

CORRESPONDENCE/MEMORANDUM

DATE: September 18, 2020

TO: Lisa Creegan – SER

FROM: Wade Strickland – WY/3 *Deane Sigil for US*

SUBJECT: Water Quality-Based Effluent Limitations for Essential Industries Inc
 WPDES Permit No. WI-0066648-01
 FIN: 268007630

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 Essential Industries Inc in Waukesha County. This industry discharges to the Bark River, located in the Bark River Watershed in the Lower Rock River Basin. This discharge is included in the Rock River TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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 | | | | | | 1,2 |
| TSS TMDL | 40 mg/L | | | 40 mg/L 1.98 lbs/day | | 1,3 |
| pH | 9.0 s.u. | 6.0 s.u. | | | | 1 |
| Ammonia Nitrogen | | | | | | 1,2 |
| Chloride | 1,510 mg/L | | 1,510 mg/L | 1,510 mg/L | | |
| Phosphorus Interim WQBEL TMDL | | | | Narrative 0.225 mg/L 0.0438 lbs/day | 0.075 mg/L | 5 |
| Oil and Grease | 15 mg/L | | | 15 mg/L | | 1 |
| Temperature | | | | | | 1,2 |

Footnotes:

1. No changes from the current general permit.
2. Monitoring only.
3. The TSS mass limit is included because the discharge is in the Rock River Basin TMDL. See the TSS section of this memo for more details.
4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.
5. The facility shall be operated such that the amount of phosphorus discharged on an annual basis does not increase over the permit term, and that the discharge of phosphorus is reduced over time through operational optimization. The phosphorus mass limit and WQBELs should be effective after a compliance schedule. See the phosphorus section of this memo for more details.

Based on the best professional judgment of staff familiar with the discharge and after consideration of the guidance in the October 29, 2019 Department's WET Program Guidance Document, no WET testing is required.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at (414) 263-8650 (Nicole.Krueger@wisconsin.gov) or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, Thermal Table & Map

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Attachment #1
**Water Quality-Based Effluent Limitations for
 Essential Industries Inc**

WPDES Permit No. WI-0066648-01

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description:

Essential Industries produces polymers and resins for floor finishes as well as a variety of detergents and packaged finished goods for the sanitary maintenance supply industries. Soft water and reverse osmosis (RO) water are used for producing the soap and detergent products. The discharge is comprised of RO filter water discharge (approximately 365 gpd), water softener brine water discharge (approximately 240 gpd), and noncontact cooling (NCCW) (approximately 69,000 gpd). This discharge is covered under the general permit for NCCW and the facility is temporarily hauling the RO filter water discharge and water softener brine water discharge to be treated and discharged elsewhere. This is the first individual permit for which Essential Industries has applied for coverage.

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

Existing Permit Limitations: Essential Industries is currently covered under the general permit for Noncontact Cooling Water or Condensate and Boiler Water (No. WI-0044938-6) which includes the following effluent limitations and monitoring requirements.

| Parameter | Daily Maximum | Daily Minimum | Weekly Average | Monthly Average | Six-Month Average | Footnotes |
|-------------------|---------------|---------------|----------------|-----------------|-------------------|-----------|
| Flow Rate | | | | | | 1 |
| BOD ₅ | | | | | | 1,2 |
| TSS | 40 mg/L | | | 40 mg/L | | |
| pH | 9.0 s.u. | 6.0 s.u. | | | | 2 |
| Ammonia Nitrogen | | | | | | 1 |
| Residual Chlorine | 38 µg/L | | | 38 µg/L | | 3 |
| Phosphorus | | | | | | 1 |
| Oil and Grease | 15 mg/L | | | 15 mg/L | | 2 |
| Temperature | | | | | | 1 |

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be evaluated at this time.
3. Chlorine monitoring and limit requirements were removed because the source water is from a deep well without chlorine addition.

Receiving Water Information:

- Name: Bark River
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish

community, non-public water supply.

- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station #05426057, where Outfall 001 is located. These flows were updated 02/20/2020 by Rob Waschbusch at USGS.

7-Q₁₀ = 7.1 cfs (cubic feet per second)

7-Q₂ = 11 cfs

90-Q₁₀ = 9.35 cfs

Harmonic Mean Flow = 10.8 cfs using a drainage area of 25.3 mi²

The Harmonic Mean has been estimated based on average flow and the 7-Q₁₀ 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).

