Ammonia is the primary form of nitrogen. The results for CBOD5 were seasonal where the lowest concentrations (2 – 5 mg/l) were in the fall and the highest concentrations (40 – 50 mg/l) were observed in the spring.

Table 4 – Seepage Cell Average Discharge and Concentrations

Year	Annual Discharge Rate	Average Chloride Concentration	Average Total Nitrogen Concentration
2018	213 MG/yr	395 mg/l	35 mg/l
2019	210 MG/yr	365 mg/l	30 mg/l
2020	198 MG/yr	390 mg/l	35 mg/l
2021	197 MG/yr	425 mg/l	25 mg/l
2022	202 MG/yr	470 mg/l	29 mg/l
2023	179 MG/yr	489 mg/l	33 mg/l

Background Groundwater Quality

Background groundwater quality is defined by the results from samples collected at MW-1. The results for chloride at MW-1 are consistent averaging 42 mg/l during the current permit term (Figure 7). The results for nitrite+nitrate were elevated averaging 12.4 mg/l and ranging up to 31 mg/l during the current permit term (Figure 8). Ammonia and phosphorus were generally non-detect.

Downgradient Groundwater Quality

The results for chloride at MW-3, MW-4 and MW-5 were elevated relative to background at average concentrations of 332 mg/l, 321 mg/l, and 351 mg/l, respectively. The results for chloride between sampling events show significant variability. The results for nitrite+nitrate were significantly elevated at MW-4 during the current permit term where a maximum concentration of 69 mg/l was reported in November 2022. The results for nitrite+nitrate are variable at both MW-3 and MW-4 and generally low to non-detect at MW-5. The results for ammonia are elevated at monitoring wells MW-3, MW-4 and MW-5 (Figure 9). Two results for ammonia at MW-4 exceeded the NR 140 ES for ammonia during the current permit term. The concentration of phosphorus at monitoring wells MW-3, MW-4 and MW-5 are variable and most often fell between 1 – 3.5 mg/l during the current permit term (Figure 10).

Table 5 – Exceedance Review – July 1, 2019 – November 10, 2023

Sample Point	Well Name	Parameter	ES Exceedances	PAL/ACL Exceedances
801	MW-1	Nitrite+nitrate, nitrogen	0/17	1/17
803	MW-3	Chloride	14/17	17/17
		Ammonia, nitrogen	0/17	5/17
		Total Dissolved Solids	N/A	14/17
804	MW-4	Chloride	12/17	14/17
		Ammonia, nitrogen	1/17	11/17
		Nitrite+nitrate, nitrogen	2/17	2/17
		Organic nitrogen	N/A	1/17
		Total Dissolved Solids	N/A	13/17
806	MW-5	Chloride	15/17	16/17
		Ammonia, nitrogen	0/17	17/17
		Total Dissolved Solids	N/A	14/17

Treatment System Impact to Groundwater and Surface Water Quality

The seepage cell treatment system discharges to both groundwater (initially) and then to surface water (subsequently). The impact of this treatment system should be reviewed for both groundwater and surface water. The impact from the seepage cells to groundwater is clear when comparing the results for chloride and ammonia at Outfall 001 with the results for chloride and ammonia at the downgradient monitoring wells. The concentration of chloride at the downgradient monitoring wells is significantly elevated and more variable relative to the concentrations observed at the background well. Similarly, ammonia is not present at the background well but is elevated at downgradient monitoring wells where it is often above the NR 140 PAL. The ammonia concentrations are currently not a significant concern for acute toxicity given the pH for most of these results range between 6.0 – 6.5 su (**Figure 11**) and the significant dilution available via the Wisconsin River. The pH of the groundwater has exhibited a decline over the past two decades that aid in reducing the concern over the discharge of ammonia to the Wisconsin River. The elevated nitrite+nitrate concentrations are unlikely to be related to Outfall 001 as nitrite+nitrate is elevated at the background well and the average concentration of nitrite+nitrate at Outfall 001 ranged between 2 – 4 mg/l during the permit term. While phosphorus is not monitored at Outfall 001 the results for phosphorus at downgradient wells relative to the background well indicate that Outfall 001 is the presumptive source. The concentration of phosphorus has exhibited an increasing trend over the past twenty years of monitoring. Assuming that the absorption capacity of the seepage cell soils and groundwater soils have been met for phosphorus, that the results for phosphorus at downgradient monitoring wells are representative of the discharge to the seepage cells and that 100% of the discharge enters the Wisconsin River, then the Sauk Prairie WWTF is sending approximately 6,396 – 8,224 lbs/yr of phosphorus to the Wisconsin River (**Table 6**).

