# Permit Fact Sheet

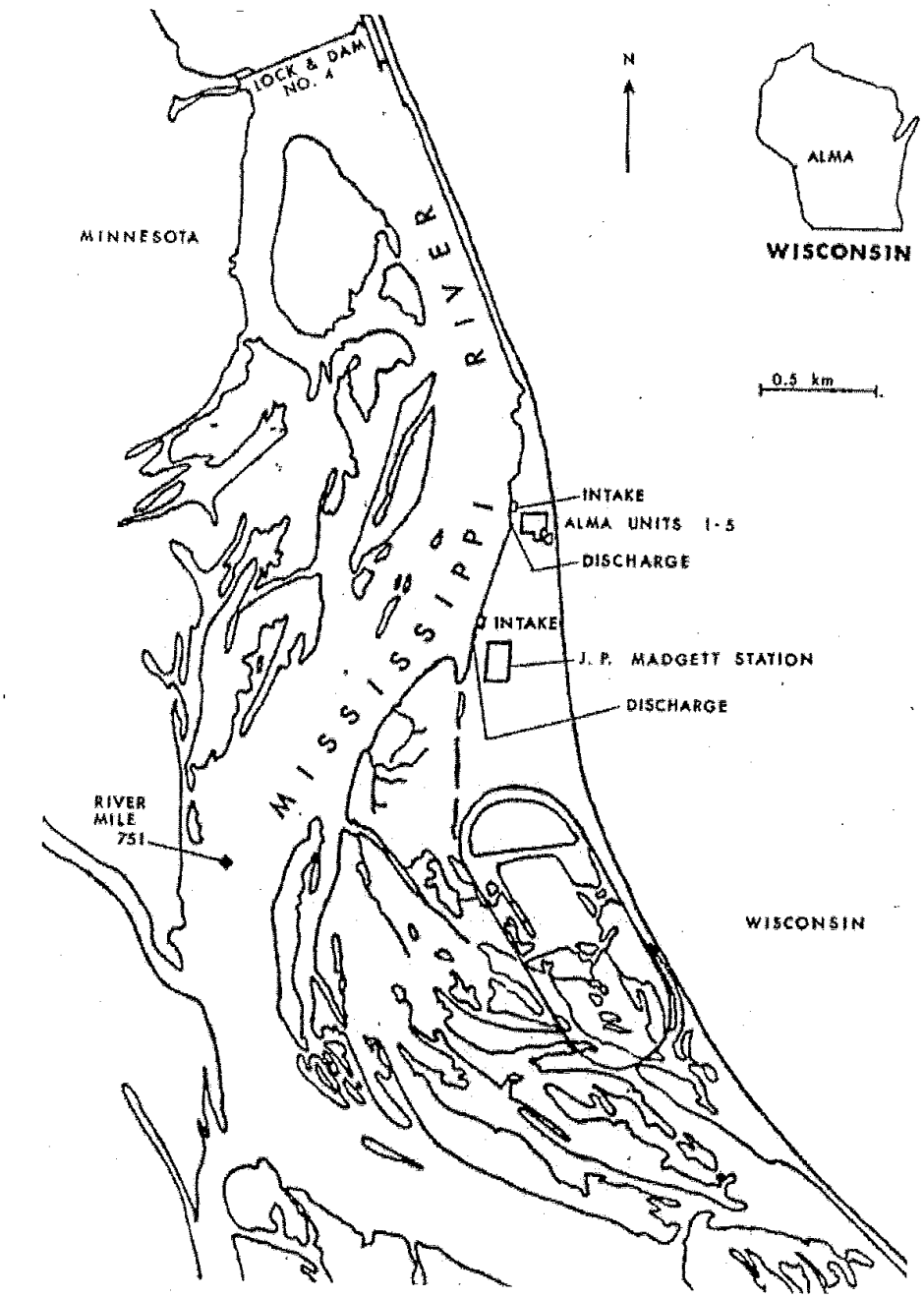
## General Information

| | |
|---|---|
| Permit Number: | WI-0040223-09-0 |
| Permittee Name: | Dairyland Power Coop Alma site |
| Address: | 500 OLD STH 35 |
| City/State/Zip: | ALMA WI 54610 |
| Discharge Location: | East bank of Mississippi River, south of J.P. Madgett screenhouse. N44 18.363' W91 54.787' |
| Receiving Water: | Mississippi River |
| StreamFlow ($Q_{7,10}$): | 6100 cfs |
| Stream Classification: | Warm Water Sport Fish Community, Non-public Water Supply |

## Facility Description

Dairyland Power Cooperative owns and operates the J.P. Madgett Unit coal-fired power station near Alma, Wisconsin. Previously the permittee operated Alma units 1-5 and J.P. Madgett Unit, however the final Alma units was taken offline in October 2014.

The J.P. Madgett Unit has been in commercial operation since November 1979. The single unit station has a generating capacity of 400 MW of electricity. All discharges covered by this permit are to the Mississippi River with the exception of the coal pile runoff which would discharge to groundwater. The only time the coal pile basins have had any water in them is when the river levels are high. Outfall 006 is process wastewater from a treatment system which consists of chemically assisted settling. De-ice water and intake and screen backwash water are diversions of cooling water and river water and are listed as Outfalls for reporting purposes. Stormwater from Outfalls 011 and 012 will continue to be covered by the facility's industrial stormwater permit. The facility's dry Flue Gas Desulfurization (FGD) system does not contribute wastewater. See Figure 1 for the site map.




## Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, land app reports, compliance schedule items, and a site visit on April 14, 2022, this facility has been found to be in substantial compliance with their current permit.

| Sample Point Designation | | |
|---|---|---|
| **Sample Point Number** | **Discharge Flow, Units, and Averaging Period** | **Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)** |
| 703 | Maximum design intake volume: 322.6 MGD.<br>Average intake volume:<br>322.6 MGD. | Intake screening system and intake water monitoring. The intake is located approximately 1.5 miles downstream of USACE Lock and Dam No. 4 on the east bank of the Mississippi River at RM 751.2 and oriented parallel to the river flow. The intake has four fore bays with a skimmer wall, trash rack, and traveling screens which feed two pump bays. A skimmer wall is located at the face of the intake and extends down to El. 659.0 ft, approximately 1 ft below normal pool level. The invert of the structure is El. 640.0 ft. The temperature probe is mounted on northwest corner of screen house on river side of travelling water screens. The temperature probe is mounted on northwest corner of screen house on river side of travelling water screens. |
| 001 | Noncontact cooling water average flow: 219.2 MGD<br>Maximum daily flow: 322.6 MGD | Condenser cooling water. East bank of the Mississippi River, South of J.P. Madgett screenhouse. N44 18.363' W91 54.787'. Non-contact condenser cooling water from J.P. Madgett. No treatment provided. Temp probe is mounted on northwest corner of screen house on river side of travelling water screens. The facility is approved to estimate flow at this sample point. Temperature and pH are collected from the northwest corner of the outfall structure prior to water entering river. |
| 002 | Maximum daily flow: 0 MGD | Coal pile runoff from Alma 1-5. East bank of the Mississippi River, North of J.P. Madgett screenhouse. N44 18.435' W91 54.797'. Treatment consists of settling. The facility is approved to estimate flow at this sample point. |
| 003 | Average flow: 0.4749 MGD<br>Daily Maximum 1.84 MGD | Intake screen backwash. East bank of the Mississippi River, at the J.P. Madgett screenhouse. N44 18.370' W91 54.815'. J.P. Madgett intake screen backwash. No treatment provided. The facility is approved to estimate flow at this sample point. |
| 004 | Average flow: 0.2556 MGD<br>Daily Maximum 0.9921 MGD | Fish Return. East bank of the Mississippi River at the J.P. Madgett screenhouse. N44 18.370' W91 54.815'.J.P.Madgett fish return, screen backwash. No treatment provided. The facility is approved to estimate flow at this sample point. |
| 005 | Average flow: 23.75 MGD<br>Daily Maximum 25.23 MGD | J.P. Madgett intake de-icing water. East bank of the Mississippi River, at the J.P. Madgett screenhouse. N44° 18.370' W91° 54.815'.. No treatment provided. The facility is approved to estimate flow at this sample point. |
| 006 | Daily Maximum flow: 0.9984 MGD includes process wastewater, coal ash landfill leachate, stormwater, and boiler blowdown. | East bank of the Mississippi River, South of J.P. Madgett screenhouse. N44° 18.183' W91° 54.808'. Boiler blowdown, demineralization wastewater, coal ash landfill leachate, stormwater, metal cleaning wastewater, and other power plant low volume wastewaters. Treatment consists of pH adjustments and settling. Wastewater from 006 may be diverted after treatment to combine |

| Sample Point Designation | | |
|---|---|---|
| **Sample Point Number** | **Discharge Flow, Units, and Averaging Period** | **Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)** |
| | | with outfall 001 after being sampled at outfall 106, prior to comingling with the non-contact condenser cooling water being sampled at outfall 001. During months when these waste streams are combined the water quality based effluent limits at outfall 001 are applicable but the ones at outfall 006 are not applicable. Grab samples are pulled from secondary lagoon weir prior to water cascading over weir teeth. Composite sample is pulled between the secondary weir and the parshall flume. Flow is measured using a radar transmitter. |
| 007 | There has only been one release of water from this discharge point due to an extreme rain event in August of 2016 with a daily maximum flow of 270,000 gallons. | Coal pile run off. South of the bottom ash dewatering building. Outfall discharges to the Mississippi river backwater area. N44° 17.948' W91° 54.719'. J.P. Madgett coal pile runoff. Treatment consists of settling. Samples are collected at end of pipe. |
| 008 | Average 0.10 MGD per precipitation event | Seepage from the Alma 1-5 coal pile runoff basin to groundwater. The facility is approved to estimate flow at this sample point. |
| 009 | Average 0.10 MGD per precipitation event | Seepage from the J.P. Madgett coal pile runoff basin to groundwater. The facility is approved to estimate flow at this sample point. |
| 101 | N/A | Field blank sample collected at the same time as the effluent sample |
| 106 | New sample point. | This sample point is at the same location as outfall 006 and samples are taken in the same manor. This outfall is where non water quality based effluent limits for low volume wastewater will be sampled and reported. This allows for a consistent sampling location and reporting location on the DMRs for non water quality based effluent limits regardless of if the low volume wastewater is discharged after treatment at outfall 006 or at outfall 001. Grab samples are pulled from secondary lagoon weir prior to water cascading over weir teeth. Composite sample is pulled between the secondary weir and the parshall flume. Flow is measured using a radar transmitter. |

# 1 Influent – Cooling Water Intake Structure - Proposed Monitoring

## Sample Point Number: 703- Influent from Mississippi R.

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Mercury, Total Recoverable | | ug/L | Monthly | Grab | |

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Temperature Average | | deg F | Daily | Continuous | |
| Flow rate | | MGD | Daily | Continuous | |
| Intake Water Used Exclusively For Cooling | | % | Daily | Calculated | |

## Changes from Previous Permit

Influent monitoring requirements were re-evaluated for the proposed permit term and the following changes were made from the previous permit;

**Intake Water:** Annual percentage reporting for Intake Water Used Exclusively For Cooling has been added.

**Flow Rate**: Flow Rate in MGD shall be reported Daily, with a Max Variable Flow Rate Limit only in effect when surface water elevation falls below top of the water intake screen. Flow Rate- feet/sec is only reported when Daily Max Variable Limit is in effect and does not need to be reported when surface water elevations are above the top of the water intake screen. See permit for additional reporting instructions and information.

**Narrative Requirements:** New requirements added per ch. NR 111 Wis. Adm. Code., promulgated in 2020.

### 1.1.1 Explanation of Limits and Monitoring Requirements

The cooling water intake is not approved as BTA (Best Technology Available) for minimizing adverse environmental impacts in accordance with the requirements in s. 283.31(6), Wis. Stats., and section 316(b) of the Clean Water Act. The facility is in compliance with impingement mortality BTA when operated optimally in accordance with the intake optimization study which the facility is in the process of finalizing. The facility is in compliance with intake entrainment BTA.

See Appendix B for an evaluation of candidate technologies for entrainment and impingement BTA. Further description of the intake is provided in that appendix as well.

Floating debris and accumulated trash collected on the intake structure and screens shall be removed and disposed of in a manner to prevent any pollutant from the material from entering the waters of the State pursuant to s. NR 205.07 (3) (a), Wis. Adm. Code.

**Intake Water:** Annual percentage reporting for Intake Water Used Exclusively For Cooling has been added to analyze applicability criteria in s. NR 111.02, Wis. Adm. Code.

**Flow Rate**: Flow Rate monitoring has been added to analyze applicability criteria in s. NR 111.02, Wis. Adm. Code.

#### 1.1.1.1 Operation of the modified traveling screens

The modified traveling screens shall be operated in an optimized manor in accordance with the optimization study.

#### 1.1.1.2 Future BTA

Requirements in this section of the permit have been established in accordance with ch. NR 111, Wis. Adm. Code. Refer to Dairyland Alma's Water Intake Structure BTA Determination (Appendix B) and the WPDES permit for more information.

#### 1.1.1.3 Visual or Remote Inspections

The permittee is required to conduct visual or remote inspections of the intake structure at least weekly during periods of operation, pursuant to s. NR 111.14(4), Wis. Adm. Code.

#### 1.1.1.4 Reporting Requirements

The permittee is required to submit an annual certification statement and report, pursuant to s. NR 111.15(1)(c), Wis. Adm. Code.

#### 1.1.1.5 Intake Screen Discharges and Removed Substances

Floating debris and accumulated trash collected on the cooling water intake trash rack shall be removed and disposed of in a manner to prevent any pollutant from the material from entering the waters of the State pursuant to s. NR 205.07 (3) (a), Wis. Adm. Code, except that backwashes may contain fine materials that originated from the intake water source such as sand, silt, small vegetation or aquatic life.

#### 1.1.1.6 Endangered Species Act

This permit does not authorize take of threatened or endangered species. 40 CFR §125.98 (b) (1) requires the inclusion of this provision in all permits subject to 316(b) requirements. Contact the state Natural Heritage Inventory (NHI) staff with inquiries regarding incidental take of state-listed threatened and endangered species and the US Fish and Wildlife Service with inquiries regarding incidental take of federally-listed threatened and endangered species.

# 2 Inplant - Proposed Monitoring and Limitations

## Sample Point Number: 101- Effluent field blank

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Mercury, Total Recoverable | | ug/L | Monthly | Grab | |

## Changes from Previous Permit:

Temperature monitoring has been removed from this sample point.

## Explanation of Limits and Monitoring Requirements

Mercury samples are required to be taken along with a field blank. This sample point gives the facility a place on the DMRs to report the mercury field blank sample.

