Permit Fact Sheet

General Information

| Permit Number | WI-0020711-10-0 |
|----------------------------------|--|
| Permittee Name | Cedar Grove Village |
| and Address | P O Box 426, Cedar Grove, WI 53013-0426 |
| Permitted Facility | Cedar Grove Wastewater Treatment Faculty |
| Name and Address | NWQ SEQ SEC 24 T13N R22E |
| Permit Term | July 01, 2025 to June 30, 2030 |
| Discharge Location | North bank of Barr Creek, approximately 100 yards south effluent sampling location. |
| Receiving Water | Barr Creek in Black River of Sheboygan River in Sheboygan County |
| Stream Flow (Q _{7,10}) | 0.07 cfs |
| Stream Classification | Limited Aquatic Life; non-public water supply |
| Discharge Type | Existing, Continuous |
| Annual Average | 0.4 MGD |
| (MGD) | |
| | |
| | |
| Industrial or | None. |
| Contributors | |
| Plant Classification | A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; L - |
| | Laboratory; SS - Sanitary Sewage Collection System |
| Approved Pretreatment | N/A |
| Program? | |

Facility Description

The Village of Cedar Grove operates a 0.4 MGD Sequential Batch Reactor wastewater treatment plant. The plant serves approximately 2,100 people with no significant industrial contribution. Raw wastewater is gravity fed to a headworks facility where larger solids are removed by cylindrical fine screen and grit is removed by an aerated grit chamber. Wastewater then flows through a 6-inch Parshall flume and ultrasonic flow meter, where it is pumped to a wet well and enters a splitter box between two basins. Wastewater is treated in sequential batch reactors by aerating and settling before being decanted and sent through tertiary filters of anthracite media. Effluent travels down a gravity reparation cascade before discharge to the north bank of Barr Creek. Waste sludge is pumped from the batch reactor basins to an aerated digestion tank and to storage before being land applied on Department approved agricultural fields.

Substantial Compliance Determination

After a desk top review of all required monitoring data and reporting under the current permit, and a site visit on June 10, 2024, the facility name has been found to be in substantial compliance with their current permit.

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 | | INFLUENT: 24-hour composite samples shall be collected from the lift station. | | | |
| 001 | 0.18 MGD (2019 – 2024 Average) | EFFLUENT: 24-hour composite samples shall be collected from the sampling building at the top of the cascade. Grab samples shall be collected from the bottom of the cascade. | | | |
| 005 | 22 dry US Tons (2024 Permit Application) | Class B, aerobically digested liquid sludge. Representative composite samples shall be collected from the sludge storage tank prior to land application. | | | |

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT TO PLANT

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

Changes from Previous Permit:

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

CBOD5: This parameter is no longer being monitored at the request of the permittee switching to BOD5 limits for effluent.

Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD5 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.

Cedar Grove currently has CBOD5 limits but has requested to return to BOD5 limits. Because the facility discharges to a receiving water that supports an LAL classification, the recommended limitations for BOD5 are 30 mg/L weekly average and 20 mg/L monthly average per s. NR 104.02(3)(b), Wis. Adm. Code.

2 Surface Water - Monitoring and Limitations

| | 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 Comp | | | | |
| BOD5, Total | Monthly Avg | 20 mg/L | 2/Week | 24-Hr Comp | | | | |
| Suspended Solids, Total | Monthly Avg | 20 mg/L | 2/Week | 24-Hr Comp | | | | |
| Suspended Solids, Total | Weekly Avg | 30 mg/L | 2/Week | 24-Hr Flow Prop Comp | | | | |
| Suspended Solids, Total | Monthly Avg | 64 lbs/day | 2/Week | Calculated | | | | |
| Suspended Solids, Total | Weekly Avg | 95 lbs/day | 2/Week | Calculated | | | | |
| 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 DMR. See TMDL Calculations 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 DMR. See TMDL Calculations section. | | | |
| pH Field | Daily Max | 9.0 su | 5/Week | Grab | | | | |
| pH Field | Daily Min | 6.0 su | 5/Week | Grab | | | | |

2.1 Sample Point Number: 001- EFFLUENT

| Monitoring Requirements and Limitations | | | | | | |
|---|--------------------------|--------------------|---------------------|-------------------------|---|--|
| Parameter | Limit Type | Limit and Units | Sample Frequency | Sample Type | Notes | |
| Dissolved Oxygen | Daily Min | 4.0 mg/L | 5/Week | Grab | | |
| Nitrogen, Ammonia Variable Limit | | mg/L | Weekly | 24-Hr Flow Prop Comp | Look up the variable ammonia limit from the 'Variable Ammonia Limitation' table and report the variable limit in the Ammonia Variable Limit column on the eDMR. | |
| Nitrogen, Ammonia (NH3-N) Total | Daily Max - Variable | mg/L | Weekly | 24-Hr Flow Prop Comp | Report the daily maximum Ammonia result in the Nitrogen, Ammonia (NH3- N) Total column of the eDMR. See Ammonia Limitation Section. | |
| Nitrogen, Ammonia (NH3-N) Total | Weekly Avg | 43 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective October- March | |
| Nitrogen, Ammonia (NH3-N) Total | Weekly Avg | 55 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective April-May. | |
| Nitrogen, Ammonia (NH3-N) Total | Weekly Avg | 35 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective June- September. | |
| Nitrogen, Ammonia (NH3-N) Total | Monthly Avg | 18 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective October- March. | |
| Nitrogen, Ammonia (NH3-N) Total | Monthly Avg | 23 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective April-May. | |
| Nitrogen, Ammonia (NH3-N) Total | Monthly Avg | 15 mg/L | Weekly | 24-Hr Flow Prop Comp | Limit effective June- September. | |
| Chloride | Weekly Avg | 400 mg/L | 4/Month | 24-Hr Flow Prop Comp | | |
| Chloride | Monthly Avg | 400 mg/L | 4/Month | 24-Hr Flow Prop Comp | | |
| Chloride | Weekly Avg - Variable | lbs/day | 4/Month | Calculated | Look up the variable chloride mass limit from the Variable Chloride Mass Limitation table in the permit. Report the variable limit in the Chloride Variable Limit column on the DMR. | |
| Chloride, Variable Limit | | lbs/day | 4/Month | Calculated | Report the chloride mass result in the Chloride | |

| Monitoring Requirements and Limitations | | | | | | |
|---|--------------------------------|--------------------|----------------------|-------------------------|---|--|
| Parameter | Limit Type | Limit and Units | Sample Frequency | Sample Type | Notes | |
| | | | | | Weekly Average Mass column on the DMR. Compare to the Variable Chloride Mass Limitation chart to determine compliance. | |
| 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 section below. Enter the result in the DMR on the last day of the month. | |
| Phosphorus, Total | Monthly Avg | 4.9 mg/L | 2/Week | 24-Hr Flow Prop Comp | | |
| Phosphorus, Total | | lbs/day | 2/Week | Calculated | | |
| Phosphorus, Total | | lbs/month | Monthly | Calculated | Calculate the Total Monthly Discharge of phosphorus and report on the last day of the month on the DMR. See TMDL Calculations 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 onth on the DMR. See TMDL Calculations section. | |
| Nitrogen, Total Kjeldahl | | mg/L | See Listed Qtr(s) | 24-Hr Flow Prop Comp | Annual in rotating quarters. See Nitrogen Series Monitoring section. | |
| Nitrogen, Nitrite + Nitrate Total | | mg/L | See Listed Qtr(s) | 24-Hr Flow Prop Comp | Annual in rotating quarters. See Nitrogen Series Monitoring section. | |

| Monitoring Requirements and Limitations | | | | | | |
|---|------------|--------------------|----------------------|----------------|---|--|
| Parameter | Limit Type | Limit and Units | Sample Frequency | Sample Type | Notes | |
| Nitrogen, Total | | mg/L | See Listed Qtr(s) | Calculated | Annual in rotating quarters. See Nitrogen Series Monitoring section below. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen. | |

Changes from Previous Permit

Changes highlighted in table above.

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

- **BOD5:** Parameter and limit added to permit.
- **CBOD5:** Parameter and limit removed from permit.
- **BOD, TSS and Ammonia:** Sample frequency set to 2/week and sampler type to 24-hr composite to reflect the sampler type at the facility.
- TSS: Mass based TSS limits of 95 lbs/day as a weekly average and 64 lbs/day as a monthly average have been added to the permit to comply with requirements of the Northeast Lakeshore (NEL) TMDL. Effluent concentration (mg/L) shall be monitored and reported 2 times per week upon permit reissuance and will be used to calculate amounts reported for mass-based limits. An additional reporting requirement for lbs/month will be used to calculate the facility's 12-month rolling sum of total monthly discharge, which can be compared directly to the facility's designated WLA.
- Chloride: Monthly Average limit added to permit. Weekly average limit changed.
- **Disinfection & E. coli:** 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 and the end of the compliance schedule.
- **Phosphorus:** Interim limit with schedule to meet final TMDL limits included.
- **Phosphorus TMDL Limits**: Mass based phosphorus limits of 0.56 lbs/day as a six-month average and 1.7 lbs/day as a monthly average have been added to the permit to comply with requirements of the Northeast Lakeshore TMDL will go into effect in accordance with compliance schedule. Effluent concentration (mg/L) shall be monitored and reported two times per week upon permit reissuance and will be used to calculate amounts reported for mass-based limits. An additional reporting requirement for lbs/month will be used to calculate the facility's 12-month rolling sum of total monthly discharge, which can be compared directly to the facility's designated WLA. An interim limit of 4.9 mg/L goes into effect upon reissuance and will remain in effect unless a more stringent limit is required at a future permit issuance by ss. NR 217.13 and NR 217.16(2), Wis. Adm. Code, or the limit is relaxed following procedures outlined in ch. NR 207, Wis. Adm. Code.

