Permit Fact Sheet

General Information

Permit Number	WI-0020443-10-0
Permittee Name and Mailing Address	City of Brillion 130 Calumet St, Brillion, WI 54110
Permitted Facility Name and Address	Brillion Wastewater Treatment Facility 1201 Clearwater Dr, Brillion, WI 54110
Permit Term	July 01, 2025 to June 30, 2030
Discharge Location	NW ¼ of Section 35, T 20N, R 20E in Calumet County (approximately at latitude 44º 9’ 53” North and longitude 88º 4’ 49” West)
Receiving Water	An unnamed tributary (WBIC no. 77100) to Spring Creek, in the North Branch Manitowoc River Watershed (MA04) of the Manitowoc River Basin in Calumet County
Stream Flow ($Q_{7,10}$)	0.05 cfs
Stream Classification	Warmwater Sport Fish (WWSF), non-public water supply
Discharge Type	Existing; Continuous
Annual Average Design Flow	0.824 MGD
Industrial or Commercial Contributors	Professional Plating; Ariens Company
Plant Classification	Advanced: A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; and Basic: SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The City of Brillion owns and operates the Brillion Wastewater Treatment Facility that treats residential, industrial, and commercial domestic wastewater from the City sanitary sewer collection system. All sludge generated from the treatment facility is stored in a reed bed system and eventually removed and hauled to a landfill. The paragraphs below describe the liquid and solids treatment train of the Brillion Wastewater Treatment Facility.

Liquid Treatment Train: The raw influent wastewater from the City of Brillion flows to four lift stations. Then three of these lift stations pump the wastewater to an influent channel in the headworks building. At the headworks, the influent passes through a vortex grit removal system. The removed grit is conveyed to a grit chamber to settle the grit. The decant water is conveyed back to the influent channel. The grit chamber is manually vacuumed out and the grit is disposed to a dumpster. The influent then passes through a cylindrical mechanical fine screen and bar screen. The screenings are disposed to a dumpster. There is a bypass channel with a manual bar screen. The influent then passes through a Parshall flume with an ultrasonic flow meter measuring the influent flow where influent composite samples are collected by an automatic sampler via Sampling Point 701. The influent then flows to a splitter box for the primary clarifiers. Following the headworks, the flow is split between two 30-ft diameter primary clarifiers operating in parallel. The splitter box was recently equipped with overflow pipes to the primary clarifiers to provide some relief during wet weather peak flows that

may exceed the design flows of the pipes to the primary clarifiers. The primary clarified wastewater then flows to a splitter box for the aeration basins. After the primary clarifiers, the flow is split between two 60-ft x 20-ft aeration basins operating in parallel. The aeration basins contain fine bubble tube diffusers. Air is supplied to the aeration basins by three large centrifugal blowers. Ferric chloride is dosed to the center of the aeration basins. The mixed liquor then flows to a splitter box for the secondary clarifiers. Following the aeration basins, the flow is split between two 30-ft diameter secondary clarifiers operating in parallel. The secondary effluent is then sent to a diversion channel. At the diversion channel, during normal flow conditions, the effluent is lifted by two screw pumps and split between a set of four tertiary sand filter beds. During high flow conditions, the effluent can bypass the screw pumps and tertiary filters to the former chlorination/dechlorination contact chamber via Sampling Point 101. The final effluent then passes through a pipe where the effluent flow rate is measured by a magnetic flow meter where effluent composite samples are collected by an automatic sampler via Sampling Point 001. The final effluent then flows by gravity to the former chlorination/dechlorination contact chamber. The former contact chamber is provided with coarse bubble diffusers at the end of the tank prior to being conveyed by gravity to an unnamed tributary to Spring Creek via Outfall 001.

Solids Treatment Train: Primary and waste activated sludges are sent to either a 40-ft x 20-ft or a 20-ft x 8-ft aerobic digestor operating in parallel. The aerobic digestors contain coarse bubble diffusers. Air is supplied by three large centrifugal blowers which also supply air to the aeration basins. The aerobic digested sludge is then pumped and feed into nine 4,680 square feet reed beds used for solids dewatering and sludge storage. The reed beds contain a perforated drain tile which is drained back to the filter backwash pit and pumped to the head of the primary clarifiers' splitter box. The reeds in the beds are cut and burned every year. The current reed beds have an approximate total storage capacity of 5 to 10-years, until such time the biosolids must be emptied and hauled to a landfill. The reed bed sludge is tracked under Outfall 007. The facility does have the ability to land apply or haul the reed bed feed sludge from the aerobic digestors in case storage in the reed beds is not available under Outfall 006.

Facility Upgrades: During the permit term, the facility proposes to upgrade the wastewater treatment facility. The proposed upgrades include replacing the three influent pumps at the main lift station, moving influent sampling and flow monitoring equipment prior to headworks, installing new fine screening and grit removal equipment, replacement of primary clarifiers to anoxic/anaerobic selector basins, rehab of existing aeration basins and installing two new aeration basins, rehab of existing final clarifiers and installing two new final clarifiers, replacing screw pumps and installing a third screw pump, replacing sand filters with cloth media disk filters, moving effluent sampling and flow monitoring to after the tertiary filtration bypass, and rehab of aerobic digestor tanks and installing two new digestor tanks.

Substantial Compliance Determination

Enforcement During Last Permit: There have been violations of effluent limits, missed samples, late reporting, and SSOs/TFOs. Several Notices of Noncompliance (NONs) have been sent to the facility during the previous permit term. The effluent limits that were exceeded are: monthly average phosphorus limit in October 2018 and October 2021; daily maximum limit for pH in October 2020; weekly average and monthly average ammonia limits in April 2020; and chloride interim weekly average limit in April 2019. Additionally, the facility has had at least six treatment facility overflows (TFOs) and sanitary sewer overflows (SSOs), as well as several tertiary filter bypasses during the previous permit term.

The facility has completed all previously required actions as part of the enforcement process.

After a desk top review of all discharge monitoring reports, compliance maintenance annual reports (CMARs), land application reports, compliance schedule items, and a site visit on **5/10/23**, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Trevor Moen, Wastewater Engineer on January 13, 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	0.861 MGD (Avg. 7/1/18-12/31/24)	INFLUENT - At Sampling Point 701, the permittee shall collect representative samples of the influent from the influent automatic sampler drawing 24-hour flow proportional composite samples from the influent channel after grit removal, fine screening, and influent flow monitoring. The permittee shall measure the influent flow rate using a continuous flow recording device on the influent channel after grit removal and fine screening prior to the primary clarifiers. Once the facility upgrades are complete, at Sampling Point 701, the permittee shall collect representative samples of the influent from the influent automatic sampler drawing 24-hour flow proportional composite samples from the influent channel prior to fine screening and grit removal. The permittee shall measure the influent flow rate using a continuous flow recording device on the force main from the main lift station to the influent channel.
101	N/A – new sample point	OTHER BYPASS - At Sampling Point 101, the permittee shall report the diverted flow which bypasses the tertiary filtration system during high flow events.
001	0.605 MGD (Avg. 7/1/18-12/31/24)	EFFLUENT - At Sampling Point 001, the permittee shall collect representative samples of the final effluent from the effluent automatic composite sampler drawing 24-hour flow proportional composite samples from the pipe following the tertiary filtration system except that the permittee shall collect grab samples of the effluent for pH, dissolved oxygen, temperature, PFOA, and PFOS from the end of the former chlorination/dechlorination contact chamber after post-aeration and prior to being discharged to the Unnamed Tributary to Spring Creek via Outfall 001. The permittee shall measure the effluent flow rate using a continuous flow recording device on the pipe following the tertiary filtration system. Once the disinfection system has been installed per the Disinfection and Effluent Limitations for E. coli Compliance Schedule, the permittee shall collect representative grab samples for E. coli, pH, dissolved oxygen, temperature, PFOA, and PFOS after the disinfection system and post-aeration and prior to being discharged to the Unnamed Tributary to Spring Creek via Outfall 001. During tertiary filtration bypass events until facility upgrades are complete, the permittee shall collect representative samples of effluent from an automatic composite sampler drawing 24-hour time proportional composites from the end of the former chlorination/dechlorination contact chamber prior to being discharged to the Unnamed Tributary to Spring Creek via Outfall 001.
006	N/A – did not land apply or landfill sludge (2018-2024)	REED BED FEED SLUDGE - Class B Liquid sludge that has been aerobically digested and fed into the reed beds. At Sampling Point

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
		006, the permittee shall collect representative composite samples of the reed bed feed sludge prior to being land applied on department approved sites via Outfall 006. This outfall has been included for emergency use in case storage in the reed beds is not available.
007	961 Metric Tons (Avg. 2022-2023)	REED BED CAKE SLUDGE - Cake sludge that has been aerobically digested and fed into the reed beds for dewatering. At Sampling Point 007, the permittee shall collect representative composite samples of reed bed cake sludge from various depths and locations within the reed beds and composite them for analysis.

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	Continuous	
BOD5, Total		mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Week	24-Hr Flow Prop Comp	

1.1.1 Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and no changes were required.

1.1.2 Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD_5 and total suspended solids is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit.

2 In-Plant – Monitoring Requirements

2.1 Sample Point Number: 101- OTHER BYPASS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Per Occurrence	Estimated	Start flow measurement at the commencement of bypass operations. Measure flow in daily increments until operation ends and report daily bypass flow on the eDMR. See the Other Bypass Requirements permit section.
Time		hours	Per Occurrence	Calculated	Report the total duration of 'Other Bypass' within a given day (12:00am - 11:59pm) in which the other bypass occurs. See the Other Bypass Requirements permit section.

2.1.1 Changes from Previous Permit:

N/A – this is a new sample point that was not included in the previous permit.

2.1.2 Explanation of Limits and Monitoring Requirements

Other Bypass Monitoring: The Department has determined that an 'other bypass' as defined in s. NR 205.07(1)(u)3., Wis. Adm. Code, may occur at the wastewater treatment facility.

Section NR 205.07(1)(u), Wis. Adm. Code, requires that the Department approve all other bypasses. The Department included this sampling point to constitute permitting and approval of the other bypass provided the other bypass monitoring requirements and conditions are followed. The other bypass may only divert flow around the tertiary filtration system during high flow events. A bypass that is defined as a controlled diversion in s. NR 205.07(1)(v), Wis. Adm. Code, is not covered under this sample point. In no case shall this include flow diversion which would constitute blending, as defined in s. NR 210.03(2e), Wis. Adm. Code.

3 Surface Water - Monitoring and Limitations

3.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	Interim limit. See the Effluent Limits for BOD,

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					DO, and Ammonia Schedule.
BOD5, Total	Weekly Avg	9.3 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies May-October.
BOD5, Total	Weekly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies November-April.
BOD5, Total	Monthly Avg	20 mg/L	2/Week	24-Hr Flow Prop Comp	Interim limit. See the Effluent Limits for BOD, DO, and Ammonia Schedule.
BOD5, Total	Monthly Avg	9.3 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies May-October.
BOD5, Total	Monthly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies November-April.
BOD5, Total	Weekly Avg	64 lbs/day	2/Week	Calculated	Monitoring only upon permit effective date. Limit effective July 1, 2027. Limit applies May-October.
BOD5, Total	Weekly Avg	102 lbs/day	2/Week	Calculated	Monitoring only upon permit effective date. Limit effective July 1, 2027. Limit applies November-April.
Suspended Solids, Total	Weekly Avg	10 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies May-October.
Suspended Solids, Total	Weekly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies November-April.
Suspended Solids, Total	Monthly Avg	10 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies May-October.
Suspended Solids, Total	Monthly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies November-April.
Suspended Solids, Total	Weekly Avg	168 lbs/day	2/Week	Calculated	
Suspended Solids, Total	Monthly Avg	113 lbs/day	2/Week	Calculated	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total		lbs/month	Monthly	Calculated	Calculate the Total Monthly Discharge of TSS and report on the last day of the month on the eDMR. See TMDL Calculations permit section.
Suspended Solids, Total		lbs/yr	Monthly	Calculated	Calculate the 12-month rolling sum of total monthly mass of TSS discharged and report on the last day of the month on the eDMR. See TMDL Calculations permit section.
Dissolved Oxygen	Daily Min	4.0 mg/L	5/Week	Grab	Interim limit. See the Effluent Limits for BOD, DO, and Ammonia Schedule.
Dissolved Oxygen	Daily Min	8.0 mg/L	5/Week	Grab	Limit effective July 1, 2027.
pH Field	Daily Min	6.0 su	5/Week	Grab	
pH Field	Daily Max	9.0 su	5/Week	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit permit section. Enter the result in the eDMR on the last day of the month.
Chloride	Daily Max	1,050 mg/L	4/Month	24-Hr Flow Prop Comp	Interim limit. Sampling shall be conducted on four consecutive days one week per month. See the Chloride Variance - Implement Source Reduction Measures permit section and the

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Chloride Source Reduction Measures (Target Value) Schedule.
Chloride	Weekly Avg	780 mg/L	4/Month	24-Hr Flow Prop Comp	Interim limit. Sampling shall be conducted on four consecutive days one week per month. See the Chloride Variance - Implement Source Reduction Measures permit section and the Chloride Source Reduction Measures (Target Value) Schedule.
Phosphorus, Total	Monthly Avg	1.0 mg/L	Weekly	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	5.6 lbs/day	Weekly	Calculated	Monitoring only upon permit effective date. Final TMDL-Based Mass Limits for Total Phosphorus go into effect per the Schedule. See also the Phosphorus TMDL permit section.
Phosphorus, Total		lbs/month	Monthly	Calculated	Calculate the Total Monthly Discharge of phosphorus and report on the last day of the month on the eDMR. See TMDL Calculations permit section.
Phosphorus, Total		lbs/yr	Monthly	Calculated	Calculate the 12-month rolling sum of total monthly mass of phosphorus discharged and report on the last day of the month on the DMR. See TMDL Calculations permit section.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	Weekly	24-Hr Flow Prop Comp	Limits apply November-April. See the Daily Maximum Ammonia Nitrogen (NH3-N) Limits permit section.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	8.0 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies April-May.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	5.7 mg/L	Weekly	24-Hr Flow Prop Comp	Interim limit. See the Effluent Limits for BOD, DO, and Ammonia Schedule. Limit applies June-September (until June 30, 2027).
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	3.0 mg/L	Weekly	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies June-September.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	5.5 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies October-November.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	16 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies December-March.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	3.2 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies April-May.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.3 mg/L	Weekly	24-Hr Flow Prop Comp	Interim limit. See the Effluent Limits for BOD, DO, and Ammonia Schedule. Limit applies June-September (until June 30, 2027).
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	1.3 mg/L	Weekly	24-Hr Flow Prop Comp	Limit effective July 1, 2027. Limit applies June-September.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.3 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies October-November.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	6.4 mg/L	Weekly	24-Hr Flow Prop Comp	Limit applies December-March.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring permit section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring permit section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring permit section. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Total Nitrite + Nitrate Nitrogen.
PFOS		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need Schedule.
PFOA		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need Schedule.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity (WET) Testing permit section.
Chronic WET	Monthly Avg	1.0 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity (WET) Testing permit section.
Temperature Maximum		deg F	3/Week	Grab	Monitoring only upon permit effective date. See the Effluent Temperature Monitoring and Effluent Temperature Limitations sections. See also the Temperature Limits (Municipal Facilities) Schedule.