Table 6 – Phosphorus Discharge Estimation

Monitoring Well	Average Dissolved Phosphorus Concentration (September 2019 – November 2023)	Average Discharge Rate (September 2019 – November 2023)	Daily Dissolved Phosphorus Load	Annual Dissolved Phosphorus Load
MW-3	2.7 mg/l	0.55 MG/day	12.4 lbs/day	4,526 lbs/yr
MW-4	2.2 mg/l		10.1 lbs/day	3,687 lbs/yr
MW-5	2.1 mg/l		9.6 lbs/day	3,504 lbs/yr

This table uses the average dissolved phosphorus results at the downgradient monitoring wells as a proxy for the concentration of dissolved phosphorus at the seepage cell discharge.

Transit Time and Distance Traveled

The southern edges of the seepage cells are approximately 400 – 800 feet from the Wisconsin River. The maximum travel distance for any wastewater discharged to the seepage cells is approximately 1,100 feet. The horizontal hydraulic gradients between monitoring wells were most often on the order of 0.002 ft/ft. The horizontal hydraulic gradients will vary over space and time and be additionally impacted by the loading of the seepage cells and the height of the Wisconsin River. The porosity and hydraulic conductivity at the monitoring wells can be approximated by referring to the boring logs for the monitoring wells which state monitoring wells MW-4 and MW-5 are screened in silty sand to coarse sand. Using an average horizontal gradient of 0.002 ft/ft, a porosity of 0.3 – 0.4 and a hydraulic conductivity of 0.1 cm/s – 0.01 cm/s, the calculated groundwater flow velocity is estimated to be between 54 – 720 feet per year (**Table 7**).

Table 7 – Calculation of Estimated Groundwater Flow Velocity

Average Horizontal Hydraulic Gradient (MW-1 to MW-5)	Estimated Porosity	Estimated Hydraulic Conductivity (cm/s)	Calculated Groundwater Flow Velocity (ft/yr)
0.002 ft/ft	0.3 – 0.4	0.1 – 0.01 cm/s	54 - 720 ft/yr

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 increasing 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.

- Σ [Background groundwater quality + (Standard Deviation of results x 3)]
- Σ [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-1 during the prior permit term. The indicator parameter PALs for use in the upcoming permit WI-0060534-10 are presented in **Table 3** and were calculated using results from MW-1 (July 1, 2019 – November 10, 2023).

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”. The ACLs for use in the upcoming permit WI-0060534-10 are presented in **Table 3** and were calculated using results from MW-1 during the current permit term (July 1, 2019 – November 10, 2023).

Conclusions, Recommendations and Schedule Requirements

- Sauk Prairie WWTF’s discharge to the seepage cells is the functional equivalent of a direct discharge to surface water.
- Sauk Prairie should develop a Land Treatment Management Plan consistent with the requirements in NR 206.07(2)(h), Wis. Adm. Code. The Land Treatment Management Plan should be submitted within one year of permit reissuance.
- An exemption for the 10 mg/l Total Nitrogen limit in NR 206 Wis. Adm. Code, Table 1 is acceptable to continue to be provided to the facility given that the seepage cells discharge to surface water and that there are currently no significant concerns regarding the concentrations of nitrogen in the form of ammonia or nitrite+nitrate.
- An exemption for the 250 mg/l Chloride limit in NR 206 Wis. Adm. Code, Table 1 is acceptable to continue to be provided to the facility given that the seepage cells discharge to surface water. However, Sauk Prairie Sewerage Commission should continue to submit annual Chloride Reduction Progress Reports. Sauk Prairie should continue their efforts towards identifying the primary sources of chloride in their influent and work with stakeholders to find solutions for reducing the overall discharge of chlorides to the sewer system.
- Phosphorus, Total Suspended Solids, and Dissolved Oxygen should be added to the monitoring requirements for Outfall 001 and the Groundwater Monitoring System to evaluate potential impacts to surface water quality.