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 7-Q ₁₀ (cfs) | 9.4 | 9.4 | 11 | 13 | 14 | 9.8 | 8.3 | 7.8 | 7.9 | 8.2 | 9.6 | 9.2 |
| 7-Q ₂ (cfs) | 14 | 15 | 18 | 21 | 21 | 17 | 15 | 14 | 14 | 14 | 15 | 14 |

- Hardness = 276 mg/L as CaCO₃. This value represents the geometric mean of data from WET tests from Delafield Hartland wastewater treatment facility from 04/21/2015 to 02/20/2018. The data from Delafield Hartland was used because Essential Industries has not sampled for receiving water hardness.
- % 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: Background chloride data from the Back River at Highway 83 was 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: None
- Impaired water status: The direct receiving water is not impaired. Approximately 35 miles downstream, at Scuppernong River, the water is impaired for total phosphorus.

Effluent Information:

- Design Flow Rate(s):
Maximum annual average = 0.070 MGD (Million Gallons per Day)
For reference, the actual average flow from 01/01/2010 to 07/29/2019 was 0.051 MGD.
- 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: Three private wells.
- Additives: None
- Effluent characterization: This facility is categorized as a secondary industry, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus Ammonia, Chloride, Hardness and Phosphorus. Because the discharge to the surface water has not commenced with all sources of discharge mixed, there is not available data for all metal substances.

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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 2010 to November 2019 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), plus BOD₅, ammonia, and phosphorus:

| | Average Measurement |
|------------------|---------------------|
| BOD ₅ | <2.0 mg/L* |
| TSS | 1.94 mg/L |
| pH field | 7.79 s.u. |
| Phosphorus | 0.12 mg/L* |
| Ammonia Nitrogen | 0.13 mg/L* |
| Oil and Grease | 1.33 mg/L* |
| Chlorine | 22.2 µg/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 P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

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

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)

if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

Q_e = 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

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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.

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ 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 Essential Industries and the limits are set based on two times the acute toxicity criteria.

The following tables list the calculated water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. Chlorine is expressed in terms of micrograms per Liter (µg/L), except for chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 5.68 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06 (3) (bm), Wis. Adm. Code.

| SUBSTANCE | ATC | MAX. EFFL. LIMIT** | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. |
|-----------------|-----|--------------------|--------------------|------------------|
| Chloride (mg/L) | 757 | 1510 | 303 | 9800 |

** The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q₁₀ 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 = 1.775 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06 (4) (c), Wis. Adm. Code

| SUBSTANCE | CTC | MEAN BACK-GRD. | WEEKLY AVE. LIMIT | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. |
|-----------------|-----|----------------|-------------------|--------------------|------------------|
| Chloride (mg/L) | 395 | 87 | 5443 | 1089 | 9800 |

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

Chloride – Considering available effluent data from the permit application (01/13/2020), the average chloride concentration is 9800 mg/L. Because there was an effluent data point that exceeded the calculated daily maximum and weekly average WQBEL (1510 mg/L and 7060 mg/L, respectively), limits are needed in accordance with s. NR 106.05(3)(a) Wis. Adm. Code. Because the daily maximum is more restrictive than the weekly average, the weekly average is set equal to the daily maximum. Therefore, both the **daily maximum and weekly average chloride limits for the reissued permit are recommended to be 1510 mg/L**. Additional limits are discussed in the expression of limits section of this memo.

The one available chloride sample concentration was collected from only RO water discharge and water softener brine discharge. When the permit commences and Essential Industries discharges to the Bark River, the RO water discharge will be mixed with the noncontact cooling water (NCCW) discharge. It is expected that the much higher amount of NCCW will dilute the RO water and water softener brine discharge so that the total effluent is able to meet the recommended chloride limits. Because there is no chloride data from the mixture at this time, a short compliance schedule is recommended in the reissued permit.

