CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: January 14, 2025

TO: Holly Heldstab– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Colby Wastewater Treatment Facility WPDES Permit No. WI-0023655

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 Colby Wastewater Treatment Facility in Clark County. This municipal wastewater treatment facility (WWTF) discharges to Dill Creek, located in the Upper Big Eau Pleine 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 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5	30 mg/L			15 mg/L		1,3
TSS	30 mg/L			20 mg/L		1,3
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1,3
Ammonia Nitrogen January - April May - September October - December	 Variable Variable Variable		 8.3 mg/L 9.7 mg/L 14 mg/L	 3.7 mg/L 4.2 mg/L 6.0 mg/L		4
E. Coli				126 #/100 mL geometric mean		5
Chloride						6
Copper						7
Hardness						8
Temperature						2
PFOS and PFOA						9
Phosphorus TBEL TMDL Limit				 1.0 mg/L 1.70 lbs/day	 0.57 lbs/day	10
TKN, Nitrate+Nitrite, and Total Nitrogen						11
Acute WET	1.0 TUa					12
Chronic WET				1.2 TUc		12,13

Footnotes:

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

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3. These limits are based on the Limited Forage Fisch (LFF) community of the immediate receiving water as described in s. NR 104.02(3)(a), Wis. Adm. Code.
4. The variable daily maximum ammonia nitrogen limit table corresponding to effluent pH values. These limits apply year-round.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	61	7.0 < pH ≤ 7.1	37	8.0 < pH ≤ 8.1	7.8
6.1 < pH ≤ 6.2	60	7.1 < pH ≤ 7.2	33	8.1 < pH ≤ 8.2	6.4
6.2 < pH ≤ 6.3	59	7.2 < pH ≤ 7.3	30	8.2 < pH ≤ 8.3	5.3
6.3 < pH ≤ 6.4	57	7.3 < pH ≤ 7.4	26	8.3 < pH ≤ 8.4	4.4
6.4 < pH ≤ 6.5	55	7.4 < pH ≤ 7.5	22	8.4 < pH ≤ 8.5	3.6
6.5 < pH ≤ 6.6	53	7.5 < pH ≤ 7.6	19	8.5 < pH ≤ 8.6	3.0
6.6 < pH ≤ 6.7	50	7.6 < pH ≤ 7.7	16	8.6 < pH ≤ 8.7	2.5
6.7 < pH ≤ 6.8	47	7.7 < pH ≤ 7.8	14	8.7 < pH ≤ 8.8	2.1
6.8 < pH ≤ 6.9	44	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.7
6.9 < pH ≤ 7.0	41	7.9 < pH ≤ 8.0	9.5	8.9 < pH ≤ 9.0	1.5

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. Quarterly monitoring.
7. Monthly monitoring.
8. Hardness monitoring is recommended because of the relationship between hardness and daily maximum limits based on acute toxicity criteria.
9. Monitoring once every two months is required in accordance with s. NR 106.98(2), Wis. Adm. Code.
10. 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.
11. 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).
12. Annual 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).
13. The Instream Waste Concentration (IWC) to assess chronic test results is 85%. According to the State of Wisconsin Aquatic Life Toxicity Testing Methods Manual (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Dill Creek.

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: 01/14/2025

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Attachment #1

Water Quality-Based Effluent Limitations for the Colby Wastewater Treatment Facility WPDES Permit No. WI-0023655

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:
The Colby Wastewater Treatment Facility treats domestic wastewater from the City of Colby. The design flow of the facility is 0.4 million gallons per day (MGD). Treatment consists of a bar screen, grit removal, three anoxic tanks designed for biological phosphorus removal, a two-channel oxidation ditch and two covered circular clarifiers. Additional phosphorus is removed by addition of ferric chloride. Sludge is aerobically digested and landspread on Department approved fields.

Attachment #3 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations
The current permit, expiring on September 30, 2025, 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	30 mg/L			15 mg/L		1,3
TSS	30 mg/L			20 mg/L		1,3
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1,3
Ammonia Nitrogen January - April May - September October - December	 Variable Variable Variable		 8.3 mg/L 9.7 mg/L 14 mg/L	 3.7 mg/L 4.2 mg/L 6 mg/L		4
Copper			19 µg/L, 0.063 lbs/day	**19 µg/L**		5,6
Chloride						2
Hardness						2
Phosphorus TBEL TMDL Limit				 1.0 mg/L 1.7 lbs/day	 0.57 lbs/day	
TKN, Nitrate+Nitrite, and Total Nitrogen						2
Acute WET	1.0 TUa					7
Chronic WET				1.2 TUc		8