Figure 1 – Seepage Cell Groundwater Flow Map – November 15, 2023



Water Table Flow Map

Sauk Prairie Sewerage Commission

November 15, 2023



Site Location

Sauk Prairie Sewerage Commission
335 Galena St
Prairie Du Sac, WI 53578

Legend

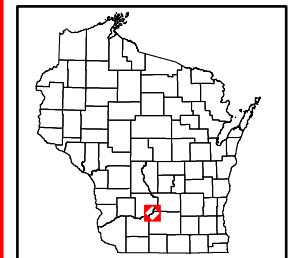
- Monitoring Wells
- DMZ
- Water Table Contour (0.5 FAMSLS 11/15/23)
- ← Groundwater Flow Direction

Notes

Water table contours generated using elevation data collected on November 15, 2023. Water table elevations and contours are presented in feet above mean sea level.

Contour interpretation generated in ArcGIS Pro.

Created By: watsoz
Date: 12/8/2023



0 110 220 330 440 550 660
Feet

1:4,000

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Figure 2 – Seepage Cell Groundwater Flow Map – November 15, 2023 Interpretation Two



Water Table Flow Map (Interpretation Two)

Sauk Prairie Sewerage Commission

November 15, 2023



Site Location

Sauk Prairie Sewerage Commission
335 Galena St
Prairie Du Sac, WI 53578

Legend

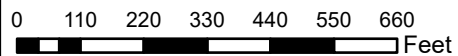
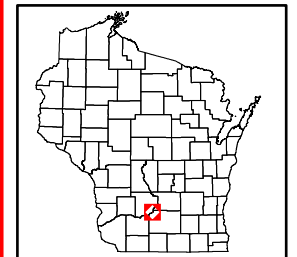
- Monitoring Wells
- DMZ
- ← Groundwater Flow Direction

Notes

Water table contours generated using elevation data collected on November 15, 2023. Water table elevations and contours are presented in feet above mean sea level.

Contour interpretation hand-drawn.

Created By: watsoz
Date: 12/8/2023



1:4,000

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.