3.1.1 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.

- Addition of mass limits, and updated weekly average and monthly average limits for BOD_5, to become effective per the Effluent Limits for BOD, DO, and Ammonia Schedule.
- Updated weekly average and monthly average limits for TSS, and the addition of TMDL-based mass limits.
- Increased the daily minimum dissolved oxygen limit from 4.0 mg/L to 8.0 mg/L, to become effective per the Effluent Limits for BOD, DO, and Ammonia Schedule.
- Addition of Escherichia coli (E. coli) monitoring and limits, to become effective per the Effluent Limitations for E. coli Schedule.
- Updated chloride variance interim limits to 1,050 mg/L as a daily maximum and 780 mg/L as a weekly average, and updated source reduction measures (SRMs) throughout the permit term.
- Addition of TMDL-based mass limits for total phosphorus, to become effective per the TMDL-Based Effluent Mass Limits for Total Phosphorus Schedule.

- Updated ammonia nitrogen daily maximum (variable), weekly average and monthly average limits. Weekly average and monthly average ammonia limits for June-Sept are to become effective per the Effluent Limits for BOD, DO, and Ammonia Schedule.
- Addition of annual total nitrogen monitoring (TKN, NO_2+NO_3 and Total N) in rotating quarters throughout the permit term.
- Addition of PFOS/PFOA monitoring at a frequency of every other month in accordance with s. NR 106.98(2)(a), Wis. Adm. Code.
- Addition of a Chronic Whole Effluent Toxicity (WET) testing effluent limit.
- Addition of maximum temperature monitoring and limits to become effective per the Temperature Limits (Municipal Facilities) Schedule.

3.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the Water Quality-Based Effluent Limits (WQBEL) memo, by Nicole Krueger, Water Resources Engineer, dated November 8, 2024.

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.

Expression of Limits – In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable. Minor changes have been made to the BOD_5 and TSS effluent limits.

Disinfection and E. coli – Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020.

Section NR 102.04(5)(a), Wis. Adm. Code, states that all surface waters shall be suitable for recreational use and meet the E. coli criteria established to protect this use. Section NR 102.04(5)(b), Wis. Adm. Code, states that exceptions to the disinfection requirement can be made if the Department determines, in accordance with the procedures specified in s. NR 210.06(3), Wis. Adm. Code, that disinfection is not required to meet water quality criteria. As part of the reissuance process, the requirements for disinfection were reviewed under s. NR 210.06(3), Wis. Adm. Code.

It was determined that the permittee is required to disinfect, during the months of May – September. See the WQBEL memo for further explanation.

At the end of the compliance schedule, disinfection requirements and E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply. Monitoring is not required until the limit becomes effective at the end of the compliance schedule.

Chloride – The City of Brillion applied for a chloride variance, under the provisions of s. NR 106.83, Wis. Adm. Code, with its application for permit reissuance. The previous permit also included a chloride variance. The Department reviewed Brillion's application for a chloride variance and the information supplied in the application supports the establishment of an interim effluent limit. The permittee and the Department have reached agreement on interim chloride limits of 1,050 mg/L (expressed as a daily maximum) and 780 mg/L (expressed as a weekly average), a target value of 702 mg/L (weekly avg), implementation of chloride source reduction measures, and submittal of annual progress reports each year by January 31st. The chloride source reduction measures that are required to be implemented can be found in the proposed permit. The Department concludes that Brillion is qualified for a variance from the water quality standard for chloride and proposes reissuance of this permit with the proposed variance.

Total Nitrogen Monitoring (TKN, NO_2+NO_3, and Total N) – The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under s. 283.55(1)(e), Wis. Stats. Testing is required during the following quarters: October – December 2025; April – June 2026; July – September 2027; January – March 2028; and October – December 2029.

Acute WET – Testing is required during the following quarters: April – June 2026; and October to December 2029.

Chronic WET – Testing is required during the following quarters: October – December 2025; April – June 2026; July – September 2027; January – March 2028; and October – December 2029.

PFOS/PFOA – NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. The facility must sample effluent once every two-months for PFOS and PFOA pursuant s. NR 106.98(2)(b), Wis. Adm. Code.

A sample frequency of 1/ 2 months means one sample is taken during any two-month period. Examples of 1/ 2 month samples would be every other month (Jan, March, May, etc.) or back-to-back months with a break in between (February & March, May & June, Aug & Sept, etc.). DMR Short Forms will be generated for the following time periods: January-February, March-April, May-June, July-August, September-October, and November-December. At a minimum, one sample result will be present on each form.

The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

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)**
006	B	Liquid	N/A	N/A	Landfilling	N/A
007	B	Cake	N/A	N/A	Landfilling	961 Metric Tons (Avg. 2022-2023)
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.						
Is a priority pollutant scan required? N/A						

4.1 Sample Point Number: 006- REED BED FEED SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Per Application	Composite	Monitoring required only when reed bed feed sludge is land applied or hauled to

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					another permitted facility in any year.
Arsenic Dry Wt	High Quality	41 mg/kg	Per Application	Composite	Monitoring required and limits applicable only when reed bed feed sludge is land applied or hauled to another permitted facility in any year.
Arsenic Dry Wt	Ceiling	75 mg/kg	Per Application	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Per Application	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Per Application	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Per Application	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Per Application	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Per Application	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Per Application	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Per Application	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Per Application	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Per Application	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Per Application	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Per Application	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Per Application	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Per Application	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Per Application	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Per Application	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Total Kjeldahl		Percent	Per Application	Composite	Monitoring required only when reed bed feed sludge is land applied in any year.
Nitrogen, Ammonium (NH4-N) Total		Percent	Per Application	Composite	
Phosphorus, Total		Percent	Per Application	Composite	
Phosphorus, Water Extractable		% of Tot P	Per Application	Composite	
Potassium, Total Recoverable		Percent	Per Application	Composite	
PFOA + PFOS		ug/kg	Per Application	Calculated	Monitoring required only when reed bed feed sludge is land applied or hauled to another permitted facility in any year. Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Per Application	Grab	Monitoring required only when reed bed feed sludge is land applied or hauled to another permitted facility in any year. Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

4.1.1 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.

- Removal of PCB monitoring consistent with the Department's Sludge Monitoring Guidance.
- Addition of Per Application PFAS (PFOA + PFOS) monitoring pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

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

4.2 Sample Point Number: 007- REED BED CAKE SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Once	Composite	Monitoring required once in 2026 and again if the reed bed cake sludge is land applied or hauled to another permitted facility in any year.
Arsenic Dry Wt	High Quality	41 mg/kg	Once	Composite	Monitoring required once in 2026 and again if the reed bed cake sludge is land applied or hauled to another permitted facility in any year. Limits applicable only when reed bed cake sludge is land applied.
Arsenic Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Once	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Once	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Once	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Once	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Once	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Once	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Once	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Once	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Once	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Once	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Once	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Once	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Once	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Once	Composite	
Nitrogen, Total Kjeldahl		Percent	Per Application	Composite	Monitoring required if the reed bed cake sludge is land

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonium (NH4-N) Total		Percent	Per Application	Composite	applied in any year.
Phosphorus, Total		Percent	Per Application	Composite	
Phosphorus, Water Extractable		% of Tot P	Per Application	Composite	
Potassium, Total Recoverable		Percent	Per Application	Composite	
PFOA + PFOS		ug/kg	Once	Calculated	Monitoring required once in 2026 and again if the reed bed cake sludge is land applied or hauled to another permitted facility in any year. Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Once	Grab	Monitoring required once in 2026 and again if the reed bed cake sludge is land applied or hauled to another permitted facility in any year. Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

4.2.1 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.

- Removal of PCB monitoring consistent with the Department's Sludge Monitoring Guidance.
- Addition of one time PFAS (PFOA + PFOS) monitoring pursuant to s. NR 204.06(2)(b)9., Wis. Adm. Code.

4.2.2 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 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 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 (Target Value)

As a condition of the variance to the water quality based effluent limitation(s) for chloride granted in accordance with s. NR 106.83(2), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Chloride Progress Report: Submit an annual chloride progress report related to the source reduction activities for the previous year. The annual chloride progress report shall: Indicate which chloride source reduction measures or activities in the Source Reduction Plan have been implemented and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why. Include an assessment of whether each implemented source reduction measure appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data; and Include an analysis of how effluent chloride varies with time and with significant loadings of chloride. Note that the interim limitation listed in the Surface Water section of this permit remains enforceable until new enforceable limits are established in the next permit issuance. The first annual chloride progress report is to be submitted by the Date Due.	01/31/2026
Annual Chloride Progress Report #2: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2027
Annual Chloride Progress Report #3: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2028
Annual Chloride Progress Report #4: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2029
Final Chloride Report: Submit the final chloride report documenting the success in meeting the chloride target value of 702 mg/L (weekly avg), as well as the anticipated future reduction in chloride sources and chloride effluent concentrations. The report shall: Summarize chloride source reduction measures that have been implemented during the current permit term and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why; Include an assessment of which source reduction measures appear to have been effective or	12/31/2029

ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data during the current permit term; and Include an analysis of how influent and effluent chloride varies with time and with significant loadings of chloride as identified in the source reduction plan. If the permittee intends to reapply for a chloride variance, for the reissued permit, proposed target limits and a detailed source reduction measures plan, outlining the source reduction activities proposed for the upcoming permit term, shall also be included per ss. NR 106.90 (5) and NR 106.83 (4), Wis. Adm. Code. An updated source reduction measures plan shall: Include an explanation of why or how each source reduction measure will result in reduced discharge of the target pollutant; and Evaluate any available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and Identify any information needs that would help to better determine pollutant sources and make plans to collect that information. Note that the target value is the benchmark for evaluating the effectiveness of the chloride source reduction measures but is not an enforceable limitation under the terms of this permit.	
Annual Chloride Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires the permittee shall continue to submit annual chloride reports for the previous year following the due date of Annual Chloride Progress Reports listed above. Annual Chloride Progress Reports shall include the information as defined above.	

5.1.1 Explanation of Schedule

Chloride Source Reduction Measures (Target Value) – This schedule is required to ensure that the permittee maintains compliance with the conditions and requirements of receiving a variance from the water quality-based chloride effluent limits of 780 mg/L expressed as a daily maximum and 400 mg/L expressed as a weekly average. Since a compliance schedule is being granted, an interim limit is required, and for Brillion the limits are established as 1,050 mg/L (as a daily maximum) and 780 mg/L (as a weekly average). The schedule requires that annual reports shall indicate which source reduction measures Brillion has implemented during each calendar year, and an analysis of chloride concentration and mass discharge data based on chloride sampling and flow data. The annual reports shall document progress made towards meeting the chloride target value of 702 mg/L (weekly avg) by the end of the permit term.

5.2 TMDL-Based Effluent Mass Limits for Total Phosphorus

The permittee shall comply with the limits for Phosphorus as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	09/30/2025
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the	09/30/2026

Surface Water section of this permit.	
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	06/30/2027
Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	07/01/2027

5.2.1 Explanation of Schedule

TMDL-Based Effluent Mass Limits for Total Phosphorus – This compliance schedule contains the remaining Required Actions from the previous permit in order to achieve compliance with the TMDL-based effluent mass limits for total phosphorus by July 1, 2027.

5.3 Effluent Limits for BOD, DO, and Ammonia

The permittee shall comply with the limits for BOD, DO, and Ammonia as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades.	09/30/2025
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades.	09/30/2026
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	06/30/2027
Achieve Compliance: The permittee shall achieve compliance with final BOD, DO, and Ammonia WQBELs.	07/01/2027

5.3.1 Explanation of Schedule

Effluent Limits for BOD, DO, and Ammonia – This compliance schedule aligns with the schedule for total phosphorus because the current/on-going upgrades to the facility are also needed in order to comply with the new, more stringent water quality-based effluent limits for BOD_5, DO, and Ammonia (weekly avg and monthly avg limits in June-Sept). The current limits will act as interim limits until the final limits become effective on July 1, 2027.

5.4 Disinfection and Effluent Limitations for E. coli

The permittee shall install disinfection treatment and comply with surface water limitations for E. coli as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Progress Report: The permittee shall submit a progress report on development and submittal of a facility plan for upgrades to meet disinfection requirements and E. coli limits.	03/31/2026
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code for meeting disinfection requirements and complying with E. coli surface water limitations. The	01/31/2027

permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to meet disinfection requirements per s. NR 210.06(1), Wis. Adm Code, achieve compliance with final E. coli limitations, and a schedule for completing construction of the upgrades by the complete construction date specified below.	01/31/2028
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	07/31/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	07/31/2029
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	01/31/2030
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2030

5.4.1 Explanation of Schedule

Disinfection and Effluent Limitations for E. coli – A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and install disinfection treatment for meeting effluent E. coli water quality-based effluent limits and disinfection requirements pursuant s. NR 210.06, Wis. Adm. Code.

5.5 Temperature Limits (Municipal Facilities)

This compliance schedule requires the permittee to achieve compliance by the specified date.

