CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: December 4, 2024

TO: Holly Heldstab – WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Pittsville Water and Sewer Department Wastewater Treatment Facility
WPDES Permit No. WI-0020494

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 the Pittsville Water and Sewer Department Wastewater Treatment Facility in Wood County. This municipal wastewater treatment facility (WWTF) discharges to the Yellow River, located in the Upper Yellow (Wood Co.) River Watershed in the Central Wisconsin River Basin. This discharge is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. 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 006:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5						1
July			34 mg/L, 49 lbs/day	30 mg/L		
August			24 mg/L, 35 lbs/day	24 mg/L		
September			34 mg/L, 49 lbs/day	30 mg/L		
October - June			45 mg/L	30 mg/L		
TSS						1
July			34 mg/L, 49 lbs/day	30 mg/L		
August			24 mg/L, 35 lbs/day	24 mg/L		
September			34 mg/L, 49 lbs/day	30 mg/L		
October - June			45 mg/L	30 mg/L		
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen						3
November - July	11 mg/L		**11 mg/L**	**11 mg/L**		
August			15 mg/L	15 mg/L		
E. Coli				126 #/100 mL geometric mean		4
Phosphorus						5
LCA Interim Limit				1.0 mg/L		
HAC Interim Limit				0.6 mg/L		
Final WQBEL				0.486 lbs/day	0.162 lbs/day	

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Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
TKN, Nitrate+Nitrite, and Total Nitrogen						6
Acute WET						7
Chronic WET						7,8

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Bacteria limits apply during the disinfection season of May - September. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
5. Under the phosphorus MDV, a level currently achievable (LCA) interim limit of 1.0 mg/L should be effective upon permit reissuance. A compliance schedule may be included in the permit until the highest attainable condition (HAC) limit of 0.6 mg/L can be met. The final WQBELs remain at 0.486 lbs/day as a monthly average and 0.162 lbs/day as a six-month average.The phosphorus mass limit is based on the Total Maximum Daily Load (TMDL) for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020.
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
7. Two acute and chronic WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
8. The Instream Waste Concentration (IWC) to assess chronic test results is 23%. According to the State of Wisconsin Aquatic Life Toxicity Testing Methods Manual (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 006 shall be a grab sample collected from the Yellow River.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Benjamin Hartenbower at (715) 225-4705 or Benjamin.Hartenbower@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

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

PREPARED BY: _____ Date: 12/04/2024

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Attachment #1

Water Quality-Based Effluent Limitations for
the Pittsville Water and Sewer Department Wastewater Treatment Facility
WPDES Permit No. WI-0020494

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:
The Pittsville Wastewater Treatment Facility treats domestic wastewater from the City of Pittsville. Historically industrial wastewater from Badger State Fruit Processing had also been treated at the facility but is not currently. The annual average design flow is 0.174 million gallons per day (MGD). Treatment consists of a fine screen, an aerated lagoon and a covered settling pond. Effluent is seasonally disinfected via ultraviolet light prior to discharge to the Yellow River.

Attachment #3 is a map of the area showing the approximate location of Outfall 006.

Existing Permit Limitations
The current permit, expiring on December 31, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5						1
July			34 mg/L, 49 lbs/day	30 mg/L		
August			24 mg/L, 35 lbs/day	24 mg/L		
September			34 mg/L, 49 lbs/day	30 mg/L		
October - June			45 mg/L	30 mg/L		
TSS						1
July			34 mg/L, 49 lbs/day	30 mg/L		
August			24 mg/L, 35 lbs/day	24 mg/L		
September			34 mg/L, 49 lbs/day	30 mg/L		
October - June			45 mg/L	30 mg/L		
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen						
August			15 mg/L	15 mg/L		
November - April	27 mg/L		27 mg/L	27 mg/L		
Fecal Coliform May - September			**780 #/100 mL geometric mean**	400 #/100 mL geometric mean		

Attachment #1

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Phosphorus						3
MDV Interim				1.00 mg/L		
TMDL Limit				0.486 lbs/day	0.162 lbs/day	
TKN, Nitrate+Nitrite, and Total Nitrogen						2
Acute WET						4

Footnotes:

1. 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.
2. Monitoring only.
3. Under the phosphorus MDV, a highest attainable condition (HAC) limit of 1.0 mg/L was effective January 1, 2020.
4. Acute WET testing required: July - Sept 2021 and Jan - March 2024.