## Sample Point Number: 106- Low Volume Wastewater

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Daily | Estimated | |
| Suspended Solids, Total | Daily Max | 100 mg/L | Daily | 24-Hr Comp | |
| Suspended Solids, Total | Monthly Avg | 30 mg/L | Daily | 24-Hr Comp | |
| Oil & Grease (Hexane) | Daily Max | 20 mg/L | Quarterly | Grab | |
| Oil & Grease (Hexane) | Monthly Avg | 15 mg/L | Quarterly | Grab | |
| Mercury, Total Recoverable | Daily Max | 4.6 ng/L | Monthly | Grab | Sample Point Number 101 will be used to report the effluent field blank. |
| Iron, Total Recoverable | Daily Max | 1.0 mg/L | See Permit Note | 24-Hr Comp | Samples are only required on days with a metal cleaning wastewater is discharged to the river. |
| Copper, Total Recoverable | Daily Max | 100 µg/L | Daily | 24-Hr Comp | Samples are only required on days with a metal cleaning wastewater is discharged to the river. |
| Copper, Total Recoverable | Daily Max | 1.2 lb/Day | Daily | Calculated | Samples are only required on days with a metal cleaning wastewater is discharged to the river. |
| PFOS | | ng/L | Monthly | Grab | Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule. |
| PFOA | | ng/L | Monthly | Grab | Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule. |

## Changes from Previous Permit:

This sample point is being added to clarify when and where non water quality based effluent limits are applicable for the Low Volume Wastewater.

## Explanation of Limits and Monitoring Requirements

**Mercury-**

The 30-day $P_{99}$ of representative data is 1.64 ng/L, which is greater than the most stringent limit (wildlife criterion of 1.3 ng/L); therefore, a limit is required for mercury. The current permit includes a mercury variance with an alternative effluent limit of 4.6 ng/L at Outfall 006; this limit is also included in this permit.

**PFOS and PFOA** – NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for industrial dischargers to be evaluated on a case-by-case basis to determine if monitoring is required pursuant to s. NR 106.98(2)(d), Wis. Adm. Code. The department evaluated the need for PFOS and PFOA monitoring taking into consideration industry type and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, it was identified that the industrial discharger category may be a potential source of PFOS/PFOA, and previous PFOS/PFOA sample results were within 1/5 of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code. Therefore, monthly monitoring is included. The initial determination of need sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

**Categorical Limits**

S. NR 290 includes the categorical limit for total suspended solids, oil and grease, iron, and copper for Metal Cleaning Wastes.

The Effluent Limitation Guidelines (ELG) the Steam Electric Power Generating Point Source Category effective on January 4, 2016. The revised ELG requires Dairyland Power- Alma to meet the following requirements:

- "No Discharge" from Bottom Ash Transport Water. The facility has completed a facility upgrade and is no longer discharging bottom ash transport water.
- Combustion Residual Leachate (Coal Ash Landfill leachate) Oil and Grease, and Total Suspended Solids limits. The limits in the revised ELG are the same as what is already required at outfall 006 where the Coal Ash Landfill Leachate discharges to following treatment; neither the sample location nor the limits are changing.

The Coal Ash Landfill Leachate TSS and Oil and Grease ELGs are the same as their current limits for at outfall 006 for Metal Cleaning Wastes; therefore the Coal Ash Landfill Leachate Oil and Grease, and Total Suspended Solids limits will not change in this permit cycle, only where the facility reports them on the DMRs.

# 3 Surface Water - Proposed Monitoring and Limitations

## Sample Point Number: 001- CONDENSER COOLING WATER - JPM

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Daily | Continuous | |
| Temperature Maximum | | deg F | Daily | Continuous | |
| pH Field | Daily Max | 9.0 su | Weekly | Grab | |
| pH Field | Daily Min | 6.0 su | Weekly | Grab | |

## Changes from Previous Permit

Temperature Difference is being removed in this sample point.

## Explanation of Limits and Monitoring Requirements

Based on the comparison of effluent data to the calculated limits, the discharge from Outfall 001 would trigger weekly average temperature limits in June, July, and August. However, the thermal mixing zone study dated January 21, 2013 demonstrated that the plume from Outfall 001 occupies a small percentage of the river width and an adequate zone of free passage exists in accordance with s. NR 106.06(4)(c)3, Wis. Adm. Code.

The pH limitation of 6.0-9.0 is a water quality standard.

**Categorical Limits**

No Categorical Limits are applicable for this Outfall.

# Sample Point Number: 002- COAL PILE RUNOFF - ALMA

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Daily | Estimated | |
| Suspended Solids, Total | Daily Max | 50 mg/L | Daily | 24-Hr Flow Prop Comp | Sample required during any day with a coal pile runoff discharge to the river. |
| pH Field | Daily Max | 9.0 su | Daily | Grab | Sample required during any day with a coal pile runoff discharge to the river. |
| pH Field | Daily Min | 6.0 su | Daily | Grab | Sample required during any day with a coal pile runoff discharge to the river. |

## Changes from Previous Permit

There are no changes from the previous permit**.**

## Explanation of Limits and Monitoring Requirements

The limits based on best professional judgement and to prevent backsliding.

# Sample Point Number: 003- INTAKE SCREEN BACKWASH - JPM; 004- FISH RETURN - JPM; 005- DE-ICING WATER - JPM

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Monthly | Estimated | |

## Changes from Previous Permit

There are no changes from the previous permit.

## Explanation of Limits and Monitoring Requirements

The flow rate is being monitored to allow for adequate flow based calculations and evaluation of the intake structure.

## Sample Point Number: 006- TREATED PROCESS WW

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Daily | Continuous | |
| Temperature Maximum | Daily Max | Deg F | Daily | Grab | Monitoring only from the effective date of this permit through 06/30/2028. Limits become effective on 07/01/2028 per the compliance schedule. See temperature sections and table in the permit. |
| Temperature Maximum | Monthly Avg | Deg F | Monthly | Calculated | Monitoring only from the effective date of this permit through 06/30/2028. Limits become effective on 07/01/2028 per the compliance schedule. See temperature sections and table in the permit. |
| Chlorine, Total Residual | Daily Max | 38 ug/L | Daily | Grab | |
| Chlorine, Total Residual | Monthly Avg | 38 ug/L | Daily | Grab | |
| Phosphorus, Total | Monthly Avg | 0.19 mg/L | Monthly | 24-Hr Flow Prop Comp | |
| Phosphorus, Total | 6-Month Avg | 0.064 mg/L | Monthly | 24-Hr Flow Prop Comp | |
| Phosphorus, Total | 6-Month Avg | 0.08 lbs/day | Monthly | Calculated | |
| pH (Minimum) | Daily Min | 4.0 su | Daily | Continuous | See Section 3.2.4.6 of the permit. |
| pH (Maximum) | Daily Max | 11 su | Daily | Continuous | See Section 3.2.4.6 of the permit. |
| pH Total Exceedance Time Minutes | Monthly Total | 446 minutes | Monthly | Calculated | pH Total Exceedance Time Minutes |
| pH Exceedances Greater Than 60 Minutes | Daily Max | 0 Number | Daily | Calculated | pH Exceedances Greater Than 60 Minutes |

## Changes from Previous Permit

Chlorine, Total Residual has been added to the permit.

Whole Effluent Toxicity(WET) monitoring has been removed due to a current lack of reasonable potential to violate WET limits.

The Temperature limits have been updated based on current discharge and stream characteristics.

TBELs and mercury monitoring have been moved from this outfall to outfall 106.

## Explanation of Limits and Monitoring Requirements

Please see the attached Water Quality Based Effluent Limits Memo for full explanation of water quality limits.

**Water Quality Based Limits**

It was determined that the effluent from Outfall 006 enters a backwater section of the Mississippi River, limiting the amount of mixing available at the point of discharge. Recent changes to NR 102 and 217 include new phosphorus criteria related procedures for calculating water quality based effluent limitations for phosphorus. See the September 12, 2011 Water Quality-Based Effluent Limitations for Dairyland Power Cooperative, Alma 1-5 and J.P. Madgett (WI-0040223) memorandum, the March 30, 2012 Revision, and the September 15, 2015 Mercury Limitations for Dairyland Power Cooperative, Alma 1-5 and J.P. Madgett memorandum for further details.

**Chlorine, Total Residual -**

Chlorine daily maximum and monthly average limits have been added based on reasonable potential for the facility to violate water quality based effluent limits.

**Temperature -**

The Temperature limits have been recalculated based on updated flow and thermal effluent data and are shown in the table below. These limits apply when discharge from Outfall 006 is being discharged directly to the receiving waterbody and not being routed to outfall 001.

| Month | Weekly maximum °F | Daily maximum °F |
|---|---|---|
| January | 59 | 86 |
| February | 59 | 87 |
| March | 59 | 87 |
| April | 58 | 90 |
| May | 69 | 91 |
| June | 77 | 90 |
| July | 82 | 90 |
| August | 80 | 89 |
| September | 76 | 91 |
| October | 63 | 88 |
| November | 54 | 89 |
| December | 59 | 90 |

**Phosphorus -**

Because the discharge is to an impaired water, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. The mass limit of 0.080 lbs/day in the current permit was calculated based on an effluent flow rate of 0.15 MGD (0.064 mg/L × 8.34 × 0.15 MGD = 0.080 lbs/day). The effluent flow rate has increased slightly to 0.167 MGD, which would correspond to a higher phosphorus mass limit. However, to allow an increase in a limit above an existing limit the facility must demonstrate the need for the higher limits consistent with s. NR 207.04(1), Wis. Adm. Code and meet the anti-backsliding requirements in s NR 207.12, Wis. Adm. Code. This would require one of the two conditions under s.

NR 207.12(3)(a)2 to be met. Neither of these conditions are met and therefore **the current phosphorus mass limit of 0.080 lbs/day should be continued in the reissued permit.**

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 **0.064 mg/L may be expressed as a six-month average**. This code specifies that the limit should be expressed as a six-month average and not an annual average. If a concentration limitation expressed as a six-month average is included in the permit, **a monthly average concentration limitation of 0.19 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.

**Zebra mussel control-**
The facility previously used chlorine to control zebra mussel. The facility has ceased use of chlorine for zebra mussel control and now manually controls zebra mussel and does not currently have plans to control zebra mussel by other means. If the facility determines that additional control is needed, the facility will need to get approval for the control, most likely by getting coverage under the Short Duration Discharge General Permit.

**pH-**
The permittee shall maintain the pH of the discharge within the range of 6.0 to 9.0 standard units (s.u.) except excursions are permitted subject to the following conditions:

- The pH is monitored continuously;
- The total time during which the pH is outside the range of 6.0 to 9.0 s.u. shall not exceed 446 minutes in any calendar month;
- No individual pH excursion outside the range of 6.0 to 9.0 s.u. shall exceed 60 minutes in duration;
- No individual pH excursion shall be outside the range of 4.0 to 11.0 s.u.; and
- On a daily basis, the permittee shall report the minimum and maximum pH, the total time that the pH is outside the range of 6.0 to 9.0 s.u.

## Sample Point Number: 007- COAL PILE RUNOFF - JPM

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Daily | Estimated | |
| Suspended Solids, Total | Daily Max | 50 mg/L | Daily | 24-Hr Comp | |
| pH Field | Daily Max | 9.0 su | Weekly | Grab | |
| pH Field | Daily Min | 6.0 su | Weekly | Grab | |

## Changes from Previous Permit

There are no changes from the previous permit**.**

## Explanation of Limits and Monitoring Requirements

The limits based on best professional judgement and to prevent backsliding.

The 50 mg/L daily maximum limit for TSS is an effluent limit guideline from 40 CFR 423.12(b)(9).

# 4 Land Treatment – Proposed Monitoring and Limitations

## Sample Point Number: 008- COAL PILE RUNOFF BSN - ALMA and 009- COAL PILE RUNOFF BSN - JPM

| Monitoring Requirements and Limitations | | | | | |
|---|---|---|---|---|---|
| **Parameter** | **Limit Type** | **Limit and Units** | **Sample Frequency** | **Sample Type** | **Notes** |
| Flow Rate | | MGD | Monthly | Estimated | |

## Changes from Previous Permit:

None.

# 5 Schedules

## 5.1 Mercury Pollutant Minimization Program

As a condition of the variance to the water quality based effluent limitation(s) for mercury granted in accordance with s. NR 106.145(6), Wis. Adm. Code, the permittee shall perform the following actions.

| Required Action | Due Date |
|---|---|
| **Annual Mercury Progress Reports:** Submit an annual mercury progress report related to the pollutant minimization activities for the previous year. The annual mercury progress report shall:<br>Indicate which mercury pollutant minimization activities or activities outlined in the Pollutant Minimization Program Plan have been implemented and state which, if any, activities from the Pollutant Minimization Program Plan were not pursued and why;<br>Include an assessment of whether each implemented pollutant minimization activity appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year;<br>Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next year to help address these barriers;<br>Include an analysis of trends in total effluent mercury concentrations based on mercury sampling; and<br>Include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury.<br>The first annual mercury progress report is to be submitted by the Due Date. | 01/31/2025 |
| **Annual Mercury Progress Report #2:** Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above. | 01/31/2026 |
| **Annual Mercury Progress Report #3:** Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above. | 01/31/2027 |
| **Annual Mercury Progress Report #4:** Submit a mercury progress report, related to the pollutant minimization activities for the previous year, as defined above. | 01/31/2028 |
| **Final Mercury Report:** Submit a final report documenting the success in reducing mercury concentrations in the effluent, as well as the anticipated future reduction in mercury sources and mercury effluent concentrations. | 03/31/2028 |

| | |
|---|---|
| The report shall:<br><br>Summarize mercury pollutant minimization activities that have been implemented during the current permit term and state which, if any, activities from the Pollutant Minimization Program Plan were not pursued and why;<br><br>Include an assessment of which pollutant minimization activities appear to have been effective or ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly;<br><br>Identification of barriers that have limited program effectiveness and adjustments to the program that will be implemented during the next variance term (if applicable) to help address these barriers;<br><br>Include an analysis of trends in mercury concentrations based on sampling and data during the current permit term; and<br><br>Include an analysis of how influent and effluent mercury varies with time and with significant loadings of mercury.<br><br>If the permittee intends to reapply for a mercury variance per s. NR 106.145, Wis. Adm. Code, for the reissued permit, a detailed Pollutant Minimization Program Plan outlining the pollutant minimization activities proposed for the upcoming permit term shall be submitted along with the final report. An updated pollutant minimization plan shall:<br><br>Include an explanation of why or how each pollutant minimization activity will result in reduced discharge of the target pollutant;<br><br>Evaluate any new available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and<br><br>Identify any information needs that would help to better determine pollutant sources and make plans to collect that information. | |
| **Annual Mercury Reports After Permit Expiration:** In the event that this permit is not reissued by the date the permit expires, the permittee shall continue to submit annual mercury reports for the previous year following the due date of Annual Mercury Progress Reports listed above. Annual Mercury Progress reports shall include the information as defined above. | |