• Total Nitrogen Monitoring (TKN, N02+N03 and Total N): Annual monitoring is required in specific quarters as outlined in the permit.

Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated December 20, 2024.

Monitoring Frequencies- The <u>Monitoring Frequencies for Individual Wastewater Permits</u> guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Monitoring frequency for BOD, TSS, and Ammonia are set in the permit at the same frequency. This is the standard practice for all WPDES permits.

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 and monthly average limits whenever practicable.

Disinfection & 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 required to disinfect, during the following months May – September. See WQBEL for further explanation.

Chlorine: This permit is the first permit term with required disinfection. If the permittee elects to use chlorine for disinfection additional limits and approvals are required. The chlorine limitations are detailed in the WQBEL memo. At the time of permit reissuance, it was unknown if the permittee would opt to use UV disinfection or chlorine.

Northeast Lakeshore Total Maximum Daily Load (TMDL): The permitted facility is located within the Northeast Lakeshore Total Maximum Daily Load (NEL TMDL), which was approved by EPA October 30, 2023. The TMDL establishes Waste Load Allocations (WLAs) for point source dischargers and determines the maximum amounts of phosphorus and total suspended solids that can be discharged and still protect water quality. The final effluent limits and monitoring expressed in the permit were derived from and comply with the applicable water quality criterion and are consistent with the assumptions and requirements of the EPA-approved WLAs in the TMDL, which are 157 lbs/yr for phosphorus and 14,631 lbs/yr for TSS for the permitted facility.

The approved TMDL expresses WLAs as lbs/year and lbs/day (maximum annual load divided by 365 days). As outlined in Section 4.6 of the department's 2023 TMDL Implementation Guidance for Wastewater Permits, TMDL limits must be given in the permit that are consistent with the TMDL WLA permit limits derived from the TMDL and need to be expressed as specified by 40 CFR 122.45 (d), s. NR 212.76 (4), and s. NR 205.065 (7), Wis. Adm. Code, unless determined to be impracticable. Impracticability has already been determined for phosphorus limits as laid out in the phosphorus impracticability agreement that was approved by USEPA in 2012 (see NPDES MOA Addendum dated July 12, 2012 at https://apps.dnr.wi.gov/swims/Documents/DownloadDocument?id=167886175.

For phosphorus, continuously discharging facilities covered by the NEL TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits (averaging period of May through October and November through April) are also included. The equivalent effluent concentration of 0.13 mg/L was calculated for the facility, thus, TMDL based mass limits are expressed as a six-month average and a monthly average equal to three times the six-month average limits.

For TSS, continuously discharging municipal/industrial facilities covered by the NEL TMDL are given monthly average and weekly average/daily max mass limits.

Facilities with NEL TMDL based effluent limits for phosphorus and TSS must report the 12-month rolling sum of total monthly discharge (lbs/yr). If reported 12-month rolling sums exceed the facility's max annual WLA, the facility's mass limits (monthly average and six-month average) may be recalculated using more appropriate CVs or monitoring frequencies when the permit is reissued to bring discharge levels into compliance with the facility's given WLA.

3 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/Dis posed (Dry Tons/Year) | | |
| 005 | В | Liquid | Fecal | Injection | Land Application | 22 US Dry Tons | | |
| Does sludge n | nanagement der | nonstrate comp | liance? Yes. | • | • | | | |
| Is additional sludge storage required? Yes. | | | | | | | | |
| Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No. | | | | | | | | |
| Is a priority po | ollutant scan red | quired? No. | | | | | | |

3.1 Sample Point Number: 005- LIQUID SLUDGE

| Monitoring Requirements and Limitations | | | | | | |
|---|--------------|--------------------|---------------------|----------------|-------|--|
| Parameter | Limit Type | Limit and Units | Sample Frequency | Sample Type | Notes | |
| Solids, Total | | Percent | Annual | Grab | | |
| Arsenic Dry Wt | Ceiling | 75 mg/kg | Annual | Composite | | |
| Arsenic Dry Wt | High Quality | 41 mg/kg | Annual | Composite | | |
| Cadmium Dry Wt | Ceiling | 85 mg/kg | Annual | Composite | | |
| Cadmium Dry Wt | High Quality | 39 mg/kg | Annual | Composite | | |
| Copper Dry Wt | Ceiling | 4,300 mg/kg | Annual | Composite | | |
| Copper Dry Wt | High Quality | 1,500 mg/kg | Annual | Composite | | |
| Lead Dry Wt | Ceiling | 840 mg/kg | Annual | Composite | | |
| Lead Dry Wt | High Quality | 300 mg/kg | Annual | Composite | | |
| Mercury Dry Wt | Ceiling | 57 mg/kg | Annual | Composite | | |
| Mercury Dry Wt | High Quality | 17 mg/kg | Annual | Composite | | |
| Molybdenum Dry Wt | Ceiling | 75 mg/kg | Annual | Composite | | |

| | Monitoring Requirements and Limitations | | | | | | |
|-------------------------------------|---|--------------------|---------------------|----------------|---|--|--|
| Parameter | Limit Type | Limit and Units | Sample Frequency | Sample Type | Notes | | |
| Nickel Dry Wt | Ceiling | 420 mg/kg | Annual | Composite | | | |
| Nickel Dry Wt | High Quality | 420 mg/kg | Annual | Composite | | | |
| Selenium Dry Wt | Ceiling | 100 mg/kg | Annual | Composite | | | |
| Selenium Dry Wt | High Quality | 100 mg/kg | Annual | Composite | | | |
| Zinc Dry Wt | Ceiling | 7,500 mg/kg | Annual | Composite | | | |
| Zinc Dry Wt | High Quality | 2,800 mg/kg | Annual | Composite | | | |
| Nitrogen, Total Kjeldahl | | Percent | Annual | Grab | | | |
| Nitrogen, Ammonium (NH4-N) Total | | Percent | Annual | Composite | | | |
| Nitrogen, Ammonia (NH3-N) Total | | Percent | Annual | Grab | | | |
| Phosphorus, Total | | Percent | Annual | Grab | | | |
| Phosphorus, Water Extractable | | % of Tot P | Annual | Grab | | | |
| Potassium, Total Recoverable | | Percent | Annual | Grab | | | |
| Nitrogen, Total Kjeldahl | | mg/L | Annual | Grab | | | |
| Phosphorus, Total | | mg/L | Annual | Grab | | | |
| Potassium, Total Recoverable | | mg/L | Annual | Grab | | | |
| PCB Total Dry Wt | Ceiling | 50 mg/kg | Once | Composite | Once in 2026 | | |
| PCB Total Dry Wt | High Quality | 10 mg/kg | Once | Composite | Once in 2026 | | |
| PFOA + PFOS | | ug/kg | Annual | Calculated | | | |
| PFAS Dry Wt | · | | Annual | Calculated | Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information. | | |

Changes from Previous Permit:

Changes highlighted in table above.

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

PCB – Sampling year updated.

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

Explanation of Limits and Monitoring Requirements

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

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 Schedules

4.1 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 <i>E. coli</i> 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 <i>E. coli</i> surface water limitations. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor. | 01/31/2027 |
| 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 <i>E. coli</i> 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 | 07/31/2028 |

| plant upgrades in accordance with the approved plans and specifications. | |
|---|------------|
| 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 <i>E. coli</i> limitations. | 04/30/2030 |

Explanation of Schedule

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.