Receiving Water Information

- Name: Yellow River
- Waterbody Identification Code (WBIC): 1352800
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: USGS for Station 05401903 (Recalculated in 2003) at the Yellow River near Pittsville, where Outfall 006 is located.

  $7\text{-}Q_{10}$ = 3.70 cfs
  $7\text{-}Q_{2}$ = 7.40 cfs

  Harmonic Mean Flow = 25.9 cfs using a drainage area of 180.0 mi^2.
  The Harmonic Mean has been estimated based on average flow and the $7\text{-}Q_{10}$ using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).
- Hardness = 45 mg/L as $CaCO_3$. This value represents the sample collected in the receiving water for WET testing on 07/20/2010.
- % 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: Chloride data is from the Yellow River. Metals data taken from the East Fork Black River at Hatfield is used in this evaluation 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: There are several other dischargers to the Yellow River however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: This discharge is located within the WI River TMDL for phosphorus.

Effluent Information:

- Design Flow Rate:
  Annual Average = 0.174 MGD (Million Gallons per Day)
  For reference, the actual average flow from January 2020 to September 2024 was 0.089 MGD.
- Hardness = 142 mg/L as $CaCO_3$. This value represents the geometric mean of 4 effluent samples collected from 05/07/2024 to 05/28/2024.
- 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 and historic industrial wastewater contribution from Badger State Fruit Processing.
- Additives: Aqua Hawk RE2 for phosphorus reduction.
- Total Phosphorus Wasteload Allocation: 49 lbs/year = 0.134 lbs/day
- 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 Chloride and Hardness. The permit-required monitoring for Ammonia Nitrogen and Phosphorus from January 2020 to September 2024 is used in this evaluation.

Chemical Specific Effluent Data at Outfall 006

Sample Date	Copper µg/L	Sample Date	Chloride mg/L
05/07/2024	5.36	05/07/2024	195
05/14/2024	4.7	05/14/2024	174
05/21/2024	4.543	05/21/2024	179
05/28/2024	4.671	05/28/2024	174
06/04/2024	4.625		
06/11/2024	4.981		
06/18/2024	5.069		
06/25/2024	4.845		
07/01/2024	6.923		
07/09/2024	6.725		
11/19/2024	11		
1-day P_{99}	11.64	mean	181
4-day P_{99}	8.36		

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.”.

The following table presents the average concentrations and loadings at Outfall 006 from January 2020 to September 2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

Parameter Averages with Limits

	Average Measurement	Average Mass Discharged
BOD_5	9.4 mg/L*	7.21 lbs/day
TSS	11.3 mg/L*	4.75 lbs/day
pH	7.34 s.u.	
Ammonia Nitrogen	10.18 mg/L	
Fecal Coliform	6#/100 mL	
Phosphorus	0.78 mg/L	

*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 P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

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

Where:

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

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

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

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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for the Pittsville Water and Sewer Department Wastewater Treatment Facility and the limits are set based on two times the acute toxicity criteria.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 3.0 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340		680	136	0.348		
Cadmium	142	15.4	0.047	30.9	6.2	<0.268		
Chromium (+3)	142	2406	0.995	4813	963	<0.282		
Copper	142	21.6	1.237	43.3			11.64	11.0
Lead	142	150	0.647	301	60	<0.385		
Nickel	142	632		1264	253	3.1		
Zinc	142	164	8.0	328	66	23		
Chloride		757	20.3	1514	303	181		195

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.93 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		152		675	135	0.348	
Cadmium	45	1.3	0.047	5.7	1.1	<0.268	
Chromium (+3)	45	69	0.995	301	60	<0.282	
Copper	45	5.2	1.237	18.9			8.36
Lead	45	13	0.647	55	11	<0.385	
Nickel	45	27		118	24	3.1	
Zinc	45	60	8.0	238	48	23	
Chloride		395	20.3	1682	336	181	

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 = 6.5 cfs (¼ of the Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MAX. EFFL. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Cadmium	370.0	0.047	9271.2	1854.2	<0.268	
Chromium (+3)	3818000	0.995	95680672	19136134	<0.282	
Lead	140	0.647	3493	699	<0.385	
Nickel	43000		1077598	215520	3.1	

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 6.5 cfs (¼ of the Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Arsenic	13.3		333.3	66.7	0.348	

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, limits are not required for toxic substances.