Required Action	Due Date
Report on Effluent Discharges: Submit a report on effluent temperature with conclusions regarding compliance. Informational Note: Refer to the Surface Water subsection regarding 'Determination of Need for Effluent Limits' for information concerning a Department determination on the need for limits and pursuing re-evaluation of limits per NR 106 Subchapters V & VI or NR 102.26, Wis. Adm. Code.	06/30/2026
Action Plan: Submit an action plan for complying with all effluent temperature limits that remain following the Department's review for necessity.	12/31/2026
Construction Plans: Submit construction plans (if construction is required for complying with effluent temperature limits) and include plans and specifications with the submittal.	06/30/2027
Initiate Actions: Initiate actions identified in the plan.	06/30/2028
Complete Actions: Complete actions necessary to achieve compliance with effluent temperature limits.	06/30/2029

5.5.1 Explanation of Schedule

Temperature Limits (Municipal Facilities) – A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and install treatment for meeting thermal effluent limitations.

5.6 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.	06/30/2026
Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan. If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued. If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.	06/30/2027

5.6.1 Explanation of Schedule

PFOS/PFOA Minimization Plan Determination of Need – As stated above, ch. NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Section NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge.

If the Department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

5.7 Reed Bed Phragmites Survey

An annual survey of adjacent lands for phragmites is required.

Required Action	Due Date
Submit an Annual Phragmites Survey: The permittee shall conduct an annual survey of adjacent lands for new Phragmites growth. Surveys shall be done at a time of the year when Phragmites are biologically active. The annual surveys shall contain the name and qualifications of the person(s) completing the inspection, the date of the survey, and at a minimum include descriptions of the area(s) inspected, land use(s), dominant plant community, existing Phragmites stands, and any areas of potential concern or newly discovered Phragmites growth. Photographic documentation of the survey area(s) is also recommended. The survey area should be as large as practicable and include any area potentially susceptible to phragmites growth. Survey results shall be submitted to the Department within 60 days of survey completion. The Department shall be notified within 24 hours whenever new growths of Phragmites are discovered. The Department may require the permittee to eradicate specific stands of Phragmites in these areas.	
Annual Phragmites Survey #2: Submit an annual phragmites survey as defined above. Survey results shall be submitted to the Department within 60 days of survey completion.	
Annual Phragmites Survey #3: Submit an annual phragmites survey as defined above. Survey results shall be submitted to the Department within 60 days of survey completion.	
Annual Phragmites Survey #4: Submit an annual phragmites survey as defined above. Survey results shall be submitted to the Department within 60 days of survey completion.	
Annual Phragmites Survey #5: Submit an annual phragmites survey as defined above. Survey results shall be submitted to the Department within 60 days of survey completion.	
Annual Phragmites Surveys After Permit Expiration: In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to conduct annual phragmites surveys and submit survey results to the Department within 60 days of survey completion.	

5.7.1 Explanation of Schedule

Reed Bed Phragmites Surveys – The permittee is required to submit annual surveys of adjacent lands of the reed beds for new Phragmites growth. This schedule serves as a reminder to submit annual Phragmites surveys to the Department by the due date.

Attachments

WQBEL Memo: Water Quality-Based Effluent Limitations for Brillion Wastewater Treatment Facility WPDES Permit No. WI-0020443-10, by Nicole Krueger, Water Resources Engineer, dated November 8, 2024

Chloride Variance EPA Data Sheet

SRM (Source Reduction Measures) Plan, dated December 29, 2022, revised February 14, 2025

Justification Of Any Waivers From Permit Application Requirements

No waivers from permit application requirements were requested or granted.

Prepared By: Sarah Donoughe, Wastewater Specialist-Adv **Date:** February 18, 2025

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 11/08/2024 – updated 11/15/2024 to include additional DO limits options

TO: Sarah Donoughe – SER

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Brillion Wastewater Treatment Facility
WPDES Permit No. WI-0020443-10

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from Brillion Wastewater Treatment Facility in Calumet County. This municipal wastewater treatment facility (WWTF) discharges to an unnamed tributary to Spring Creek, located in the North Branch Manitowoc River Watershed in the Manitowoc River Basin. This discharge is included in the Northeast Lakeshore Basin Total Maximum Daily Load (TMDL) as approved by EPA in October 2023. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
BOD_5					3,4,5
Interim			30 mg/L	20 mg/L	
Final					
May – October			6.3 mg/L 43 lbs/day	**6.3 mg/L**	
Nov – April			10 mg/L 69 lbs/day	**10 mg/L**	
TSS					3,4,6
TMDL			168 lbs/day	113 lbs/day	
Interim			30 mg/L	20 mg/L	
Final			10 mg/L	**10 mg/L**	
Dissolved Oxygen		7.0 mg/L			5
pH	9.0 s.u.	6.0 s.u.			1
Bacteria					7
Final Limit *E. coli*				126 #/100 mL geometric mean	
Chloride	780 mg/L 5,400 lbs/day		400 mg/L 2,700 lbs/day		8
Phosphorus					6,9
Interim				1.0 mg/L	
TMDL				5.6 lbs/day	
Ammonia Nitrogen					10
April & May			8.0 mg/L	3.2 mg/L	
June – September			3.0 mg/L	1.3 mg/L	
Oct. & Nov.			5.5 mg/L	2.3 mg/L	
Dec. – March			16 mg/L	6.4 mg/L	
Nov. – April	Variable				

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
PFOS and PFOA					11
TKN, Nitrate+Nitrite, and Total Nitrogen					12
Acute WET					13
Chronic WET				1.0 TUc	13
Temperature					14

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. A compliance schedule may be included in the reissued permit to meet the BOD_5 concentration and mass limits and the TSS concentration limits. The current limits may be included as interim limits.
5. Alternative DO, BOD_5, and TSS limits are shown below. A compliance schedule to meet these limits may be included in the reissued permit.

	Daily minimum	Weekly Average	Monthly Average
BOD_5 May – October Nov – April		9.3 mg/L 64 lbs/day 15 mg/L 102 lbs/day	**9.3 mg/L** **15 mg/L**
TSS May – October Nov – April		10 mg/L 15 mg/L	**10 mg/L** **15 mg/L**
Dissolved Oxygen	8.0 mg/L		

6. The TSS and phosphorus mass limits are based on the Total Maximum Daily Load (TMDL) for the Northeast Lakeshore Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA in October 2023.
7. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL. A compliance schedule to meet the bacteria limits is recommended.
8. These are WQBELs for chloride. Alternative effluent limitations of 1050 mg/L as a daily maximum and 780 mg/L as a weekly average (equal to the 4-day P_{99}) may be included in the permit in place of this limit if the chloride variance application that was submitted is approved by EPA. If the variance is not approved, a weekly average wet weather mass limit would also be required.
9. The monthly average phosphorus limit is a technology-based limit which also functions as an interim limit for the phosphorus compliance schedule.
10. The variable daily maximum ammonia nitrogen limits apply November – April:

Effluent pH s.u.	**Limit mg/L**	**Effluent pH s.u.**	**Limit mg/L**	**Effluent pH s.u.**	**Limit mg/L**
$6.0 \leq pH \leq 6.1$	54	$7.0 < pH \leq 7.1$	33	$8.0 < pH \leq 8.1$	6.9
$6.1 < pH \leq 6.2$	53	$7.1 < pH \leq 7.2$	30	$8.1 < pH \leq 8.2$	5.7
$6.2 < pH \leq 6.3$	52	$7.2 < pH \leq 7.3$	26	$8.2 < pH \leq 8.3$	4.7

6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

11. Monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code at a once every two month frequency
12. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
13. 2/permit term acute and annual chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 99%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the unnamed tributary. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
14. After a compliance schedule, the following limits are recommended be become effective:

Month	Calculated Effluent Limit	
	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	49	76
FEB	50	76
MAR	52	77
APR	55	79
MAY	65	82
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82
OCT	61	80
NOV	49	77
DEC	49	76

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

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

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Trevor Moen, Wastewater Engineer – NER
Heidi Schmitt Marquez, Regional Wastewater Supervisor – NER
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Brillion Wastewater Treatment Facility

WPDES Permit No. WI-0020443-10

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PART 1 – BACKGROUND INFORMATION

Facility Description

A conventional gravity sewer system collects wastewater from throughout the City of Brillion. Three lift stations are part of this sewer system. At the WWTF, raw wastewater receives preliminary treatment by a vortex type degritter and a mechanically-cleaned fine screen, and a manually-cleaned bar rack is available as a back-up. Wastewater then flows through a Parshall flume to a splitter box; influent samples are collected prior to the flume. The splitter box sends flow to a pair of primary clarifiers. After primary clarification wastewater receives biological treatment via aeration tanks operating in the "conventional" mode. Phosphorus removal is accomplished by adding ferric chloride to the aeration tanks. Secondary clarifiers are then employed. Screw pumps lift effluent from the secondary clarifiers to a conventional sand filter for tertiary treatment. A sampler set up in the meter room collects composite samples of the and filter effluent.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations

The current permit, which expired on June 30, 2023, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			30 mg/L	20 mg/L		2,3
TSS			30 mg/L	20 mg/L		2,3
Dissolved Oxygen		4.0 mg/L				2,3
pH	9.0 s.u.	6.0 s.u.				2
Chloride			1,100 mg/L			4
Phosphorus Interim Final				 1.0 mg/L 0.225 mg/L	 0.075 mg/L 0.062 lbs/day	5
Ammonia Nitrogen November – April December – March April May June – September Oct. – November	 Variable		 18 mg/L 8.0 mg/L 8.0 mg/L 5.7 mg/L 5.8 mg/L	 7.0 mg/L 3.2 mg/L 3.2 mg/L 2.3 mg/L 2.3 mg/L		6
Acute WET						7

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Chronic WET						7

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. These limits are based on the Limited Aquatic Life (LAL) community of the immediate receiving water as described in s. NR 104.02(3)(b), Wis. Adm. Code.
4. This is a variance limit to the weekly average WQBEL of 395 mg/L.
5. A compliance schedule is in the current permit to meet the final WQBEL by July 2027.
6. The following daily maximum daily limits are effective for the months of November – April:

Effluent pH - su	**NH_3-N Limit – mg/L**	**Effluent pH - su**	**NH_3-N Limit – mg/L**
pH ≤ 7.7	>19	8.4 < pH ≤ 8.5	4.9
7.7 < pH ≤ 7.8	19	8.5 < pH ≤ 8.6	4.1
7.8 < pH ≤ 7.9	16	8.6 < pH ≤ 8.7	3.4
7.9 < pH ≤ 8.0	13	8.7 < pH ≤ 8.8	2.8
8.0 < pH ≤ 8.1	11	8.8 < pH ≤ 8.9	2.4
8.1 < pH ≤ 8.2	8.8	8.9 < pH ≤ 9.0	2.0
8.2 < pH ≤ 8.3	7.3	pH > 9.0	<2.0
8.3 < pH ≤ 8.4	6.0		

7. Acute WET testing is required 2x/permit term and chronic WET testing is required once every other year. The IWC for chronic testing is 100%.

Receiving Water Information

- Name: Unnamed tributary to Spring Creek
- Waterbody Identification Code (WBIC): 77100
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warmwater sport fish (WWSF) classification, non-public water supply. Note: Cold Water and Public Water Supply criteria are used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin.
  - Previously, the limits were based on a Limited Aquatic Life (LAL) classification per table 5 in ch. NR 104, Wis. Adm. Code. However, the outfall moved to a different receiving water in 1981 that is not classified as a variance water in ch. NR 104, Wis. Adm. Code. Therefore, a site visit was conducted in September 2022 and September 2024 by Department biologists. Due to the nature of the receiving water and several fish being observed near the discharge pipe, and it was recommended that the classification be updated to WWSF.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are estimates from USGS where Outfall 001 is located.
  7-Q_{10} = 0.05 cfs (cubic feet per second)
  7-Q_2 = 0.18 cfs
- Hardness = 356 mg/L as $CaCO_3$. This value represents the geometric mean of data from chronic WET testing from 02/11/2014 – 05/07/2019.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code:

25%

- Source of background concentration data: Metals data from the Manitowoc River at County Highway JJ is used for this evaluation because there is no data available for the South Branch Manitowoc River. The Manitowoc River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: None.
- Impaired water status: The immediate receiving water is not 303(d) listed as impaired. The North Branch Manitowoc River, approximately 2 miles downstream, is 303(d) listed as impaired for total phosphorus and TSS.

Effluent Information

- Design flow rate(s):
  From the June 2024 Facility Plan:

  Annual average = 0.824 MGD (Million Gallons per Day)
  Peak daily = 2.121 MGD
  Peak monthly = 1.222 MGD

  For reference, the actual average flow from 07/01/2018 – 08/31/2024 was 0.63 MGD.

  *The previous WQBEL memos used an annual design flow of 0.708 MGD.

- Hardness = 431 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit reissuance application from 04/24/2022 – 05/06/2022.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells and two industrial contributors: Ariens Company and Professional Plating.
- Additives: Ferric chloride is used for phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Effluent Copper Data

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
4/24/2022	4.5	5/10/2022	4.3	5/27/2022	3.5
4/28/2022	4.2	5/14/2022	4.2	5/31/2022	3.7
5/2/2022	4.3	5/19/2022	4.5	6/4/2022	3.4
5/6/2022	4.0	5/23/2022	5.0		
1-day P_{99} = 5.4 µg/L					

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Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
4-day P_{99} = 4.7 µg/L					

Effluent Chloride Data

	Chloride mg/L
1-day P_{99}	1070
4-day P_{99}	782
30-day P_{99}	630
Mean	553
Std	172
Sample size	296
Range	169 – 1150

The following table presents the average concentrations and loadings at Outfall 001 from 07/01/2018 – 08/31/2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameter Averages with Limits

	Average Measurement
BOD_5	2.27 mg/L*
TSS	1.15 mg/L*
pH field	7.86 s.u.
Phosphorus	0.64 mg/L
Ammonia Nitrogen	0.40 mg/L*
Chloride	553 mg/L
Dissolved Oxygen	9.48 mg/L

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

PART 2 - BOD_5 and TSS

In establishing BOD_5 (Biochemical Oxygen Demand) limitations, the primary intent is to prevent a lowering of dissolved oxygen levels in the receiving water below water quality standards as specified in ss. NR 102.04(4)(a) and (b). The previous permits established BOD_5 and DO limits based on an LAL receiving water classification. These limits are re-evaluated here to be protective of a warmwater sport fish community.