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. These limits are based on the Limited Forage Fisch (LFF) community of the immediate receiving water as described in s. NR 104.02(3)(a), Wis. Adm. Code.
4. The variable daily maximum ammonia nitrogen limit table corresponding to effluent pH values. These limits apply year-round.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	61	7.0 < pH ≤ 7.1	37	8.0 < pH ≤ 8.1	7.8
6.1 < pH ≤ 6.2	60	7.1 < pH ≤ 7.2	33	8.1 < pH ≤ 8.2	6.4
6.2 < pH ≤ 6.3	59	7.2 < pH ≤ 7.3	30	8.2 < pH ≤ 8.3	5.3
6.3 < pH ≤ 6.4	57	7.3 < pH ≤ 7.4	26	8.3 < pH ≤ 8.4	4.4
6.4 < pH ≤ 6.5	55	7.4 < pH ≤ 7.5	22	8.4 < pH ≤ 8.5	3.6
6.5 < pH ≤ 6.6	53	7.5 < pH ≤ 7.6	19	8.5 < pH ≤ 8.6	3.0
6.6 < pH ≤ 6.7	50	7.6 < pH ≤ 7.7	16	8.6 < pH ≤ 8.7	2.5
6.7 < pH ≤ 6.8	47	7.7 < pH ≤ 7.8	14	8.7 < pH ≤ 8.8	2.1
6.8 < pH ≤ 6.9	44	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.7
6.9 < pH ≤ 7.0	41	7.9 < pH ≤ 8.0	9.5	8.9 < pH ≤ 9.0	1.5

5. The alternative wet weather limit is 0.14 lbs/day expressed as a weekly average in accordance with s. NR 106.07(9),Wis. Adm. Code.
6. Additional limits to comply with the expression of limits requirements are included in bold.
7. Acute WET testing required: Apr - June 2021, Jan - March 2022, July - Sept 2023, Oct - Dec 2024, and Apr - June 2025.
8. Chronic WET testing required: Apr - June 2021, Jan - March 2022, July - Sept 2023, Oct - Dec 2024, and Apr - June 2025. The IWC for chronic WET was 85%.

Receiving Water Information

- Name: Dill Creek
- Waterbody Identification Code (WBIC): 1430700
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited Forage Fish (LFF), non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: USGS for Station 05399250 in Dill Creek at Colby.

  $7\text{-}Q_{10}$ = 0.10 cfs (cubic feet per second)

  $7\text{-}Q_2$ = 0.22 cfs

  Harmonic Mean Flow = 1.11 cfs using a drainage area of 12.3 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).
- Downstream Water: Dill Creek (classification change at Blackberry Road)
  - Classification: Warm Water Forage Fish community, non-public water supply.
  - Low Flow: At classification change to WWSF, the 7-Q10 is estimated using USGS derived low flow regression equations.

    $7\text{-}Q_{10}$ = 0.11 cfs

    $7\text{-}Q_2$ = 0.24 cfs

- Hardness = 232 mg/L as $CaCO_3$. This value represents a 96% calculated effluent mix combined with the geometric mean of 11 samples collected in the receiving water from WET Testing from 11/10/2005 to 03/22/2022.
- % 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 Upper Big Eau Pleine River watershed. Metals data taken from the Big Eau Pleine River at Cherokee is used in this evaluation because there is no data available for Dill Creek and the Upper Big Eau Pleine River watershed 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: There are no other dischargers within the vicinity of outfall 001, but the City of Abbotsford (WI-0023141) which discharges to Elm Brook were utilized to develop weekly and monthly ammonia limits (Ammonia WLA memo dated 05/23/2007) to protect the downstream WWSF classification of Dill Creek.
- Impaired water status: This discharge is located within the WI River TMDL for phosphorus.

Effluent Information:

- Design Flow Rates(s):
  Annual Average = 0.400 MGD (Million Gallons per Day)
  For reference, the actual average flow from January 2022 to October 2024 was 0.197 MGD.
- Hardness = 237 mg/L as $CaCO_3$. This value represents the geometric mean of 12 effluent samples collected from 03/10/2022 to 10/03/2024.
- 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: Ferric Chloride
- Total Phosphorus Wasteload Allocation: 168 lbs/year = 0.460 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 . The permit-required monitoring for Ammonia Nitrogen, Copper, Chloride, Hardness, and Phosphorus from January 2022 to October 2024 is used in this evaluation.