PFOS and PFOA
The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Monitoring of the water supply produced a PFOS result of 1.50 ng/L and a PFOA result of 1.90 ng/L. These results are less than one fifth of the respective criteria for each substance. Based on the annual design flow, it is unlikely that the effluent will contain PFOS or PFOA. **Therefore, monitoring is not recommended.** If information becomes available that indicates PFOS or PFOA may be present in the effluent, the monitoring requirements may change.

Mercury – The permit application did not require monitoring for mercury because the Pittsville Water and Sewer Department Wastewater Treatment Facility 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). 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 2021 was 1.20 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 006.

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.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- 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.

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

Where:

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

The effluent pH data was examined as part of this evaluation. A total of 492 sample results were reported from January 2020 to September 2024. The maximum reported value was 8.30 s.u. (Standard pH Units). The effluent pH was 8.20 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.14 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 8.11 s.u. Therefore, a value of 8.20 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.20 s.u. into the equation above yields an ATC = 5.73 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 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

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

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	11.45
1-Q_{10}	89.78

The 2×ATC method yields the most stringent limits for the Pittsville Water and Sewer Department Wastewater Treatment Facility.

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

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

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

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

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

Where:

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

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

The "default" basin assumed values are used for temperature and background ammonia concentrations, because minimum ambient data is available. The values for pH are based on data collected from the Yellow River. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		May-July	August	September & October	November-April
Effluent Flow	Qe (MGD)	0.174	0.174	0.174	0.174
Background Information	7-Q_{10} (cfs)	5.0	3.7	4.1	4.7
	7-Q_2 (cfs)	10	7.4	8.2	9.4
	Ammonia (mg/L)	0.07	0.07	0.07	0.14
	Temperature (°C)	20.6	19.4	15.6	8.9
	pH (s.u.)	7.67	7.63	7.51	7.31
	% of Flow used	100	100	50	25
	Reference Weekly Flow (cfs)	5.0	3.7	2.1	1.2
	Reference Monthly Flow (cfs)	8.5	6.3	3.5	2.0
Criteria mg/L	4-day Chronic				
	Early Life Stages Present	6.28	7.02	10.13	12.64
	Early Life Stages Absent	6.28	7.02	10.13	18.17
	30-day Chronic				
	Early Life Stages Present	2.51	2.81	4.05	5.06
	Early Life Stages Absent	2.51	2.81	4.05	7.27
Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present	122	103	87	67
	Early Life Stages Absent				
	Monthly Average				
	Early Life Stages Present	80	67	56	42
	Early Life Stages Absent				

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from January 2020 to September 2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Pittsville Water and Sewer Department Wastewater Treatment Facility permit for the respective month ranges.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	May-July	August	September & October	November-April
1-day P_{99}	37.934	8.472	4.968	38.009
4-day P_{99}	23.21	5.474	3.451	23.474
30-day P_{99}	15.786	3.95	2.661	16.14
Mean	12.373	3.227	2.273	12.75
Std	7.283	1.568	0.857	7.257
Sample size	131	45	76	243
Range	1.174 - 33.3	0.9 - 9.3	0.5 - 4.9	0.479 - 26.4

Based on this comparison, daily limits are required November through July.

The permit currently has daily maximum, weekly average, and monthly average limits of 27 mg/L for November throught April and weekly and monthly average limits of 15 mg/L for August. 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.

Expression of Limits

Revisions to ch. NR 106, Wis. Adm. Code, in September 2016 aligned Wisconsin's WQBELs with 40 CFR § 122.45(d), which specifies that effluent limits for continuous dischargers must be expressed as weekly and monthly averages for publicly owned treatment works and as daily maximums and monthly averages for all other dischargers, unless shown to be impracticable. Because a daily maximum ammonia limit is necessary for November through July, 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), Wis. Adm. Code, 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.