**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 monitoring, which is summarized in the table below:

| | Ammonia mg/L |
|------------|--------------|
| 01/14/2019 | 0.36 |
| 11/11/2019 | 0.03 |
| 01/13/2020 | <0.03 |
| Average | 0.13 |

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

Because the average ammonia concentration is very low and the receiving water to effluent flow rate ratio ($7Q_{10}:Q_e = 65.6:1$) is high, there is no reasonable potential for the effluent to exceed any calculated limits. This is a very limited data set, and **monitoring is recommended to continue in the permit.**

PART 4 – PHOSPHORUS

Technology Based Phosphorus Limit

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires industrial facilities that discharge greater than 60 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 Essential Industries does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 60 lbs/month, which is the threshold for industrial facilities in accordance to s. NR 217.04(1)(a)2, Wis. Adm. Code, and therefore no technology-based limit is required.

| Month | Average Phosphorus Concentration (mg/L) | Total Effluent Flow (Million Gallons) | Calculated Mass (lbs/month) |
|----------------|---|---------------------------------------|-----------------------------|
| October 2011 | 0.3 | 1.24 | 3.1 |
| January 2019 | 0.12 | 2.42 | 2.4 |
| November 2019 | 0.047 | 1.12 | 0.44 |
| January 2020 | <0.058 | 1.12 | 0.0 |
| Average | 0.12 | 1.48 | 1.44 |

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

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

Water Quality-Based Effluent Limits (WQBEL)

Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining

WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 102.06(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.100 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.075 mg/L applies for the Bark River.

The conservation of mass equation is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs):

$$\text{Limitation} = [(WQC)(Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)] / Q_e$$

Where:

WQC = 0.075 mg/L for Bark River

Qs = 100% of the 7-Q₂ of 11 cfs

Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Qe = effluent flow rate = 0.070 MGD = 1.08 cfs

f = the fraction of effluent withdrawn from the receiving water = 0

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall equal the median of at least four samples collected during the months of May through October, and that all samples collected during a 28-day period shall be considered as a single sample and the average of these concentrations used to determine a median. Averaging begins at the date of the first sample in the range of May through October.

A review of available in stream total phosphorus data stored in Surface Water Integrated Monitoring System database shows there is background phosphorus data approximately 6 miles upstream of Essential Industries' outfall at County Highway Q. Because there is a millpond in between the location of the background data and the outfall, it is expected that the background phosphorus concentration leaving the millpond is above the criterion of 0.075 mg/L.

Substituting a background concentration above criteria into the limit calculation equation above would result in a calculated limit that is less than the applicable criterion of 0.075 mg/L. However, s. NR 217.13(7), Wis. Adm. Code, specifies that "if the water quality-based effluent limitation calculated pursuant to the procedures in this section is less than the phosphorus criterion specified in s. NR 102.06, Wis. Adm. Code, for the water body, the effluent limit shall be set equal to the criterion."

Reasonable Potential Determination

There are only 4 available phosphorus data so a 30-day P₉₉ cannot be calculated at this time. Therefore, the average effluent concentration is compared to the calculated WQBEL of 0.075 mg/L to determine reasonable potential. Because the average effluent concentration of 0.12 mg/L is greater than 0.075 mg/L, there is reasonable potential for Essential Industries to exceed this limit.

Limit Expression

According to s. NR 217.14 (2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration

limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Rock River TMDL

Under the Total Maximum Daily Load (TMDL) for the Rock River Basin, approved September 2011, Essential Industries is located in Reach 55. In the TMDL, a group wasteload allocation (WLA) was set aside for general permits. This group WLA covers all general permit holders in the TMDL area and facilities with general permits are considered to be in compliance with their WLA as long as they are meeting the terms of their general permit. For Reach 55, the general permit allocation for phosphorus is 74.51 lbs/year, which is found in Appendix J of the TMDL. The full TMDL document can be found here: <https://dnr.wi.gov/topic/TMDLs/RockRiver>.

Since Essential Industries is switching to an individual permit, they will no longer be covered by the WLA for general permits and will need an individual WLA for their discharge. A WLA needs to be determined and carved out of the available general permit allocation specified in the TMDL. There is limited data from this facility and a WLA should be calculated using the recommended concentration limit of 0.075 mg/L. The following equation was used to calculate an annual WLA:

$$\begin{aligned} \text{Annual WLA} &= \text{conc.} \times \text{total flow} \times 8.34 \\ \text{Annual WLA} &= 0.075 \text{ mg/L} \times 25.6 \text{ million gallons} \times 8.34 \\ \text{Annual WLA} &= 16.0 \text{ lbs/year} \end{aligned}$$

The total flow used was calculated based on the expected annual flow of 0.070 MGD.

It is recommended that the monthly average limit based on the annual WLA is 0.0438 lbs/day (16 lbs/year ÷ 365 days). Since there is limited effluent data, a compliance schedule is recommended before the monthly average mass limit is effective.