The 26-lb method is the most frequently used approach for calculating BOD_5 limits when resources are not available to develop a detailed water quality model. This simplified model was developed in the 1970's by the Wisconsin Committee on Water Pollution on the Fox, Wisconsin, Oconto, and Flambeau Rivers. Further studies throughout the 1970's proved this model to be relatively accurate. The model has since then been used by the Department on many occasions when resources are not available to perform a site-specific model. The "26" value stems from the following equation:

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

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

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

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

Calculations based on Full Assimilative Capacity at 7Q10 Conditions:

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

Where:
Q_{eff} = effluent design flow = 0.824 MGD
DO_{stream} = background dissolved oxygen = 7 mg/L
DO_{std} = dissolved oxygen criteria from s. NR 102.04(4) = 5.0 mg/L
${}_7Q_{10}$ = 0 cfs
T = Receiving water temperature from s. NR 102.25

The two tables below show the calculated BOD_5 limits based on two different scenarios: an effluent DO of 7 mg/L and an effluent DO of 8 mg/L.

BOD_5 Limitations – Effluent DO of 7 mg/L

BOD Effluent Limitations (26 LB Method)		Summer	Winter
Background Information:	7-Q_{10} (cfs)	0.05	0.05
	River Temperature (°C)	17	3.3
Dissolved Oxygen mg/L:	Effluent	7	7
	Background	7	7
	Mix DO	7	7
	Criteria	5	5
Weekly Ave BOD Effluent Limitations	Concentration Limits (mg/L)	**6.3**	**10**
	Mass (lbs/d)	**43**	**69**

The TSS limitations are primarily given to maintain or improve water clarity and are not water quality based. However, the Department typically does not require TSS limits lower than 10 mg/L, otherwise suspended solids limitations are established as the same concentration as the BOD_5 limitations. In this case, **the year-round TSS limits are recommended to be 10 mg/L.**

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BOD_5 Limitations – Effluent DO of 8 mg/L

BOD Effluent Limitations (26 LB Method)		Summer	Winter
Background Information:	7-Q_{10} (cfs)	0.05	0.05
	River Temperature (°C)	17	3.3
Dissolved Oxygen mg/L:	Effluent	8	8
	Background	7	7
	Mix DO	7.96	7.96
	Criteria	5	5
Weekly Ave BOD Effluent Limitations	Concentration Limits (mg/L)	**9.3**	**15**
	Mass (lbs/d)	**64**	**102**

In this case, **the TSS limit for summer would be 10 mg/L and the TSS limit for winter would be 15 mg/L.**

Data from the current permit term for BOD_5, TSS, and DO are summarized below:

Effluent Data

	BOD_5 mg/L	TSS mg/L	DO mg/L
1-day P_{99}	18.5	12.4	12.1
4-day P_{99}	9.95	6.28	10.7
30-day P_{99}	4.54	2.77	9.92
Mean	2.27	1.15	9.48
Std	4.78	3.80	1.02
Sample size	592	601	1607
Range	<2 - 65.7	<2 - 31.2	5.1 - 13.7

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

Expression of Limits:
Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code require WPDES permits contain weekly average and monthly average limitations whenever practicable and necessary to protect water quality. **Therefore, monthly average limits for BOD_5 and TSS are required** to meet expression of limits requirements in addition to the weekly average limits. Because weekly average BOD_5 and TSS limits are necessary for Brillion, monthly average limits are also required under this code revision. **Therefore, the following limits are recommended** (Brillion may choose which effluent DO option to have):

Recommended Limits – Effluent DO of 7 mg/L

	Daily minimum	Weekly Average	Monthly Average
BOD_5 May – October		6.3 mg/L 43 lbs/day	**6.3 mg/L**
Nov – April		10 mg/L 69 lbs/day	**10 mg/L**
TSS		10 mg/L	**10 mg/L**

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	Daily minimum	Weekly Average	Monthly Average
Dissolved Oxygen	7.0 mg/L		

Recommended Limits – Effluent DO of 8 mg/L

	Daily minimum	Weekly Average	Monthly Average
BOD_5 May – October Nov – April		9.3 mg/L 64 lbs/day 15 mg/L 102 lbs/day	**9.3 mg/L** **15 mg/L**
TSS May – October Nov – April		 10 mg/L 15 mg/L	 **10 mg/L** **15 mg/L**
Dissolved Oxygen	8.0 mg/L		

Additional limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are in the table above in bold.

Because there would have been several exceedances of the BOD_5 and TSS limits based on WWSF during the permit term, **a compliance schedule to meet the BOD_5 and TSS limits is recommended in the reissued permit.** See the TMDL section of this memo for additional TSS mass limits.

There were 6 dissolved oxygen samples that were less than 7.0 mg/L out of 1607 total samples during the permit term. Therefore, **no compliance schedule is needed for the daily minimum DO limit of 7.0 mg/L and this limit is recommended to become effective upon reissuance.**

There were 75 dissolved oxygen samples that were less than 8.0 mg/L during the permit term. Therefore, a **compliance schedule may be included for the daily minimum DO limit of 8.0 mg/L.**

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

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

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

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for

other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

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

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

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

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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Brillion.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.04 cfs (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340		350	70.1	<0.28		
Cadmium	431	55.1	0.2	56.8	11.4	<1.3		
Chromium	301	4446		4585	917	<2.5		
Copper	431	61.6	12.3	63.1			5.4	5.0
Lead	356	365	9.9	376	75.2	<5.9		
Nickel	268	1080	20	1114	223	4.8		
Zinc	333	345	28.3	355	70.9	21.4		
Chloride (mg/L)		757	31.1	780			**1070**	**1150**

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

* * Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q_{10} flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.0125 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

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SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		152		154	30.7	<0.28	
Cadmium	175	3.82	0.2	3.86	0.77	<1.3	
Chromium	301	326		329	65.8	<2.5	
Copper	356	30.7	12.3	30.9			4.7
Lead	356	95.5	9.9	96.3	19.3	<5.9	
Nickel	268	120	20	121	24.2	4.80	
Zinc	333	345	28.3	348	69.6	21.4	
Chloride (mg/L)		395	31.1	399			**782**

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)
The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)
RECEIVING WATER FLOW = 0.1477 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.2	370	74.0	<1.3
Chromium (+3)	3818000		3818000	763600	<2.5
Lead	140	9.9	140	28.0	<5.9
Nickel	43000	20	43000	8600	4.8

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 0.1477 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		13.3	2.66	<0.28

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

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

Chloride – Considering available effluent data from the current permit term (07/01/2018 – 08/14/2024), the 1-day P_{99} chloride concentration is 1070 mg/L, and the 4-day P_{99} of effluent data is 782 mg/L.

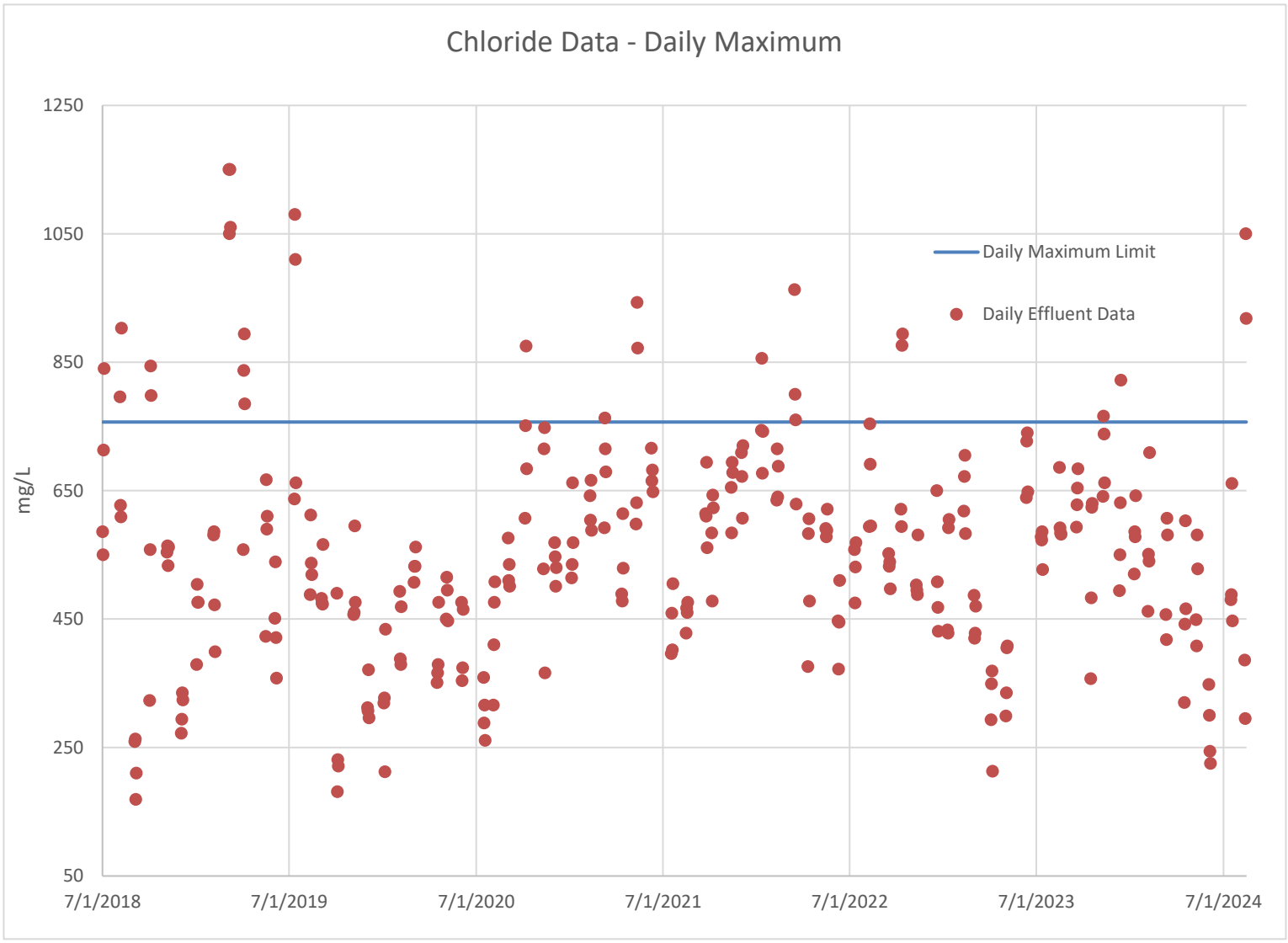
Because the 1-day and 4-day P_{99} exceed the calculated daily maximum and weekly average WQBELs, effluent limits are needed in accordance with ss. NR 106.05(4)(a) and (b), Wis. Adm. Code.

However, Subchapter VII of ch. NR 106, Wis. Adm. Code, provides for a variance from water quality standards for this substance, and Brillion has requested such a variance. That variance may be granted subject to the following conditions:

1) The permit shall include an "Interim" limitation intended to prevent an increase in the discharge of Chloride;
2) The permit shall specify "Source Reduction Measures" to be implemented during the permit term, with periodic progress reports; and
3) The permit shall include a "Target Limit" or "Target Value" to gage the effectiveness of the Source Reduction Measures, and progress toward the WQBELs.

Attachment #1

The graphs below show the effluent data from the current permit term, compared to the daily maximum and weekly average limits:



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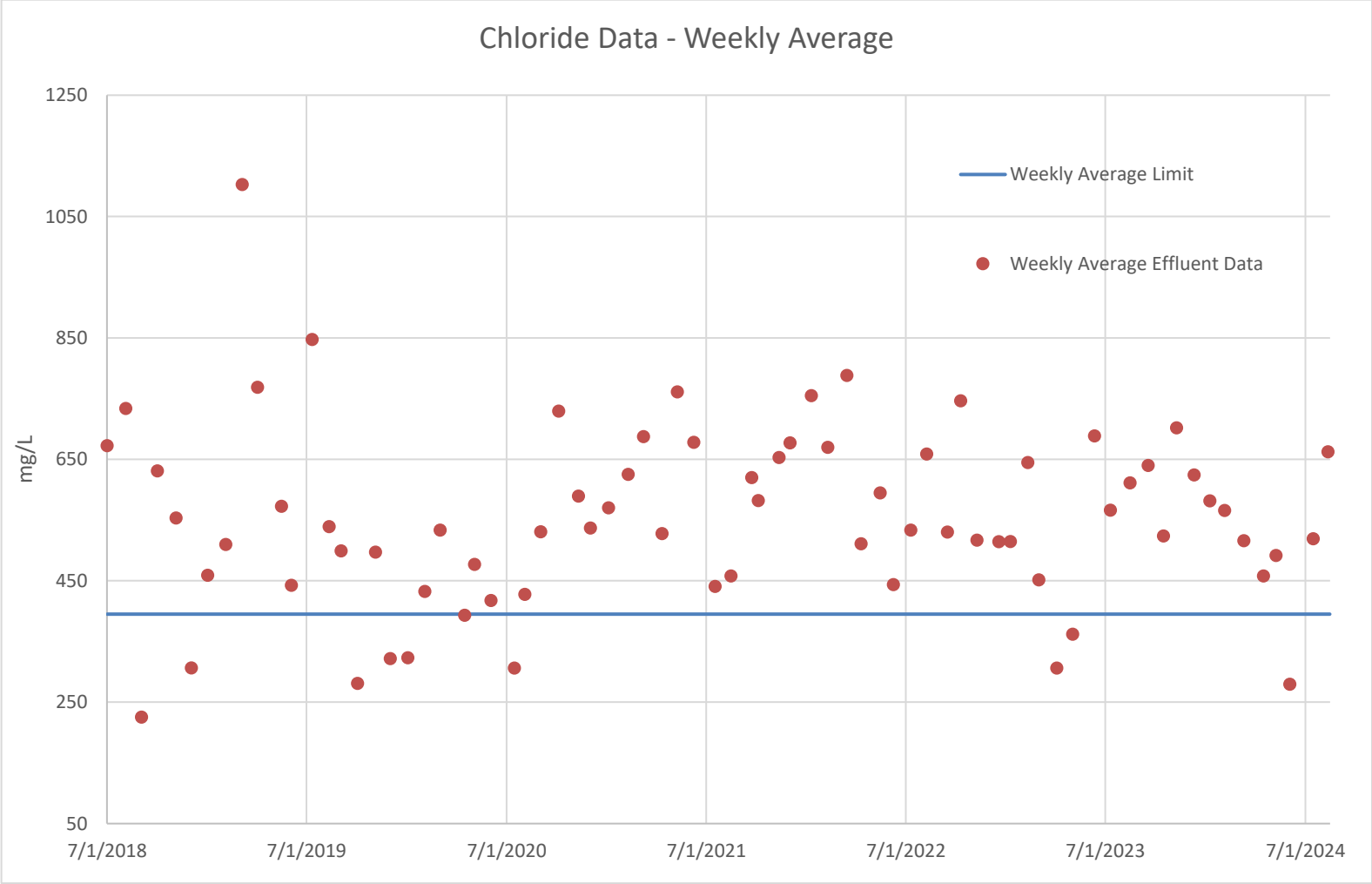

Interim Limits for Chloride
Section NR 106.82(4), Wis. Adm. Code, defines a "Daily maximum interim limitation" as either the 1-day P_{99} concentration or no greater than 105% of the highest representative data. The current permit does not have an interim limit for the daily maximum limit. **It's recommended that the interim daily maximum limit be 1050 mg/L** which is less than the 1-day P_{99} but it has not been exceeded since 2019.