Chemical Specific Effluent Data at Outfall 001

	Copper µg/L
1-day P_{99}	20.40
4-day P_{99}	15.20
30-day P_{99}	12.42
Mean	11.00
Std	3.17
Sample size	69
Range	6 - 19

Chemical Specific Effluent Data at Outfall 001

Sample Date	Chloride mg/L
02/03/2022	285
04/14/2022	147
08/04/2022	298
11/03/2022	264
03/02/2023	256
04/06/2023	181
08/03/2023	242
11/02/2023	187
01/04/2024	201
05/02/2024	123
08/21/2024	251
10/03/2024	373
1-day P_{99}	443
4-day P_{99}	327

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 001 from January 2022 to October 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	4.0 mg/L	
TSS	1.4 mg/L*	
pH	7.08 s.u.	
Dissolved Oxygen	5.55 mg/L	
Ammonia Nitrogen	0.16 mg/L*	
Copper	11.00 µg/L	
Phosphorus	0.15 mg/L*	0.25 lbs/day

*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 the case for the Colby Wastewater Treatment Facility.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.08 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		384	77	<1.2		
Cadmium	237	27.71	0.025	31.28	6.26	<1		
Chromium (+3)	237	3653	0.337	4125	825	<2		
Copper	237	35.00	1.266	39.36			20.4	19.0
Lead	237	245.93	0.283	277.68	55.54	<1		
Nickel	237	972.9		1098.7	219.7	<9		
Zinc	237	255.83	2.011	288.63	57.73	26		
Chloride		757	20.5	852			443	373

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.03 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		158	32	<1.2	
Cadmium	175	3.82	0.025	3.97	0.79	<1	
Chromium (+3)	232	263	0.337	274	55	<2	
Copper	232	21.27	1.266	22.08			15.2
Lead	232	63.15	0.283	65.69	13.14	<1	
Nickel	232	106.4		110.7	22.1	<9	
Zinc	232	251.28	2.011	261.35	52.27	26	
Chloride		395	20.5	410			327

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 = 0.28 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	0.025	536.4	107.3	<1	
Chromium (+3)	3818000	0.337	5535291	1107058	<2	
Lead	140	0.283	203	41	<1	
Nickel	43000		62341	12468	<9	

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 0.28 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		19.3	3.9	<1.2	

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.

Copper – Considering available effluent data from the current permit term (January 2022 to October 2024), the 30-day P_{99} concentration is 12.4 µg/L, the 4-day P_{99} concentration is 15.2 µg/L, and the 1-day P_{99} concentration is 20.4 µg/L, with a maximum concentration of 19.0 µg/L. These effluent concentrations are below the calculated WQBELs for Copper, therefore no effluent limits are needed. To ensure that representative sample results are available at the next permit issuance, **monthly copper monitoring is recommended.**

Antidegradation and Antibacksliding
Since current treatment capability is expected to remain in place, the removal of copper limits will not increase the concentration, level, or loading of copper to Dill Creek. Therefore, antidegradation would not be applicable. To be consistent with antibacksliding requirements, the current limits may be removed in accordance with s. NR 207.12(3)(b), Wis. Adm. Code.

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 effluent produced a PFOS result of 10.70 ng/L and a PFOA result of 14.00 ng/L. Monitoring of the water supply produced a PFOS result of 2.70 ng/L and a PFOA result of 2.80 ng/L. The PFOS result is greater than one fifth of the criterion for the substance. Based on the known levels of PFOS/PFOA in the effluent and source water, **PFOS and PFOA monitoring is recommended once every two months.**

Mercury – The permit application did not require monitoring for mercury because the Colby 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 2022 to 2024 was 1.63 mg/kg, with a maximum reported concentration of 4.60 mg/kg. **Therefore, no mercury monitoring is recommended at Outfall 001.**

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 Limited Forage Fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1035 sample results were reported from January 2022 to October 2024. The maximum reported value was 7.50 s.u. (Standard pH Units). The effluent pH was 7.40 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 7.41 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 7.41 s.u. Therefore, a value of 7.41 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 7.41 s.u. into the equation above yields an ATC = 22.66 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	45.31
1-Q_{10}	25.56

The 1-Q_{10} method yields the most stringent limits for the Colby Wastewater Treatment Facility.

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.