## 5.2 PFOS/PFOA Minimization Plan Determination of Need

Submit sampling data to be used to determine the need for PFOS and PFOA monitoring and limits.

| Required Action | Due Date |
|---|---|
| **Report on Effluent Discharge:** Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code.<br><br>This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. | 09/30/2025 |
| **Report on Effluent Discharge and Evaluation of Need:** Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan.<br><br>This report shall include all additional PFOS and PFOA data that may be collected including any | 09/30/2026 |

| | |
|---|---|
| influent, intake, in-plant, collection system sampling, and blank sample results.<br><br>The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan.<br><br>If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued.<br><br>If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit. | |

## 5.3 Cooling Water Intake Structure (CWIS) Annual Certification Statement

Submit an annual certification statement as required by the influent 'Annual Certification Statement and Report' section of the permit.

| Required Action | Due Date |
|---|---|
| **Annual Certification Statement:** Submit an Annual Certification on the water intake structure, as required by section 1.3.3.1. | 01/31/2025 |
| **Annual Certification Statement:** Submit an Annual Certification on the water intake structure, as required by section 1.3.3.1. | 01/31/2026 |
| **Application Materials Exemption Request:** Submit a statement by the due date on whether or not the permittee wishes to request a 316(b) application materials exemption. If no exemption is being requested, all applicable requirements in s. NR 111.40(2)(c), Wis. Adm. Code shall be submitted with the application for reissuance of this permit. | 09/30/2027 |
| **Annual Certification Statement:** Submit an Annual Certification on the water intake structure, as required by section 1.3.3.1. | 01/31/2027 |
| **Annual Certification Statement:** Submit an Annual Certification on the water intake structure, as required by section 1.3.3.1. | 01/31/2028 |
| **Annual Certification Statement:** Submit the application materials required in NR 111.40(2)(c), Wis. Adm. Code with the application for reissuance of this permit. | 10/03/2028 |

## 5.4 Temperature Limits (Industrial Facilities)

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

| Required Action | Due Date |
|---|---|
| **Report on Effluent Discharges:** Submit a report on effluent temperature with conclusions regarding compliance. If the Department determines that because of data variability, 24 months of monitoring data is required to determine the need for temperature limits, the Department will so notify the permittee in writing and all dates in the permit schedule will be extended by 12 months.<br>Informational Note - Refer to the Surface Water subsection regarding 'Determination of Need for Effluent Limits' for information concerning a Department determination on the need for limits and | 07/01/2025 |

| | |
|---|---|
| pursuing re-evaluation of limits per NR 106 Subchapters V & VI or NR 102.26, Wis. Adm. Code. | |
| **Action Plan:** Submit an action plan for complying with all effluent temperature limits that remain following the Department's review for necessity. | 07/01/2026 |
| **Construction Plans:** Submit construction plans (if construction is required for complying with effluent temperature limits) and include plans and specifications with the submittal. | 07/01/2027 |
| **Initiate Actions:** Initiate actions identified in the plan. | 01/01/2028 |
| **Complete Actions:** Complete actions necessary to achieve compliance with effluent temperature limits. | 07/01/2028 |

## Explanation of Compliance Schedules

Cooling Water Intake Structure Annual Certification Statement: The facility shall submit an annual certification statement as required by Section 1.3.3.1.

Mercury Pollutant Minimization Program: As a condition of the variance to the water quality based effluent limitation(s) for mercury granted in accordance with s. NR 106.145(6), Wis. Adm. Code.

PFOS/PFOA Determination of Need: The facility shall submit information in accordance with this schedule to allow for future calculations of determinations of need for PFOS and PFOA monitoring and limits.

Temperature limits: the facility is required to determine options to address temperature limits at outfall 006 and either perform operational changes or install treatment to come into compliance with temperature limits.

# Special Reporting Requirements

Not applicable.

# Other Comments:

None.

# Attachments:

A. Water Quality Based Effluent Limits

B. 316(b) surface water intake evaluation

# Proposed Expiration Date:

**September 30, 2028**

# Justification Of Any Waivers From Permit Application Requirements

**Not Applicable.**

**Prepared By:**

**Jonathan Hill  Wastewater Engineer**

**Date: June 18, 2024**

# CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: April 19, 2022

TO: Jonathan Hill – WY/3

FROM: Rachel Fritz – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the Dairyland Power Coop Alma Site WPDES Permit No. WI-0040223-09-0

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 Dairyland Power Coop Alma Site in Buffalo County. This facility discharges to the Mississippi River, located in the Mississippi River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

**Outfall 001-Condenser Cooling Water JPM**

| Parameter | Daily Maximum | Daily Minimum | Weekly Average | Monthly Average | Six-Month Average | Footnotes |
|---|---|---|---|---|---|---|
| Flow Rate | | | | | | 1 |
| pH | 9.0 s.u. | 6.0 s.u. | | | | |
| Temperature | | | | | | 1 |

**Outfall 006-Treated Process Wastewater**

| Parameter | Daily Maximum | Daily Minimum | Weekly Average | Monthly Average | Six-Month Average | Footnotes |
|---|---|---|---|---|---|---|
| Flow Rate | | | | | | 1 |
| TSS | 100 mg/L | | | 30 mg/L | | 2 |
| pH | 9.0 s.u. | 6.0 s.u. | | | | |
| Oil and Grease | 20 mg/L | | | 15 mg/L | | 2 |
| Phosphorus | | | | 0.19 mg/L | 0.064 mg/L<br>0.080 mg/L | 3 |
| Mercury | 4.6 ng/L | | | | | 4 |
| Temperature | | | | | | 5 |
| Chlorine | 38 µg/L | | | **38 µg/L** | | 6 |
| Iron | 1.0 mg/L | | | | | 2 |
| Copper | 100 ug/L<br>1.2 lbs/day | | | | | 2 |

Footnotes:

1. Monitoring only
2. These are categorical limits which are not addressed in this memo.
3. A phosphorus WQBEL well below criteria is required in accordance with s. NR 217.13(8), Wis. Adm. Code, because the relocated Outfall 006 is a new discharge of phosphorus to a phosphorus impaired water.
4. In the absence of a variance for mercury, a WQBEL of 1.3 ng/L as a monthly average and a corresponding mass limit would need to be included in the permit. An alternative effluent limitation of 4.6 ng/L as a daily maximum may be included in the permit in place of the WQBEL

if the mercury variance application that was submitted is approved by EPA. In months when Outfall 001 and 006 are combined, the variance limit will apply at an internal sampling point for the Outfall 006 discharge.

5. The following temperature limits are recommended in the reissued permit for Outfall 006:

| Month | Weekly Average Limit (°F) | Daily Maximum Limit (°F) |
|---|---|---|
| January | 59 | 86 |
| February | 59 | 87 |
| March | 59 | 87 |
| April | 58 | 90 |
| May | 69 | 89 |
| June | 77 | 90 |
| July | 82 | 90 |
| August | 80 | 89 |
| September | 76 | 89 |
| October | 63 | 88 |
| November | 54 | 89 |
| December | 59 | 90 |

6. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.

No WET testing is required because information related to the discharge indicates low to no risk for toxicity. The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, and additional limits are not required.

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

Attachments (3) – Narrative, Thermal Table & Maps

PREPARED BY: Rachel Fritz Date: 4/19/22

Rachel Fritz, Water Resources Engineer

E-cc: Geisa Thielen, Field Supervisor – WCR/Eau Claire
Jason Knutson, Wastewater Section Chief – WY/3
Diane Figiel, Water Resources Engineer – WY/3
Emma Lorenzen, Wastewater Engineer – WY/3

Attachment #1

**Water Quality-Based Effluent Limitations for**
**Dairyland Power Coop Alma Site**

**WPDES Permit No. WI-0040223-09-0**

Prepared by: Rachel Fritz

## PART 1 – BACKGROUND INFORMATION

**Facility Description:**
Dairyland Power Cooperative owns and operates the J.P. Madgett Unit coal-fired power station near Alma, Wisconsin. Previously the permittee operated Alma units 1-5 and J.P. Madgett Unit, however the final Alma unit was taken offline in October 2014.

The J.P. Madgett Unit has been in commercial operation since November 1979. The single unit station has a generating capacity of 400 MW of electricity. All discharges covered by this permit are to the Mississippi River with the exception of the coal pile runoff which would discharge to groundwater. The coal pile runoff lagoons would discharge to Outfalls 002 and 007. Over the current permit term, Outfall 007 has discharged one day in August 2016 and Outfall 002 has not discharged. The discharge from Outfall 006 is process wastewater treated by chemically assisted settling. De-icing water and intake and screen backwash water are diversions of cooling water and river water and are listed as Outfalls 003, 004, and 005 for reporting purposes. Non-contact condenser cooling water from J.P. Madgett is discharged via Outfall 001. This evaluation focuses on the discharges from Outfalls 001 and 006

The permit was modified in March 2021 to allow the Outfall 006 discharge to be rerouted to Outfall 001 in July and October in order to achieve additional mixing and meet temperature limits for Outfall 006. In the rest of the year, Outfall 006 is discharged separately.

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

**Existing Permit Limitations:** The current permit, which expired on March 31, 2022, includes the following effluent limitations and monitoring requirements.

**Outfall 001-Condenser Cooling Water JPM**

| Parameter | Daily Maximum | Daily Minimum | Monthly Average | Six-Month Average | Annual Average | Footnotes |
|---|---|---|---|---|---|---|
| Flow Rate | | | | | | 1 |
| pH | 9.0 s.u. | 6.0 s.u. | | | | 2 |
| Temperature | | | | | | 1 |

**Outfall 006-Treated Process Wastewater**

| Parameter | Daily Maximum | Daily Minimum | Monthly Average | Six-Month Average | Annual Average | Footnotes |
|---|---|---|---|---|---|---|
| Flow Rate | | | | | | 1 |
| TSS | 100 mg/L | | 30 mg/L | | | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| pH | 9.0 s.u. | 6.0 s.u. | | | | 2 |
| Oil and Grease | 20 mg/L | | 15 mg/L | | | 2 |
| Phosphorus | | | | | | 3 |
| Interim | | | | | 0.12 mg/L | |
| Effective Jan 2020 | | | 0.30 mg/L | 0.10 mg/L | | |
| Effective Jul 2021 | | | 0.19 mg/L | 0.064 mg/L<br>0.080 lbs/day | | |
| Mercury | 4.6 ng/L | | | | | |
| Temperature | | | | | | 4 |
| Iron | 1.0 mg/L | | | | | 2 |
| Copper | 100 ug/L<br>1.2 lbs/day | | | | | 2 |
| Acute WET | | | | | | 1 |
| Chronic WET | | | | | | 1 |

Footnotes:

1. Monitoring only
2. These limitations are not being evaluated as part of this review because they are categorical limits or because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed.
3. The current permit includes a compliance schedule to meet the WQBELs of 0.30 mg/L and 0.1 mg/L by January 1, 2020. More restrictive phosphorus limits which took effect July 1, 2021, were recalculated for the March 2021 permit modification allowing the Outfall 006 discharge to be rerouted to Outfall 001 in July and October.
4. The following temperature limits are included in the current permit with a compliance schedule to meet them by June 1, 2021.

| Month | Weekly Average Limit (°F) | Daily Maximum Limit (°F) |
|---|---|---|
| January | 59 | 86 |
| February | 59 | 87 |
| March | 60 | 87 |
| April | 60 | 90 |
| May | 69 | 89 |
| June | 77 | 90 |
| July | 83 | 90 |
| August | 80 | 89 |
| September | 76 | 89 |
| October | 63 | 88 |
| November | 54 | 89 |
| December | 59 | 90 |

**Receiving Water Information:**

- Name: Mississippi River. Outfall 001 is located on the main channel and Outfall 006 is located on a backwater of the Mississippi 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:
  Outfall 006: Because Outfall 006 discharges to a small backwater with little or no unidirectional flow, a ten-to-one dilution ratio is used for calculating effluent limitations based on chronic or long-term

impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code.

All other outfalls: The following 7-$Q_{10}$ and 7-$Q_2$ values are from USGS for Station 05378500 at Winona, MN, near where Outfall 001 is located.

7-$Q_{10}$ = 6,553 cfs (cubic feet per second)
7-$Q_2$ = 10,805 cfs
1-$Q_{10}$ = 5166 cfs
90-$Q_{10}$ = 9184 cfs (estimated at 85% of the 7-$Q_2$)
Harmonic Mean Flow = 30,527 cfs, calculated from flow data from 1993 to 2020.

Monthly Low flows were calculated by USGS using the 1970-2011 flow record from Lock and Dam 4:

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **7-$Q_{10}$ (cfs)** | 9220 | 9016 | 10158 | 22255 | 18152 | 14636 | 10102 | 7712 | 8378 | 9344 | 11061 | 7818 |

- Hardness = 144 mg/L as $CaCO_3$. This value represents the geometric mean of data from WET testing from 2018 to 2020 and SWIMs data from the Mississippi River at Lock at Dam # 4 at Alma
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%. A thermal mixing zone study dated January 21, 2013 demonstrated that an adequate zone of free passage exists for temperature at Outfall 001 as allowed in s. NR 106.06(4)(c)3, Wis. Adm. Code.
- Source of background concentration data: The permittee has submitted toxics monitoring results from the intake water with the permit application and these values are used as background concentrations in this evaluation. Mercury data from Mississippi River-Pool 4 – Lock and Dam 4 At Alma from 2003 to 2021 is also used in the evaluation. The numerical values are shown in the tables below.
- Multiple dischargers: The Alma WWTF discharges about 0.45 mi upstream from Outfall 001 but mixing zones are not expected to overlap given the large receiving water flow. Due to the amount of dilution available, mixing zones from the multiple discharges from Dairyland Power-Alma are not expected to overlap.
- Impaired water status: This segment of the Mississippi River is 303(d) listed as impaired for PCBs, mercury, phosphorus, and PFOS.
- Flow Rates: Based on flow data from November 2016 to October 2021. The maximum 365-day average flow rates are used in limit calculations in this evaluation.

| | 001 | 003 | 004 | 005 | 006 |
|---|---|---|---|---|---|
| Maximum 365-Day Average (MGD) | **233.81** | **0.729** | **0.393** | **24.09** | **0.167** |
| Peak Daily (MGD) | 322.60 | 1.84 | 0.992 | 25.23 | 0.998 |
| Peak 7-Day Average (MGD) | 322.60 | 1.84 | 0.992 | 24.36 | 0.619 |
| Peak 30-Day Average (MGD) | 322.60 | 1.84 | 0.992 | 24.23 | 0.332 |
| Overall Average (MGD) | 217.56 | 0.472 | 0.254 | 23.90 | 0.103 |

- Hardness = 141 mg/L as $CaCO_3$ at Outfall 001 and 458 mg/L as $CaCO_3$ at Outfall 006. These values represent the geometric mean of data from the permit application monitoring in 2021 and WET testing from 2015 and 2020.
- 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: Outfall 006 is supplied by onsite wells. The remaining outfalls are supplied by

Mississippi River intake with a small amount from other sources (<0.1% of total water use).