Section NR 106.82(9), Wis. Adm. Code, defines a "Weekly average interim limitation" as either the 4-day P_{99} concentration or 105% of the highest weekly average concentration of the representative data. The current permit has an interim limit of 1,100 mg/L as a monthly average. Most reported data was well below this interim limit, with one exceedance in March 2019. **The monthly average interim limit is recommended to be 780 mg/L, which is equal to the 4-day P_{99},** rounded to two significant figures.

Target limits and permit language for Source Reduction Measures are not recommended as part of this evaluation. These should follow contact with Brillion. Though if the Department and Brillion are unable to reach agreement on all the terms of a Chloride Variance, the calculated limits described earlier should be included in the permit, in accordance with s. NR 106.83(3), Wis. Adm. Code.

Chloride Monitoring Recommendations
Four samples per month (on consecutive days) are recommended. This allows for averaging of the results to compare with the interim limit and allows the use of the average in determining future interim limits, and degree of success with chloride reduction measures.

In the absence of a variance, Brillion would be subject to the WQBEL of 760 mg/L as a daily maximum and daily maximum mass limit of 5,400 lbs/day (780 mg/L × 0.824 MGD × 8.34). Brillion would also be subject to the WQBEL of 400 mg/L as a weekly average; the weekly average mass limit of 2,700 lbs/day (399 mg/L × 0.824 MGD × 8.34); and an alternative wet weather mass limit.

Mercury – The permit application did not require monitoring for mercury because Brillion is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. All samples were reported as nondetect from 04/05/2021 – 06/13/2023. Therefore, **no mercury monitoring is recommended at Outfall 001.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Previous monitoring produced a PFOS result of 1.32 ng/L and a PFOA result of 1.31 ng/L which are less than one fifth of the respective criteria for each substance. Based on the types of indirect dischargers contributing to the collection system (metal finishing/plating), **PFOS and PFOA monitoring is recommended at a once every two months frequency.**

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

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

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- The immediate receiving water is now considered WWSF, rather than LAL.
- The maximum expected effluent pH has changed

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

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

Where:

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

The effluent pH data was examined as part of this evaluation. A total of 1610 sample results were reported from 07/03/2018 – 08/30/2024. The maximum reported value was 9.1 s.u. (Standard pH Units). The effluent pH was 8.23 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.27 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 8.26 s.u. Therefore, a value of 8.23 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.23 s.u. into the equation above yields an ATC = 5.4 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method
In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the the 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q_{10} (estimated as 80 % of 7-Q_{10}) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	11
1-Q_{10}	5.6

The 1-Q_{10} method yields the most stringent limits for Brillion. The current permit has variable daily maximum effluent limits based on effluent pH. Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – WWSF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	56	7.0 < pH ≤ 7.1	34	8.0 < pH ≤ 8.1	7.2
6.1 < pH ≤ 6.2	55	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.9
6.2 < pH ≤ 6.3	54	7.2 < pH ≤ 7.3	27	8.2 < pH ≤ 8.3	4.9
6.3 < pH ≤ 6.4	52	7.3 < pH ≤ 7.4	24	8.3 < pH ≤ 8.4	4.0
6.4 < pH ≤ 6.5	50	7.4 < pH ≤ 7.5	21	8.4 < pH ≤ 8.5	3.3
6.5 < pH ≤ 6.6	48	7.5 < pH ≤ 7.6	18	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	46	7.6 < pH ≤ 7.7	15	8.6 < pH ≤ 8.7	2.3
6.7 < pH ≤ 6.8	43	7.7 < pH ≤ 7.8	13	8.7 < pH ≤ 8.8	1.9
6.8 < pH ≤ 6.9	40	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6
6.9 < pH ≤ 7.0	37	7.9 < pH ≤ 8.0	8.7	8.9 < pH ≤ 9.0	1.4

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

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

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

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

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

Where:

pH = the pH (s.u.) of the receiving water,
E = 0.854,
C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or
$C = 1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and
T = the temperature (ºC) of the receiving water – (Early Life Stages Present), or
T = the maximum of the actual temperature (ºC) and 7 - (Early Life Stages Absent)

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q_3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 ºC, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in the unnamed tributary. So "ELS Absent" criteria apply from October through March, and "ELS Present" criteria will apply from April through September for a warmwater sport fish classification.

Brillion collected instream pH and temperature data in 2011 which are used in this evaluation. "Default" background ammonia concentrations are used.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		Spring	Summer	Fall	Winter
		April & May	June – Sept.	Oct. & Nov.	Dec. – March
Effluent Flow	Qe (MGD)	0.824	0.824	0.824	0.824
Background Information	7-Q_{10} (cfs)	0.05	0.05	0.05	0.05
	7-Q_2 (cfs)	0.18	0.18	0.18	0.18
	Ammonia (mg/L)	0.16	0.04	0.05	0.05
	Temperature (°C)	1.9	10	21	11
	Temperature (°C)	9.0	12.2	29.3	19.5
	pH (s.u.)	7.51	7.79	7.85	7.85

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		Spring	Summer	Fall	Winter
		April & May	June – Sept.	Oct. & Nov.	Dec. – March
	% of Flow used	25	25	100	50
	Reference Weekly Flow (cfs)	0.0125	0.0125	0.05	0.025
	Reference Monthly Flow (cfs)	0.038	0.038	0.153	0.077
Criteria mg/L	4-day Chronic				
	Early Life Stages Present	8.1	2.9		
	Early Life Stages Absent			5.4	15
	30-day Chronic				
	Early Life Stages Present	3.2	1.2		
	Early Life Stages Absent			2.2	6.2
Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present	**8.1**	**3.0**		
	Early Life Stages Absent			**5.5**	**16**
	Monthly Average				
	Early Life Stages Present	**3.3**	**1.3**		
	Early Life Stages Absent			**2.3**	**6.4**

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 07/02/2018 – 08/13/2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in Brillion's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	April & May	June – Sept.	Oct. – Nov.	Dec. – March
1-day P_{99}	10.6	4.56	1.68	1.19
4-day P_{99}	5.90	2.78	0.98	0.66
30-day P_{99}	2.54	1.16	0.41	0.29
Mean*	1.14	0.38	0.16	0.13
Std	2.79	1.45	0.48	0.30
Sample size	53	109	49	97
Range	<0.04 – 9.57	<0.038 – 9.3	<0.038 – 2.33	<0.038 – 1.79

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

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

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

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

Antidegradation

The calculated weekly average limit of 8.1 mg/L for April & May is less restrictive than the limit of 8.0 mg/L in the current permit as well as the calculated monthly average of 3.3 mg/L compared to 3.2 mg/L in the current permit. There were two days that exceeded 8.0 mg/L; however, they were caused by plant upsets (power outage and wasting timer failure). Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limit of 8.0 mg/L must be continued in the reissued permit.

Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

	Weekly Average mg/L	Monthly Average mg/L
April & May	8.0	3.2
June – September	3.0	1.3
October & November	5.5	2.3
December – March	16	6.4

The following table shows the variable daily maximum limits for the months of November – April:

Daily Maximum Ammonia Nitrogen Limits

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	56	$7.0 < pH \leq 7.1$	34	$8.0 < pH \leq 8.1$	7.2
$6.1 < pH \leq 6.2$	55	$7.1 < pH \leq 7.2$	30	$8.1 < pH \leq 8.2$	5.9
$6.2 < pH \leq 6.3$	54	$7.2 < pH \leq 7.3$	27	$8.2 < pH \leq 8.3$	4.9
$6.3 < pH \leq 6.4$	52	$7.3 < pH \leq 7.4$	24	$8.3 < pH \leq 8.4$	4.0
$6.4 < pH \leq 6.5$	50	$7.4 < pH \leq 7.5$	21	$8.4 < pH \leq 8.5$	3.3
$6.5 < pH \leq 6.6$	48	$7.5 < pH \leq 7.6$	18	$8.5 < pH \leq 8.6$	2.7
$6.6 < pH \leq 6.7$	46	$7.6 < pH \leq 7.7$	15	$8.6 < pH \leq 8.7$	2.3
$6.7 < pH \leq 6.8$	43	$7.7 < pH \leq 7.8$	13	$8.7 < pH \leq 8.8$	1.9
$6.8 < pH \leq 6.9$	40	$7.8 < pH \leq 7.9$	10	$8.8 < pH \leq 8.9$	1.6
$6.9 < pH \leq 7.0$	37	$7.9 < pH \leq 8.0$	8.7	$8.9 < pH \leq 9.0$	1.4

PART 5 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

Brillion had previously been exempted from disinfection based on the limited aquatic life or limited forage fish community classification of the receiving water. Section NR 210.06(3)(g), Wis. Adm. Code, states that disinfection decisions may be made based on the hydrologic classifications listed in s. NR 104.02(1), Wis. Adm. Code (**not** on the water quality classifications - i.e., limited forage fish, limited aquatic life - that are defined in s. NR 104.02(3), Wis. Adm. Code). The receiving water classification has since been updated to be considered warmwater sport fish and no longer considered LAL.

Discharges to noncontinuous streams with $Q_{7,10}$ values < 0.1 cfs usually result in effluent-dominated situations. The risk of illness is related to the concentration of E. coli and therefore dilution is an important consideration when considering risk to human health. Since little to no dilution is present in these situations, disinfection should not be exempted based solely on this hydrological classification.

The Department has considered the information required by s. NR 210.06(3), Wis. Adm. Code, and has determined that the discharge cannot meet bacteria limits without disinfection. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

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

These limits are required during May through September.

PART 6 – PHOSPHORUS

Technology-Based Effluent Limit
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Brillion currently has a limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

Northeast Lakeshore TMDL
Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* (April 2020) and are based on the annual phosphorus wasteload allocation (WLA) given in pounds per year. This WLA found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Northeast Lakeshore Region* report are expressed as maximum annual loads (lbs/year). The annual WLA for Brillion is 1,081 lbs/year.

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL. Therefore, limits given to facilities included in the Northeast Lakeshore Basin TMDL are given monthly average mass limits and, if the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\text{TP Equivalent Effluent Concentration} = \text{WLA} \div (365 \text{ days/yr} * \text{Flow Rate} * \text{Conversion Factor})$$
$$= 1{,}081 \text{ lbs/yr} \div (365 \text{ days/yr} * 0.824 \text{ MGD} * 8.34)$$
$$= 0.43 \text{ mg/L}$$

Since this value is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required.

TP Monthly Average Permit Limit = WLA ÷ 365 days/yr * multiplier
= (1,081 lbs/yr ÷ 365 days/yr) * 1.9
= 5.6 lbs/day

The multiplier used in the six-month average calculation was determined according to the implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 0.6. This is the standard deviation divided by the mean of mass data. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

Monthly average mass effluent limits are recommended for this discharge. The limits are equivalent to a concentration of 0.82 mg/L at the facility design flow of 0.824 MGD.

The TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries in the Northeast Lakeshore Basin. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

The current permit has a compliance schedule to meet phosphorus limits of 0.075 mg/L as a six-month average and 0.225 mg/L as a monthly average per ch. NR 217, Wis. Adm. Code. Because these limits have not become effective yet, they can be removed without an antidegradation evaluation.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from 07/01/2018 – 08/27/2024. The mass data was calculated using effluent flow rates reported on the same day.

Total Phosphorus Effluent Data

	Phosphorus mg/L	Phosphorus lbs/day
1-day P_{99}	2.02	10.1
4-day P_{99}	1.23	6.11
30-day P_{99}	0.83	4.10
Mean	0.64	3.18
Std	0.39	1.95
Sample size	626	626
Range	0.118 - 7.09	0 – 20

Interim Limit
An interim limit is required per s. NR 217.17, Wis. Adm. Code, when a compliance schedule is needed in the permit to meet the WQBEL. The interim limit should reflect a concentration that the facility is able to meet without investing in additional “temporary” treatment, but also should prevent backsliding from

current conditions. Therefore, **it is recommended that the interim limit be set equal to 1.0 mg/L for permit reissuance along with requirements for optimization of phosphorus removal.** This interim limit is the same as the current technology-based limit, but the reissued permit will also include requirements for optimization of phosphorus removal.

PART 7 – TOTAL SUSPENDED SOLIDS

Total Suspended Solids (TSS) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs (*April 2020). This WLAs found in Appendix I of the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Northeast Lakeshore Region* report are expressed as maximum annual loads (lbs/year). The WLA for Brillion is 25,897 lbs/year.

Revisions to chs. NR 106 and 205, Wis. Adm. Code align Wisconsin water quality-based effluent limits with 40 CFR 122.45(d), which requires WPDES permits to contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210.
- Daily maximum and monthly average limitations for all other discharges.

Brillion is a municipal treatment facility and is therefore subject to weekly average and monthly average TSS limits derived from TSS annual WLAs.

TSS Monthly Average Permit Limit = WLA ÷ 365 days/yr * multiplier
= (25,897 lbs/yr ÷ 365 days/yr) * 1.59
= 113 lbs/day

TSS Weekly Average Permit Limit = WLA ÷ 365 days/yr * multiplier
= (25,897 lbs/yr ÷ 365 days/yr) * 2.37
= 168 lbs/day

The multiplier used in the weekly average and monthly average calculation was determined according to implementation guidance. A coefficient of variation was calculated, based on TSS mass monitoring data, to be 6.5. This is the standard deviation divided by the mean of mass data. However, it is believed that the optimization of the wastewater treatment system to achieve the WLA-derived permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by the facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies TSS monitoring as 2/week; if a different monitoring frequency is used, the stated limits should be reevaluated.