Figure 3 – Outfall 001 – Chloride

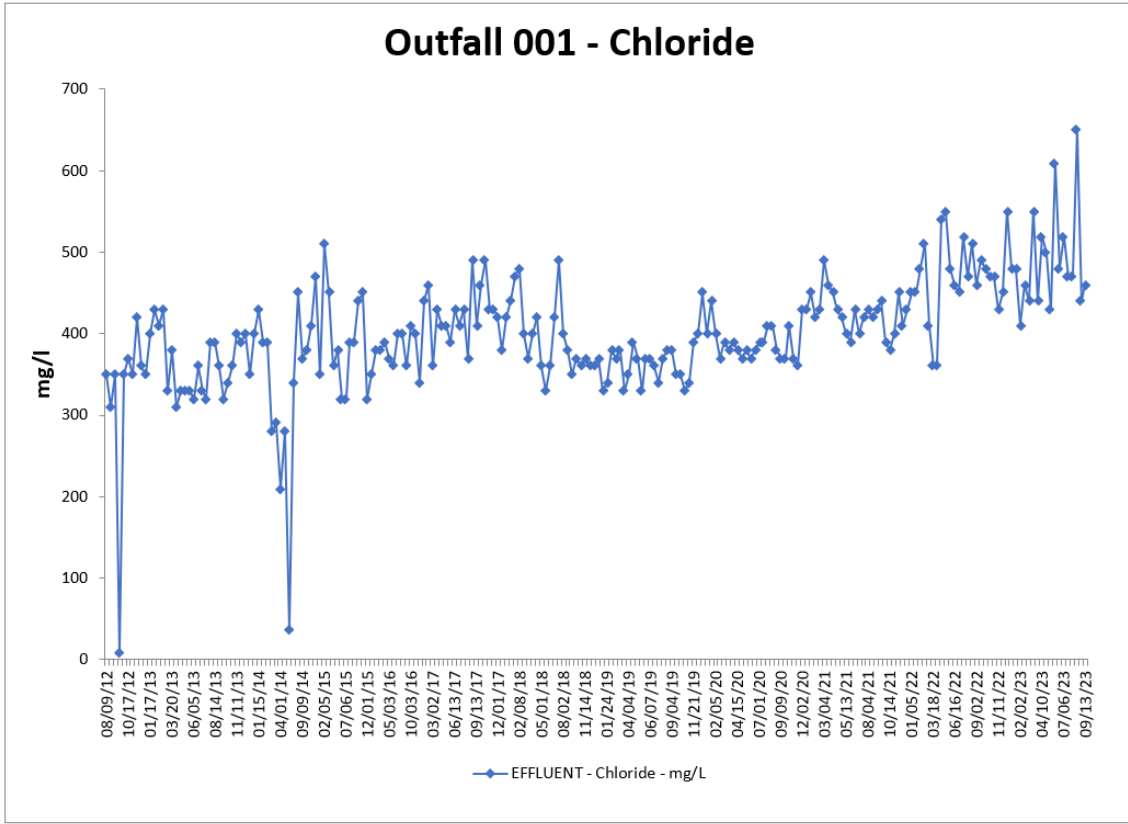


Figure 4 – Outfall 001 – Total Nitrogen

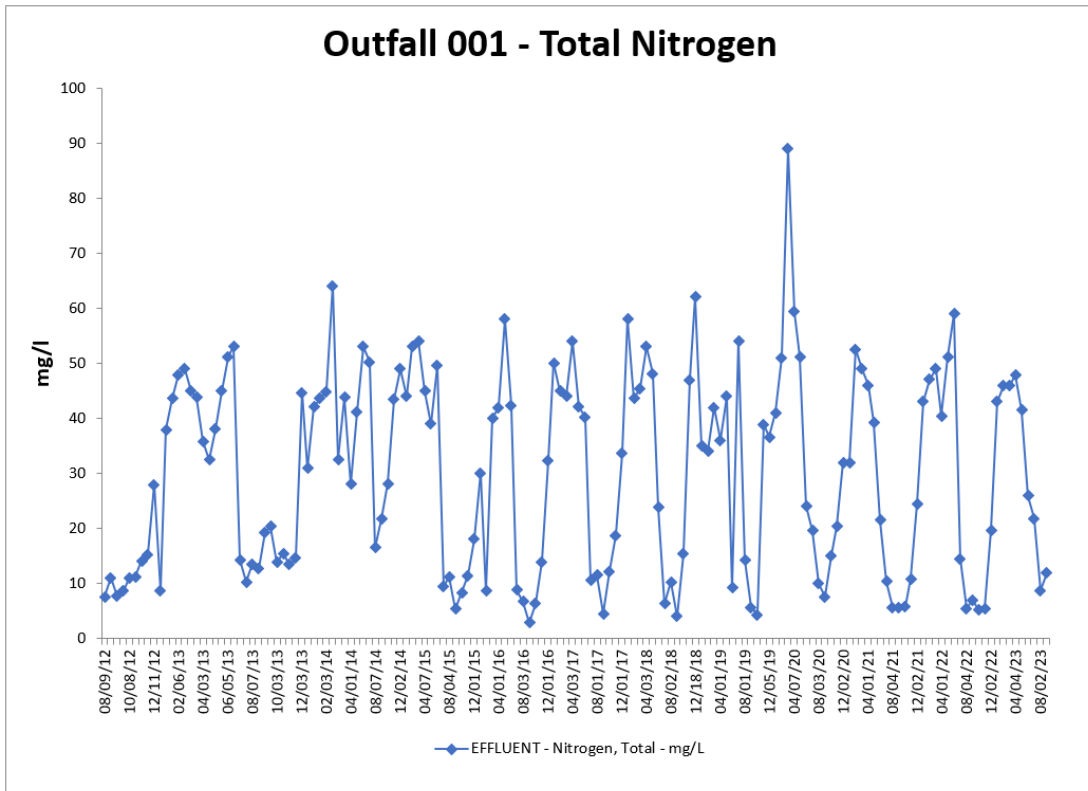