- Additives: Vitec 8200, sodium bisulfite, 25% sodium hydroxide, 12.5 % sodium hypochlorite, and sulfuric acid are used in the process wastewater discharged at Outfall 006. These are evaluated in Part 7.
- Effluent characterization: This facility is categorized as an industrial discharger, so the permit application required effluent sample analyses for all the "priority pollutants" except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for copper and mercury at Outfall 006 from November 2016 to October 2021 is also used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

| Sample Date | Outfall 001 Copper (µg/L) |
|---|---|
| 07/27/2021 | 4.28 |
| 08/03/2021 | 3.28 |
| 08/10/2021 | 2.29 |
| 08/17/2021 | 2.59 |
| Average | 3.11 |

The following table presents the average concentrations and loadings at Outfall 006 from November 2016 to October 2021 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

**Parameter Averages with Limits**

| | Average Measurement | Average Mass Discharged |
|---|---|---|
| TSS | 2.7 mg/L | |
| Oil and Grease | 0.074 mg/L* | |
| pH field | 8.62 s.u. | |
| Phosphorus | 0.038 mg/L* | 0.056 lbs/day* |
| Mercury | 1.24 ng/L* | |
| Iron | 0.039 mg/L* | |
| Copper | 1.5 ug/L* | 0.00061 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 99$^{th}$ 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)

**Daily Maximum Limit Calculation Method**

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. In accordance with s. NR 106.06(3)(b), limitations based on acute toxicity are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation below, whichever is more restrictive.

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

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.

In this case, limits set equal to two times the acute criteria are more restrictive and this method is used to calculate the daily maximum limits shown in the table below.

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

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

RECEIVING WATER FLOW = 5242 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. |
|---|---|---|---|---|---|---|---|---|
| Chlorine | | 19.0 | | 38.1 | 7.61 | **20** | | |
| Arsenic | | 340 | 2.4 | 674.8 | 135.0 | 1.3 | | |
| Cadmium | 457 | 58.9 | <0.48 | 117.8 | 23.6 | <0.48 | | |
| Chromium | 301 | 4446 | 1.69 | 8888.3 | 1778 | 1.69 | | |
| Copper | 458 | 65.2 | 0.92 | 128.5 | | | 5.16 | 5.70 |
| Lead | 356 | 365 | 0.36 | 728.6 | 145.7 | 0.32 | | |
| Mercury (ng/L) | | 830 | 1.67 | 1656.7 | | | 7.56 | 9.28 |
| Nickel | 268 | 1080 | <3.4 | 2160.6 | 432 | <3.4 | | |
| Zinc | 333 | 345 | <13 | 689.4 | 137.9 | <13 | | |
| Chloride (mg/L) | | 757 | 20.7 | 1472.6 | 295 | 9.1 | | |

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

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

**Weekly Average Limits based on Chronic Toxicity Criteria (CTC)**

RECEIVING WATER FLOW = 1638 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. | WEEKLY AVE. LIMIT | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. | 4-day $P_{99}$ |
|---|---|---|---|---|---|---|---|
| Chlorine | | 7.28 | | 46079.64 | 9215.93 | 20 | |
| Arsenic | | 152.2 | 2.4 | 948180 | 189635.9 | 1.3 | |
| Cadmium | 167 | 3.68 | <0.48 | 23293.00 | 4658.6 | <0.48 | |
| Chromium | 167 | 200.80 | 1.69 | 1260292 | 252058.5 | 1.69 | |
| Copper | 167 | 16.03 | 0.92 | 95631.3 | | | 2.70 |
| Lead | 167 | 45.90 | 0.36 | 288251.3 | 57650.3 | 0.32 | |
| Mercury (ng/L) | | 440 | 1.67 | 2774464 | | | 4.09 |
| Nickel | 167 | 80.44 | <3.4 | 509155 | 101830.9 | <3.4 | |
| Zinc | 167 | 188.23 | <13 | 1191424 | 238284.9 | <13 | |
| Selenium | | 5.00 | 0.65 | 27534.50 | 5506.90 | 4.8 | |
| Chloride (mg/L) | | 395 | 20.7 | 2369198 | 473839.5 | 9.1 | |

**Monthly Average Limits based on Wildlife Criteria (WC)**

RECEIVING WATER FLOW = 2296 cfs (¼ of the 90-$Q_{10}$), as specified in s. NR 106.06(4), Wis. Adm. Code

| SUBSTANCE | WC | MEAN BACK-GRD. | MO'LY AVE. LIMIT | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. | 30-day $P_{99}$ |
|---|---|---|---|---|---|---|
| Mercury (ng/L) | 1.3 | 1.67 | 1.3 | | | **2.07** |

**Monthly Average Limits based on Human Threshold Criteria (HTC)**

RECEIVING WATER FLOW = 7632 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

| SUBSTANCE | HTC | MEAN BACK-GRD. | MO'LY AVE. LIMIT | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. | 30-day $P_{99}$ |
|---|---|---|---|---|---|---|
| Antimony | 373 | .34 | 1.10E+07 | 2.20E+06 | 0.33 | |
| Cadmium | 370 | 0.00 | 1.09E+07 | 2.18E+06 | <0.48 | |
| Chromium (+3) | 3818000 | 1.69 | 1.13E+11 | 2.25E+10 | 1.69 | |
| Lead | 140 | 0.36 | 4.12E+06 | 8.23E+05 | 0.32 | |
| Mercury (ng/L) | 1.5 | 1.67 | 1.5 | | | **2.07** |
| Nickel | 43000 | 0.00 | 1.27E+09 | 2.54E+08 | <3.4 | |
| Selenium | 2600 | .65 | 7.66E+07 | 1.53E+07 | 4.80 | |

**Monthly Average Limits based on Human Cancer Criteria (HCC)**

RECEIVING WATER FLOW = 7632 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

| SUBSTANCE | HCC | MEAN BACK-GRD. | MO'LY AVE. LIMIT | 1/5 OF EFFL. LIMIT | MEAN EFFL. CONC. |
|---|---|---|---|---|---|
| Arsenic | 13.3 | 2.4 | 321364.2 | 64272.84 | 1.3 |

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

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

Total Residual Chlorine – Because chlorine is added in the discharge from Outfall 006, effluent limitations are recommended to assure proper dechlorination. Specifically, a **daily maximum limit of 38 µg/L is required**. Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required. Weekly average limitations are not needed based on reasonable potential as the daily maximum limitations will provide adequate protection of the resource. Additionally, **a monthly average limit of 38 µg/L is required** to meet the expression of limits requirements in s. NR 106.07(4), Wis. Adm. Code.

Mercury – The 30-day $P_{99}$ of representative data is 1.64 ng/L, which is greater than the most stringent limit (wildlife criterion of 1.3 ng/L); therefore, a limit is required for mercury.

The current permit includes a mercury variance with an alternative effluent limit of 4.6 ng/L at Outfall 006. Section NR 106.145(4), Wis. Adm. Code, allows for eligibility for an alternative mercury effluent limitation if the permittee applies for an alternative mercury limit, which includes the submittal of a pollutant minimization plan. The permittee has submitted this application. The effluent mercury monitoring data from April 2017 to October 2021 is summarized below. Data from prior to April 2017 was excluded because no field blanks were reported during this time and sufficient data with field blanks is available since this date to characterize the effluent (s. NR 106.14(9), Wis. Adm. Code).

| | **Mercury ng/L** |
|---|---|
| 1-day $P_{99}$ | 5.66 |
| 4-day $P_{99}$ | 3.08 |
| 30-day $P_{99}$ | 1.64 |
| Mean | 1.05 |
| Std | 1.17 |
| Sample size | 54 |
| Range | <0.2 – 6.13 |

Because the discharge from Outfall 006 is rerouted upstream during two months of the year, the combined discharge of Outfall 001 and 006 is considered a new discharge during these months. The mercury variance for Outfall 006 needs to meet the following requirement for variances:

> **40 CFR 131.14(b)1ii** "…The requirements shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(*2*) of this section…"

Moving the discharge from Outfall 006 upstream or to another location not on the current discharge flow path could potentially lower water quality at those locations depending on the existing instream mercury concentration.

To determine if relocating the discharge upstream lowers water quality at that location, effluent concentrations must be compared to the instream mercury concentrations at the upstream site. Mercury data from the Mississippi River at Lock and Dam 4 in Alma from the SWIMS database (2003 to 2021) is summarized below.

| | Mississippi River Pool 4 at Alma (Station 63029) | Outfall 006 |
|---|---|---|
| Sample Count | 74 | 44 |
| Average | 2.07 ng/L | 1.05 ng/L |
| Geomean | 1.67 ng/L | 0.78 ng/L |
| 1-day $P_{99}$ | 6.87 ng/L | 5.66 ng/L |
| Range | <0.14 – 6.46 ng/L | <2 – 6.13 ng/L |

Based on this comparison, it appears that effluent mercury concentrations are lower than instream mercury concentrations, and the relocated Outfall 006 discharge does not cause a lowering of water quality at the upstream location in the Mississippi River. Therefore, the discharge from Outfall 006 is still eligible for a mercury variance.

Section NR 106.145(5), Wis. Adm. Code, specifies that an alternative limitation shall equal the 1-day $P_{99}$ of the effluent data, and shall be expressed as a daily maximum concentration. Additionally, an alternative effluent limit for mercury may not be set greater than a previously established alternative mercury effluent limit unless previous monitoring was not representative of the discharge. Both the calculated 1-day $P_{99}$ of effluent data of 5.66 ng/L and the 1-day $P_{99}$ of receiving water data of 6.87 ng/L are greater than the current alternative effluent limit of 4.6 ng/L. Therefore, if a variance is granted and approved by US Environmental Protection Agency **an alternative mercury limitation of 4.6 ng/l, expressed as a daily maximum, is recommended.**

In the absence of a mercury variance, mass limits and additional concentration limits to meet the expression of limits requirements in s. NR 106.07, Wis. Adm. Code, would be required.

The mercury variance limit applies only to the process discharge associated with Outfall 006. The current Outfall 001 discharge is non-contact cooling water sourced from the receiving water with no additives, so no mercury contribution is expected from this discharge. When the discharge from Outfall 006 is combined with Outfall 001, monitoring should be performed on only the Outfall 006 discharge for compliance with the mercury variance limit.

## 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. Given the fact that Dairyland Power-Alma does not currently have ammonia

nitrogen limits, the need for limits is evaluated at this time. Ammonia monitoring data provided with the permit application is summarized in the table below.

| Outfall 001 | | Outfall 006 | |
|---|---|---|---|
| Sample Date | Ammonia Nitrogen mg/L | Sample Date | Ammonia Nitrogen mg/L |
| 07/27/2021 | <0.14 | 08/10/2021 | <0.14 |
| 08/03/2021 | <0.14 | 08/13/2021 | <0.14 |
| 08/10/2021 | <0.14 | 08/17/2021 | <0.14 |
| 08/17/2021 | <0.14 | 08/24/2021 | <0.14 |

Ammonia-nitrogen was not detected in the monitoring at either Outfall 001 or 006. No limits or additional monitoring are recommended in the reissued permit.

## PART 4 – PHOSPHORUS

Outfall 001 – There are no phosphorus limits or monitoring data at Outfall 001. Phosphorus limits are not calculated for this discharge because the discharge is noncontact cooling water sourced from receiving water intake with no sources of phosphorus (s. NR 217.10(2), Wis. Adm. Code). The remainder of this section evaluates the need for phosphorus limits at Outfall 006.

**Technology-Based Effluent 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 12-month rolling average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because Dairyland Power-Alma currently has a monthly average WQBEL of 0.19 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

**Water Quality Based Effluent Limit**
Because Outfall 006 is rerouted upstream in part of the year, the discharge is considered a "new discharger" under NR 217.11(3) Wis. Adm. Code. Section NR 217.13(8) states "If a new discharger is proposing a discharge of phosphorus to a receiving or downstream water that is a phosphorus impaired water, the new discharger may not discharge phosphorus except as follows:

1. The new discharger of phosphorus is allocated part of the reserve capacity or part of the wasteload allocation in an EPA approved TMDL;
2. The new discharger can demonstrate the new discharge of phosphorus will improve water quality in the phosphorus impaired segment; or
3. The new discharger can demonstrate that the new phosphorus load will be offset through a phosphorus trade or other means with another discharge of phosphorus to the 303 (d) listed water. The offset must be approved by the Department and must be implemented prior to discharge."

The discharger is not located in a TMDL, so Option 1 is not possible in this situation. The permittee can either discharge at a concentration that improves water quality or offset the discharged phosphorus load from Outfall 006 through water quality trading. The current permit includes limits which will improve water quality under Option 2.

Section 2.07 of the Department's *Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges* references two methodologies for making this type of demonstration: (a) perform an analysis showing water quality criteria is being improved or attained, or (b) discharge at an effluent concentration well below the criteria. The first option requires the applicant to submit sufficient analysis through modeling and monitoring demonstrating that the discharge will reduce in stream phosphorus concentrations with a goal of attaining water quality criteria. The modeling analysis should quantify sources of phosphorus on a mass basis similar to a TMDL analysis. The permittee has not submitted such an analysis with the permit application.

In lieu of such an analysis, the applicant may choose to discharge phosphorus well below the criteria. The policy of established effluent limitations well below the applicable phosphorus criteria for new dischargers is supported in EPA's approval letter of ch. NR 217, Wis. Adm. Code (dated 7/25/2012).

In accordance with the guidance, a three-part analysis was conducted to determine appropriate limitations for a new phosphorus discharger to a phosphorus impaired water body considering USEPA Ecoregion concentrations, environmental phosphorus zones, and breakpoint analyses used to derive the statewide total phosphorus criteria. The US EPA ecoregion recommendation for estimated background phosphorus concentrations in the Driftless Area is 0.057 mg/L, and the estimate for environmental phosphorus zone 4 at the point of discharge is 0.055 mg/L. For large rivers such as the Mississippi River, the critical biological breakpoint of concern is suspended chlorophyll *a*, which has a phosphorus breakpoint of 0.064 mg/L. The guidance recommends that the applicable phosphorus limitation be set equal to the highest of the three values. Therefore, **a water quality-based effluent concentration limit of 0.064 mg/L, based upon the US EPA ecoregion, is recommended at Outfall 006.**

Option 3 allows for water quality trading to meet this limit. If pursued, the trading plan would need to offset the difference between the total discharged phosphorus load and a discharge at the level well below criteria limit of 0.064 mg/L.