Weekly average and monthly average mass effluent limits are recommended for this discharge. The limits are equivalent to a concentration of 24 mg/L and 16 mg/L, respectively, at the facility design flow of 0.824 MGD.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TSS. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

Effluent Data

The following table summarizes effluent total suspended solids monitoring data from 07/01/2018 – 08/31/2024. The mass data was calculated using effluent flow rates reported on the same day.

Total Suspended Solids Effluent Data

	TSS mg/L	TSS lbs/day
1-day P_{99}	12.4	99.3
4-day P_{99}	6.28	56.4
30-day P_{99}	2.77	23.6
Mean*	1.15	6.54
Std	3.80	42.9
Sample size	601	601
Range	<2 – 31.2	0 – 404

*Results below the level of detection (LOD) were included as zeroes in calculation of average.

Brillion can currently meet the TSS mass limits, and a compliance schedule is not needed.

PART 8 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 07/01/2018 – 08/31/2024.

Monthly Temperature Effluent Data & Limits

Month	Calculated Effluent Limit	
	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	49	76
FEB	50	76
MAR	52	77
APR	55	79

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Month	Calculated Effluent Limit	
	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
MAY	65	82
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82
OCT	61	80
NOV	49	77
DEC	49	76

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

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

In accordance with s. NR 106.56(12), Wis. Adm. Code, when representative effluent temperature data is not available at the time of permit reissuance, **the proposed permit shall include effluent temperature monitoring, WQBELs for temperature, and a compliance schedule to meet the temperature limits.**

The following general options are available for a facility to explore potential relief from the temperature limits:

- Effluent monitoring data: Verification or additional effluent monitoring (flow and/or temperature) may be appropriate if there were questions on the representativeness of the current effluent data.
- Monthly low receiving water flows: Contract with USGS to generate monthly low flow estimates for the receiving water to be used in place of the annual low flow.
- Mixing zone studies: A demonstration of rapid and complete mixing may allow for the use of a mixing zone other than the default 25%.

- Dissipative cooling demonstration: Effluent limitations based on sub-lethal criteria may be adjusted based on the potential for heat dissipation from municipal treatment plants as described in s. NR 106.59(4), Wis. Adm. Code.
- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the small stream defaults used in the above tables
- A variance to the water quality standard: This is typically considered to be the least preferable and most complex option as it requires the evaluation of the other alternatives.

These options are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*
http://dnr.wi.gov/topic/surfacewater/documents/ThermalGuidance2edition8152013.pdf

PART 9 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022).*

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of **99%** shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

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

Where:

Q_e = annual average flow = 0.824 MGD = 1.275 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 0.05 cfs ÷ 4 = 0.0125 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use.

The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations. Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. Data collected prior to July 1, 2005, is excluded in this evaluation.

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %					Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae (IC_{50})	Pass or Fail?	Use in RP?	
01/25/2007	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
07/17/2008	>100	>100	Pass	No	>100	>100		Pass	No	1
08/28/2012	>100	>100	Pass	Yes	>100	86.3		Fail	Yes	
10/23/2012					45.8	>100		Fail	Yes	
11/06/2012					>100	>100		Pass	Yes	
02/11/2014	>100	>100	Pass	Yes	88.8	>100		Fail	Yes	
04/08/2014					31.1	>100		Fail	Yes	
06/10/2014					>100	>100		Pass	Yes	
05/07/2019	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
07/20/2021	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
09/26/2023	>100	>100	Pass	Yes	>100	>100		Pass	Yes	

Footnotes:

1. *Tests done by S-F Analytical, July 2008 – March 2011.* The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
  Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

  According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

  Acute Reasonable Potential = $0 < 1.0$, reasonable potential is not shown, and a limit is not required.

Attachment #1

Chronic Reasonable Potential = [(TU_c effluent) (B)(IWC)]

Chronic WET Limit Parameters

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/31.1 = 3.2	2.6 Based on 4 detects	99%

[(TUc effluent) (B)(IWC)] = 8.3 > 1.0

Therefore, reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 01/25/2007 – 09/26/2023.

Expression of WET limits

Chronic WET limit = [100/IWC] TU_c = 1.0 TU_c expressed as a monthly average

The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

WET Checklist Summary

	Acute	**Chronic**
AMZ/IWC	Not Applicable. **0 Points**	IWC = 99%. **15 Points**
Historical Data	6 tests used to calculate RP. No tests failed. **0 Points**	10 tests used to calculate RP. 4 tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Warmwater sport fish. **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for chloride based on ATC; Ammonia, copper, nickel, and zinc detected. Additional Compounds of Concern: None. **8 Points**	Reasonable potential for limits for chloride based on CTC; Ammonia, copper, nickel, and zinc detected. Additional Compounds of Concern: None. **8 Points**

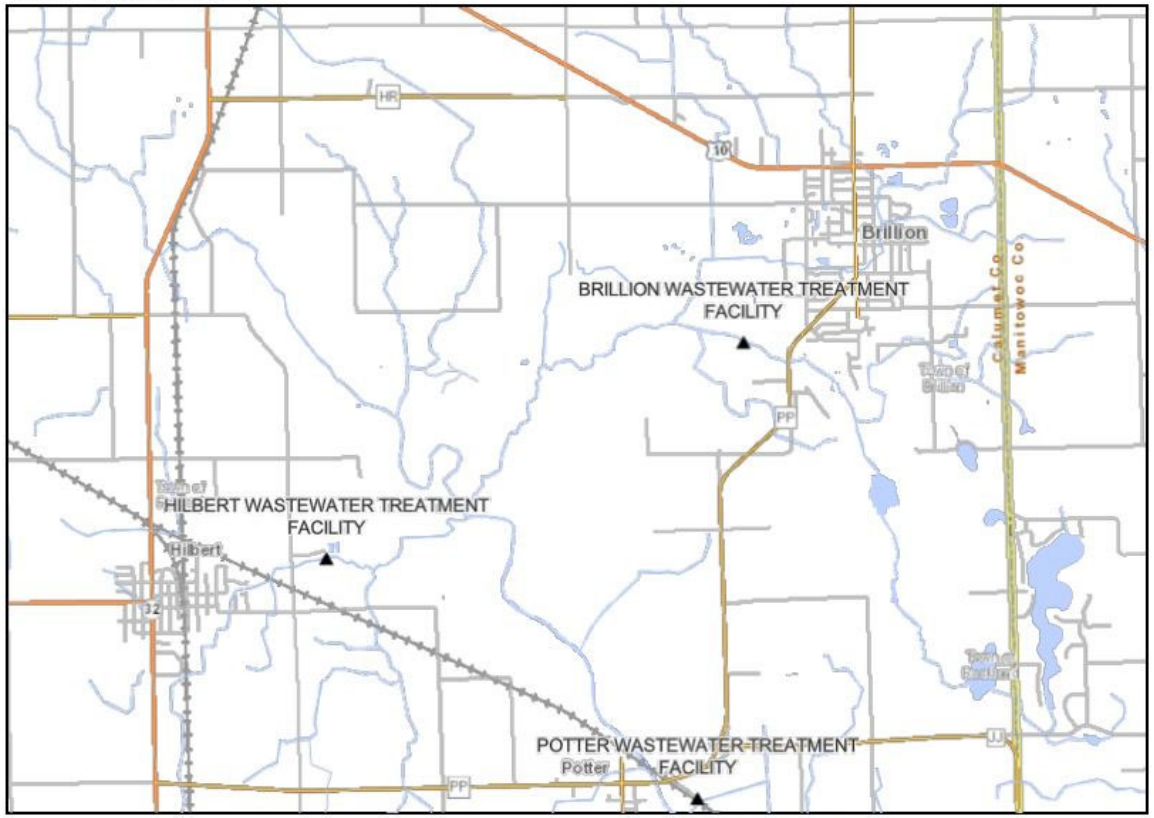
Attachment #1

	Acute	Chronic
Additives	1 Water Quality Conditioner (ferric chloride) added. Permittee has proper P chemical SOPs in place. **1 Point**	All additives used more than once per 4 days. **1 Point**
Discharge Category	2 Industrial Contributors. **6 Points**	Same as Acute. **6 Points**
Wastewater Treatment	Secondary or Better **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**20 Points**	**35 Points**
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term	Quarterly
Limit Required?	No	Limit = 1.0 TU_c
TRE Recommended? (from Checklist)	No	No

- Quarterly chronic testing and a TRE is recommended by the checklist based on the past failures. However, there have been several chronic tests that did not have toxicity detects so a TRE and quarterly testing is not recommended at this time.
- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, **2/permit term acute and annual chronic WET tests are recommended in the reissued permit.** Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, a chronic WET limit is required. The chronic WET limit shall be expressed as 1.0 TUc as a monthly average in the effluent limits table of the permit.
- A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Brillion WWTF Outfall Location



Legend

- Permits
  - Surface Water Outfalls
- Surface Water
  - 24K Streams and Rivers
- Basemaps
  - Hydro
    - 24K Hydro (Cached) Inland Water Resources
      - Rivers and Streams
      - Intermittent Streams
      - Open Water
      - Great Lakes water

Notes

1:60,000

0 1 2 mi

Service layer credits:
WI DNR, Water Division | WI Dept. of Natural Resources, Division of Water

Date Printed: 09/20/2024

Attachment #3

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Brillion WWTP	**7-Q10:**	0.05 cfs	**Flow Dates**	
Outfall(s):	001	**Dilution:**	25%	**Start:**	07/01/18
Date Prepared:	11/8/2024	**f:**	0	**End:**	12/25/23
Design Flow (Qe):	0.824 MGD	**Stream type:**	Small warm water sport or forage fish co		
Storm Sewer Dist.	0 ft	**Qs:Qe ratio:**	0.0 :1		
		Calculation Needed?	YES		

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	0.05	0.840	1.045	0			49	76
FEB	34	50	76	0.05	0.707	1.350	0			50	76
MAR	38	52	77	0.05	1.012	1.320	0			52	77
APR	48	55	79	0.05	1.138	1.440	0			55	79
MAY	58	65	82	0.05	0.903	1.238	0			65	82
JUN	66	76	84	0.05	0.795	1.067	0			76	84
JUL	69	81	85	0.05	0.811	1.231	0			81	85
AUG	67	81	84	0.05	0.952	1.995	0			81	84
SEP	60	73	82	0.05	0.939	1.779	0			73	82
OCT	50	61	80	0.05	0.886	2.241	0			61	80
NOV	40	49	77	0.05	1.265	5.869	0			49	77
DEC	35	49	76	0.05	0.837	1.140	0			49	76

Facility Specific Chloride Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: City of Brillion

B. Facility Name: Brillion Wastewater Treatment Facility

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Chloride **Date completed:** February 17, 2025

E. Permit #: WI-0020443-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** July 1, 2025 **End Date:** June 30, 2030

G. Date of Variance Application: December 8, 2022

H. Is this permit a: ☐ **First time submittal for variance**
☒ **Renewal of a previous submittal for variance** *(Complete Section IX)*

I. Description of proposed variance:

The City of Brillion Wastewater Treatment Facility (WWTF) discharges to an unnamed tributary to Spring Creek in Calumet County. The City of Brillion seeks a variance to the water quality standards for chloride for its WWTF.

The Department concludes that the City of Brillion has met the requirements of s. NR 106.83(2), Wisconsin Administrative Code, and s. 283.15, Wisconsin Statutes. The Department further concludes that requiring the City of Brillion to meet the water quality standard for chloride would result in substantial and widespread adverse social and economic impacts in its service area. Furthermore, the Department concludes that there is no feasible pollutant control technology that can be applied to achieve compliance with the chloride water quality-based effluent limit (WQBEL). The Department therefore proposes that this permit include a discharger-specific variance to the chloride water quality standard for aquatic life.

The proposed variance for chloride is from the WQBELs of 400 mg/L as a weekly average and 780 mg/L as a daily maximum, to interim limits of 780 mg/L expressed as a weekly average limit and 1,050 mg/L expressed as a daily maximum limit. The Department concludes that the interim limit reflects the greatest pollutant reduction achievable by the permittee with the pollutant control technologies currently applied in the permittee's WWTF. The permit requires the permittee to implement Source Reduction Measures (SRMs). The Department considers the highest attainable condition (HAC) of the receiving water to be the interim limit – applied for the term of the variance – combined with the permittee's implementation of SRMs. The term of the proposed variance is five years, concurrent with the term of the proposed WPDES permit. The underlying designated uses and criteria of Wisconsin's chloride water quality standards (WQS) will be retained, and all other applicable WQS will remain in effect with adoption of the proposed variance.

This is a renewal of a previous submittal to EPA for a chloride variance for this permittee. The previous permit for this facility contained an interim chloride limit, target value and requirements to implement source reduction measures, in accordance with s. NR 106.83(2), Wis. Adm. Code.

Citation: An interim chloride effluent limitation under s. NR 106.83(2), Wis. Adm. Code represents a variance to water quality standards authorized by s. 283.15, Wis. Stats., and 40 CFR §131.14.

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Sarah Donoughe	Sarah.Donoughe@Wisconsin.gov	920-366-6076	Permit Drafter
Trevor Moen	Trevor.Moen@Wisconsin.gov	920-410-5192	Compliance Engineer
Nicole Krueger	Nicole.Krueger@Wisconsin.gov	414-897-5750	Parts II D-H and J

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Chloride (395 mg/L aquatic life chronic toxicity criterion)

B. List other criteria likely to be affected by variance: None

C. Source of Substance: Regeneration wastewater from two municipal ion exchange softening plants (the Well #1 and #2 Plant plus the Well #3 Plant), regeneration wastewater from approximately 66 point-of-use water softeners, ferric chloride at wastewater treatment plant (for phosphorus removal), domestic sewage, a barrel zinc plating line at Professional Plating Inc., as well as snow melt and wash water from snowplow vehicles inside a shop.

D. Ambient Substance Concentration: 31.1 mg/L ☐ **Measured** ☒ **Estimated** ☐ **Default** ☐ **Unknown**

E. **If measured or estimated, what was the basis? Include citation.** Background chloride data from the Manitowoc River measured at County Highway JJ is used in this evaluation because it is assumed to have similar characteristics as the unnamed tributary to Spring Creek.