Figure 5 – Monitoring Wells – Groundwater Elevation

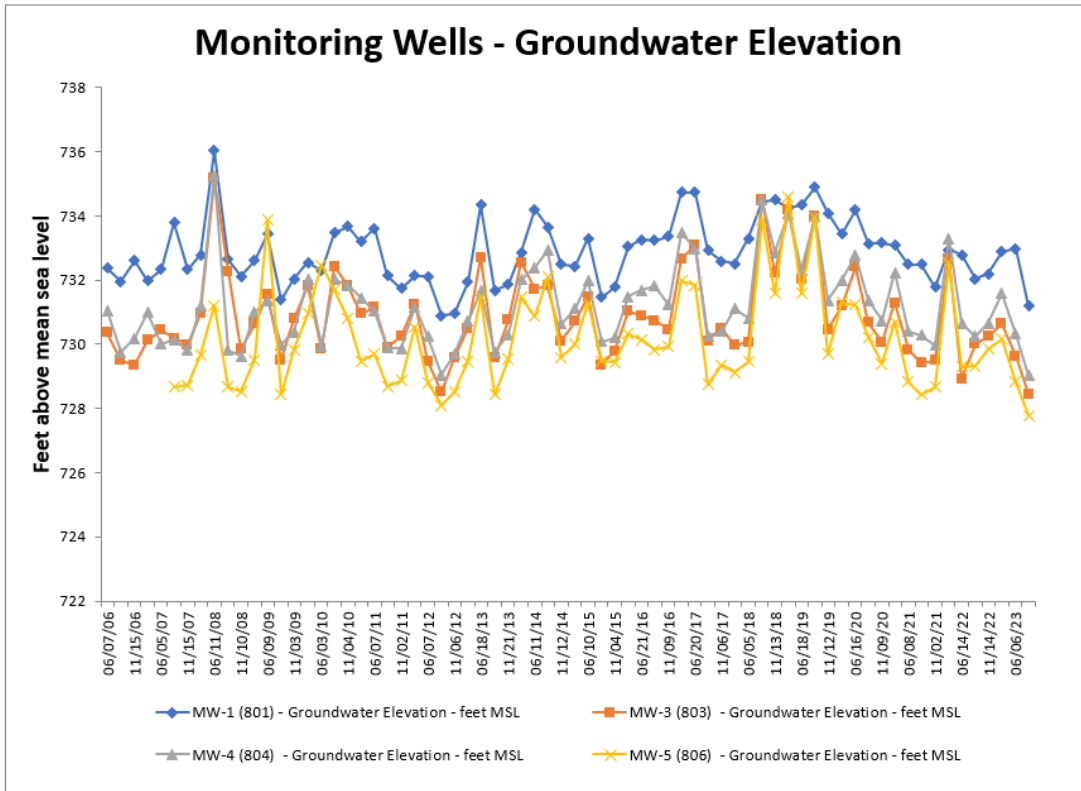


Figure 6 – Groundwater Elevation and Wisconsin River Water Level