4.2 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

The permittee shall comply with the WQBELs 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 |
|--|------------|
| Operational Evaluation Report: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in phosphorus discharges from the treatment plant during the period prior to complying with final phosphorus WQBELs and, where possible, enable compliance with final phosphorus WQBELs by July 1, 2028 . The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications will enable compliance with final phosphorus WQBELs. Regardless of whether they are expected to result in compliance, the permittee shall implement the measures, improvements, and modifications in accordance with the plan and schedule specified in the operational evaluation report. | 06/30/2026 |
| If the operational evaluation report concludes that the facility can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the permittee shall comply with the final phosphorus WQBEL by July 1, 2028 and is not required to comply with the milestones identified below for years 3 through 9 of this compliance schedule ('Preliminary Compliance Alternatives Plan', 'Final Compliance Alternatives Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet WQBELs', 'Complete Construction', 'Achieve Compliance'). | |
| STUDY OF FEASIBLE ALTERNATIVES - If the Operational Evaluation Report concludes that the permittee cannot achieve final phosphorus WQBELs with source reduction measures, operational improvements and other minor facility modifications, the permittee shall initiate a study of feasible alternatives for meeting final phosphorus WQBELs and comply with the remaining required actions of this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the Department may reopen and modify the permit to include an implementation schedule for achieving the final phosphorus WQBELs sooner than January 31, 2034. | |

| Compliance Alternatives, Source Reduction, Improvements and Modifications Status: The permittee shall submit a 'Compliance Alternatives, Source Reduction, Operational Improvements and Minor Facility Modification' status report to the Department. The report shall provide an update on the permittee's: (1) progress implementing source reduction measures, operational improvements, and minor facility modifications to optimize reductions in phosphorus discharges and, to the extent that such measures, improvements, and modifications will not enable compliance with the WQBELs, (2) status evaluating feasible alternatives for meeting phosphorus WQBELs. | 06/30/2027 |
|---|------------|
| Preliminary Compliance Alternatives Plan: The permittee shall submit a preliminary compliance alternatives plan to the Department. | 06/30/2028 |
| If the plan concludes upgrading of the permittee's wastewater treatment facility is necessary to achieve final phosphorus WQBELs, the submittal shall include a preliminary engineering design report. | |
| If the plan concludes Adaptive Management will be used, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 without the Adaptive Management Plan. | |
| If water quality trading will be undertaken, the plan must state that trading will be pursued. | |
| Final Compliance Alternatives Plan: The permittee shall submit a final compliance alternatives plan to the Department. | 06/30/2029 |
| If the plan concludes upgrading of the permittee's wastewater treatment is necessary to meet final phosphorus WQBELs, the submittal shall include a final engineering design report addressing the treatment plant upgrades, and a facility plan if required pursuant to ch. NR 110, Wis. Adm. Code. | |
| If the plan concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an engineering report addressing any treatment system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. | |
| If the plan concludes water quality trading will be used, the submittal shall identify potential trading partners. | |
| Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit. | |
| Progress Report on Plans & Specifications: Submit progress report regarding the progress of preparing final plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit. | 06/30/2030 |
| Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.) | 06/30/2031 |
| Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit. | |
| Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats, Upon approval of the final construction plans and schedule | 12/31/2031 |

| 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. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit. | |
|--|------------|
| 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. | 06/30/2032 |
| 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 Surface Water section of this permit. | 12/31/2032 |
| 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. | 12/31/2033 |
| 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. | 01/31/2034 |

Explanation of Schedule

The permitee is receiving final TMDL TP limits for the first time in this permit and therefore has been provided time to determine compliance options.

4.3 Land Application Management Plan

A management plan is required for the land application system.

| Required Action | Due Date |
|---|------------|
| Land Application Management Plan Submittal: Submit an update to the management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all landspreading activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes. | 07/01/2026 |

Explanation of Schedule

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

Other Comments

None.

Attachments

Water Quality Based Effluent Limitations for Cedar Grove Wastewater Treatment Facility dated December 20, 2024 and prepared by Nicole Krueger.

Justification Of Any Waivers From Permit Application Requirements

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

Prepared By: Jennifer Jerich, Wastewater Specialist Date: 5/1/2025 Revisions post fact check date: 5/14/2025 Revisions post public notice date:

CORRESPONDENCE/MEMORANDUM

DATE: 12/20/2024 – updated 05/14/2025 for TMDL limits

TO: Melanie Burns – SER

FROM: Nicole Krueger - SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Cedar Grove Wastewater Treatment Facility WPDES Permit No. WI-0020711-10

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 Cedar Grove Wastewater Treatment Facility in Sheboygan County. This municipal wastewater treatment facility (WWTF) discharges to Barr Creek, located in the Black River Watershed in the Sheboygan River Basin. 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:

| | Daily | Daily | Weekly | Monthly | Six-Month | Footnotes |
|----------------------|---------------------------|----------|---------------|----------------|--------------|-----------|
| Parameter | Maximum | Minimum | Average | Average | Average | |
| Flow Rate | | | | | | 1,2 |
| BOD ₅ | | | 30 mg/L | 20 mg/L | | |
| TSS | | | 30 mg/L | 20 mg/L | | 3 |
| TMDL | | | 95 lbs/day | 64 lbs/day | | |
| pН | 9.0 s.u. | 6.0 s.u. | | | | 1 |
| Dissolved Oxygen | | 4.0 mg/L | | | | 1 |
| Ammonia Nitrogen | | | | | | 1,4 |
| April – May | Variable | | 55 mg/L | 23 mg/L | | |
| June – September | Variable | | 35 mg/L | 15 mg/L | | |
| October – March | Variable | | 43 mg/L | 18 mg/L | | |
| Bacteria | | | | | | 5 |
| E. coli | | | | 126 #/100 mL | | |
| | | | | geometric mean | | |
| Chloride | | | 400 mg/L | 400 mg/L | | 6 |
| Dry weather | | | 1,330 lbs/day | | | |
| Wet weather | | | 4,560 lbs/day | | | |
| Phosphorus | | | | | | 3,7 |
| Interim | | | | 4.9 mg/L | | |
| TMDL | | | | 1.7 lbs/day | 0.56 lbs/day | |
| TKN, | | | | | | 8 |
| Nitrate+Nitrite, and | | | | | | |
| Total Nitrogen | | | | | | |
| Chlorine | $\overline{20 \ \mu g/L}$ | | 7.3 μg/L | 7.3 μg/L | | 6,9 |

Footnotes:

- 1. No changes from the current permit.
- 2. Monitoring only.
- 3. 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.



| Effluent pH s.u. | Limit mg/L | Effluent pH s.u. | Limit mg/L | Effluent pH s.u. | Limit mg/L |
|------------------------------|---------------|---------------------|---------------|---------------------|---------------|
| $6.0 \le pH \le 6.1$ | 74 | $7.0 < pH \leq 7.1$ | 45 | $8.0 < pH \leq 8.1$ | 9.5 |
| $6.1 < pH \leq 6.2$ | 72 | $7.1 < pH \leq 7.2$ | 40 | $8.1 < pH \leq 8.2$ | 7.8 |
| $6.2 < pH \leq 6.3$ | 71 | $7.2 < pH \leq 7.3$ | 36 | $8.2 < pH \leq 8.3$ | 6.4 |
| $6.3 < pH \leq 6.4$ | 69 | $7.3 < pH \leq 7.4$ | 31 | $8.3 < pH \leq 8.4$ | 5.3 |
| $6.4 < pH \leq 6.5$ | 67 | $7.4 < pH \leq 7.5$ | 27 | $8.4 < pH \leq 8.5$ | 4.4 |
| $6.5 < pH \leq 6.6$ | 64 | $7.5 < pH \leq 7.6$ | 23 | $8.5 < pH \leq 8.6$ | 3.6 |
| $6.6 < \mathrm{pH} \leq 6.7$ | 61 | $7.6 < pH \leq 7.7$ | 20 | $8.6 < pH \leq 8.7$ | 3.0 |
| $6.7 < pH \leq 6.8$ | 57 | $7.7 < pH \leq 7.8$ | 17 | $8.7 < pH \leq 8.8$ | 2.5 |
| $6.8 < pH \le 6.9$ | 53 | $7.8 < pH \le 7.9$ | 14 | $8.8 < pH \le 8.9$ | 2.1 |
| $6.9 < pH \leq 7.0$ | 49 | $7.9 < pH \leq 8.0$ | 11 | $8.9 < pH \le 9.0$ | 1.8 |

4. The variable daily maximum limits are shown below:

5. 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.

6. 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.

7. A compliance schedule may be included in the reissued permit to meet the final TMDL limits.

8. 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 (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (TKN) (all expressed as N).

9. Chlorine limits shall only be effective if/when Cedar Grove chlorinates.

No WET testing is required because information related to the discharge indicates low to no risk for toxicity.

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, & 2019 Ammonia Calculations

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

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

Attachment #1 Water Quality-Based Effluent Limitations for Cedar Grove Wastewater Treatment Facility

WPDES Permit No. WI-0020711-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The Village of Cedar Grove operates a 0.4 MGD Sequential Batch Reactor wastewater treatment plant. The plant serves approximately 2,100 people with no significant industrial contribution. Raw wastewater is gravity fed to a headworks facility where larger solids are removed by cylindrical fine screen and grit is removed by an aerated grit chamber. Wastewater then flows through a 6-inch Parshall flume and ultrasonic flow meter, where it is pumped to a wet well and enters a splitter box between two basins. Wastewater is treated in sequential batch reactors by aerating and settling before being decanted and sent through tertiary filters of anthracite media. The plant has the ability to disinfect using UV if needed. Effluent travels down a gravity reparation cascade before discharge to the north bank of Barr Creek. Waste sludge is pumped from the batch reactor basins to an aerated digestion tank and to storage before being land applied on Department approved agricultural fields.