Interim Limit

An interim limit is required per s. NR 217.17, Wis. Adm. Code, when a compliance schedule is needed in the permit to meet the WQBEL. The interim limit should reflect a concentration that the facility is able to meet without investing in additional “temporary” treatment, but also should prevent backsliding from current conditions. There is an extremely limited data set for phosphorus from this facility. Therefore, a narrative interim phosphorus limit is deemed more appropriate than a numeric interim phosphorus limit and a **narrative** Interim Phosphorus Limitation similar to the following is recommended: “The plant shall be operated such that the amount of phosphorus being discharged on an annual basis does not increase over the permit term, and that the phosphorus reductions will occur over time through optimization.”

PART 5 – TOTAL SUSPENDED SOLIDS

Rock River TMDL

The Rock River TMDL also specifies percent reductions for total suspended solids (TSS). The TSS load reduction target from wastewater discharges for Reach 55 is 28%. Like phosphorus WLAs, Essential Industries will need an individual WLA since they are switching to an individual permit. For Reach 55, the general permit allocation for TSS is 7.00 tons/year or 14,000 lbs/year, which is found in Appendix K of the TMDL.

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Now that that facility is switching to an individual permit, they need a specific WLA for their discharge. A WLA needs to be determined and carved out of the available general permit allocation specified in the TMDL. There are 11 data points available for this discharge and a WLA should be calculated using available effluent data which ranged from <1.10 to 3.40 mg/L, with the average loading being 0.97 lbs/day. The following equation was used to calculate an annual WLA:

$$\begin{aligned} \text{Annual WLA} &= \text{conc.} \times \text{total flow} \times 8.34 \\ \text{Annual WLA} &= 3.40 \text{ mg/L} \times 25.6 \text{ million gallons} \times 8.34 \\ \text{Annual WLA} &= 724 \text{ lbs/year} \end{aligned}$$

It is recommended that the monthly average limit based on the annual WLA is 1.98 lbs/day (724 lbs/year ÷ 365 days). The maximum reported effluent data is 1.96 lbs/day, and it is expected that Essential Industries can currently meet the monthly average mass limit based on the calculated annual WLA. Therefore, it is recommended that the monthly average limit of 1.98 lbs/day be effective upon permit issuance.

Effluent Data

The table below summarizes the TSS data from 10/31/2017 to 11/11/2019.

| | TSS mg/L | TSS lbs/day |
|------------|----------|-------------|
| 10/31/2017 | 2.80 | 1.00 |
| 01/22/2018 | 2.80 | 1.21 |
| 04/30/2018 | 3.40 | 1.96 |
| 07/09/2018 | 1.40 | 0.87 |
| 10/22/2018 | 1.90 | 1.21 |
| 01/14/2019 | 2.30 | 1.50 |
| 04/15/2019 | <1.30 | 0 |
| 07/29/2019 | 2.00 | 0.99 |
| 11/11/2019 | <1.10 | 0 |
| Average | 1.73 | 0.97 |

The current limit has concentration limits of 40 mg/L as a daily maximum and monthly average. To avoid backsliding, these concentration limits are recommended to continue in the individual permit.

PART 6 – 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

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used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 01/01/2010 to 11/11/2019.

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2010 to 11/11/2019.

| Month | Representative Highest Monthly Effluent Temperature | | Calculated Effluent Limit | |
|-------|---|---------------|------------------------------------|-----------------------------------|
| | Weekly Maximum | Daily Maximum | Weekly Average Effluent Limitation | Daily Maximum Effluent Limitation |
| | (°F) | (°F) | (°F) | (°F) |
| JAN | - | 70 | NA | 120 |
| FEB | - | - | NA | 120 |
| MAR | - | - | NA | 120 |
| APR | - | 75 | NA | 120 |
| MAY | - | - | NA | 120 |
| JUN | - | - | NA | 120 |
| JUL | - | 75 | NA | 120 |
| AUG | - | - | NA | 120 |
| SEP | - | - | NA | 120 |
| OCT | - | 120 | NA | 120 |
| NOV | - | - | NA | 120 |
| DEC | - | - | NA | 120 |

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. There are only 4 representative daily maximums which do not exceed the acute WQBEL of 120° F. The recorded daily max effluent temperature of 120° F was recorded in October of 2011 and data before and since that date have been significantly lower (58 – 85 °F).