Daily Maximum Ammonia Nitrogen Limits – LFF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	61	7.0 < pH ≤ 7.1	37	8.0 < pH ≤ 8.1	7.8
6.1 < pH ≤ 6.2	60	7.1 < pH ≤ 7.2	33	8.1 < pH ≤ 8.2	6.4
6.2 < pH ≤ 6.3	59	7.2 < pH ≤ 7.3	30	8.2 < pH ≤ 8.3	5.3
6.3 < pH ≤ 6.4	57	7.3 < pH ≤ 7.4	26	8.3 < pH ≤ 8.4	4.4
6.4 < pH ≤ 6.5	55	7.4 < pH ≤ 7.5	22	8.4 < pH ≤ 8.5	3.6
6.5 < pH ≤ 6.6	53	7.5 < pH ≤ 7.6	19	8.5 < pH ≤ 8.6	3.0
6.6 < pH ≤ 6.7	50	7.6 < pH ≤ 7.7	16	8.6 < pH ≤ 8.7	2.5
6.7 < pH ≤ 6.8	47	7.7 < pH ≤ 7.8	14	8.7 < pH ≤ 8.8	2.1
6.8 < pH ≤ 6.9	44	7.8 < pH ≤ 7.9	11	8.8 < pH ≤ 8.9	1.7
6.9 < pH ≤ 7.0	41	7.9 < pH ≤ 8.0	9.5	8.9 < pH ≤ 9.0	1.5

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 Limited Forage 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 = 1.0,
C = the minimum of 3.09 or $3.73 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or
C = $3.73 \times 10^{(0.028 \times (25 - T))}$ – (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 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Forage 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.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 ºC, during the winter and spring months. Based on a review of the DNR Fisheries database, burbot, an early spawning species, are not believed to be present in Dill Creek. So “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a LFF classification.

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 Dill Creek. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – LFF

		January-April	May-September	October-December
Effluent Flow	Qe (MGD)	0.400	0.400	0.400
Background Information	7-Q_{10} (cfs)	0.10	0.10	0.10
	7-Q_2 (cfs)	0.22	0.22	0.22
	Ammonia (mg/L)	0.18	0.07	0.06
	Temperature (°C)	10.0	20.6	12.8
	pH (s.u.)	6.97	7.50	7.49
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	0.03	0.10	0.03
	Reference Monthly Flow (cfs)	0.05	0.19	0.05
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	18.95	13.88	14.03
	Early Life Stages Absent	60.15	22.31	37.23
	30-day Chronic			
	Early Life Stages Present	7.58	5.55	5.61
	Early Life Stages Absent	24.06	8.93	14.89
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present		16	
	Early Life Stages Absent	63		39
	Monthly Average			
	Early Life Stages Present		7.2	
	Early Life Stages Absent	26		16

At the classification change downstream to WWFF (Blackberry Road):

Weekly and Monthly Ammonia Nitrogen Limits – WWFF

		January-April	May-September	October-December
Effluent Flow	Qe (MGD)	0.400	0.400	0.400
Background Information	7-Q_{10} (cfs)	0.11	0.11	0.11
	7-Q_2 (cfs)	0.24	0.24	0.24
	Ammonia (mg/L)	0.18	0.07	0.06
	Temperature (°C)	8.9	20.6	10.0
	pH (s.u.)	6.97	7.50	7.49
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	0.03	0.11	0.03
	Reference Monthly Flow (cfs)	0.05	0.20	0.05

Attachment #1

		January-April	May-September	October-December
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	14.92	7.41	11.05
	Early Life Stages Absent	21.45	7.41	14.78
	30-day Chronic			
	Early Life Stages Present	5.97	2.96	4.42
	Early Life Stages Absent	8.58	2.96	5.91
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	16	8.7	
	Early Life Stages Absent			15
	Monthly Average			
	Early Life Stages Present	6.4	3.9	
	Early Life Stages Absent			6.4

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from January 2022 to October 2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Colby Wastewater Treatment Facility permit for the respective month ranges.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	January-April	May-September	October-December
1-day P_{99}	2.286	0.89	0.548
4-day P_{99}	1.23	0.486	0.3
30-day P_{99}	0.546	0.222	0.13
Mean*	0.259	0.114	0.06
Std	0.608	0.215	0.145
Sample size	249	305	135
Range	<0.028 - 3.293	<0.023 - 1.831	<0.036 - 1.297

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

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

The permit currently has daily maximum, weekly average, and monthly average limits. 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, **the current limits and monitoring for ammonia nitrogen are recommended to continue.**

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
January-April	Variable	8.3	3.7
May-September	Variable	9.7	4.2
October-December	Variable	14	6

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.