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

Existing Permit Limitations

The current permit, expiring on March 31, 2025, includes the following effluent limitations and monitoring requirements.

| Parameter | Daily Maximum | Daily Minimum | Weekly Average | Monthly Average | Footnotes |
|--|----------------------------------|------------------|-------------------------------|-------------------------------|-----------|
| Flow Rate | | | | | 1 |
| CBOD | | | 25 mg/L | 16 mg/L | 2,3 |
| BOD ₅ | | | | | 1 |
| TSS | | | 30 mg/L | 20 mg/L | 2,4 |
| pН | 9.0 s.u. | 6.0 s.u. | | | 2 |
| Dissolved Oxygen | | 4.0 mg/L | | | 2,4 |
| Ammonia Nitrogen April – May June – September October – March | Variable Variable Variable | | 55 mg/L 35 mg/L 43 mg/L | 23 mg/L 15 mg/L 18 mg/L | 5 |
| Chloride | | | 530 mg/L | | 6 |
| Phosphorus | | | | | 1 |

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 210.05(3)(e), Wis. Adm. Code.
- 4. 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.

| Effluent pH | Limit | Effluent pH | Limit | Effluent pH | Limit |
|----------------------|-------|---------------------|-------|---------------------|-------|
| s.u. | mg/L | s.u. | mg/L | s.u. | mg/L |
| $6.0 \le pH \le 6.1$ | 74 | $7.0 < pH \le 7.1$ | 45 | $8.0 < pH \le 8.1$ | 9.5 |
| $6.1 < pH \le 6.2$ | 72 | $7.1 < pH \leq 7.2$ | 40 | $8.1 < pH \leq 8.2$ | 7.8 |
| $6.2 < pH \le 6.3$ | 71 | $7.2 < pH \leq 7.3$ | 36 | $8.2 < pH \leq 8.3$ | 6.4 |
| $6.3 < pH \le 6.4$ | 69 | $7.3 < pH \leq 7.4$ | 31 | $8.3 < pH \leq 8.4$ | 5.3 |
| $6.4 < pH \le 6.5$ | 67 | $7.4 < pH \leq 7.5$ | 27 | $8.4 < pH \leq 8.5$ | 4.4 |
| $6.5 < pH \leq 6.6$ | 64 | $7.5 < pH \leq 7.6$ | 23 | $8.5 < pH \leq 8.6$ | 3.6 |
| $6.6 < pH \leq 6.7$ | 61 | $7.6 < pH \leq 7.7$ | 20 | $8.6 < pH \leq 8.7$ | 3.0 |
| $6.7 < pH \leq 6.8$ | 57 | $7.7 < pH \leq 7.8$ | 17 | $8.7 < pH \leq 8.8$ | 2.5 |
| $6.8 < pH \le 6.9$ | 53 | $7.8 < pH \le 7.9$ | 14 | $8.8 < pH \le 8.9$ | 2.1 |
| $6.9 < pH \le 7.0$ | 49 | $7.9 < pH \le 8.0$ | 11 | $8.9 < pH \le 9.0$ | 1.8 |
| | | | | | |

5. The variable daily maximum ammonia limits are shown below:

6. This is an interim variance limit to the weekly average WQBEL of 400 mg/L.

Receiving Water Information

- Name: Tributary to Barr Creek
- Waterbody Identification Code (WBIC): 50200
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited aquatic life (LAL), non-public water supply from the outfall to Lake Michigan, approximately 1.5 miles. Lake Michigan is classified as coldwater and public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are estimates from USGS, where Outfall 001 is located.

 $7-Q_{10} = 0.07$ cfs (cubic feet per second)

$$7-Q_2 = 0.02$$
 cfs

- Hardness = 295 mg/L as CaCO₃. This value represents the geometric mean of data from 09/13/2011-06/18/2013 from chronic WET testing.
- % 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 Otter Creek at Willow Road in Sheboygan County is used for this evaluation because there is no data available for Barr Creek. Otter Creek 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: Lake Michigan, approximately 1.5 miles downstream from Outfall 001 is 303(d) listed as impaired for mercury and PCBs.

Effluent Information

• Design flow rate(s): Annual average = 0.40 MGD (Million Gallons per Day)

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Peak weekly = 1.4 MGD

Peak monthly = 0.85 MGD

The peak design flows were estimated from the annual average design flow and a peaking factor based on data from 10/01/2019 - 10/31/2024.

For reference, the actual average flow from 10/01/2019 - 10/31/2024 was 0.18 MGD.

- Hardness = 420 mg/L as CaCO₃. This value represents the geometric mean of data from the permit reissuance application from 08/22/2024 09/03/2024.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells.
- Additives: None.
- 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.

| Enuent Copper Data | | | | | | |
|----------------------------|-------------|-------------|-------------|-------------|-------------|--|
| Sample Date | Copper µg/L | Sample Date | Copper µg/L | Sample Date | Copper µg/L | |
| 04/11/2024 | 3.5 | 04/29/2024 | 3.038 | 05/16/2024 | 6.095 | |
| 04/15/2024 | 4.2 | 05/02/2024 | 4.412 | 05/20/2024 | 5.895 | |
| 04/19/2024 | 3.6 | 05/07/2024 | 4.15 | 05/27/2024 | 6.028 | |
| 04/23/2024 | <8.06 | 05/13/2024 | 6.637 | | | |
| Average = $4.32 \ \mu g/L$ | | | | | | |

Effluent Copper Data

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

| Enfuent Chloride Data | | | |
|------------------------|---------------|--|--|
| | Chloride mg/L | | |
| 1-day P ₉₉ | 512 | | |
| 4-day P ₉₉ | 425 | | |
| 30-day P ₉₉ | 376 | | |
| Mean | 350 | | |
| Std | 59.7 | | |
| Sample size | 244 | | |
| Range | 202 - 525 | | |

Effluent Chloride Data

The following table presents the average concentrations and loadings at Outfall 001 from 10/01/2019 - 10/31/2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

| Farameter Averages with Limits | | | | |
|--------------------------------|------------------------|----------------------------|--|--|
| | Average Measurement | Average Mass Discharged | | |
| CBOD ₅ | 2.58 mg/L* | | | |
| TSS | 2.55 mg/L* | | | |
| pH field | 7.4 s.u. | | | |
| Ammonia Nitrogen | 3.78 mg/L* | | | |
| Dissolved Oxygen | 8.5 mg/L | | | |
| Chloride | 350 mg/L | | | |

| A | ttachment | #1 | |
|-----------|-----------|------|--------|
| Parameter | Averages | with | Limits |

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

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

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

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

Acute Limits based on 1-Q₁₀

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

Limitation = (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 the case for Cedar Grove.

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 (μ g/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.016 cfs, $(1-Q_{10} \text{ (estimated as 80\% of 7-}Q_{10}))$, as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

| | REF. | | MEAN | MAX. | 1/5 OF | MEAN | | 1-day |
|-----------------|--------|------|-------|---------|--------|---------|-------|-------|
| | HARD.* | ATC | BACK- | EFFL. | EFFL. | EFFL. | 1-day | MAX. |
| SUBSTANCE | mg/L | | GRD. | LIMIT** | LIMIT | CONC. | P99 | CONC. |
| Chlorine | | 19.0 | | 20 | | | | |
| Arsenic | | 340 | 10 | 348 | 69.7 | 0.98 | | |
| Cadmium | 420 | 150 | 0.2 | 154 | 30.7 | < 0.268 | | |
| Chromium | 301 | 4446 | 3 | 4561 | 912 | 0.40 | | |
| Copper | 420 | 60.1 | 3 | 61.6 | 12.3 | 4.32 | | |
| Lead | 356 | 365 | 3 | 374 | 74.8 | < 0.385 | | |
| Nickel | 268 | 1080 | 20 | 1108 | 222 | 1.02 | | |
| Zinc | 333 | 345 | 10 | 353 | 70.7 | 25 | | |
| Chloride (mg/L) | | 757 | | 777 | | | 512 | 525 |

* 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-Q₁₀ flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

| | REF. | | MEAN | WEEKLY | 1/5 OF | MEAN | |
|-----------------|--------|------|-------|--------|--------|---------|-------|
| | HARD.* | CTC | BACK- | AVE. | EFFL. | EFFL. | 4-day |
| SUBSTANCE | mg/L | | GRD. | LIMIT | LIMIT | CONC. | P99 |
| Chlorine | | 7.28 | | 7.3 | | | |
| Arsenic | | 152 | 10 | 153 | 30.7 | 0.98 | |
| Cadmium | 175 | 3.82 | 0.2 | 3.85 | 0.77 | < 0.268 | |
| Chromium | 280 | 307 | 3 | 309 | 61.9 | 0.40 | |
| Copper | 280 | 25.0 | 3 | 25.2 | 5.03 | 4.32 | |
| Lead | 280 | 75.7 | 3 | 76.3 | 15.3 | < 0.385 | |
| Nickel | 268 | 169 | 20 | 170 | 34.1 | 1.02 | |
| Zinc | 280 | 296 | 10 | 299 | 59.7 | 25 | |
| Chloride (mg/L) | | 395 | | 398 | | | 425 |

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.0050 cfs (¹/₄ of the 7-Q₁₀), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

* 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.