**Effluent Data**
The following table summarizes effluent total phosphorus monitoring data from Outfall 006 from November 2016 to October 2021.

| | **Phosphorus mg/L** |
|---|---|
| 1-day $P_{99}$ | 0.50 |
| 4-day $P_{99}$ | 0.30 |
| 30-day $P_{99}$ | 0.20 |
| Mean | 0.15 |
| Std | 0.10 |
| Sample size | 23 |
| Range | 0.05 - 0.50 |

**Reasonable Potential Determination**
The discharge has reasonable potential to cause or contribute to an exceedance of the water quality criterion because the 30-day $P_{99}$ of reported effluent total phosphorus data is greater than the calculated WQBEL of 0.064 mg/L**.** Therefore, **a WQBEL is required.**

**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 **0.064 mg/L may be expressed as a six-month average**. This code specifies that the limit should be expressed as a six-month average and not an annual average. If a concentration limitation expressed as a six-month average is included in the permit, **a monthly average concentration limitation of 0.19 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.

**Mass Limits**
Because the discharge is to an impaired water, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. The mass limit of 0.080 lbs/day in the current permit was calculated based on an effluent flow rate of 0.15 MGD (0.064 mg/L × 8.34 × 0.15 MGD = 0.080 lbs/day). The effluent flow rate has increased slightly to 0.167 MGD, which would correspond to a higher phosphorus mass limit. However, to allow an increase in a limit above an existing limit the facility must demonstrate the need for the higher limits consistent with s. NR 207.04(1), Wis. Adm. Code and meet the anti-backsliding requirements in s NR 207.12, Wis. Adm. Code. This would require one of the two conditions under s. NR 207.12(3)(a)2 to be met. Neither of these conditions are met and therefore **the current phosphorus mass limit of 0.080 lbs/day should be continued in the reissued permit.**

This mass limit should be expressed as a six-month average. During months when Outfall 006 is combined with Outfall 001, the phosphorus limits should be applied at an internal sampling point with just the 006 discharge, since Outfall 001 is not expected to contribute a phosphorus load to the receiving water.

## PART 5 – 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.

The current permit includes the following temperature limits at Outfall 006:

| Month | Weekly Average Limit (°F) | Daily Maximum Limit (°F) |
|---|---|---|
| January | 59 | 86 |
| February | 59 | 87 |
| March | 60 | 87 |
| April | 60 | 90 |
| May | 69 | 89 |
| June | 77 | 90 |
| July | 83 | 90 |
| August | 80 | 89 |
| September | 76 | 89 |
| October | 63 | 88 |

| | | |
|---|---|---|
| November | 54 | 89 |
| December | 59 | 90 |

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 November 2016 to October 2021.

**Outfall 001:**

The table below summarizes the maximum temperatures from Outfall 001 based on data reported during monitoring from November 2016 to October 2021. Because the flow rates from Outfall 006 are very small in comparison to Outfall 001, the flow and temperature of the discharge contribution from Outfall 006 does not have a significant impact on the limits or reasonable potential in the months when Outfall 006 is routed to Outfall 001.

| 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 | 73 | 77 | NA | 120 |
| FEB | 70 | 73 | NA | 120 |
| MAR | 70 | 80 | NA | 120 |
| APR | 86 | 92 | NA | 120 |
| MAY | 88 | 100 | 105 | 120 |
| JUN | 107 | 112 | **100** | 120 |
| JUL | 104 | 118 | **100** | 120 |
| AUG | 101 | 101 | **93** | 120 |
| SEP | 92 | 95 | 94 | 120 |
| OCT | 80 | 87 | 94 | 120 |
| NOV | 80 | 86 | NA | 120 |
| DEC | 74 | 76 | NA | 120 |

**Outfall 006:**

The table below summarizes the maximum temperatures from 006 based on data reported during monitoring from November 2016 to October 2021. Because Outfall 006 discharges to a backwater and not the main channel, temperature limits assuming dilution with the main channel are not appropriate for this discharge. Instead limits for Outfall 006 are calculated using the procedures for shore discharge to inland lakes in s. NR 106.55(7)(b), Wis. Adm. Code, and the temperature criteria and assumed background concentration for the Mississippi River in Table 3 of ch. NR 102, Wis. Adm. Code.

Attachment #1

| 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 | 65 | 79 | **62** | 96 |
| FEB | 45 | 53 | 71 | 95 |
| MAR | 60 | 62 | **59** | 93 |
| APR | 68 | 78 | **58** | 92 |
| MAY | 89 | 93 | **70** | **91** |
| JUN | 88 | 94 | **77** | **90** |
| JUL | 96 | 96 | **82** | **90** |
| AUG | 95 | 101 | **82** | **89** |
| SEP | 94 | 99 | **78** | **91** |
| OCT | 76 | 85 | **67** | 101 |
| NOV | 70 | 74 | **54** | 93 |
| DEC | 59 | 67 | 63 | 96 |

**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

**Outfall 001:**
Based on the comparison of effluent data to the calculated limits, the discharge from Outfall 001 would trigger weekly average temperature limits in June, July, and August. However, the thermal mixing zone study dated January 21, 2013 demonstrated that the plume from Outfall 001 occupies a small percentage of the river width and an adequate zone of free passage exists in accordance with s. NR 106.06(4)(c)3, Wis. Adm. Code. The discharge volume from Outfall 006 is relatively very small compared to Outfall 001 (0.15 MGD versus 232.7 MGD) and the mixing zone study findings are not expected to be significantly different in the months when Outfall 006 discharge is combined with Outfall 001.

Therefore, the department expects that an adequate zone of free passage will exist and **no temperature**

**limits are required in the permit at Outfall 001.** Temperature monitoring should continue at Outfall 001.

**Outfall 006:**
Based on the comparison of effluent data to the calculated limits, the discharge from Outfall 006 triggers weekly average temperature limits in January and March through November and daily maximum limits in May through September. The current permit includes daily maximum and weekly average limits year-round. The current permit limits are more restrictive than the calculated limits in all but three months. The weekly average limits in March, April, and July are calculated to be slightly more restrictive due to an increase in effluent flow rates during those months. All other temperature limits in the current permit should remain unchanged in the reissued permit. **The updated temperature limits are summarized in the table below.**

| Month | Weekly Average Limit (°F) | Daily Maximum Limit (°F) |
|---|---|---|
| January | 59 | 86 |
| February | 59 | 87 |
| March | 59* | 87 |
| April | 58* | 90 |
| May | 69 | 89 |
| June | 77 | 90 |
| July | 82* | 90 |
| August | 80 | 89 |
| September | 76 | 89 |
| October | 63 | 88 |
| November | 54 | 89 |
| December | 59 | 90 |

*Updated from the current permit.

## PART 6 – 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 (October 29, 2019).*

Outfall 001 is comprised solely of noncontact cooling water with no additives. Outfalls 002 and 007 are coal pile runoff which may discharge when there's overflow, but this has never occurred at either outfall. Outfalls 003 (intake screen backwash), 004 (fish return), and 005 (De-icing water) are comprised of untreated intake water only and are not expected to contribute toxicity. These discharges do not have a history of WET failures and no toxic compounds are expected at levels of concern. Since there is believed to be a very low risk of toxicity, WET testing is not recommended at Outfalls 001, 002, 003, 004, 005, and 007 during the reissued permit term.

Outfall 006:

Chronic testing is usually not recommended where the ratio of the 7-$Q_{10}$ to the effluent flow exceeds 100:1 and acute testing is not typically recommended if the ratio exceeds 1000:1. For Dairyland Power-Alma, that ratio is approximately 6300:1. With this amount of dilution, there is believed to be little potential for acute or chronic toxicity effects in the Mississippi River associated with the discharge from Outfall 006, so the need for acute and chronic WET testing will not be considered further.

For informational purposes, recent available WET data for Outfall 006 is shown in the table below. There has been one chronic detect result, but this would not trigger a chronic WET limit due to the high level of dilution available.

**WET Data History – Outfall 006**

| 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 | Pass or Fail? | Use in RP? | |
| 05/19/2006 | >100 | >100 | Pass | Yes | | | | | |
| 11/14/2007 | >100 | >100 | Pass | Yes | | | | | |
| 11/05/2008 | >100 | | Pass | Yes | | | | | |
| 12/16/2009 | >100 | >100 | Pass | No | | | | | 1 |
| 11/03/2010 | >100 | >100 | Pass | No | | | | | 1 |
| 12/07/2011 | >100 | >100 | Pass | Yes | | | | | |
| 04/18/2012 | >100 | >100 | Pass | Yes | | | | | |
| 05/22/2013 | >100 | >100 | Pass | Yes | | | | | |
| 06/11/2014 | >100 | >100 | Pass | Yes | | | | | |
| 06/24/2015 | >100 | >100 | Pass | Yes | | | | | |
| 07/13/2016 | >100 | >100 | Pass | Yes | | | | | |
| 02/20/2018 | >100 | >100 | Pass | Yes | >100 | 57.3 | Pass | Yes | |
| 04/28/2020 | >100 | >100 | Pass | Yes | >100 | >100 | Pass | Yes | |

Footnotes:

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

## PART 7 – ADDITIVE REVIEW

Unlike the metals and toxic substances evaluated in Part 2, most additives have not undergone the amount of toxicity testing needed to calculate water quality criteria. Instead, in cases where the minimum data requirements necessary to calculate a WQC are not met, a secondary value can be used to regulate the substance, according to s. NR 105.05, Wis. Adm. Code. Whenever an additive is discharged directly into a surface water without receiving treatment or an additive is used in the treatment process and is not expected to be removed before discharge, a review of the additive is needed. Secondary values should be derived according to s. NR 105.05, Wis. Adm. Code. Guidance related to conducting an additive review can be found in *Water Quality Review Procedures for Additives* (2019) (http://dnr.wi.gov/topic/wastewater/Guidance.html).

Five additives may be present in the discharge from Outfall 006: Vitec 8200, sodium bisulfite, 25% sodium hydroxide, 12.5 % sodium hypochlorite, and sulfuric acid. Use restrictions are not required for sulfuric acid, sodium bisulfite, and sodium hydroxide as the use of these products will be sufficiently limited by the pH limits at Outfall 006. Similarly, sodium hypochlorite usage will be limited by the chlorine limits recommended in the reissued permit and secondary values are not needed.

Vitec 8200 is an anti-scalant with a proposed usage rate of 0.25 gal/day. At this usage and the effluent flow rate of 0.167 MGD, the estimated discharge concentration would be 1.49 mg/L. The secondary acute value for this product is 12.5 mg/L based on the toxicity data provided by the manufacturer. The secondary chronic value is 0.69 mg/L and the corresponding weekly average chronic limitation would be 4990 mg/L. The estimated discharge concentration is well below both limits. Therefore use of Vitec 8200 is approved at this dosage rate and no usage restriction is recommended in the reissued permit.

## Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

| | | | | | | Temp Dates | Flow Dates |
|---|---|---|---|---|---|---|---|
| **Facility:** | Dairyland Power-Alma | | **7-$Q_{10}$:** | 6553.00 | cfs | | |
| **Outfall(s):** | 001 | | **Dilution:** | 25% | | **Start:** | 11/01/16 | 11/01/16 |
| **Date Prepared:** | 12/08/2021 | | **f:** | 1 | | **End:** | 10/31/21 | 10/31/21 |
| **Design Flow (Qe):** | 233.81 | MGD | **Stream type:** | Large warm water sport or forage fish co | | | |
| **Storm Sewer Dist.** | 0 | ft | **Qs:Qe ratio:** | 4.5 | :1 | | |
| | | | **Calculation Needed?** | YES | | | |

| Month | Water Quality Criteria | | | Receiving Water Flow Rate (Qs) | Representative Highest Effluent Flow Rate (Qe) | | f | Representative Highest Monthly Effluent Temperature | | Calculated Effluent Limit | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ta (default) | Sub-Lethal WQC | Acute WQC | | 7-day Rolling Average (Qesl) | Daily Maximum Flow Rate (Qea) | | Weekly Average | Daily Maximum | Weekly Average Effluent Limitation | Daily Maximum Effluent Limitation |
| | (°F) | (°F) | (°F) | (cfs) | (MGD) | (MGD) | | (°F) | (°F) | (°F) | (°F) |
| JAN | 33 | 49 | 76 | 9220 | 138.057 | 141.000 | 1 | 73 | 77 | NA | 120 |
| FEB | 33 | 50 | 76 | 9016 | 138.057 | 141.000 | 1 | 70 | 73 | NA | 120 |
| MAR | 36 | 52 | 76 | 10158 | 161.300 | 161.300 | 1 | 70 | 80 | NA | 120 |
| APR | 46 | 55 | 79 | 22255 | 227.400 | 322.600 | 1 | 86 | 92 | NA | 120 |
| MAY | 60 | 65 | 82 | 18152 | 322.600 | 322.600 | 1 | 88 | 100 | 105 | 120 |
| JUN | 71 | 75 | 85 | 14636 | 322.600 | 322.600 | 1 | 107 | 112 | **100** | 120 |
| JUL | 75 | 80 | 86 | 10102 | 322.600 | 322.600 | 1 | 104 | 118 | **100** | 120 |
| AUG | 74 | 79 | 86 | 7712 | 322.600 | 322.600 | 1 | 101 | 101 | **93** | 120 |
| SEP | 65 | 72 | 84 | 8378 | 322.600 | 322.600 | 1 | 92 | 95 | 94 | 120 |
| OCT | 52 | 61 | 80 | 9344 | 322.600 | 322.600 | 1 | 80 | 87 | 94 | 120 |
| NOV | 39 | 50 | 77 | 11061 | 171.300 | 249.600 | 1 | 80 | 86 | NA | 120 |
| DEC | 33 | 49 | 76 | 7818 | 161.614 | 163.000 | 1 | 74 | 76 | NA | 120 |

## Temperature limits for receiving waters without unidirectional flow

(calculation using default ambient temperature data)