The Colby Wastewater Treatment Facility had previously been exempted from disinfection based on the limited aquatic life or limited forage fish community classification of the receiving water. Section NR 210.06(3)(g), Wis. Adm. Code, states that disinfection decisions may be made based on the hydrologic classifications listed in s. NR 104.02(1), Wis. Adm. Code (not on the water quality classifications - i.e., limited forage fish, limited aquatic life - that are defined in s. NR 104.02(3), Wis. Adm. Code). The hydrologic classification for Dill Creek is listed in ch. NR 104, Wis. Adm. Code, as noncontinuous.

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

With a weekly monitoring frequency, 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.

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 Colby Wastewater Treatment Facility currently has an existing technology-based limit, it 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:

$$\begin{aligned} \text{TP Equivalent Effluent Concentration} &= \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor}) \\ &= 0.460 \text{ lbs/day} \div (0.400 \text{ MGD} * 8.34) \\ &= 0.14 \text{ mg/L} \end{aligned}$$

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.

$$\begin{aligned} \text{TP 6-Month Average Permit Limit} &= \text{Daily WLA} * \text{6-Month average multiplier} \\ &= 0.460 \text{ lbs/day} * 1.23 \\ &= 0.57 \text{ lbs/day} \end{aligned}$$

$$\begin{aligned} \text{TP Monthly Average Permit Limit} &= \text{TP 6-Month Average Permit Limit} * 3 \\ &= 0.57 \text{ lbs/day} * 3 \\ &= 1.70 \text{ lbs/day} \end{aligned}$$

The multiplier used in the six-month average calculation was determined according to TMDL implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 0.8. This is greater than the CV calculated for the previous evaluation and facility is able to meet the permit limits based on the WLA, so the previous CV of 0.8 is used. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as thrice 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 2022 to October 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}	0.39	0.95
4-day P_{99}	0.26	0.56
30-day P_{99}	0.19	0.34
Mean	0.15	0.25
Std	0.07	0.19
Sample Size	451	451
Range	<0.05 - 0.565	0.09 - 1.63

Conclusions:

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

- Total Phosphorus concentration limit of 1.0 mg/L
- Monthly average Total Phosphorus mass limit of 1.70 lbs/day
- Six-month average Total Phosphorus mass limit of 0.57 lbs/day

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 2022 to October 2024.

The table below summarizes the maximum temperatures reported during monitoring from December 2014 to May 2020.

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	49	51	55	81
FEB	47	48	55	80
MAR	47	47	58	81
APR	50	54	63	82
MAY	59	66	70	85
JUN	63	64	78	86
JUL	67	69	82	87
AUG	69	71	80	87
SEP	71	71	74	86
OCT	63	63	**63**	84
NOV	60	60	**55**	82
DEC	52	52	55	82

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

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

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on this analysis, weekly average temperature limits are necessary for October and November. The complete thermal table used for the limit calculation is attached.

Dissipative Cooling Re-Evaluation
The City of Colby has submitted a request for consideration of dissipative cooling. Dissipative cooling was previously approved in March 2016. It was noted that within 5-10 stream widths, elevated stream temperatures dissipated to ambient stream temperature. Additionally, an island near the outfall creates a zone of free passage where elevated temperatures are unlikely to impede aquatic life movement and provides opportunity for aquatic life to avoid potential thermal impacts. The request states that there have been no substantial changes in the operation of, or thermal loadings to, the treatment facility since the previouse dissipative cooling determination. The department has reviewed that request and associated data and believes that the effluent does not have a reasonable potential to cause or contribute to an exceedance of the sub-lethal criterion outside of a small area of mixing and cooling. Therefore, a temperature limit is not recommended at this time. **Effluent monitoring is recommended for the 4th year of the permit term.**

Future WPDES Permit Reissuance
Dissipative cooling requests must be re-evaluated every permit reissuance. The permittee is responsible to submit an updated DC request prior to permit reissuance. Such a request must either include:
a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or
b) New information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

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 85% 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 = 0.400 MGD = 0.619 cfs
  f = fraction of the Qe withdrawn from the receiving water = 0
  Qs = 100% of the downstream (WWFF classification change) 7-Q_{10} = 0.11 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 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.