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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 = 0.1328 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

| | | MEAN | MO'LY | 1/5 OF | MEAN |
|---------------|---------|-------|----------|---------|---------|
| | HTC | BACK- | AVE. | EFFL. | EFFL. |
| SUBSTANCE | | GRD. | LIMIT | LIMIT | CONC. |
| Cadmium | 880 | 0.2 | 1069 | 214 | < 0.268 |
| Chromium (+3) | 8400000 | 3 | 10202613 | 2040523 | 0.40 |
| Lead | 2240 | 3 | 2720 | 544 | < 0.385 |
| Nickel | 110000 | 20 | 133601 | 26720 | 1.02 |

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0.1328 cfs (¹/₄ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

| | | MEAN | MO'LY | 1/5 OF | MEAN |
|-----------|-----|-------|-------|--------|-------|
| | HCC | BACK- | AVE. | EFFL. | EFFL. |
| SUBSTANCE | | GRD. | LIMIT | LIMIT | CONC. |
| Arsenic | 40 | 10 | 46.4 | 9.29 | 0.98 |

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.

<u>Chloride</u> – Considering available effluent data from the current permit term (10/08/2019 - 10/17/2024), the 1-day P₉₉ chloride concentration is 512 mg/L, and the 4-day P₉₉ of effluent data is 425 mg/L.

Because the 4-day P₉₉ exceeds the calculated weekly average WQBEL, a weekly average effluent limit of 400 mg/L (rounded) is needed in accordance with s. NR 106.05(4)(b), Wis. Adm. Code. Cedar Grove currently has a chloride variance and an interim limit of 530 mg/L as a weekly average. They did not reapply for a variance because they have been able to meet the chloride WQBEL.

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.

Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code require WPDES permits contain weekly average and monthly average limitations for municipal dischargers whenever practicable and necessary to

protect water quality. Therefore, a monthly average limit of 400 mg/L is required to meet expression of limits requirements in addition to the weekly average limit.

Per s. NR 106.07(2)(c), Wis. Adm. Code, a dry weather weekly average mass limit equal to 1,330 lbs/day (398 mg/L \times 0.40 MGD \times 8.34) and an alternative wet weather weekly average mass limit equal to 4,650 lbs/day (398 mg/L \times 1.4 MGD \times 8.34) are also recommended to be included in the reissued permit.

The graph below shows the effluent weekly average chloride data compared to the recommended weekly average WQBEL of 400 mg/L.



<u>Mercury</u> – The permit application did not require monitoring for mercury because Cedar Grove 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. The average



concentration in the sludge from 06/17/2020 - 09/07/2023 was 0.35 mg/kg, with a maximum reported concentration of 0.73 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

<u>PFOS and PFOA</u> – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the effluent flow rate, the lack of indirect dischargers contributing to the collection system and known levels of PFOS/PFOA in the source water, PFOS and PFOA monitoring is not recommended. The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

PART 3 – 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 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 in mg/L =
$$[A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$$

Where:

A = 0.633 and B = 90.0 for Limited Aquatic Life, and pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1379 sample results were reported from 10/01/2019 - 10/31/2024. The maximum reported value was 8.2 s.u. (Standard pH Units). The effluent pH was 7.8 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.7 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.7 s.u. Therefore, a value of 7.7 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.7 s.u. into the equation above yields an ATC of 22 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-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the $2 \times ATC$ approach are shown below.

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| aAII | | ts – Inniculate Rece |
|------|------------|----------------------|
| | | Ammonia Nitrogen |
| | | Limit mg/L |
| | 2×ATC | 45 |
| | $1-Q_{10}$ | 23 |

Attachment #1
Daily Maximum Ammonia Limits – Immediate Receiving Water

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

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, which are equal to the current variable daily maximum limits.

| Effluent pH s.u. | Limit mg/L | Effluent pH s.u. | Limit mg/L | Effluent pH s.u. | Limit mg/L | | |
|-----------------------------|---------------|---------------------|---------------|---------------------|---------------|--|--|
| $6.0 \le pH \le 6.1$ | 74 | $7.0 < pH \leq 7.1$ | 45 | $8.0 < pH \leq 8.1$ | 9.5 | | |
| $6.1 < pH \le 6.2$ | 72 | $7.1 < pH \leq 7.2$ | 40 | $8.1 < pH \leq 8.2$ | 7.8 | | |
| $6.2 < pH \le 6.3$ | 71 | $7.2 < pH \leq 7.3$ | 36 | $8.2 < pH \leq 8.3$ | 6.4 | | |
| $6.3 < pH \le 6.4$ | 69 | $7.3 < pH \leq 7.4$ | 31 | $8.3 < pH \leq 8.4$ | 5.3 | | |
| $6.4 < pH \le 6.5$ | 67 | $7.4 < pH \leq 7.5$ | 27 | $8.4 < pH \leq 8.5$ | 4.4 | | |
| $6.5 < pH \leq 6.6$ | 64 | $7.5 < pH \le 7.6$ | 23 | $8.5 < pH \leq 8.6$ | 3.6 | | |
| $6.6 < \mathrm{pH} \le 6.7$ | 61 | $7.6 < pH \le 7.7$ | 20 | $8.6 < pH \leq 8.7$ | 3.0 | | |
| $6.7 < pH \leq 6.8$ | 57 | $7.7 < pH \leq 7.8$ | 17 | $8.7 < pH \leq 8.8$ | 2.5 | | |
| $6.8 < pH \leq 6.9$ | 53 | $7.8 < pH \leq 7.9$ | 14 | $8.8 < pH \leq 8.9$ | 2.1 | | |
| $6.9 < pH \le 7.0$ | 49 | $7.9 < pH \le 8.0$ | 11 | $8.9 < pH \le 9.0$ | 1.8 | | |

| Daily Maximum Ammonia Nitros |
|------------------------------|
|------------------------------|

The daily maximum variable limits were calculated to be protective of the downstream coldwater which considers decay over the 1.5 miles from the outfall to Lake Michigan. The calculated ammonia decay varies between 93%-96% by the time the effluent reaches Lake Michigan, depending on the season. The calculations from the previous WQBEL memo are shown in Attachment #3.

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

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 10/11/2019 - 10/03/2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in Cedar Grove's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

| Annionia Mitrogen Ennuent Data | | | | | | |
|--------------------------------|--------------|------------------|-----------------|--|--|--|
| Ammonia Nitrogen mg/L | April - May | June - September | October - March | | | |
| 1-day P ₉₉ | 37.8 | 18.8 | 30.0 | | | |
| 4-day P ₉₉ | 20.7 | 10.5 | 16.4 | | | |
| 30-day P ₉₉ | 10.9 | 4.45 | 7.62 | | | |
| Mean* | 6.84 | 1.85 | 4.07 | | | |
| Std | 7.97 | 5.32 | 6.86 | | | |
| Sample size | 42 | 87 | 133 | | | |
| Range | <0.11 - 24.8 | <0.11 - 20 | <0.11 - 36.7 | | | |

Attachment #1 Ammonia Nitrogen Effluent Data

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

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

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

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.

| | Daily | Weekly | Monthly |
|------------------|----------|---------|---------|
| | Maximum | Average | Average |
| | mg/L | mg/L | mg/L |
| April & May | Variable | 55 | 23 |
| June – September | Variable | 35 | 15 |
| October – March | Variable | 43 | 18 |

Final Ammonia Nitrogen Limits

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

Section NR 102.04(5), Wis. Adm. Code, states that all surface waters shall be suitable for supporting recreational use and shall meet *E. coli* criteria during the recreation season. Section NR 102.04(5)(b), Wis. Adm. Code, allows the Department to make exceptions when it determines, in accordance with s. NR 210.06(3), Wis. Adm. Code, that wastewater disinfection is not required to meet E. coli limits and protect the recreational use. Section NR 210.06(3), Wis. Adm. Code, tasks the Department with determining the need for disinfection using a site-specific analysis based on potential risk to human or animal health. It sets out the factors that must be considered in determining the necessity to disinfect municipal wastewater or to change the length of the disinfection season.

Cedar Grove 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

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aquatic life - that are defined in s. NR 104.02(3), Wis. Adm. Code). The hydrologic classification for Barr Creek is listed in ch. NR 104, Wis. Adm. Code, as continuous. Continuous streams have a higher likelihood of providing opportunities for full contact recreational activities. Therefore, 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. The permit will include a compliance schedule to meet these limits.

<u>Total Residual Chlorine</u> – If Cedar Grove decides to upgrade to use chlorination for disinfection, effluent limitations would be recommended to assure proper operation of the de-chlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states, "When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L." Because the WQBELs are more restrictive, they are recommended instead. Specifically, a daily maximum limit of 20 µg/L would be required if Cedar Grove decides to use chlorination for disinfection. Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required. The calculated weekly average effluent limitation of 7.3 µg/L would also be included in the permit because it is more restrictive than the daily maximum limit.

Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code require WPDES permits contain weekly average and monthly average limitations for municipal dischargers whenever practicable and necessary to protect water quality. **Therefore, a weekly average and monthly average limit of 7.3 \mug/L would also be required to meet expression of limits requirements in addition to the daily max limit.**

PART 5 – 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 Cedar Grove does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, Wis. Adm. Code, and therefore no technology-based limit is required.

| 1111111111 | Annual Average Mass Total Thosphorus Loading | | | | | |
|------------|--|------------|------------------|--|--|--|
| Month | Monthly Avg. | Total Flow | Total Phosphorus | | | |
| Ivionui | mg/L | MG/month | lb./mo. | | | |
| Nov 2023 | 2.52 | 4.35 | 91 | | | |
| Dec 2023 | 2.59 | 4.77 | 103 | | | |
| Jan 2024 | 0.91 | 6.64 | 50 | | | |
| Feb 2024 | 1.41 | 6.43 | 76 | | | |
| Mar 2024 | 0.47 | 8.17 | 32 | | | |
| Apr 2024 | 0.45 | 7.57 | 28 | | | |
| May 2024 | 1.43 | 6.53 | 78 | | | |
| Jun 2024 | 1.49 | 8.28 | 103 | | | |
| Jul 2024 | 1.50 | 6.14 | 77 | | | |
| Aug 2024 | 8.20 | 5.19 | 355 | | | |
| Sep 2024 | 2.76 | 3.66 | 84 | | | |
| Oct 2024 | 2.97 | 3.48 | 86 | | | |
| Average | | | 97 | | | |

Attachment #1 Annual Average Mass Total Phosphorus Loading

Total P (lbs/month) = Monthly average (mg/L) \times total flow (MG/month) \times 8.34 (lbs/gallon) Where total flow is the sum of the actual (not design) flow (in MGD) for that month

In addition, the need for a WQBEL for phosphorus must be considered.

TMDL Limits

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).

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:

TP Equivalent Effluent Concentration = WLA ÷ (365 days/yr * Flow Rate * Conversion Factor) = 157 lbs/yr ÷ (365 days/yr * 0.40 MGD * 8.34) = 0.13 mg/L

Since this value is less than 0.3 mg/L, both a six-month average mass limit and a monthly average mass limit are applicable for total phosphorus. The monthly average limit is set equal to three times the six-month average limit.

TP 6-Month Average Permit Limit = WLA ÷ 365 days/yr * multiplier = (157 lbs/yr ÷ 365 days/yr) * 1.30 = 0.56 lbs/day Page 12 of 27 Cedar Grove Wastewater Treatment Facility

TP Monthly Average Permit Limit = TP 6-Month Average Permit Limit * 3 = 0.56 lbs/day * 3 = 1.7 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 monthly; however, the EPA recommends that permit limits be derived using a frequency of at least weekly.

Six-month average and monthly average mass effluent limits are recommended for this discharge. The limits are equivalent to concentrations of 0.17 mg/L and 0.50 mg/L, respectively, at the facility design flow of 0.40 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, WLAbased 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.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 10/17/2019 - 10/03/2024.

| | Phosphorus mg/L | Phosphorus lbs/day |
|------------------------|--------------------|-----------------------|
| 1-day P ₉₉ | 8.50 | 9.91 |
| 4-day P ₉₉ | 4.88 | 5.94 |
| 30-day P ₉₉ | 3.04 | 3.94 |
| Mean | 2.23 | 3.03 |
| Std | 1.68 | 1.92 |
| Sample size | 62 | 62 |
| Range | 0.33 - 9.61 | 0.57 - 9.8 |

Total Phosphorus Effluent Data

Interim Limit

An interim limit is needed when a compliance schedule is included in the permit to meet the TMDL limits. This limit should reflect a value which the facility is able to currently meet; however, it should also consider the receiving water quality, keeping the water from further impairment. It's recommended that the interim limit be set equal to 4.9 mg/L, expressed as a monthly average. This value reflects the 4-day P_{99} concentration from 10/01/2019 - 10/31/2024. This value is recommended instead of the 30-day P_{99} concentration of 3.0 mg/L to allow operational flexibility when the facility begins to initiate

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phosphorus treatment optimization activities, which often consist of trial and error.



The graph below shows the monthly average phosphorus data from the current permit term, for informational purposes.

PART 6 – 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).

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.

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• Daily maximum and monthly average limitations for all other discharges.

Cedar Grove 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 = (14,631 lbs/yr ÷ 365 days/yr) * 1.59 = 64 lbs/day

TSS Weekly Average Permit Limit = WLA ÷ 365 days/yr * multiplier = (14,631 lbs/yr ÷ 365 days/yr) * 2.37 = 95 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 2.2. 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 concentrations of 28 mg/L and 19 mg/L, respectively, the facility design flow of 0.40 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.

| I otal Suspended Sonds Efficient Data | | | | |
|---------------------------------------|-------------|----------------|--|--|
| | TSS mg/L | TSS lbs/day | | |
| 1-day P ₉₉ | 13.8 | 38.4 | | |
| 4-day P ₉₉ | 8.06 | 20.8 | | |
| 30-day P ₉₉ | 4.20 | 9.28 | | |
| Mean | 2.55 | 4.51 | | |
| Std | 3.10 | 9.92 | | |
| Sample size | 532 | 532 | | |
| Range | <2 - 28 | 0 - 98 | | |

Total Suspended Solids Effluent Data

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.

Cedar Grove can currently meet the TMDL-based TSS limits so no compliance schedule is needed.

Attachment #1 PART 7 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

LAL discharge

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 and described in s. NR 106.55(2), Wis. Adm. Code, which has a daily maximum effluent temperature limitation of 120 °F. The 86° F limit applies because the hydrologic classification is not listed as wetland in ch. NR 104, Wis. Adm. Code.

Reasonable Potential

Based on the available discharge temperature data from 01/03/2024 - 10/31/2024 shown below, the maximum daily effluent temperature reported was 70 °F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits or monitoring are recommended**.

| Marsth | Representat Monthly Tempo | tive Highest Effluent erature | Calculated Effluent Limit | | |
|--------|---------------------------------|-------------------------------------|---|--|--|
| Month | Weekly Daily Maximum Maximum | | Weekly Average Effluent Limitation | Daily Maximum Effluent Limitation | |
| | (°F) | (°F) | (°F) | (°F) | |
| JAN | 54 | 56 | - | 86 | |
| FEB | 51 | 52 | - | 86 | |
| MAR | 51 | 52 | - | 86 | |
| APR | 54 | 55 | - | 86 | |
| MAY | 58 | 58 | - | 86 | |
| JUN | 62 | 62 | - | 86 | |
| JUL | 66 | 68 | - | 86 | |
| AUG | 68 | 68 | - | 86 | |
| SEP | 69 | 70 | - | 86 | |
| OCT | 68 | 68 | - | 86 | |
| NOV | | | - | 86 | |
| DEC | | | - | 86 | |

Monthly Temperature Effluent Data & Limits

Attachment #1 PART 8 – WHOLE EFFLUENT TOXICITY (WET)

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

- 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 LC₅₀ (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 IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of **9%** 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:

The IWC is 9% based on dilution of 10 parts lake water to 1-part effluent, as specified in s. NR 106.06(4)(b)2, Wis. Adm. Code, or a factor of 1 in 11 to calculate the IWC.

*Lake Michigan, 1.5 miles downstream, is used in the calculation of the IWC because the immediate receiving water has a current and attainable use which is a variance water.

- 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 2005 is excluded in this evaluation.

| (The Data History | | | | | | | | | |
|-------------------|-------------------------------|---------|-----------------|---------|----------|-----------------|------------|--------|-----------|
| | Acute Results Chronic Results | | | | | | | | |
| Date | | LC | ₅₀ % | | | IC ₂ | <u>5</u> % | | Footnotes |
| Test | C dubia | Fathead | Pass or | Used in | C dubia | Fathead | Pass or | Use in | or |
| Initiated | C. uubiu | minnow | Fail? | RP? | C. uubiu | Minnow | Fail? | RP? | Comments |
| 07/19/2005 | >100 | >100 | Pass | No | 5.47 | >100 | Fail | No | 1 |
| 09/27/2005 | | | | | 29.78 | >100 | Fail | No | 1 |
| 11/03/2005 | | | | | >100 | >100 | Pass | No | 1 |
| 03/31/2009 | | | | | >100 | >100 | Pass | No | 2 |
| 05/20/2010 | >100 | >100 | Pass | No | >100 | >100 | Pass | No | 2 |
| 09/13/2011 | | | | | >100 | >100 | Pass | Yes | |
| 10/02/2012 | | | | | >100 | >100 | Pass | Yes | |
| 03/26/2013 | | | | | 57.1 | 67 | Fail | Yes | |
| 05/21/2013 | | | | | 79.5 | >100 | Fail | Yes | |
| 06/18/2013 | | | | | >100 | >100 | Pass | Yes | |

Attachment #1 WET Data History

Footnotes:

1. Data Not Representative. Cedar Grove had a major facility upgrade which was completed in September 2006. The treatment plant consisted of a lagoon system which was upgraded to the sequencing batch reactor. Data collected prior to this date is not representative of current treatment conditions.