**Facility:** Dairyland Power-Alma

**Outfall(s):** 006

**Date Prepared:** 12/08/2021

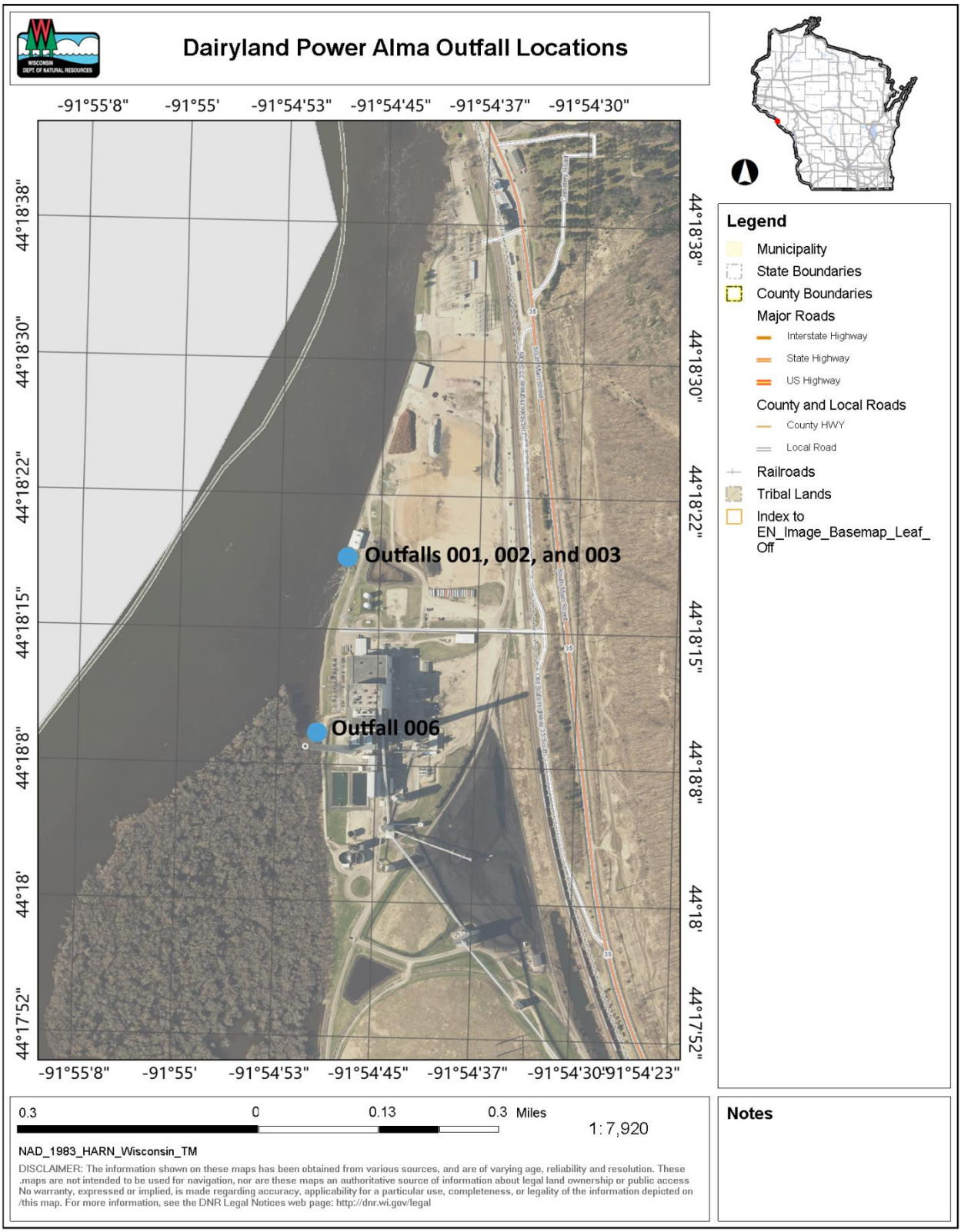
**Design Flow (Qe):** 0.16730359 MGD

**Lake Type:** Southern Inland Lakes

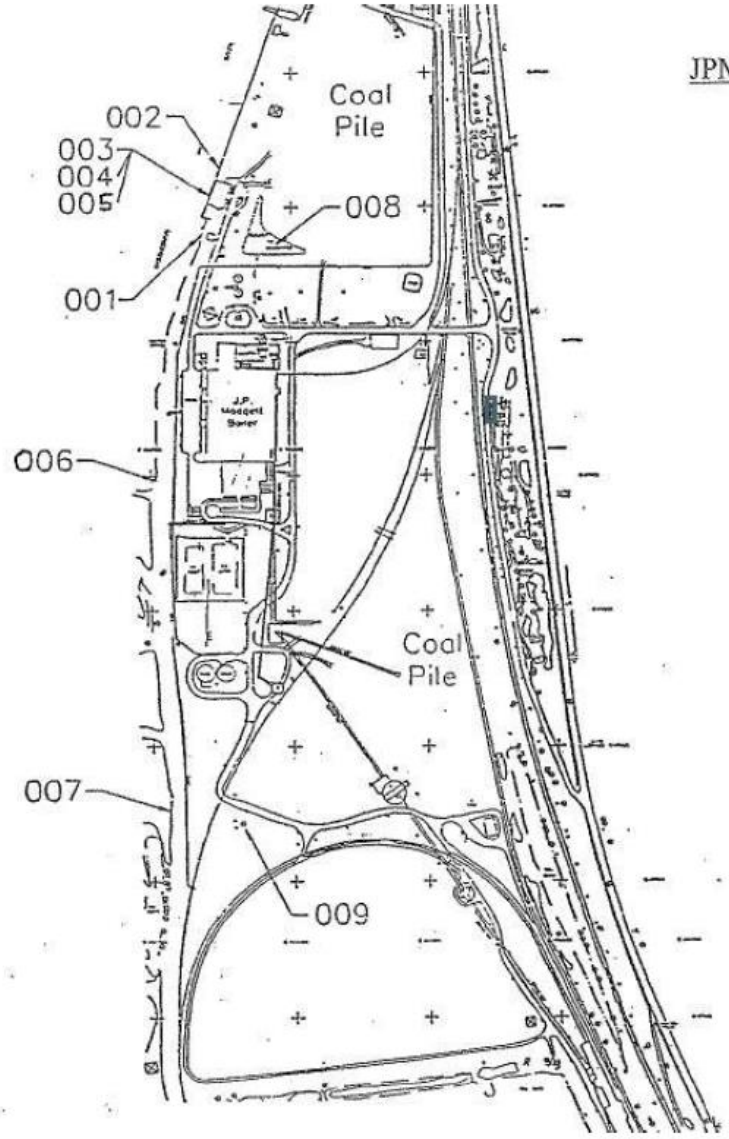
**Discharge Type:** Inland lake or impoundment shore discharge

**Maximum area of mixing zone allowed (coefficient "A"):** 15,708 $ft^2$

| Month | Water Quality Criteria | | | Representative Highest Effluent Flow Rate (Qe) | | B | $e^{-a}$ (for SL-WQBEL) | $e^{-a}$ (for A-WQBEL) | 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) | (MGD) | (MGD) | | | | (°F) | (°F) | (°F) | (°F) |
| JAN | 32 | 49 | 75 | 0.38 | 0.56 | 0.405 | 0.560 | 0.677 | 65 | 79 | **62** | 96 |
| FEB | 33 | 50 | 76 | 0.27 | 0.59 | 0.405 | 0.452 | 0.692 | 45 | 53 | 71 | 95 |
| MAR | 36 | 52 | 76 | 0.61 | 0.61 | 0.405 | 0.702 | 0.702 | 60 | 62 | **59** | 93 |
| APR | 47 | 55 | 79 | 0.62 | 0.62 | 0.405 | 0.704 | 0.704 | 68 | 78 | **58** | 92 |
| MAY | 60 | 65 | 82 | 0.39 | 0.75 | 0.555 | 0.513 | 0.706 | 89 | 93 | **70** | **91** |
| JUN | 72 | 75 | 85 | 0.52 | 0.87 | 0.667 | 0.571 | 0.715 | 88 | 94 | **77** | **90** |
| JUL | 76 | 80 | 86 | 0.62 | 0.83 | 0.667 | 0.623 | 0.703 | 96 | 96 | **82** | **90** |
| AUG | 76 | 79 | 86 | 0.45 | 1.00 | 0.667 | 0.523 | 0.747 | 95 | 101 | **82** | **89** |
| SEP | 67 | 73 | 84 | 0.42 | 0.76 | 0.555 | 0.535 | 0.709 | 94 | 99 | **78** | **91** |
| OCT | 54 | 61 | 81 | 0.33 | 0.40 | 0.405 | 0.523 | 0.577 | 76 | 85 | **67** | 101 |
| NOV | 40 | 50 | 77 | 0.60 | 0.60 | 0.405 | 0.694 | 0.694 | 70 | 74 | **54** | 93 |
| DEC | 33 | 49 | 76 | 0.35 | 0.57 | 0.405 | 0.533 | 0.685 | 59 | 67 | 63 | 96 |


Dairyland Power Alma Outfall Locations
WISCONSIN DEPT OF NATURAL RESOURCES
-91°55'8"
-91°55'
-91°54'53"
-91°54'45"
-91°54'37"
-91°54'30"
-91°54'23"
44°18'38"
44°18'30"
44°18'22"
44°18'15"
44°18'8"
44°18'
44°17'52"
Outfalls 001, 002, and 003
Outfall 006
Legend
Municipality
State Boundaries
County Boundaries
Major Roads
Interstate Highway
State Highway
US Highway
County and Local Roads
County HWY
Local Road
Railroads
Tribal Lands
Index to EN_Image_Basemap_Leaf_Off
0.3
0
0.13
0.3 Miles
1:7,920
NAD_1983_HARN_Wisconsin_TM
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These .maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access No warranty, expressed or implied, is made regarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on /this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal
Notes

Attachment #3




JPM Outfalls

001 – Condenser Cooling Water
002 – Coal Pile Runoff
003 – Intake Screen Backwash
004 – Fish and Debris Return
005 – Intake Deice Water
006 – Low Volume Waste, Boiler Blowdown, [redacted] Metal Cleaning Wastewater, and Phase IV Leachate
007 – Coal Pile Runoff
008 – Coal Pile Runoff and Lagoon Seepage
009 – Coal Pile Runoff and Lagoon Seepage

North

Scale (feet)
500 0 500

# Appendix B

Dairyland Power Co-op: Alma Water Intake Structure BTA Determination

## 1. Executive Summary

Dairyland Power Co-op Alma (DLP Alma) operates a modified traveling screen which the department has determined does not meet best technology available (BTA) for impingement and entrainment. In order to support the use of the modified traveling screens as BTA for controlling impingement mortality per s. NR 111.12(1)(a)5., Wis. Adm. Code, the facility was required to perform a 2-year water intake optimization study. The permittee will operate the traveling screen during this permit term in an optimized manner, in accordance with the department's findings after reviewing the study results. To ensure the intake structure is optimized to minimize entrainment and impingement the modified traveling screens shall be operated with either continuous rotation at 2.4 meters per minute or with holds, and the spray pressure shall be 20 psi under all circumstances except during limited periods when removal of debris or ice necessitates a higher spray pressure.

This intake structure meets BTA for impingement mortality based on s. NR 111.12(1)(a)5., Wis. Adm. Code, when operated as per the optimization requirements listed above, and meets BTA for entrainment based on s. NR 111.13, Wis. Adm. Code.

Section 316(b) of the Clean Water Act requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact. The BTA determination for this CWIS is based on the required information submitted for a facility that withdraws greater than 2 MGD Design Intake Flow (DIF) and less than or equal to 125 MGD Actual Intake Flow (AIF) and uses greater than 25% of water withdrawn exclusively for cooling purposes. Dairyland Power Alma is considered an existing facility for purposes of the rule because construction of the facility commenced prior to January 17, 2002 (s. NR 111.02(3)(a), Wis. Adm. Code). The department has concluded that Dairyland Power Alma is subject to ch. NR 111, Wis. Adm. Code both because its DIF is greater than 2 MGD and because greater than 25% of the water it withdraws is utilized solely for cooling purposes (99%).

The permittee has elected to comply with the impingement mortality BTA by use of modified traveling screens and has completed an optimization study. The WPDES permit will require the permittee to operate the modified traveling screens in accordance with the department's findings after reviewing the results of that study.

The department must establish BTA standards for entrainment reduction for the intake on a site-specific basis (s. NR 111.13, Wis. Adm. Code). "These standards shall reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in subs. (2) and (3)." (s. NR 111.13, Wis. Adm. Code). After consideration of the factors specified in s. NR 111.13(2) and (3), Wis. Adm. Code, the department has concluded that Dairyland Power Alma's (DLP) CWIS is considered the best technology available to achieve the maximum reduction in entrainment.

The BTA determination will be reviewed at the next permit reissuance and at subsequent reissuances in accordance with ch. NR 111, Wis. Adm. Code, as applicable. In subsequent permit reissuance applications, the permittee shall provide all the information required in s. NR 111.40(2)(b), Wis. Adm. Code, unless a request to reduce the information required has been submitted by the permittee and accepted by the department, as allowed by s. NR 111.42(1)(a), Wis. Adm. Code.

## 2. Water Intake Description and Background

Dairyland Power Alma operates a coal-fired power plant located on the Wisconsin River at Alma, Wisconsin. The facility uses the Wisconsin River as the source of once-through cooling water while it uses municipal water and well water for facility processes and sanitary purposes. Dairyland Power Alma withdraws an average of 219.2 MGD and a maximum annual average of 229.6 MGD, based on historical data from Outfall 001 that consists of the noncontact cooling water, process wastewater, and other low volume.

Intake flows vary throughout the year; the intake consists of two pumps, pump 6-1 and pump 6-2. From 2014 through 2018 the average percent of days pump 6-1 was used was 68% and the average percent of days pump 6-2 was used 63%. Generally, the pumps are not used in tandem except when operational needs warrant it. The maximum design intake volume for this structure is 322.6 MGD based on each pump's design capacity of 161.28 MGD.

DLP has one CWIS that is located approximately 1.5 miles downstream of USACE Lock and Dam No. 4 on the east bank of the Mississippi River at RM 751.2. The CWIS provides water for one, 400-megawatt coal-fired unit at Madgett, Unit 6. The DLP CWIS has four forebays with a skimmer wall, trash rack, and traveling screens which feed two pump bays. A skimmer wall is located at the face of the intake and extends down to El. 659.0 ft above sea level, approximately 1 ft below normal pool level. The invert of the structure is El. 640.0 ft. A steel trash rack with 4.0-inch openings prevents large debris from entering the intake bays. One Hydrolox$^{TM}$ traveling screen is located in each bay about 40 ft upstream of the circulating water pumps. The 14-ft wide through-flow traveling screens have an invert of El. 640.0 ft, 3/8-inch square openings, and extended basket frames to help carry fish to the return sluiceway. The screens have three possible rotation speeds, 1.3, 7.8, and 10.4 feet per minute (ft/min). A dual pressure spray wash system is intended to increase survival of impinged fish. The low-pressure spray operates at 121 gallons per minute (gpm) at 40 pounds per square inch (psi), to gently wash fish from the screens into a fish return sluiceway. The high-pressure sprays operate at 406 gpm and 100 psi to remove debris. From 2014 through 2018, the average annual operating hours for pumps 6-1 and 6-2 are 5,977 hours and 5,502 hours, respectively, which equates to an average of about 16 hours a day.