For November through April, the daily maximum limit of 11 mg/L is more restrictive than the current weekly and monthly average limits of 27 mg/L. Therefore, **monthly and weekly average limits of 11 mg/L** are recommended in the permit for November through April as well as May through July.

Conclusions and Recommendations

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

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
May-July	11	**11**	**11**
August		15	15
September & October			
November-April	11	**11**	**11**

Limits are not required for September and October, but twice weekly monitoring is recommended to continue.

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.

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.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because the Pittsville Water and Sewer Department Wastewater Treatment Facility permit requires 2/week monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the required disinfection season.

Effluent Data
The Pittsville Water and Sewer Department Wastewater Treatment Facility has monitored effluent *E. coli* from August 2023 to July 2024 and a total of 44 results are available. A geometric mean of 126 counts/100 mL was never exceeded, with a maximum monthly geometric mean of 2 counts/100 mL. Effluent data never exceeded 410 counts/100 mL. The maximum reported value was 44 counts/100 mL. Based on this effluent data it appears that the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.

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 the Pittsville Water and Sewer Department Wastewater Treatment currently has a phosphorus limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

TMDL Limits – Phosphorus

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* (May 2020). The wasteload allocations (WLA) that implement site-specific criteria for Lakes Petenwell, Castle Rock, and Wisconsin are found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 and are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). The WLA that implement statewide criteria found in Appendix J of the TMDL report are no longer applicable following approval of these site-specific criteria. The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

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 continuously discharging facilities covered by the WRB 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 are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\begin{aligned} \text{TP Equivalent Effluent Concentration} &= \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor}) \\ &= 0.134 \text{ lbs/day} \div (0.174 \text{ MGD} * 8.34) \\ &= 0.09 \text{ mg/L} \end{aligned}$$

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.

$$\begin{aligned} \text{TP 6-Month Average Permit Limit} &= \text{Daily WLA} * \text{6-Month average multiplier} \\ &= 0.134 \text{ lbs/day} * 1.21 \\ &= 0.162 \text{ lbs/day} \end{aligned}$$

$$\begin{aligned} \text{TP Monthly Average Permit Limit} &= \text{TP 6-Month Average Permit Limit} * 3 \\ &= 0.162 \text{ lbs/day} * 3 \\ &= 0.486 \text{ lbs/day} \end{aligned}$$

The multiplier used in the six-month average calculation was determined according to TMDL implementation guidance. A standard coefficient of variation (CV) of 0.6, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as twice weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

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

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

Effluent Data

The following table lists the statistics for effluent phosphorus levels from January 2020 to September 2024 for informational purposes. In the cases where reporting the mass discharge is not required in the current permit, the mass is calculated using the reported phosphorus concentration and the effluent flow rate for that day.

Total Phosphorus Statistics

	Concentration (mg/L)	Mass Discharge (lbs/day)
1-day P_{99}	5.77	4.87
4-day P_{99}	3.18	2.77
30-day P_{99}	1.47	1.22
Mean	0.78	0.58
Std	1.27	1.12
Sample Size	495	495
Range	0.04 - 25	0.02 - 21.89

Conclusions:

In summary, the following limits are recommended by this evaluation:

- Monthly average Total Phosphorus mass limit of 0.486 lbs/day
- Six-month average Total Phosphorus mass limit of 0.162 lbs/day

Multi-Discharge Variance Interim Limit

With the permit application, the City of Pittsville Water and Sewer Department has re-applied for the phosphorus multi-discharger variance (MDV). Conditions of the phosphorus MDV require the facility to comply with an interim phosphorus limit in lieu of meeting the final WQBEL. The recommended interim limit during the 2nd permit under MDV approval, pursuant to s. 283.16 (6) (a), Wis. Stats., is 0.6 mg/L as a monthly average. A compliance schedule may be appropriate to meet this interim limit but compliance with 0.6 mg/L shall be no later than the end of the reissued permit. The previous interim limit of 1.0 mg/L should not be exceeded during the compliance schedule.