F. Average effluent discharge rate: 0.824 MGD **Maximum effluent discharge rate:** 2.5 MGD (design flow)

G. Effluent Substance Concentration: 1-day P99 = 1070 mg/L; 4-day P99 = 782 mg/L; Average = 553 mg/L ☒ **Measured** ☐ **Estimated** ☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Permit-required monitoring from 07/01/2018 – 08/14/2024.

I. Type of HAC:
☐ **Type 1: HAC reflects waterbody/receiving water conditions**
☐ **Type 2: HAC reflects achievable effluent conditions**
☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its Chloride SRM plan. Thus, the HAC at commencement of this variance is 780 mg/L as a weekly average and 1,050 mg/L as a daily maximum, which reflect the greatest chloride reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Chloride SRM plan. The current effluent condition is reflective of on-site optimization measures that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for the City of Brillion WWTF at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: Daily maximum = 1050 mg/L, weekly average = 780 mg/L

L. Level currently achievable (LCA): 1050 mg/L as a daily maximum and 780 as a weekly average

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*

Data collected from the current permit term 07/01/2018 – 08/14/2024.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.

Daily maximum variance limit is less than the 1-day P99 of 1070 mg/L from the current permit term. This is because 1050 mg/L was not exceeded since 2019 so 1050 mg/L is more representative of levels currently achievable.

Weekly average variance limit = 4 Day P99. The limit is established in accordance with s. 283.15 (5), Wis. Stats. and ch. NR 106 Subchapter II, Wis. Adm. Code.

Chapter NR 106, Subchapter VII, Wis. Adm. Code, allows for a variance; the imposition of a less restrictive interim limit; a compliance schedule that stresses source reduction and public education; and allowance for a target value or limit to be a goal for reduction.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ 6

Use of reverse osmosis treatment at the WWTF was evaluated. That treatment was estimated to result in an average cost that would be about 9.00% of the MHI. Replacing the current municipal ion-exchange water softening system with a lime softening system was also evaluated, and the estimated cost of doing so would be about 10.87% of the MHI. Those cost estimates are in the range in which the application of either treatment would be expected to result in substantial and widespread economic and social impacts to the community.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Calumet; Manitowoc

B. Receiving waterbody at discharge point: Unnamed tributary to Spring Creek

C. Flows into which stream/river? Spring Creek, North Branch Manitowoc River, Manitowoc River **How many miles downstream?** <1 mile to Spring Creek, 2 miles to North Branch

D. Coordinates of discharge point (UTM or Lat/Long): 44º 9’ 53” N Latitude, 88º 4’ 49” W Longitude

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?
Approximately 15 miles downstream, where the 7Q10 of the Manitowoc River is 3 cfs.

F. Provide the equation used to calculate that distance *(Include definitions of all variables, identify the values used for the clarification, and include citation):*

Mass balance equation solving for the cumulative stream flow needed to result in an instream concentration less than or equal to the acute toxicity criteria of 757 mg/L and the chronic toxicity criteria of 395 mg/L.

(interim limit in mg/L x effluent design flow in cfs) + (background concentration in mg/L x background stream flow in cfs)) / (effluent design flow in cfs + background stream flow in cfs) = < 395 mg/L.

Design flows from Brillion, Potter, Hilbert, and Rockland SD 1 are used in the equation above.

To determine when the receiving water meets the acute toxicity criteria of 757 mg/L, actual 1-day P99 effluent data from Potter, Hilbert, and Rockland SD 1 and the proposed daily maximum interim limit for Brillion is used.

To determine when the receiving water meets the chronic toxicity criteria of 395 mg/L, interim weekly average limits for Brillion and Potter are used, the WQBEL of 400 mg/L for Rockland SD 1 and the actual 4-day P99 data from Hilbert is used since this facility does not have chloride limits.

In order for the receiving water to meet both criterion, the receiving water flow needs to be at least 1.3 cfs. This happens at the Manitowoc River at Rockland.

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?
The receiving water and downstream waters are designated for recreation, non-public water supply, and fish and aquatic life uses (warmwater sport fish classification).

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on

the waterbody: The flow-weighted effluent chloride concentration based on all of these facilities, including Brillion WWTF, using the current annual average design flow (total flow of 3.47 MGD) is 405 mg/L.

Permit Number	Facility Name	Facility Location	Variance Limit [mg/L]
WI-0022195	St. Nazianz (design flow = 0.20 MGD)	St. Nazianz	Current = 490 mg/L
WI-0022799	Chilton (design flow = 1.189 MGD)	Chilton	Current = 670 mg/L; Proposed = 560 mg/L
WI-0020893	New Holstein (design flow = 1.33 MGD)	New Holstein	Current = 420 mg/L
WI-0029025	Potter (design flow = 0.0434 MGD)	Potter	Current = 450 mg/L; Proposed = 450 mg/L

I. Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet
See attached map "Current Outfall Variances September 2024"

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☐ **Yes** ☐ **No** ☐ **Unknown**
The receiving water is not on the 303(d) list (Impaired Waters List), but the North Branch of the Manitowoc River and the Manitowoc River (downstream) are included on that list for degraded habitat and low dissolved oxygen impairments caused by excessive levels of sediment and phosphorus. The Manitowoc River is also listed as impaired for contaminated sediment and fish tissue caused by PCBs.

***K.* Please list any contributors to the POTW in the following categories:**
May need to contact facility for this information

Food processors (cheese, vegetables, meat, pickles, soy sauce, etc.)	None
Metal Plating/Metal Finishing	Professional Plating Inc; Ariens Company
Car Washes	Best Car Wash
Municipal Maintenance Sheds (salt storage, truck washing, etc.)	City of Brillion DPW
Laundromats	Wascomat Wash Center (does not soften water)
Other presumed commercial or industrial chloride contributors to the POTW	Cobblestone Creek Dining & Banquet (has its own softener)

L. If the POTW does not have a DNR-approved pretreatment program, is a sewer use ordinance enacted to address the chloride contributions from the industrial and commercial users? If so, please describe.
The City's ordinance requires sampling and testing for wastewaters from industrial and commercial users on an as-needed basis. However, a chloride pretreatment limit is not in effect. The City has determined currently that there are no known significant industrial sources of chloride discharges to the City's sanitary sewer.

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing chloride to the POTW? If so, please list.
N/A

B. Are all industrial users in compliance with local pretreatment limits for chloride? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
N/A

C. When were local pretreatment limits for chloride last calculated?
N/A

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW
N/A

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ **Yes** ☐ **No**
B. If yes, was a public hearing held as well? ☒ **Yes** ☐ **No** ☐ **N/A**
C. What type of notice was given?
☒ **Notice of variance included in notice for permit** ☐ **Separate notice of variance**
D. Date of public notice: February 27, 2025 **Date of hearing:** April 14, 2025
E. Were comments received from the public in regards to this notice or hearing? *(If yes, see notice of final determination)* ☐ **Yes** ☐ **No**

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☐ **Yes** ☒ **No**
B. Applicable criteria affected by variance: No human health criteria for chloride
C. Identify any expected impacts that the variance may have upon human health, and include any citations:
None

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Warmwater sport fish classification
B. Applicable criteria affected by variance: Aquatic life acute and chronic toxicity criterion for chloride are 757 mg/L and 395 mg/L from NR 105, applicable to all Wisconsin water regardless of classification.

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:
The proposed interim limits exceed the genus mean chronic values for *Ceriodaphnia* (417 mg/L), *Daphnia* (639 mg/L), *Physa* (663 mg/L), *Lirceu*s (770 mg/L), *Cricotopus* (991 mg/L), and *Hydroptila* (1055 mg/L).

List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations: None that would affect the water quality criterion, as the chronic toxicity criterion for chloride is more stringent than all genus mean chronic values for organisms with chloride toxicity data. As a result, no endangered species with data would need more protection than already provided by the existing criterion**.**

County	Species	Status

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:
Treatment processes include preliminary and primary treatment using fine screens and clarifiers; secondary treatment using activated sludge technology; phosphorus removal; tertiary treatment using sand filters; sludge stabilization using aerobic digestion; and sludge thickening/drying using reed beds. None of these wastewater treatment processes remove chloride.

B. What modifications would be necessary to comply with the current limits? Include any citations.
Upgrades to the WWTF would include installing reverse osmosis (RO) to comply with the WQBEL of 395 mg/L. Alternatively, changing the municipal softening system from ion-exchange to lime softening treatment would be expected to result in the WWTF's compliance with the chloride WQBEL.

C. How long would it take to implement these changes?

It would not be economically feasible for the City of Brillion to install reverse osmosis treatment at the WWTF, or to change the municipal softening system from ion-exchange to a lime softening system. Affordability is the limiting factor for both of these treatments, and it is unknown how long that will continue to be the case.

D. Estimate the capital cost *(Citation)***:** RO Treatment: $796,500 (source: WDNR Form 3400-193 Chloride Variance Application from permittee, with adjusted design flow rate applied by DNR)
Lime Softening: $15,333,339 (source: Chloride Variance Economic Eligibility Tool (Lime Softening)

E. Estimate additional O & M cost *(Citation)***:** RO Treatment: $258,420 (source: WDNR Form 3400-193 Chloride Variance Application from permittee, with adjusted design flow rate applied by DNR)
Lime Softening: Cost estimate not available

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:
Reverse osmosis wastewater treatment systems can be operated to achieve levels of chloride below the water quality standard of 395 mg/L. Municipal lime softening systems do not generate chloride waste as do ion-exchange softening systems, thus the concentration of chloride in the WWTF's discharge would be expected to be at levels below the water quality standard with a municipal lime softening system. However, neither of these technologies is economically feasible for the City of Brillion at this time.

G. Identify any expected environmental impacts that would result from further treatment, and include any citations:
End-of-pipe RO wastewater treatment technology for chloride produces concentrated brine that can be as much or more of an environmental liability than the untreated effluent. Since the concentrated brine cannot be further treated, the only recourse for the disposal of the brine is transfer to another community, which is often not feasible. Appropriate chloride source reduction activities are preferable environmentally to effluent end-of-pipe treatment in most cases, since the end product of treatment (production of a concentrated brine) does not remove the load of chloride from the environment.

There would be some impacts based on disposal of brine from RO. These include air pollution impacts from trucking brine and increased chloride impacts at the point where brine is discharged.

Lime softening results in the generation of a sludge that would need to be disposed of, and there would be air pollution impacts from the transport of that material.

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ **Yes** ☒ **No** ☐ **Unknown**
Reverse Osmosis treatment of the City of Brillion WWTF effluent to meet the WQBEL is technically feasible. However, it is not economically feasible. See DNR variance application and screening tool for costs of reverse osmosis. Use of reverse osmosis at the WWTF was evaluated; the resulting total cost for sewer user rates was estimated to result in an average cost to households that would be 9.0% of the MHI. An increase of this magnitude would cause substantial and widespread adverse social and economic impacts in the area where the discharge is located.

Lime softening treatment of the City of Brillion's water supply – in lieu of ion-exchange (as currently practiced) – is technically feasible, and would enable the WWTF effluent to meet the chloride WQBEL. However, lime softening is not economically feasible. See the Chloride Variance Economic Eligibility Tool (Lime Softening) screening tool for costs of lime softening. Use of municipal lime softening was evaluated; the resulting cost for sewer user rates was estimated to result in an average cost to households that would be 10.87% of the MHI. An increase of this magnitude would cause substantial and widespread adverse social and economic impacts in the area where the discharge is located.

I. If treatment is possible, is it possible to comply with the limits on the substance? ☒ **Yes** ☐ **No** ☐ **Unknown**

J. If yes, what prevents this from being done? Include any citations.

The cost of adding RO to the existing WWTF's treatment train, or replacing the current municipal ion-exchange water softening system with a lime softening system, would cause substantial and widespread adverse social and economic impacts in the area where the discharge is located. Implementation of the SRMs in the proposed permit is preferable economically and environmentally to installing either of these treatments.

K. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

Alternative water supply sources were considered since water softening was determined to be a primary source of chloride. The City of Manitowoc draws its water from the relatively 'softer' Lake Michigan; however, it is approximately 23 miles from Brillion to Manitowoc. In projects in which one municipality has supplied water to another, the Department has witnessed costs in the range of $1 million per mile to install the pipeline between the two municipalities. Capital costs in that range exceed those estimated for the addition of RO treatment at the WWTF, thus this option would not be considered to be economically feasible.

The Department has also considered other wastewater treatment options, including hauling or piping wastewater to another POTW. In this situation piping wastewater to another POTW was considered to the City of Manitowoc, approximately 23 miles away. The cost of installing a wastewater pipeline over that distance would be comparable to that identified above for a water pipeline – and that cost would be prohibitive. Hauling wastewater from the City of Brillion to another POTW for treatment – approximately 700,000 gal/day – was deemed to be practicably unfeasible.

Citations: Justification for Variances to Water Quality Standards for Chloride in Wisconsin (07/09/2010 DRAFT)

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

As part of implementing the chloride source reduction measures (SRMs) as required per s. NR 106.83(2), Wis. Adm. Code, the permittee conducted the following activities:

A. SRMs Targeting Municipal Water Softening

1. Optimized the operation of the municipal ion-exchange softeners.
2. Evaluated the economic feasibility for re-use of the brine wastewater from the municipal softeners and develop plans to implement re-use options identified to be economically feasible.
3. Encouraged water conservation measures.

B. SRMs Targeting Point-of-Use Water Softening Sources

1. Educated point-of-use softener owners of the availability of municipally softened water and the impact of chloride on water quality; provide information about increasing softener efficiency and reducing the use of softened water.
2. Developed an inventory of point-of-use water softeners in use in the City, and collected information about the type of regeneration control unit and when each was last tuned-up.
3. Evaluated the need for a requirement – through an ordinance or other means – for periodic tune-ups of point-of-use softeners.

C. SRMs Targeting Industrial, Commercial and Municipal Sources

1. Worked with industrial and commercial contributors to prevent increases in the amount of chloride discharged and sought reductions from those sources.
2. Evaluated the feasibility of switching to a non-chloride containing chemical, or using biological processes, for phosphorus removal at the wastewater treatment facility.
3. Evaluated the need to adopt an amendment to the sewer use ordinance that limits the discharge of chloride from industrial sources.

4. Developed and implement management practices to reduce/eliminate the discharge of chloride to the sanitary sewer system at municipal/county facilities housing vehicles used for snow plowing and road de-icing/anti-icing.