The intake structure at DLP Alma consists of the following:

Type of Pumps: vertical, mixed-flow

Pump Rating: 249.5 cfs (112,000 gpm) at 37 ft head; only one pump is operated from November 1–April 1.

Actual Intake Flow = 219.2 MGD average intake

Maximum Annual Intake Flow = 229.6 MGD

Design Intake Flow = 322.6 MGD

Source Water: Mississippi River in Alma Wisconsin

Location: on the Mississippi River at: 44° 18' 20.052'' N; 91° 54' 46.764'' W

O&M: The traveling screens are rotated and are cleaned using a dual pressure backwash system.

Maximum approach velocity calculation:

$V(Trashracks)$ = 499$cfs$ / (4 $*$ 19.0 $ft$ $*$ 14.7 $ft$) = 0.45 $ft/s$

($Travelling\ Screens$) = 499$cfs$ / (4 $*$ 19.0 $ft$ $*$ 14.0 $ft$) = 0.5 $ft/s$

Maximum Design Through-Screen Velocity and calculations:

Maximum Design Through-Screen Velocity = DIF / [Open Area of Screens]

Percent open through 3/8$^{th}$ inch mesh screen = 48%

Flow (Q): 499 cfs

Opening height: 19.0 ft

Bay Width: 14.7 ft

Screen Width: 14.0 ft

Number of Bays: 4

Open Flow area = 536 ft$^2$

Maximum Design Through-Screen Velocity = 499 cfs/536 ft$^2$ = **0.93 ft/sec**

*The reported surface and open areas were provided by Dairyland Power Alma permit application materials*

Based on a review of the flow monitoring data submitted to the department with the permit application, DLP's Actual Intake Flow (AIF) is above 125 MGD. Because the AIF is greater than 125 MGD, the permittee was required to submit information required under s. NR 111.41(1) through (12).

DLP provided the information required under s. NR 111.41(1) through (12). Most of the relevant application materials were included in a report titled "John P. Madgett Generating Station § 316(b) 122.21(r) Information", dated February 2020 with additional information provided via follow-up emails.

In accordance with s. NR 111.11(1)(a), DLP is subject to the best technology available (BTA) standards for impingement mortality reduction under s. NR 111.12 and entrainment mortality reduction under s. NR 111.13, including any measures to protect federally-listed threatened and endangered species and designated critical habitat established under s. NR 111.14(7). A discussion on the BTA standards for impingement mortality is provided first followed by entrainment. Crystal Darters, an endangered fish species, were caught three times during the span of the intake optimization study at the time that this evaluation was written.

## 3. BTA standards for Entrainment

For entrainment control, the regulations expressly call for the permitting agency to make a site-specific determination of which technologies and/or practices satisfy the BTA standard for each individual facility (s. NR 111.13, Wis. Adm. Code). The BTA "shall reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in subs. (2) and (3)." The regulations also give the department the discretion to reject an otherwise available technology as the BTA for entrainment if the costs are not justified by the social benefits or if there are other unacceptable adverse factors that cannot be mitigated (s. NR 111.13(4)).

The proposed determination must be based on consideration of any additional information required by the department and the factors listed in s. NR 111.13(2)(a). The weight given to each factor is within the department's discretion based upon the circumstances of each facility. In addition, the proposed determination may be based on consideration of the factors listed in s. NR 111.13(3).

In accordance with s. NR 111.13(2), the following factors must be considered when determining whether a technology is viable and technologically attainable. Of the viable and technologically

attainable options, the department determines the best technology or best combinations of technologies.

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

In addition, the department's proposed BTA determination may be based on consideration of any of the following factors to the extent the applicant submitted information:

a) FACTOR s. NR 111.13(3)(a)., Entrainment impacts on the waterbody.

b) FACTOR s. NR 111.13(3)(b)., Thermal discharge impacts.

c) FACTOR s. NR 111.13(3)(c)., Credit for reductions in flow associated with the retirement of units occurring within 10 years preceding October 14, 2014.

d) FACTOR s. NR 111.13(3)(d)., Impacts on the reliability of energy delivery within the immediate area.

e) FACTOR s. NR 111.13(3)(e)., Impacts on water consumption.

f) FACTOR s. NR 111.13(3)(f)., Availability of process water, gray water, wastewater, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

In the preamble to the 316(b) Rule (79 Fed. Reg. 48300 at 48303), USEPA indicated the following:

“The entrainment provision reflects EPA’s assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis. Site-specific decision making may lead to a determination by the NPDES permitting authority that entrainment requirements should be based on variable speed pumps, water reuse, fine mesh screens, a closed-cycle recirculating system, or some combination of technologies that constitutes BTA for the individual site. The site-specific decision-making may also lead to no additional technologies being required.”

Candidate entrainment control technologies are provided in s. NR 111.41(13), including a closed cycle recirculation system, fine mesh screens with a mesh size of 2 mm or smaller, water reuse or alternate sources of cooling water, and variable speed pumps (i.e., variable frequency drive pumps).

## Entrainment Characterization Data and Technology Synopsis

DLP has performed an entrainment study and report at the Alma Plant. Source water (in-river) ichthyoplankton surveys were conducted in 2003 and 2015 to determine their composition and abundance in the river drift near the facility and it’s CWIS. In the study, a total of 114,998 fish specimens, representing 36 distinct taxa from 14 different fish families, were collected in 2003 and 2015. Larvae was the dominant life stage and composed 81.7% and 94.8% of the catches in 2003 and

2015, respectively. Freshwater Drum and Gizzard Shad (+Clupeidae sp.) (Dorosoma cepedianum) were the two dominate larval taxa in 2003. Collectively, they composed 83.3% of all larval fish collected. In 2015, Freshwater Drum overwhelmingly dominated (88.1%) the larval catch. Although Gizzard Shad (+Clupeidae sp.) was the second most abundant larval fish taxa collected in 2015, it composed only 2.9% of the catch. Eggs were the second most abundant life stage collected each year, composing 16.5% of the total catch in 2003 and 5.0% in 2015. Cyprinidae sp. and Freshwater Drum made up the vast majority (84.8%) of the egg catch in 2015. Although eggs from the 2003 study were not identified, it is reasonable to assume that either or both of these taxa would have dominated the egg collections given their prevalence in the river drift during 2015. As expected, juveniles (0.2% to 1.8%) and particularly adults (<0.1% each year) were markedly less abundant in the river drift. Gizzard Shad, Emerald Shiner, and Freshwater Drum collectively composed 89.0% of the juvenile catch in 2003 and Emerald Shiner composed 71.3% of the juvenile catch in 2015.

Impingeable sized organisms are defined at s. NR 111.03(20) of the Rule and are individuals sufficiently large to not pass through 3/8-inch square or 1/2 x 1/4-inch rectangular mesh screens. They are trapped against the screen by the force of intake water flowing through the screen. Organisms that pass through the mesh are entrained (see Rule definition at s. NR 111.03(12)). Entrained specimens will pass through the condenser cooling water systems and are not a deterrent to facility operation. Generally, a fish species' vulnerability to impingement and/or entrainment is a function of life history such as habitat preference, water column distribution, reproductive behavior, early life history characteristics, swimming ability, natural mortality, or physical influences such as water body hydraulics and ambient water temperature and may not be dictated by their abundance in the source water body.

The Rule states at s. NR 111.13(4) that "The Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits," when their derivation is of sufficient rigor.

The overall conclusion of the information provided in this report is that all the entrainment reduction technologies evaluated had social costs (they include compliance costs) that were wholly disproportionate to their entrainment reduction benefits. The entrainment technology with the lowest cost to benefit ratio is 0.5 mm fine-mesh modified traveling screens; however, this technology has an annualized cost benefit ratio of 57 to 1 and 58 to 1 at discount rates of 3% and 7%, respectively. In terms of the § 122.21(r)(4) information, a review of the U.S. Fish and Wildlife Service (USFWS) website determined there are no federally or state protected threatened or endangered species nor their designated critical habitat at risk from the DLP Alma cooling water intake structure (CWIS). These findings combined with compliance with Wisconsin's thermal mixing zone standards, and a healthy recreational fishery, support a determination that the existing Madgett's CWIS is BTA for entrainment at DLP Alma.

Another consideration for DLP Alma is that the maximum design intake is 322.6 MGD, the average intake is 219.2 MGD and the 7Q10 of Mississippi River water is 3283 MGD meaning the water intake design flow represents 9.8% of the critical low flow of the Mississippi river and the average intake flow represents 6.7% of the critical low flow of the Mississippi River water. Because eggs and larvae are relatively non-mobile and often neutrally buoyant, the percent of the river withdrawn will roughly equal the percent loss of eggs and larvae drift within the river.

## Entrainment BTA Determination

For entrainment control, the regulations expressly call for the permitting agency to make a site-specific determination of which technologies and/or practices satisfy the BTA standard for each individual facility. The BTA must reflect the department's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors. Where costs and benefits have been quantified in sufficient rigor, the regulations also give the department the discretion to reject an otherwise available technology as the BTA for entrainment if the social costs are not justified by the social benefits or if there are other unacceptable adverse factors that cannot be mitigated.

The department has considered the following technologies for entrainment BTA at DLP Alma: Cooling water towers (Closed-cycle Recirculating Systems), High capacity wells, Fine mesh screens with a mesh size of 2 mm or smaller, Water reuse, Modified traveling screen, and Variable speed pumps. The department has determined that permittee meets BTA for entrainment for DLP Alma's surface water intake structure. Each of these technologies is discussed below.

## Evaluation of Candidate Entrainment Control Technologies

The department has evaluated the following candidate entrainment control technology to make BTA determinations and has included summaries/conclusions below.

### Cooling towers:

EPRI conducted a study to inform the § 316(b) Rulemaking on the cost and implications of designating a Cooling Tower system as BTA for entrainment. Based on a consideration of the alternative designs, the Rule requires evaluating at § 122.21(r)(i)(A), the all-wet closed-cycle recirculating system with a mechanical-draft cooling tower was determined to be the most feasible retrofit option at Madgett and would reduce cooling water flow, and therefore entrainment numbers, by an estimated 97.2%.

Based on the selected size of the tower, a conceptual layout and siting of the tower, along with all of the necessary piping, pumps, and basins, was completed. The 14-cell tower block with 54 ft x 54 ft cells has basin dimensions of 386 ft x 116 ft. The basin extends 4 ft beyond the cells on all sides.

The proposed cooling tower footprint is shown superimposed on the site aerial photo below. The project capital costs were estimated to be approximately $76.1 million. The project operation, maintenance, and heat rate penalty costs per year were estimated to be approximately $0.72 million, $0.4 million, and $0.99 million, respectively. Because of the cost and impact of changes in particulate emissions or other pollutants associated with entrainment technologies, the department finds that closed-cycle recirculating systems are not BTA for DLP Alma.


The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The department finds that a closed cycle cooling system would reduce entrainment directly proportionally to flow reductions. As discussed in the 316(b) Rule Preamble, mechanical draft cooling towers operating in freshwater sources can achieve flow reductions of 97.5 percent (based on a cycle of concentration of 3.0). 79 Fed. Reg. 48300 at 48338. Therefore, USEPA estimates that freshwater cooling towers, compared to once-through cooling systems, reduce impingement mortality and entrainment by 97.5 percent; at DLP Alma specifically, the amount reduction would be 97.2%.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

The department finds that the particulate emissions and other pollutants would not be significantly altered by this technology. New and increased air emissions from DLP Alma would be expected as a result of installation of cooling towers. The vapor plume from the cooling cells would be a new emission. Even with plume abatement technology, this emission could create issues associated with visibility

reduction due to fogging, ice formation on surfaces downwind from the cells, and visual pollution as perceived by receptors adjacent to the power plant and within the power plant's viewshed. It is expected that the parasitic load created by the addition of the tower fans and pump station would increase the load on the power plants electric generators, thus increasing fuel consumption and associated increase in gas combustion emissions associated with increased output.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that there is land available for this technology.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

There are no plans to decommission the plant. Therefore, this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The department finds that there is potential negative impact from this technology due to the additional moisture in the air during the winter that could negatively affect nearby roads. The engineering evaluation estimates that an average of 2.8 MW of additional pumping power is required for the two hot water pumps under the closed-cycle cooling retrofit. An additional 0.005 MW of pumping power are required for the blowdown pumps. The results in an additional 2.805 megawatts (MW) of pumping power required for a closed-cycle cooling retrofit. This electricity would be required whenever the units are operating. In addition, another 3.0 MW is required to operate the fans. When there are important efficiency effects, these lead to variable hourly unit-level efficiency changes and system-level cost and emission impacts. Other concerns include concentration of pollutants such as mercury as the water cycling through would be non-contact river water high in mercury. In addition, the estimated social benefit would be $12,113 which is significantly less than the cost to incorporate this technology.

f) FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

The cooling tower would reduce thermal discharge impacts. However, the facility is in compliance with applicable effluent temperature limitations which are protective of surface water quality. The department does not consider this a significant factor.

Summary/Conclusion.

Both a Natural Draft Cooling Tower and a Mechanical Draft Cooling Tower would potentially reduce entrainment due to decreased flows at DLP Alma. However, the practicality of this technology is limited due to the following factors:

• Increase in particulate emissions (which would likely require a minor source air permit), including visibility and viewshed concerns

• Increased energy usage

• Increased chemical usage

• The need to supplement raw river water as treatment plant feed due to decreases in condenser effluent

For these reasons, the department has rejected additional natural draft and mechanical draft cooling towers as options for DLP Alma.

## Water Reuse (in-plant recycling, use of greywater from other nearby dischargers)

The Rule at § 122.21(r)(10)(i) requires evaluation of "water reuse or alternate sources of cooling water" and in subsection (C) of that provision, "A discussion of available sources of process water, grey water, waste water, reclaimed water, or other waters of appropriate quantity and quality for use as some or all of the cooling water needs of the facility". However, the EPA in the Rule's Technical Development Document (USEPA 2014) Section 6.1.4 titled Water Reuse states, "For power plants, water reuse (outside of closed-cycle cooling) is typically not an available option, as there is very little water that is used for purposes other than non-contact cooling; the 'credit' would be extremely small. EPA has seen examples where cooling water is reused in air pollution control processes." Process wastewater flow makes up a small percent, approximately 0.3% of the cooling water intake needs and is therefore not result in significant entrainment reduction.