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?	
05/01/1996	>100	>100	Pass	No	>95					1
10/23/1996	>100	100	Pass	No	>95					1
09/23/1998	>100	>100	Pass	No	>100					1
10/28/1999					>100	>100		Pass	No	1
05/29/2003	>100	>100	Pass	No	>100	>100		Pass	No	1
08/26/2004	>100	>100	Pass	No	>100	>100		Pass	No	1
11/10/2005	>100	>100	Pass	Yes						
11/29/2005					>100	>100		Pass	Yes	
03/21/2006	>100	>100	Pass	Yes	**52.66**	>100		Fail	Yes	
07/06/2006					>100	>100		Pass	Yes	
06/19/2007	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
03/13/2008	**89.09**	>100	Fail	Yes	**58.74**	>100		Fail	Yes	
10/25/2011	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
03/19/2013	>100	>100	Pass	Yes	>100	**89.2**		Pass	Yes	
06/03/2013					>100	**64.7**		Fail	Yes	
06/18/2013					>100	>100		Pass	Yes	
06/17/2014					>200	>100		Pass	Yes	
08/25/2015	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
06/28/2021	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
03/22/2022	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
09/12/2023	>100	>100	Pass	Yes	>100	>100		Pass	Yes	

Footnotes:

1. *Data Not Representative.* 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.

- 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)]

Acute WET Limit Parameters

TUa (maximum) 100/LC_{50}	**B** (multiplication factor from s. NR 106.08(5)(c), Wis. Adm. Code, Table 4)
100/89.09 = 1.12	6.2 Based on 1 detects

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

Chronic WET Limit Parameters

TUc (maximum) 100/IC25	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/52.7 = 1.9 TUc	2.6 Based on 4 detects	85%

[(TUc effluent)(B)(IWC)] = 4.7 > 1.0

Therefore, reasonable potential is shown for acute and chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 2005 to 2023.

Expression of WET limits

Acute WET limit = 1.0 TU_a (daily maximum)

Chronic WET limit = [100/IWC] TU_c = 1.2 TU_c expressed as a monthly average

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

Attachment #1

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 85% **15 Points**
Historical Data	Ten tests used to calculate RP. 1/10 tests failed. **0 Points**	14 tests used to calculate RP. 3/14 tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	<4 miles to WWFF (5 pts) **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	No reasonable potential for limits based on ATC. Ammonia nitrogen limit carried over from the current permit. Copper, Zinc, and Chloride detected. (3 pts) Additional Compounds of Concern: none **3 Points**	No reasonable potential for limits based on CTC. Ammonia nitrogen limit carried over from the current permit. Copper, 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	No Industrial Contributors **0 Points**	Same as Acute. **0 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:	**9 Points**	**24 Points**
Recommended Monitoring Frequency (from Checklist):	1x yearly	1x yearly
Limit Required?	Yes Limit = 1.0 TU_a	Yes Limit = 1.2 Tu_c
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, annual 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).

- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, acute and chronic] WET limits are required. The acute WET limit shall be expressed as 1.0 TUa as a daily maximum in the effluent limits table of the permit. The chronic WET limit shall be expressed as 1.2 TUc as a monthly average in the effluent limits table of the permit.

- A minimum of annual acute and chronic monitoring is required because acute and chronic WET limits are required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.

Attachment #2

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Colby WWTF		**7-Q_{10}:**	0.10	cfs		**Temp Dates**	**Flow Dates**
Outfall(s):	001		**Dilution:**	25%		**Start:**	12/06/14	01/01/22
Date Prepared:	12/05/2024		**f:**	0		**End:**	05/29/20	10/31/24
Design Flow (Qe):	0.400	MGD	**Stream type:**	Limited forage fish community				
Storm Sewer Dist.	0	ft	**Qs:Qe ratio:**	0.0	:1			
			Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	37	54	78	0.03	0.193	0.216	0	49	51	55	81
FEB	39	54	79	0.03	0.254	0.477	0	47	48	55	80
MAR	43	57	80	0.03	0.425	0.782	0	47	47	58	81
APR	50	63	81	0.03	0.564	0.856	0	50	54	63	82
MAY	59	70	84	0.03	0.372	0.528	0	59	66	70	85
JUN	64	77	85	0.03	0.312	0.467	0	63	64	78	86
JUL	69	81	86	0.03	0.276	0.441	0	67	69	82	87
AUG	68	79	86	0.03	0.301	0.535	0	69	71	80	87
SEP	63	73	85	0.03	0.247	0.455	0	71	71	74	86
OCT	55	63	83	0.03	0.391	0.662	0	63	63	63	84
NOV	46	54	80	0.03	0.206	0.336	0	60	60	55	82
DEC	40	54	79	0.03	0.167	0.228	0	52	52	55	82

Attachment #3