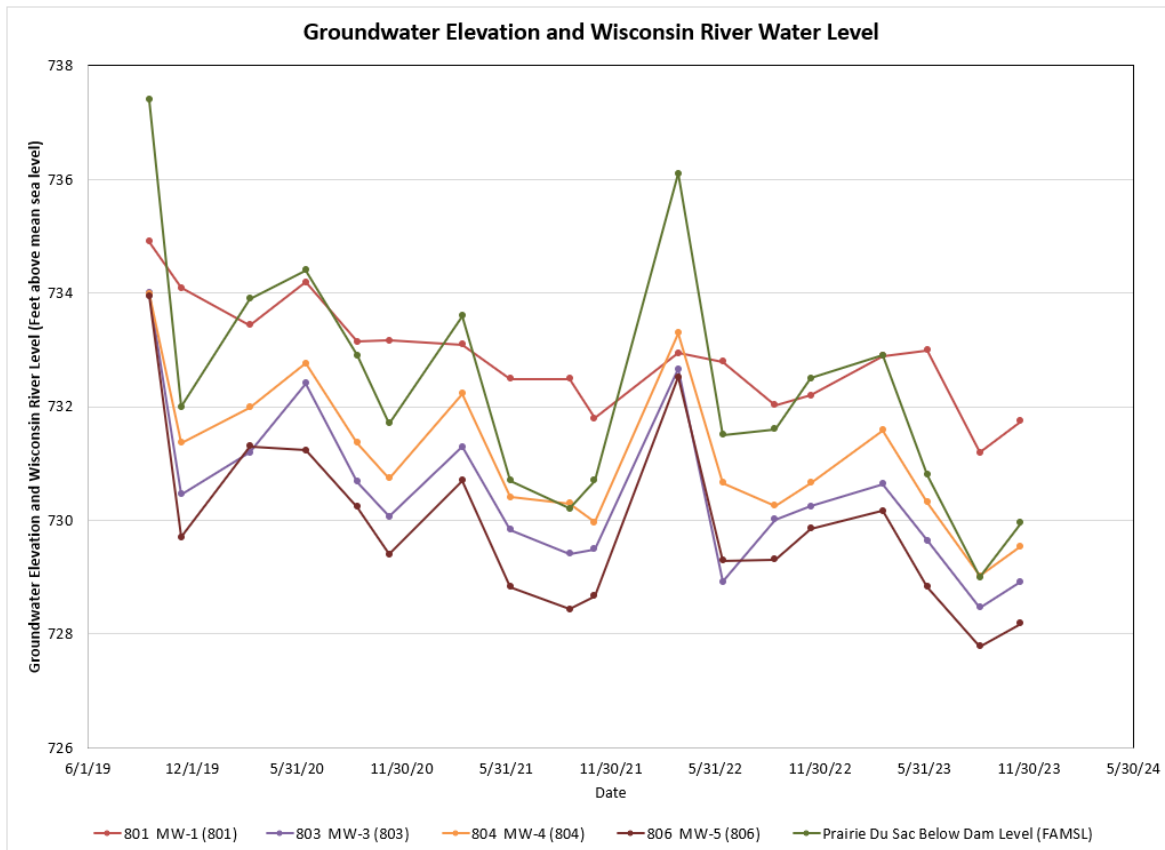


Figure 7 – Monitoring Wells – Chloride

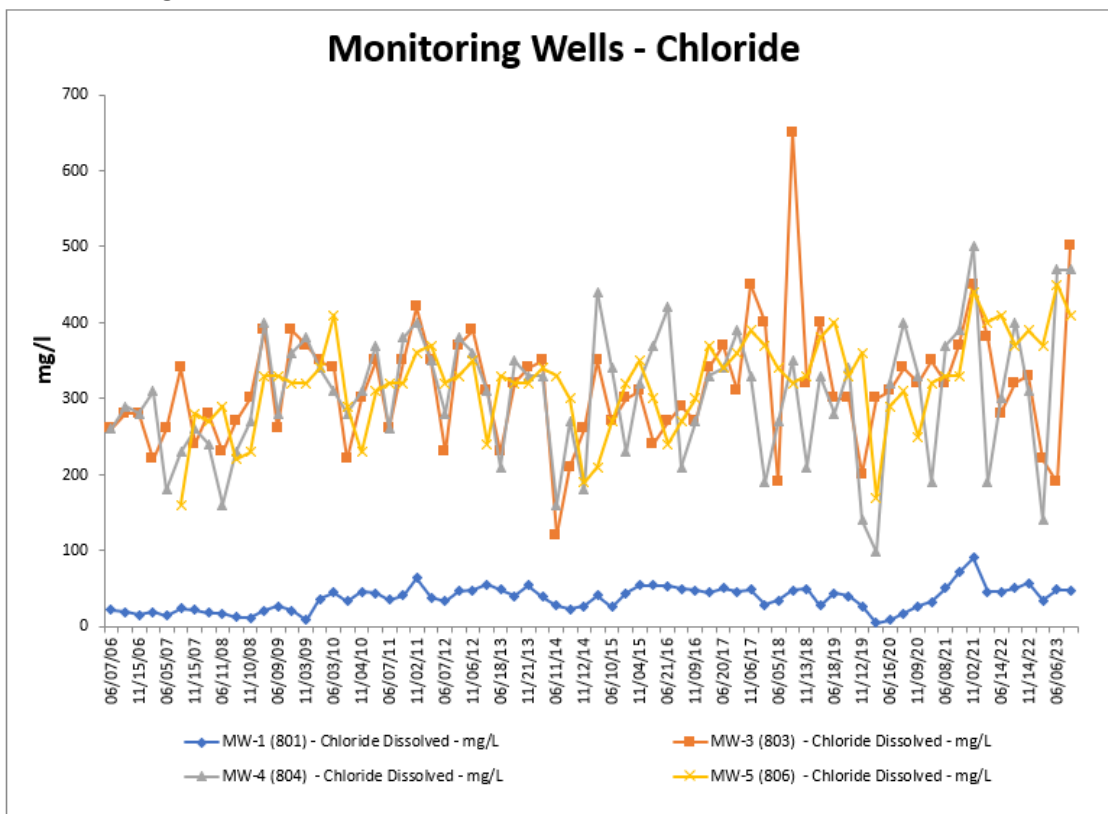