 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 $IC_{50} \ge 100\%$).

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

Chronic Reasonable Potential = $[(TU_c \text{ effluent}) (B)(IWC)]$

| TUc (maximum) 100/IC ₂₅ | B (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4) | IWC | | | | |
|---------------------------------------|---|-----|--|--|--|--|
| 100/57.1 = | 3.8 | 9% | | | | |

Chronic WET Limit Parameters

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| Attachment #1 | | | | | | |
|--|---|-----|--|--|--|--|
| TUc (maximum) 100/IC ₂₅ | B (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4) | IWC | | | | |
| 1.75 | Based on 2 detects | | | | | |

[(TUc effluent) (B)(IWC)] = 0.60 < 1.0

Therefore, no reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 09/13/2011 - 06/18/2013.

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.

| | Acute | Chronic |
|-------------------|---|--|
| | Not Applicable. | IWC = 9%. |
| AMZ/IWC | | |
| | 0 Points | 0 Points |
| | 0 tests used to calculate RP. | 5 tests used to calculate RP, over 5 years old. |
| Historical | | 2 tests failed. |
| Data | | |
| | 5 Points | 5 Points |
| | Little variability, no violations or upsets, | Same as Acute. |
| Effluent | consistent WWTF operations. | |
| Variability | | |
| | 0 Points | 0 Points |
| | LAL, with less than 4 miles to a coldwater | Same as Acute. |
| Receiving Water | classification. | |
| Classification | | |
| | 5 Points | 5 Points |
| | No reasonable potential for limits for based on | Reasonable potential for limits for chloride based |
| | ATC; Ammonia nitrogen limit carried over from | on CTC; Ammonia nitrogen limit carried over |
| Chemical-Specific | the current permit. Arsenic, chromium, copper, | from the current permit. Arsenic, chromium, |
| Data | nickel, zinc, chloride, and ammonia detected. | copper, nickel, zinc, and ammonia detected. |
| | Additional Compounds of Concern: None. | Additional Compounds of Concern: None. |
| | 2 Dointa | 9 Dointa |
| | | |
| Addition | Zero additives used. | Zero additives used. |
| Auditives | 0 Points | A Doints |
| Disahanga | 0 Industrial Contributors | Sama as A suta |
| Cotogory | o industrial Contributors. | Same as Acute. |
| Category | | |

WET Checklist Summary

| Attachment #1 | | | | | | | |
|--|----------------------|----------------------|--|--|--|--|--|
| | Acute Chro | | | | | | |
| | 0 Points | 0 Points | | | | | |
| Wastewater | Secondary or Better | Same as Acute. | | | | | |
| Treatment | 0 Points | 0 Points | | | | | |
| Downstream | No impacts known | Same as Acute. | | | | | |
| Impacts | 0 Points | 0 Points | | | | | |
| Total Checklist Points: | 13 Points | 18 Points | | | | | |
| Recommended Monitoring Frequency (from Checklist): | No testing necessary | No testing necessary | | | | | |
| Limit Required? | No | No | | | | | |
| TRE Recommended? (from Checklist) | No | No | | | | | |

• No WET testing is required because information related to the discharge indicates the potential for effluent toxicity is believed to be low.

PART 9 – BIOLOGICAL OXYGEN DEMAND

Cedar Grove currently has $CBOD_5$ limits but would like to switch to BOD_5 limits. Because the facility discharges to a receiving water that supports an LAL classification, the recommended limitations for BOD_5 and TSS are 30 mg/L weekly average and 20 mg/L monthly average per s. NR 104.02(3)(b), Wis. Adm. Code.

The available BOD₅ data is from the current permit term is shown below:

| Elliuent DOD5 Data | | | | | |
|------------------------|-----------------------|--|--|--|--|
| | BOD ₅ mg/L | | | | |
| 1-day P ₉₉ | 35.7 | | | | |
| 4-day P ₉₉ | 20.3 | | | | |
| 30-day P ₉₉ | 10.8 | | | | |
| Mean | 6.81 | | | | |
| Std | 7.75 | | | | |
| Sample size | 25 | | | | |
| Range | <2-38.2 | | | | |

Effluent BOD₅ Data

Cedar Grove can currently meet the BOD₅ limits, so no compliance schedule is needed.

Antidegradation and antibacksliding requirements per ch. NR 207, Wis. Adm. Code don't need to be met because both of the new BOD₅ and current CBOD₅ limits are protective of the dissolved oxygen criteria in s. NR 104.02(3)(b)2.a., Wis. Adm. Code.



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Attachment #3 2019 Ammonia Calculations

Daily Maximum Limits based on Acute Toxicity Criteria (ATC):

Daily maximum limitations are based on acute toxicity criteria, 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 in mg/L = $[A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$

Where:

A = 0.633 and B = 58.4 for a Limited Aquatic Life, and A = 0.275 and B = 39.0 for a Cold Water Category 1 fishery, and pH (s.u.) = that characteristic of the <u>effluent</u>.

The effluent pH data was examined as part of this evaluation. A total of 1349 sample results were reported from 05/01/2015 - 04/30/2019. The maximum reported value was 8.5 s.u. (Standard pH Units). The effluent pH was 8.3 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), is 7.93 s.u. And the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.9 s.u. Therefore, a value of 7.9 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.9 s.u. into the equation above for Limited Aquatic Life yields an ATC = 15.6 mg/L.

Potential changes to daily maximum Ammonia Nitrogen effluent limitations:

Updates to subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) outline the option for the Department to implement use of the 1- Q_{10} receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits would apply.

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

| | Ammonia Nitrogen Limit mg/L |
|-------------------|-----------------------------------|
| 2×ATC | 31.2 |
| 1-Q ₁₀ | 16.0 |

The 1-Q₁₀ method for Barr Creek yields the most stringent limits for Cedar Grove.

Downstream Impacts:

Due to 10:1 dilution for Lake Michigan downstream, the $2 \times ATC$ method yields the most stringent limits for Cedar Grove at the downstream waterbody. Substituting a value of 7.9 s.u. into the equation above for the downstream classification of Cold Water yields an ATC = 6.8 mg/L and a computed daily maximum limit of 13.5 mg/L using two times the ATC.

There is some decay expected of the effluent before it reaches the Cold Water classification at Lake Michigan approximately 1.5 miles downstream. The following discussion considers this amount of decay

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in the calculation of the effluent limit at the outfall. Limits will be calculated for downstream protection of the Cold Water classification and consider the amount of decay that will occur between the outfall and the classification change.

Weekly Average & 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, since those limits relate to the assimilative capacity of the receiving water.

Ammonia limits were last calculated in 2014. At that time, default stream pH and temperatures were used to calculate limits. At this time, though, more specific information is available for both parameters which warrant a re-calculation of weekly and monthly average limits. New default temperature data are available for relatively small warm water streams as part of the state's new thermal standards; the new default ambient stream temperatures are contained in Table 2 of ch. NR 102. Seasonal mean pH values are now available for Barr Creek in Sheboygan County. The new ambient values are used in conjunction with the effluent and stream low flows to re-calculate limits using the procedure in s. NR 106.32, Wis. Adm. Code.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria. The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as Limited Aquatic Life is calculated by the following equation.

CTC = E × { $[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]$ } × C Where: pH = the pH (s.u.) of the <u>receiving water</u>, E = 1.0, C = 8.09 × 10^{(0.028 × (25 - T))} T = the temperature of the receiving (°C)

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

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified for a Cold Water Community is calculated by the following equation.

 $\begin{array}{l} \text{CTC} = \text{E} \times \left\{ [0.0676 \div (1 + 10^{(7.688 - \text{pH})})] + [2.912 \div (1 + 10^{(\text{pH} - 7.688)})] \right\} \times \text{C} \\ \text{Where:} \\ \text{pH} = \text{the pH (s.u.) of the receiving water,} \\ \text{E} = 0.854, \\ \text{C} = \text{the minimum of } 2.85 \text{ or } 1.45 \times 10^{(0.028 \times (25 - \text{T}))}, \\ \text{T} = \text{the temperature (°C) of the receiving water} \end{array}$

The 4-day criterion is simply equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used to derive weekly average limitations, and the 30-day criteria are used to derive monthly average limitations, both by a mass-balance using a ten-to-one dilution ratio.