Although there is not a full year of representative temperature data, a comparison of the available data can be used for other months of the year because the temperature is not expected to vary depending on the month. Therefore, there is not reasonable potential that the effluent will exceed a daily maximum limit of 120 °F. **It is recommended that temperature monitoring is included in the reissued permit so that an analysis can be completed on a full year of data.**

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 WET Program Guidance Document (October 29, 2019).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09 (3) (b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 6% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

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

Where:

Q_e = annual average flow = 0.070 MGD = 0.108 cfs

f = fraction of the Q_e withdrawn from the receiving water = 0

Q_s = ¼ of the 7- Q_{10} = 7.1 cfs ÷ 4 = 1.78 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits,

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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: <http://dnr.wi.gov/topic/wastewater/WETguidance.html>.

WET Checklist Summary

| | Acute | Chronic |
|---|---|--|
| AMZ/IWC | Not Applicable. 0 Points | IWC = 6%. 0 Points |
| Historical Data | 0 tests used to calculate RP. No tests failed. 5 Points | 0 tests used to calculate RP. No tests failed. 5 Points |
| Effluent Variability | No treatment present 10 Points | Same as Acute. 10 Points |
| Receiving Water Classification | Full fish and aquatic life 5 Points | Same as Acute. 5 Points |
| Chemical-Specific Data | Limits for chloride and chlorine based on ATC; ammonia detected. Additional Compounds of Concern: None 7 Points | Limits for chloride based on CTC; chlorine and ammonia detected. Additional Compounds of Concern: None 7 Points |
| Additives | 0 Biocides and 0 Water Quality Conditioners added. P treatment chemical other than Ferric Chloride (FeCl), Ferrous Sulfate (FeSO ₄), or alum used: No 0 Points | All additives not used more than once per 4 days. 0 Points |
| Discharge Category | 0 Industrial Contributors. 0 Points | Same as Acute. 0 Points |
| Wastewater Treatment | No treatment 10 Points | Same as Acute. 10 Points |
| Downstream Impacts | No impacts known 0 Points | Same as Acute. 0 Points |
| Total Checklist Points: | 37 Points | 37 Points |
| Recommended Monitoring Frequency (from Checklist): | 1x yearly | 1x yearly |
| Limit Required? | No | No |
| TRE Recommended? (from Checklist) | No | No |

- Following the checklist, annual acute and annual chronic WET tests are recommended in the reissued permit. Because there is no treatment at Essential Industries, a total of 20 points are added to each of the acute and chronic total points (10 for the effluent variability category and 10 for the wastewater treatment category). Because the discharge is made up of mostly noncontact cooling water, with little RO water and water softener brine water, no treatment is necessary. If 20 points are removed from the checklist for both acute and chronic testing, the total points would be 17. At 17 points, **no WET testing is recommended in the reissued permit.**

PART 7 – EXPRESSION OF LIMITS

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

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

Essential Industries is an industrial discharge and is therefore subject to daily maximum and monthly average limitations whenever limitations are determined to be necessary.

This evaluation provides additional limitations necessary to comply with the expression of limits in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. Pollutants already compliant with these rules or that have an approved impracticability demonstration, are excluded from this evaluation including water-quality based effluent limitations for phosphorus, temperature, and pH, among other parameters. Mass limitations are not subject to the limit expression requirements if concentrations limits are given.

Method for calculation:

The methods for calculating limitations for industrial discharges to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(4), Wis. Adm. Code, as follows:

1. Whenever a daily maximum limitation is determined necessary to protect water quality, a 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.
2. Whenever a weekly average limitation is determined necessary to protect water quality:
 - A monthly average limitation shall also be included in the permit and set equal to the weekly average limit unless a more restrictive limit is already determined necessary to protect water quality.
 - Chloride – A weekly average limit of 1,500 mg/L is required based on reasonable potential in Part 2 of this memo. Therefore, a monthly average limit of 1,500 mg/L is also required in the permit.
 - A daily maximum limitation shall also be included in the permit and set equal to the daily maximum WQBEL calculated under s. NR 106.06, Wis. Adm. Code or a daily maximum limitation calculated using the following procedure, whichever is more restrictive:

$$\text{Daily Maximum Limitation} = \text{WQBEL}_c \times \text{DMF}$$

Where:

DMF = Daily Multiplication Factor as defined in Table 2

CV = coefficient of variation (CV) as calculated in s. NR 106.07(5m)