Figure 8 – Monitoring Wells – Nitrite+nitrate

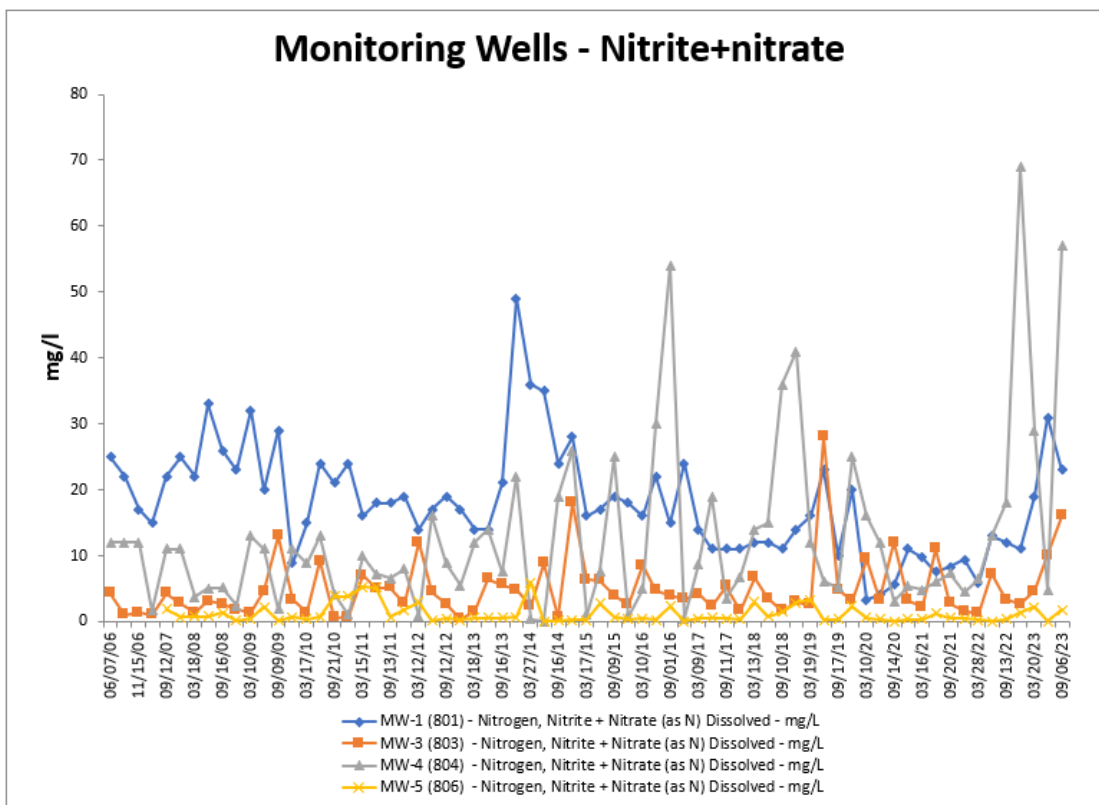


Figure 9 – Monitoring Wells – Ammonia

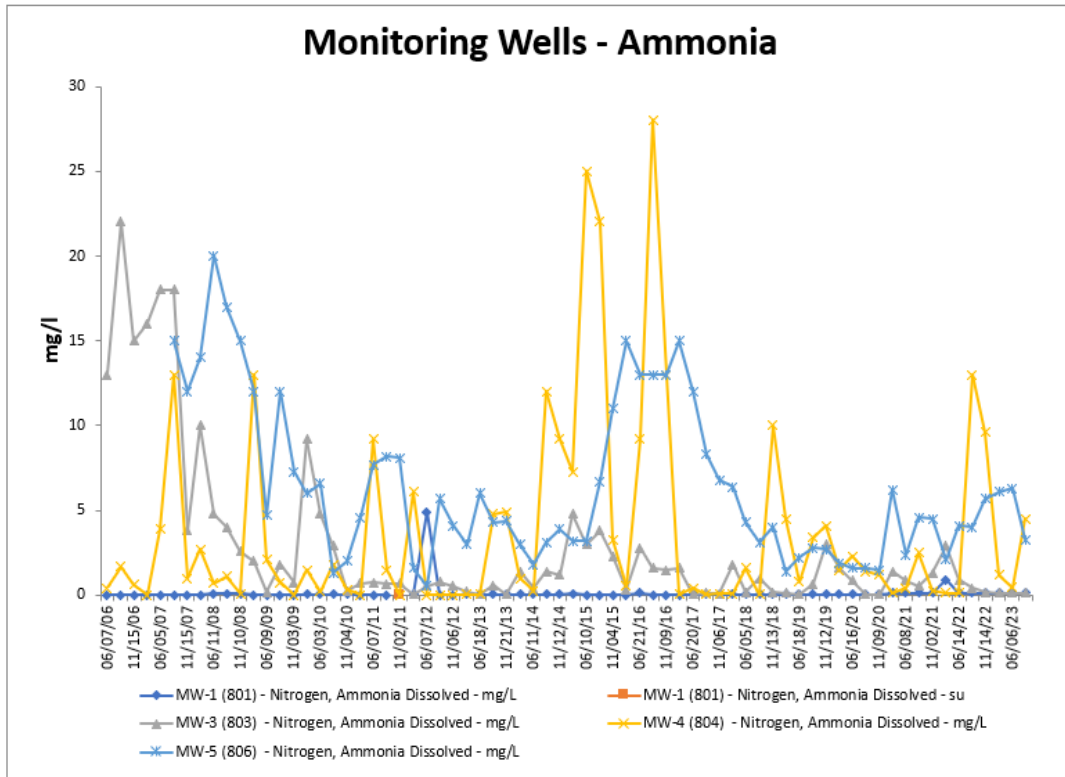