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from January 2020 to September 2024.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN			NA	120
FEB			NA	120
MAR			NA	120
APR			NA	120
MAY			NA	120
JUN			NA	120
JUL			NA	120
AUG			NA	120
SEP			NA	120
OCT			92	120
NOV			100	120
DEC			NA	120

Since this facility provides hydraulic detention times of approximately 100 days, elevated effluent temperatures are unlikely and discharge temperatures are expected to be similar to ambient conditions and less than 92 deg. F. **Therefore, temperature limits and monitoring are not recommended.**

PART 7 – 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 IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The **IWC of 23%** 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:

$$IWC\ (as\ \%) = Qe \div \{(1 - f)\ Qe + Qs\} \times 100$$

Where:

Qe = annual average flow = 0.174 MGD = 0.269 cfs
f = fraction of the Qe withdrawn from the receiving water = 0
Qs = ¼ of the 7-Q_{10} = 3.70 cfs ÷ 4 = 0.93 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual*, 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.

- 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 006 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 006. 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.

Attachment #1

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %					Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae (IC_{50})	Pass or Fail?	Use in RP?	
07/20/2010	>100	>100	Pass	Yes						
03/13/2013	>100	>100	Pass	Yes						
07/14/2021	>100	>100	Pass	Yes						
02/20/2024	>100	>100	Pass	Yes						

- 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)]

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

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

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.

Attachment #1

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 23% **0 Points**
Historical Data	Four tests used to calculate RP. No tests failed. **0 Points**	Data not available. **5 Points**
Effluent Variability	Phosphorus and TSS exceedances. **5 Points**	Same as Acute. **5 Points**
Receiving Water Classification	Warm Water Sport Fish (WWSF) (5 pts) **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for Ammonia limits based on ATC; (5 pts) Copper, Nickel, Zinc, and Chloride detected. (3 pts) Additional Compounds of Concern: none **8 Points**	No reasonable potential for limits based on CTC. Ammonia nitrogen limit carried over from the current permit. Copper, Nickel, Zinc, and Chloride detected. (3 pts) Additional Compounds of Concern: none **3 Points**
Additives	No biocides and one water quality conditioner (1 pt) added. Permittee has proper P chemical SOPs in place. **1 Point**	All additives used more than once per 4 days. **1 Point**
Discharge Category	One Industrial Contributor (5 pts) **5 Points**	Same as Acute. **5 Points**
Wastewater Treatment	Secondary or Better **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**24 Points**	**24 Points**
Recommended Monitoring Frequency (from Checklist):	2 tests during permit term	2 tests during permit term
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, two acute and chronic WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

Attachment #2

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Pittsville Water and Sewer Department WWTF		**7-Q_{10}:**	3.70	cfs	**Temp Dates**	**Flow Dates**
Outfall(s):	006		**Dilution:**	25%		**Start:** N/A	01/01/20
Date Prepared:	11/06/2024		**f:**	0		**End:** N/A	09/30/24
Design Flow (Qe):	0.174	MGD	**Stream type:**	Small warm water sport or forage fish community			
Storm Sewer Dist.	0	ft	**Qs:Qe ratio:**	3.4	:1		
			Calculation Needed?	YES			

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	1.28	0.109	0.119	0			NA	120
FEB	34	50	76	1.18	0.101	0.127	0			NA	120
MAR	38	52	77	1.63	0.176	0.180	0			NA	120
APR	48	55	79	11.25	0.240	0.279	0			NA	120
MAY	58	65	82	4.25	0.175	0.272	0			NA	120
JUN	66	76	84	2.20	0.189	0.224	0			NA	120
JUL	69	81	85	1.25	0.183	0.187	0			NA	120
AUG	67	81	84	0.93	0.213	0.250	0			NA	120
SEP	60	73	82	1.03	0.114	0.132	0			NA	120
OCT	50	61	80	1.15	0.262	0.299	0			92	120
NOV	40	49	77	2.05	0.233	0.290	0			100	120
DEC	35	49	76	1.58	0.085	0.194	0			NA	120

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Pittsville Water and Sewer Dept

Legend

Permits

Surface Water Outfalls

Basemaps

Imagery

Latest Leaf Off Imagery

Red: Band_1

Green: Band_2

Blue: Band_3

Notes

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

1:4,126

0 300 600 ft

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