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Temperature values were used from "default" basin data, pH values used are site-specific from Barr Creek, and ambient ammonia concentrations used are from the Sheboygan Drainage Basin. These values are shown in the table below with resulting criteria and effluent limitations.

| | | Spring | Summer | Winter |
|----------------------|------------------------------|-------------|--------------|-----------|
| | | April & May | June – Sept. | Oct March |
| Effluent Flow | Qe (MGD) | 0.4 | 0.4 | 0.4 |
| | $7-Q_{10}$ (cfs) | 0.02 | 0.02 | 0.02 |
| | $7-Q_2$ (cfs) | 0.07 | 0.07 | 0.07 |
| | Ammonia (mg/L) | 0.04 | 0.05 | 0.16 |
| Background | Temperature (°C) | 12 | 19 | 4 |
| Information | Temperature (°F) | 54 | 66 | 39 |
| | pH (s.u.) | 7.77 | 7.84 | 8.14 |
| | % of Flow used | 50 | 100 | 25 |
| | Reference Weekly Flow (cfs) | 0.01 | 0.02 | 0.005 |
| | Reference Monthly Flow (cfs) | 0.02975 | 0.0595 | 0.014875 |
| Criteria | 4-day Chronic | 54 | 33 | 43 |
| mg/L | 30-day Chronic | 22 | 13 | 17 |
| Effluent Limits | Weekly Average | 55 | 34 | 43 |
| mg/L | Monthly Average | 23 | 15 | 18 |

The table below summarizes the inputs and effluent limits if the outfall was located in Lake Michigan and had the Cold Water classification. Temperature values are site-specific from Northern Lake Michigan, ambient ammonia concentrations from "default" basin data, and ambient pH values from "default" hardness values.

| | | Spring | Summer | Winter |
|-----------------|------------------|-------------|--------------|-----------|
| | | April & May | June – Sept. | Oct March |
| Effluent Flow | Qe (MGD) | 0.4 | 0.4 | 0.4 |
| | Dillution factor | 10 | 10 | 10 |
| | Ammonia (mg/L) | 0.04 | 0.05 | 0.16 |
| | Temperature (°C) | 6 | 10 | 10 |
| Background | Temperature (°F) | 43 | 50 | 50 |
| Information | pH (s.u.) | 8.04 | 8.08 | 7.98 |
| Criteria | 4-day Chronic | 5.74 | 5.40 | 6.26 |
| mg/L | 30-day Chronic | 2.30 | 2.16 | 2.50 |
| Effluent Limits | Weekly Average | 62.7 | 59.0 | 67.3 |
| mg/L | Monthly Average | 24.9 | 23.3 | 26.0 |

Ammonia Decay

Because the calculated limits are more restrictive than the current limits ammonia decay is considered to determine limits at the outfall to protect the downstream classification. The more restrictive calculated limits should be used to protect at the point of discharge and downstream uses. Where the calculated limits are more restrictive based on downstream uses, ammonia decay can be considered to determine if these more restrictive limits are needed or if the ammonia will decay before it reaches the point of the classification change.

Ammonia decay rates are dependent on temperature with in-stream nitrification essentially non-existent in the winter. In-stream decay is expected so a first order decay model will be used. Based on the available literature, a decay rate of 0.25 day⁻¹ at 20°C has been suggested as a default rate. A temperature correction factor of $\theta = 1.08$ is (k_i= k₂₀ $\theta^{(T-20)}$).

$$N_{\text{Limit}} = \left(\frac{N_{\text{down}}}{\text{EXP}(-k_{t}T)} \right)$$

Where: N_{Limit} = Ammonia limit needed to protect downstream use (mg/L)

- N_{down} = Ammonia limit calculated based on downstream classification and flow (mg/L)
- $-k_t$ = Ammonia decay rate at background stream temperature (day⁻¹)

T = Travel time from outfall to downstream use (day)

The velocity of receiving water is assumed to be 5 miles per day and the distance from the point of discharge to the classification change is approximately 1.5 miles for a travel time of 0.3 days. The following table provides a summary of the effluent limits calculated mentioned earlier and what limits would be needed to protect the Cold Water classification when Barr Creek flows into Lake Michigan.

| | LAL limits - At outfall - | | | CW limits - Without decay - | | Ammonia Nitrogen | | CW limits After decay | r - | |
|----------------------|------------------------------|-----------------------------|------------------------------|--------------------------------|-----------------------------|------------------------------|---|----------------------------|-----------------------------|------------------------------|
| Months Applicable | Daily Maximum (mg/L) | Weekly Average (mg/L) | Monthly Average (mg/L) | Daily Maximum (mg/L) | Weekly Average (mg/L) | Monthly Average (mg/L) | Remaining at Lake Michigan (%) | Daily Maximum (mg/L) | Weekly Average (mg/L) | Monthly Average (mg/L) |
| April – May | 16.0 | 55.0 | 22.7 | 13.5 | 62.7 | 24.9 | 96 | 14.0 | 55.0 | 22.7 |
| June – Sept | 16.0 | 34.6 | 14.7 | 13.5 | 60.0 | 23.3 | 93 | 14.5 | 34.6 | 14.7 |
| Oct – March | 16.0 | 43.4 | 17.7 | 13.5 | 67.3 | 26.0 | 98 | 13.8 | 43.4 | 17.7 |

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 11/19/2014 - 04/26/2019, with those results being compared to the calculated limits to determine the need to include ammonia limits in Cedar Grove's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit. Based on this comparison, daily limits are required for all months.

| Ammonia Nitrogen mg/L | April – May | June – September* | October – March* |
|--------------------------|-------------|-------------------|------------------|
| 1-day P ₉₉ | 41.9 | 30.8 | 42.1 |
| 4-day P ₉₉ | 25.6 | 17.9 | 22.8 |
| 30-day P ₉₉ | 17.4 | 7.67 | 11.6 |
| Mean* | 13.6 | 3.41 | 6.98 |
| Std | 8.06 | 7.45 | 8.96 |
| Sample size | 18 | 31 | 113 |
| Range | 0.18-23.7 | <0.087-30.4 | <0.087-39.2 |

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

Expression of Limits:

Revisions to ch. NR 106 align Wisconsin's WQBELs with 40 CFR 122.45(d), which requires WPDES permits for municipal treatment facilities contain weekly average and monthly average limitations, whenever concentration limits are deemed practicable and necessary to protect water quality. Because a daily maximum ammonia limit is necessary for Cedar Grove, weekly and monthly average limits are also required under this code revision.

The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), and are as follows:

Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

Conclusions and Recommendations:

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. Because the calculated weekly and monthly limits were greater than the daily maximum limits (besides the June - September monthly limit), the weekly and monthly limits were set equal to the daily to meet the expression of limits requirements. No mass limitations are recommended in accordance with s. NR 106.32(5).

| Months | Daily | Weekly | Monthly |
|------------------|---------|---------|---------|
| Applicable | Maximum | Average | Average |
| April & May | 14 | 14 | 14 |
| June – September | 15 | 15 | 15 |
| October – March | 14 | 14 | 14 |

Presented below are tables of daily maximum limitations corresponding to various effluent pH values and seasons. Use of these tables is not necessarily recommended in the permit, but they are presented herein for informational purposes. The maximum daily values were calculated for the Cold Water classification.

| Effluent pH | Limit | Effluent pH | Limit | Effluent pH | Limit |
|---------------------|-------|---------------------|-------|---------------------|-------|
| s.u. | mg/L | s.u. | mg/L | s.u. | mg/L |
| $6.0 < pH \leq 6.1$ | 74 | $7.0 < pH \leq 7.1$ | 45 | $8.0 < pH \leq 8.1$ | 9.5 |
| $6.1 < pH \leq 6.2$ | 72 | $7.1 < pH \leq 7.2$ | 40 | $8.1 < pH \leq 8.2$ | 7.8 |
| $6.2 < pH \leq 6.3$ | 71 | $7.2 < pH \leq 7.3$ | 36 | $8.2 < pH \leq 8.3$ | 6.4 |
| $6.3 < pH \leq 6.4$ | 69 | $7.3 < pH \leq 7.4$ | 31 | $8.3 < pH \leq 8.4$ | 5.3 |
| $6.4 < pH \le 6.5$ | 67 | $7.4 < pH \leq 7.5$ | 27 | $8.4 < pH \leq 8.5$ | 4.4 |
| $6.5 < pH \leq 6.6$ | 64 | $7.5 < pH \leq 7.6$ | 23 | $8.5 < pH \leq 8.6$ | 3.6 |
| $6.6 < pH \leq 6.7$ | 61 | $7.6 < pH \leq 7.7$ | 20 | $8.6 < pH \leq 8.7$ | 3.0 |
| $6.7 < pH \leq 6.8$ | 57 | $7.7 < pH \leq 7.8$ | 17 | $8.7 < pH \leq 8.8$ | 2.5 |
| $6.8 < pH \le 6.9$ | 53 | $7.8 < pH \le 7.9$ | 14 | $8.8 < pH \le 8.9$ | 2.1 |
| $6.9 < pH \le 7.0$ | 49 | $7.9 < pH \le 8.0$ | 11 | $8.9 < pH \le 9.0$ | 1.8 |

If the variable daily maximum limit table is used in place of the single limit, the weekly average limits should be the cold water limits after decay as follows:

| Attachment #5 | | | | | | | |
|------------------|----------|---------|---------|--|--|--|--|
| | Daily | Weekly | Monthly | | | | |
| | Maximum | Average | Average | | | | |
| | mg/L | mg/L | mg/L | | | | |
| April – May | Variable | 55 | 23 | | | | |
| June – September | Variable | 35 | 15 | | | | |
| October – May | Variable | 43 | 18 | | | | |

Attachment #3