Figure 10 – Monitoring Wells – Phosphorus

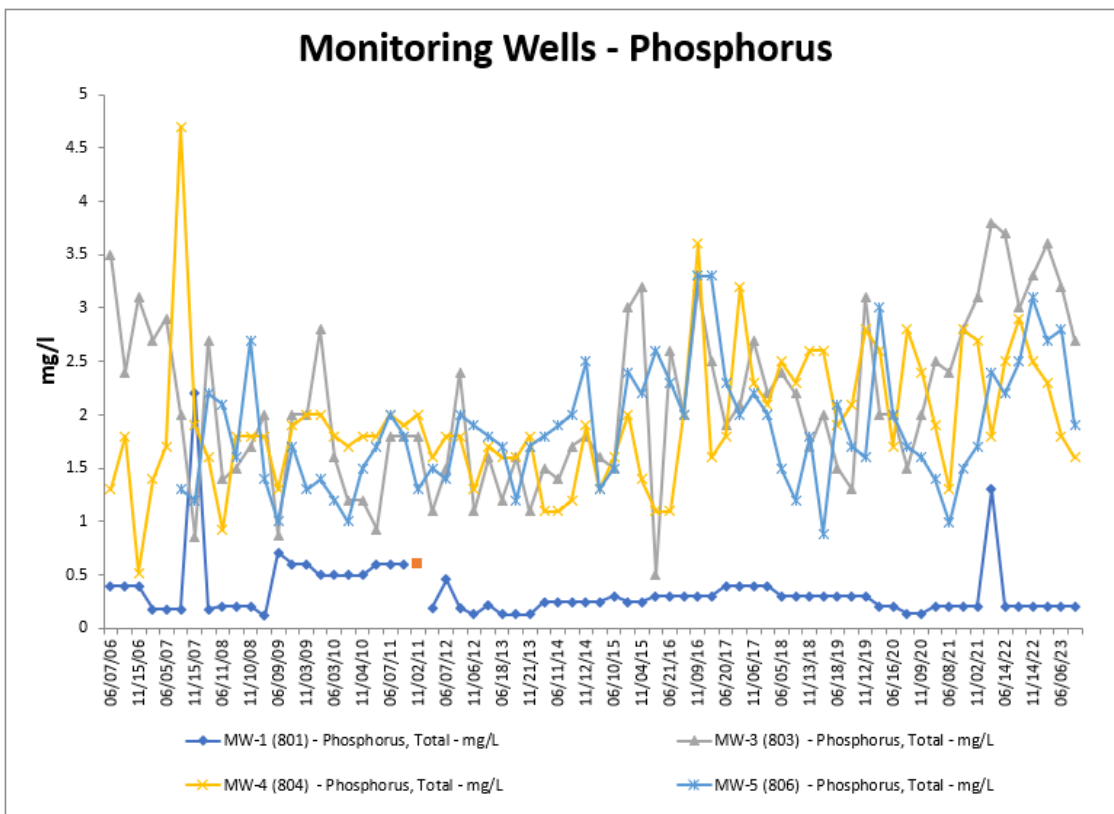


Figure 11 – Acute Ammonia Toxicity at Downgradient Monitoring Wells