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s. NR 106.07 (4) (e). Table 2 — Daily Multiplication Factor

| | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CV | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 |
| DMF | 1.114 | 1.235 | 1.359 | 1.460 | 1.557 | 1.639 | 1.712 | 1.764 | 1.802 | 1.828 |

| | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| CV | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| DMF | 1.842 | 1.849 | 1.851 | 1.843 | 1.830 | 1.815 | 1.801 | 1.781 | 1.751 | 1.744 |

- Whenever a monthly average limitation is determined necessary to protect water quality, a daily maximum limit shall be calculated using the following procedure and included in the permit unless a more restrictive limit is already determined necessary to protect water quality:

$$\text{Daily Maximum Limit} = (\text{Monthly Average Limitation} \times \text{MF})$$

Where:

MF= Multiplication factor as defined in Table 1

CV= coefficient of variation (CV) as calculated in s. NR 106.07(5m)

n= the number of samples per month required in the permit

s. NR 106.07 (3) (e) 4. Table 1 — Multiplication Factor (for CV = 0.6)

| | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|
| CV | n=1 | n=2 | n=3 | n=4 | n=8 | n=12 | n=16 | n=20 | n=24 | n=30 |
| 0.6 | 1.00 | 1.31 | 1.51 | 1.64 | 1.95 | 2.12 | 2.23 | 2.30 | 2.36 | 2.43 |

Note: This methodology is based on the *Technical Support Document for Water Quality-based Toxics Control* (March 1991). PB91-127415.

Summary of Additional Limitations:

In conclusion, the following additional limitations are required to comply with ss. NR 106.07 and NR 205.065(7) Expression of Limits.

| Parameter | Daily Maximum | Weekly Average | Monthly Average |
|-----------|---------------|------------------|------------------|
| Chloride | 1510 mg/L | 1510 mg/L | 1510 mg/L |

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

| | | | | | |
|-------------------------------------|----------------------|----------------------------|--|-------------------|-------------------|
| Facility: | Essential Industries | 7-Q₁₀: | 7.10 cfs | Temp Dates | |
| Outfall(s): | 001 | Dilution: | 25% | Start: | 01/01/10 01/01/10 |
| Date Prepared: | 03/24/2020 | f: | 0 | End: | 11/11/19 11/11/19 |
| Design Flow (Q_e): | 0.07 MGD | Stream type: | Small warm water sport or forage fish co ▼ | | |
| Storm Sewer Dist. | 0 ft | Qs:Qe ratio: | 16.9 :1 | | |
| | | Calculation Needed? | YES | | |

| Month | Water Quality Criteria | | | Receiving Water Flow Rate (Qs) (cfs) | 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) (MGD) | Daily Maximum Flow Rate (Qea) (MGD) | | Weekly Average (°F) | Daily Maximum (°F) | Weekly Average Effluent Limitation (°F) | Daily Maximum Effluent Limitation (°F) |
| | (°F) | (°F) | (°F) | | (MGD) | (MGD) | | (°F) | (°F) | (°F) | (°F) |
| JAN | 33 | 49 | 76 | 7.10 | 0.034 | 0.040 | 0 | 70 | NA | 120 | |
| FEB | 34 | 50 | 76 | 7.10 | | | 0 | | NA | 120 | |
| MAR | 38 | 52 | 77 | 7.10 | | | 0 | | NA | 120 | |
| APR | 48 | 55 | 79 | 7.10 | 0.035 | 0.040 | 0 | 75 | NA | 120 | |
| MAY | 58 | 65 | 82 | 7.10 | | | 0 | | NA | 120 | |
| JUN | 66 | 76 | 84 | 7.10 | | | 0 | | NA | 120 | |
| JUL | 69 | 81 | 85 | 7.10 | 0.040 | 0.040 | 0 | 75 | NA | 120 | |
| AUG | 67 | 81 | 84 | 7.10 | | | 0 | | NA | 120 | |
| SEP | 60 | 73 | 82 | 7.10 | | | 0 | | NA | 120 | |
| OCT | 50 | 61 | 80 | 7.10 | 0.030 | 0.040 | 0 | 120 | NA | 120 | |
| NOV | 40 | 49 | 77 | 7.10 | | | 0 | | NA | 120 | |
| DEC | 35 | 49 | 76 | 7.10 | | | 0 | | NA | 120 | |