See the submitted Annual Chloride Progress Reports for further details.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

1. SRMs Targeting Municipal Water Softening

a. Continue to optimize the operation of the municipal ion-exchange softeners as a short-term solution.
b. Continue to encourage water conservation.
c. Complete a Water System Study to evaluate water supply and treatment alternatives that would best serve the City in the long-term on a cost-effective basis.

2. SRMs Targeting Point-of-Use Water Softeners

a. Educate point-of-use softener owners of the availability of municipally softened water and the impact of chlorides on water quality; provide information about increasing softener efficiency and reducing the use of softened water.
b. Continue to update the inventory of point-of-use water softeners in use in the City and collect information about the type of regeneration control unit and when each was last tuned-up.

3. SRMs Targeting Industrial, Commercial and Municipal Sources

a. Continue to work with industrial and commercial contributors to prevent increases in the amount of chlorides discharged, and seek reductions from those sources.
b. Evaluate and implement road salt minimization strategies, document and maintain SaltWise certifications, and conduct public outreach to reduce chloride contributions from winter road deicing/anti-icing activities; document and discuss these actions in the Annual Reports.

Citation: Chloride Source Reduction Measures Plan, City of Brillion, dated December 29, 2022, revised February 14, 2025

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: May 21, 2018 **Date of EPA Approval:** June 25, 2018

B. Previous Permit #: WI-0020443-09-0 **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 1-day P99 = 1,070 mg/L; 4-day P99 = 782 mg/L **Variance Limit:** 1,100 mg/L (weekly average)

D. Target Value(s): 990 mg/L (weekly average) **Achieved?** ☒ **Yes** ☐ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

Condition of Previous Variance	Compliance
Annual Chloride Progress Report #1	☒ **Yes** ☐ **No**
Annual Chloride Progress Report #2	☒ **Yes** ☐ **No**
Annual Chloride Progress Report #3	☒ **Yes** ☐ **No**
Annual Chloride Progress Report #4	☒ **Yes** ☐ **No**
Final Chloride Report	☒ **Yes** ☐ **No**
Annual Chloride Progress Report #6 (*After permit expiration*)	☒ **Yes** ☐ **No**
Annual Chloride Progress Report #7 (*After permit expiration*)	☒ **Yes** ☐ **No**

Engineering Report

Source Reduction Measures Plan

WPDES Permit No. WI-0020443-09-0

Prepared for the

CITY OF BRILLION

CALUMET COUNTY, WISCONSIN

DECEMBER 29, 2022

REVISED FEBRUARY 14, 2025

McMAHON ASSOCIATES, INC.
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Engineering Report

Source Reduction Measures Plan
WPDES Permit No. WI-0020443-09-0

Prepared for the

CITY OF BRILLION
CALUMET COUNTY, WISCONSIN

DECEMBER 29, 2022
REVISED FEBRUARY 14, 2025
McM. No. B0004-09-22-00652

I. INTRODUCTION

Wastewater generated within the City of Brillion is treated at the City's Wastewater Treatment Facility (WWTF) and discharge to the Brillion Marsh, via Black Creek under Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI-0020443-09-0.

The current permit, effective July 1, 2018, includes an interim weekly average effluent chloride limitation of 1,100 mg/L. The unenforceable effluent chloride target concentration was 990 mg/L. As part of the chloride variance the City was required to develop and implement a Chloride Source Reduction Plan over the term of the current WPDES Permit.

The City was granted a variance for the chloride limitation in accordance with Wisconsin Administrative Code NR 106.83(2). Without the variance, the City would have been required to meet a weekly average effluent chloride concentration of 395 mg/L, based on water quality standards.

The following is a summary of chloride Source Reduction Measures (SRM's), included in the City's 2018-2023 chloride Source Reduction Plan:

A. SRM's Targeting Municipal Water Softening

1. Optimized the operation of the municipal ion-exchange softeners.
2. Evaluated the economic feasibility for re-use of the brine wastewater from the municipal softeners and developed plans to implement re-use options identified to be economically feasible.
3. Encouraged water conservation measures.

B. SRM's Targeting Point-of-Use Water Softening Sources

1. Educated point-of-use softener owners of the availability of municipal softeners and the impact of chloride on water quality; provide information about increasing softener efficiency and reducing the use of softened water.
2. Developed an inventory of point-of-use water softeners in use in the City and collected information about the type of regeneration control unit and when each was last tuned up.
3. Evaluated the need for a requirement – through an ordinance or other means – for periodic tune-ups of point-of-use softeners.

C. SRM's Targeting Industrial, Commercial and Municipal Sources

1. Worked with industrial and commercial contributors to prevent increases in the amount of chloride discharged and seek reductions from those sources.
2. Evaluated the feasibility of switching to a non-chloride containing chemical, or using biological processes, for phosphorus removal at the wastewater treatment facility.
3. Evaluated the need to adopt an amendment to the sewer use ordinance that limits the discharge of chlorides from industrial sources.
4. Developed and implemented management practices to reduce / eliminate the discharge of chloride to the sanitary sewer system at municipal / county facilities housing vehicles used for snow plowing and road de-icing / anti-icing.

Over the course of the current permit term, the City of Brillion has demonstrated success in reducing chloride below the target concentration of 990 mg/L, where the overall weekly average chloride concentration from January 2018 through November 2022 was 581 mg/L. The maximum weekly average chloride concentration over the Permit term was 1,103 mg/L in March 2019; however, the maximum weekly average over the past three (3) years was 788 mg/L.

The City intends to apply for a Chloride Variance with the upcoming application for WPDES Permit reissuance as the water quality based weekly average effluent chloride limit of 395 mg/L cannot be met under current conditions.

II. CHLORIDE SOURCE IDENTIFICATION

The City of Brillion softens all its water supply at two (2) ion-exchange softening facilities. The two (2) softening facilities use a brine (salt) solution to regenerate the ion exchange resins after their exchange capacity is exhausted. The water softener regeneration wastewater is discharged to the sanitary sewer system. The total annual average salt usage at the two (2) softening facilities from January 2018 through November 2022 is 2,687 lbs./day, corresponding to an estimated 1,649 lbs./day of chlorides discharged to the WWTF. The municipal softeners currently accounted for approximately 51% of the chlorides discharged at the WWTF. The municipal softener regeneration is the main contributor of chlorides to the WWTF.

Table #1 identifies the known chloride sources to the WWTF. The total average chloride loading to the WWTF in 2018 through 2022 was estimated at 3,256 lbs./day, based on the WWTF DMR data. Therefore, the identified estimated known chloride sources account for nearly 56% of the chlorides in the WWTF flow. It is assumed the majority of the unknown chloride sources are those that are typically found in the City's domestic and industrial wastewater or from sewer system infiltration and inflow containing road salt.

Table # 1
Known Chloride Loadings to the WWTF

Chloride Source Category	Annual Average Mass (lbs./day)	Annual Percent of Total (%)
Municipal Softening Facility	1,649	51
Residential/Commercial Softening	50	2
Car Wash Point of Use Softener	22	1
Ferric Chloride Addition at WWTF	109	3
Unknow Chloride Source (e.g., I/I road salt)	1,426	44
Total to WWTF	3,256	100

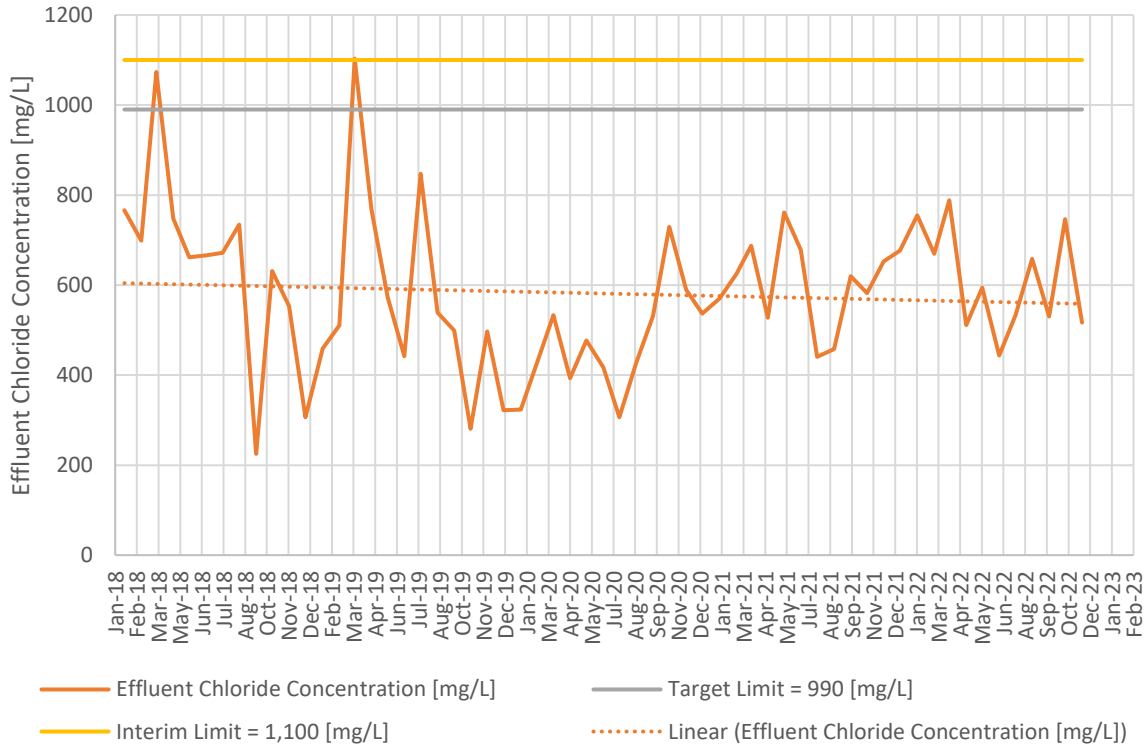
III. DATA ANALYSIS

Figure #1 shows the weekly average effluent chloride concentration in the WWTF flow over the period between January 2018 to November 2022. Since the effective date of the permit term in 2018, the City of Brillion has exceeded the weekly average limitation of 1,100 mg/L only once, in March of 2019 at a weekly average concentration of 1,103 mg/L.

In 2020, the maximum weekly average chloride concentration was 729 mg/L which occurred in October. The spike in effluent chloride concentration in October of 2020 was likely a result of a failure to one of the softener shells at the Main Street facility, which resulted in additional regeneration cycles at the Main Street facility and increased operation of the less efficient Well #3 softening facility while the issue at Main Street was corrected.

In 2021, the maximum weekly average chloride concentration was 761 mg/L which occurred in May. In 2022, the maximum weekly average chloride concentration was 788 mg/L which occurred in March. This is likely attributed to operational issues with the softening equipment at the Main Street facility and the effects of spring thaw and infiltration into the sewer system carrying residual road salt along with it.

Figure #1: Effluent Weekly Average Chloride Concentration taken over the permit term (January 2018 to November 2022)
City of Brillion WWTF



IV. PROPOSED SOURCE REDUCTION MEASURES

The following table lists the source reduction measure and the steps the City plans to undertake during the next WPDES permit term to reduce chloride discharges from the treatment plant.

Source Reduction Measure	Actions	Start Target Completion/Frequency
SRMs Targeting Municipal Water Softening		
Continue to optimize the operation of the municipal ion-exchange softeners as a short-term solution.	Ensure optimum operational factors – including regeneration interval, salt dosage and other factors are maintained to optimize municipal softening operation.	Start: Year 1 Frequency: Annual, ongoing
	Continue to evaluate the current condition of the ion-exchange softeners, including the efficiency and life expectancy of resins.	Start: Year 1 Frequency: Annual, ongoing
Continue to encourage water conservation	Continue to meet with commercial and industrial customers on a periodic basis to discuss water use, wastewater discharges, and evaluate their impact on City infrastructure.	Start: Year 1 Frequency: Annual, ongoing
Complete a Water System Study to evaluate water supply and treatment alternatives that would best serve the City in the long-term on a cost-effective basis.	Evaluate the following: - Maintaining ion exchange softening but incorporating segregation, storage, and disposal of high chloride regeneration wastewater at another facility able to accept the waste stream. - Replacing the municipal softeners with an alternative treatment technology. - Alternative water sources/supplies.	Start: Year 1 Target Completion: Year 4
SRMs Targeting Point-of-Use Water Softeners		
Educate point-of-use softener owners of the availability of municipally softened water and the impact of chlorides on water quality; provide information about increasing softener efficiency and reducing the use of softened water.	Send information (e.g., brochures) to customers and post information on the City's web site.	Start: Year 1 Frequency: Annual, ongoing

Continue to update the inventory of point-of-use water softeners in use in the City and collect information about the type of regeneration control unit and when each was last tuned-up.	Continue to update the inventory of point-of-use softeners.	Start: Year 1 Frequency: Annual, ongoing
SRMs Targeting Industrial, Commercial and Municipal Sources		
Continue to work with industrial and commercial contributors to prevent increases in the amount of chlorides discharged, and seek reductions from those sources	Conduct annual meetings and inspections with each industrial and commercial contributor, during which sources of chloride discharged will be identified; potential means of reducing the amount of chloride discharged will be identified; and – where appropriate – plans will be developed to implement additional source reduction measures.	Start: Year 1 Frequency: Annual, ongoing
Evaluate and implement road salt minimization strategies, document and maintain staff SaltWise certifications, and conduct public outreach to reduce chloride contributions from winter road deicing/anti-icing activities. Document and discuss these actions in Annual Reports.	Continue to work with City Staff on minimizing discharges of chlorides associated with the housing of vehicles used for snow plowing and road de-icing / anti-icing, specifically, working to limit chloride discharge from the vehicles to the garage floor drains by removing residual salt and snow from the equipment prior to storage. Investigate ways to calibrate road salting equipment for more efficient salt application, evaluate costs and efficiencies of any alternatives identified, and discuss any follow-up actions taken for the preferred alternative(s). Evaluate updating/replacing snow plowing and road salting equipment and purchasing brine making equipment. Track annual road salt usage and discuss any trends observed in Annual Reports. Maintain staff certifications through Wisconsin SaltWise and encourage City Staff to attend annual SaltWise and APWA salt seminars.	Start: Year 1 Target Completion: Year 4

	Document staff certifications through SaltWise. Report how many staff members are certified and their roles in road salting in Annual Reports. Conduct public outreach regarding safe salting practices by posting SaltWise information on the City's website, posting informational flyers at city/community centers, and/or sending out informational brochures with billing statements.	