Additionally, the study considered the closest municipal wastewater plant, identified is the Alma Wastewater Treatment Plant, that is located less than one mile away north of DLP Alma. However, as noted in Table 10-5 of DLP Alma's intake study report, the Alma Treatment Plant's average annual flow for the past two years is 0.06 mgd, representing less than a tenth of a percent of DLP Alma's DIF. Therefore, use of this water source is not considered practical. The nearest relatively large WWTP is located in La Crosse, WI almost 50 miles downstream, and running piping that far is not considered practical. In addition, this option could potentially require additional treatment costs due to contaminants in the water. Due to the lack of available process water, gray water, wastewater, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water the department finds that water reuse is not an available BTA for DLP Alma.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The department finds that the number of organisms entrained would be reduced by this technology. Cooling water reuse of 0.3% would result In the equivalent 0.3% reduction in entrained organisms.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

The department finds that the additional electrical loads associated with pumping and treating wastewater from an outside source would likely result in increased electrical demand and production, which could increase associated emissions with the generation process and that the process wastewater is of insufficient volume to make a significant impact on the amount of water needed to be withdrawn.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that there is likely land available for this technology. Any land needed to connect to other facilities would not be owned by DLP Alma and land acquisition or easements would be required.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

There are no plans to decommission the plant therefore this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

Because there is not an alternative source of water within a reasonable distance the facility states that it the technology option is infeasible and therefore did not submit cost information. The department agrees with this conclusion. However it is apparent that the costs of installing a pipeline and treatment would have significantly greater costs than the minimal benefits that would be provided.

The department finds that information on benefits and costs is not of sufficient rigor to make a decision.

f) FACTOR s. NR 11.13(3)(f): Availability of process water, gray water, wastewater, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water. The wastewater from DLP Alma makes up about 0.03 percent of the cooling water needs and therefore is not a viable source of water to be used for cooling.

The department finds the process wastewater is an insignificant, approximately 0.2, percent of the total cooling water needs and the impact would be insignificant and there are no other sources of wastewater to be reused in the area that could be obtained that would make a significant impact on the cooling water needs.

Summary/Conclusion.

Water reuse would potentially reduce entrainment due to decreased flows at DLP Alma. However, the practicality of this technology is limited due to the following factor:

• alternative water source availability.

For this reason, the department has rejected additional natural draft and mechanical draft cooling towers as options for DLP Alma.

### Variable Frequency Drives/Variable Speed Pumps

The facility utilizes two pumps that can be used independently of each other. However, no evaluation of variable frequency drives or variable speed pumps was provided in DLP Alma's intake study, although at one point it does mention that since the facility is a fossil fuel plant, it is expected to generate electricity and operate pumps on a consistent basis. The department finds that installation of variable frequency drives/variable speed pumps is part of BTA for DLP Alma's intake system.

Plants whose production varies significantly during a given day will have the greatest entrainment benefits from VFDs. On average, EPA predicts that VFDs will reduce entrainment by 20%. However, using less cooling water increases in-plant and discharge temperatures, lowering the survival rate of entrained organisms. VFD's can also be useful in optimizing the intake flow as a function of cooling system needs relative to water temperatures and cooling process needs. This is particularly evident with the seasonal variations associated with surface water-based cooling processes, in that less cooling water is needed when the surface water temperatures are lower and thus provide more efficient cooling. Although DLP Alma does not have VFDs, as previously stated, they account for variation by only using one pump most of the time versus the two pumps that are required during peak demand operation to maintain plant cooling requirements.

VFDs would potentially reduce entrainment due to decreased flows. This technology would be feasible since there are no adverse factors that cannot be mitigated. however, due to the cost associated with this option versus the benefit, the department has determined that VFDs are not part of an entrainment BTA option for DLP Alma at this time.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

Variable frequency drives (VFDs) would potentially reduce entrainment. This is because VFDs can reduce entrainment mortality by decreasing the volume of water withdrawn (and thereby decreasing the number of organisms entrained). Plants whose production varies significantly during a given day will have the greatest entrainment benefits from VFDs. On average, EPA predicts that VFDs will reduce entrainment by 20%. However, using less cooling water increases in-plant and discharge temperatures, lowering the survival rate of entrained organisms. A sweet spot exists where less water is withdrawn for cooling, but still enough to keep in-plant and discharge temperatures below the lethal level for ichthyoplankton. VFD's can also be useful in optimizing the intake flow as a function of cooling system needs relative to water temperatures and cooling process needs. This is particularly evident with the seasonal variations associated with surface water-based cooling processes, in that less cooling water is needed when the surface water temperatures are lower and thus provide more efficient cooling. The department finds that the number of organisms entrained would be reduced by this technology.

VFDs would help the facility to make incremental reductions year-round, such as allowing them to withdraw at 60% rather than 75%, thereby reducing entrainment incrementally. Adding a VFD on even one pump would allow the facility to operate at any capacity between the current stepped pumping levels, resulting in incremental reductions in entrainment. The benefit would be even greater during summer months when entrainable organisms are more active and the facility is unable to use recirculated water to augment NCCW needs.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

Utilization of VFDs would likely reduce the total amount of electricity consumed and thus reduce the amount of emissions associated with electricity generation. The department estimates the amount is likely insignificant, though.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that there is land available for the installation of VFDs for the river pumps

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life.

There are no plans to decommission the plant therefore this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The permittee has submitted a cost estimate for the two VFDs of $3.9 million and result in a 9% reduction in flow. It is expected that any costs would be passed on to rate payers through increased user rates (social costs).

The permittee's application materials indicate that use of cooling towers would result in a present value social benefit of $12,113. Cooling towers would result in an approximately 98% flow reduction, whereas

VFDs would yield a 9% reduction in flow. Scaling these benefits by flow reductions yields an approximate social benefit of $1112 for VFDs.

While VFDs can increase the life of other equipment because they have a built-in soft start, the cost is determined to be sufficiently high relative to expected benefits ($3.9 million vs. $1112) such that VFDs are not considered BTA at this time.

f) FACTOR s. NR 111.13(3)(a)., Entrainment impacts on the waterbody.

The department finds that VFDs can reduce the number of organisms entrained by reducing the through-screen velocity.

g) FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.

The department finds VFDs can increase discharge temperature because BTU loading remains constant while flow is decreased. It also may reduce the amount of mixing at the outfall. However, the facility is in compliance with applicable effluent temperature limitations which are protective of surface water quality and therefore the department does not consider this a significant factor.

Conclusion:

The use of two pumps allows the facility to adequately withdraw river water incrementally during summer months, when higher river temperatures necessitate the use of higher intake volumes to serve NCCW needs.. Currently the Department does not view VFDs as a viable entrainment BTA for DLP Alma.

### Aquatic Filter Barriers

Aquatic filter barriers, while biologically effective to exclude around 90% of eggs and larvae, were not studied in DLP Alma's intake study. The department has determined that this technology is not an available BTA because the size and durability of this technology limits its feasibility along a larger navigable waterway and because while the facility does not currently accept coal by barge, they have in the past and they do still hold an active barge fleeting permit which allows for that option and for which an aquatic filter barrier could pose a problem.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The department finds that the number of organisms entrained would be reduced by this technology because of the increased screen area would decrease the through screen velocity. The sweep velocity of the Mississippi river would be greater than the velocity through the aquatic filter barrier, this would effectively remove any entrained fish on the barrier.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

The department finds that the particulate emissions and other pollutants would not be significantly impacted by use of this technology.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that there is not land available for this technology due to impacts to navigability of the waterway and the ability for the facility to receive coal via barge.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life

There are no plans to decommission the plant therefore this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The department finds that information on benefits and costs is not of sufficient rigor to make a decision.

Conclusion:

Aquatic filter barriers are not found to be a viable BTA for DLP Alma based on the following factor:

- the size of the river and the impact on uses on the waterbody.

For this reason, the department has rejected aquatic filter barriers as an entrainment BTA option for DLP Alma.

### Intake Relocation (and/or Passive Screens)

Intake relocation and/or passive screens were not discussed in DLP Alma's intake study however the department has considered this tech and has the made the following determination. Due to any change in intake location still being on the same water body, the numbers and types of organisms entrained would not significantly differ from the current intake therefore the department finds that intake relocation is not an available BTA for DLP Alma.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

Intakes on shorelines typically have a potential for greater environmental impact than offshore intakes because shallow waters are typically biologically productive waters, containing a high density of early life stage organisms (i.e. nursery areas). However, the Department does not currently have the biological data necessary to evaluate the potential for entrainment minimization associated with intake relocation. Additionally, habitat quality/substrate type should be taken into account when relocating an outfall. Generally, sandy substrate will be associated with lower density of entrainable organisms than rocky habitat will be. An analysis of riverbed substrate would be needed to show whether substrate types between locations could impact entrainment rates.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

There would be no additional or new emissions associated with intake relocation or the installation of static screens.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The use of river bottom for the screens would need to be approved by the appropriate state and federal agencies.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life

There are no plans to decommission the plant therefore this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

Information on benefits and costs is not of sufficient rigor to make a decision.

Conclusion:

Outfall relocation is found to not be a viable BTA for DLP Alma based on the following factor:

- Absent of data regarding offshore biodensity and substrate matter, the Department is unable to determine whether this technology qualifies as BTA for entrainment by merit of relocating the outfall in an area with less entrainable organisms.

For this reason, the department has rejected outfall relocation as an entrainment BTA option for DLP Alma.

### Fine Mesh Screens with a Safe Removal/Return System

Fine-mesh modified traveling screens with fish protection features installed in the existing CWIS with a fish return system are a potentially feasible option for reducing entrainment at DLP Alma. Fine-mesh screens are more prone to debris plugging than the existing coarse-mesh screens. The ability to maintain the screens in a clean condition under all debris loading conditions at DLP Alma is unknown and could result in loss of cooling water events that could impact station and grid reliability if they cannot be maintained. The evaluation determined that installing new 0.5 mm, 1.0 mm and 2.0 mm narrow-slot wedgewire screens were technically feasible and have an estimated capital cost of $30.8 million for 0.5 mm screens, $23.5 million for 1.0 mm screens and $16.9 million for 2.0 mm screens. The increase in the DLP Alma's annual O&M cost is $13.4 million for 0.5 mm screens, $5.8 million for 1.0 mm screens and $3.8 million for 2.0 mm screens.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

For any entrainment reductions to be seen, a screen with a mesh size of <2.0 mm should be used, as nearly 100% of eggs still pass through a 2.0mm mesh screen. Fine mesh traveling screens alone do not reduce entrainment, since even small organisms (those than fit through a 3/8" mesh) that are impinged on fine mesh are still defined as "entrained" and safe removal of such organisms is required to reduce entrainment. Survival of organisms removed from fine mesh screens depends on the species entrained but is still relatively low, therefore the department does not consider this a significant factor. The department finds that the number of organisms entrained would not be reduced by this technology.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

No changes in particulate emissions or other pollutants are expected other than potential resuspension of sediments during construction. Therefore, the department finds that the particulate emissions and other pollutants would not be significantly impacted by use of this technology.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

Where screens are retrofitted with fine mesh, the size of the screen face may need to be increased to maintain current flow rates. EPA estimated that 17% of existing intake screens in the U.S. could not be enlarged to accommodate a 2mm screen, and 55% could not be enlarged to accommodate a 0.5mm screen. In order to equip fine mesh screens and maintain a through-screen velocity of < 0.5 fps, as many as 68% of facilities would need to expand their intake screen area by more than five times. An increase in intake screen area is site-specific and given the limited amount of information, it is not of sufficient rigor to make a decision. The department finds that there is land available for this technology.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life

There are no plans to decommission the plant therefore this factor does not rule out use of this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The study determined that retrofitting the existing Hydrolox$^{tm}$ screens with fine mesh screens would have a total installation cost of $1.2 million with no incremental annual cost and would have a net present value at 7% discount rate of $776,360 and a net present value at 3% discount rate of $931,371. The average annualized monetized benefits for entrainment ranged from $3,546 for 2 mm screens at a 7% discount rate to $7,227 at a 3% discount rate for 0.5 mm screens.

Conclusion:

The department has determined that retrofitting the existing hydrolox$^{tm}$ screens with 1.75 mm fine mesh screens is not part of entrainment BTA based the following factor:

- on the limited positive impact on entrainment and impingement; given that fine mesh may only be a practical option when combined with other entrainment reduction options and due to lack of perceived benefit in flow reductions.

For this reason, the department has rejected fine mesh screen installation as an entrainment BTA option for DLP Alma.

## High Capacity Wells

The facility currently uses 3 onsite high capacity wells that generate an average of 0.223 MGD which contribute to about 0.1 percent of the total water used onsite. The intake study did not evaluate adding additional high capacity wells. The department has determined that the number of high capacity wells would likely be prohibitively large to make a significant impact on the surface water withdrawn to meet the needs of the facility and is not an available BTA for entrainment at DLP Alma. A feasibility and cost analysis would need to be considered to see if groundwater could be a viable option. A groundwater withdrawal option would require the Applicant to apply for multiple high-capacity wells. The department reviews proposed high-capacity wells on a case-by-case basis and accounts for the proposed wells and all existing nearby wells in an analysis of potential harm to waters of the state. In addition, due to the volume of water needed for this site, if new wells were to be applied for and the resulting water loss was greater than 2 MGD in any 30-day period, a water loss approval would be required under s. 281.35, Wis. Stats.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The department finds that elimination of the surface water intake would eliminate entrainment, and the 316(b) regulations would no longer apply to the facility.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

The department finds that there would be no additional or new emissions associated with entrainment technologies as the surface water intake would be eliminated. Switching to groundwater could cause additional metals and other pollutants to need to be treated by the facility.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that an analysis would need to be conducted to determine if there is adequate land available for this technology.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life

The department finds that the useful plant life does not have an impact by this technology.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The department finds that there may be social costs to this technology due to its potential impacts to the groundwater level impacts to any surrounding wells. For groundwater, the actual costs for drilling one or more wells to withdraw up to 150 MGD (existing Water Use capacity, including fire protection) would need to be considered. This option would also require the applicant to apply for multiple high-capacity wells. The department reviews proposed high-capacity wells on a case-by-case basis and accounts for the proposed wells and all existing nearby wells in an analysis of potential harm to waters of the state. It should be noted however that given the fact that the current three high capacity wells contribute 0.223 MGD to the facilities water supply out of the approximately 220 MGD used on average and maximum design of 322.6 MGD it is unlikely that additional high capacity wells would make a significant impact on the number of organisms enterained.

f) FACTOR s. NR 111.13(3)(b), Wis. Adm. Code: Thermal discharge impacts.
Groundwater may be cooler than surface water, lowering the temperature of the cooling water effluent.

g) FACTOR s. NR 111.13(3)(e)., Impacts on water consumption.

The department finds that it is possible that additional high capacity wells could have an impact on surrounding wells and that additional information would be needed before a decision on the viability of this technology can be determined.

Conclusion:

The department finds that the practicality of this technology is limited due to the following factors:

- Possible impacts to surrounding wells
- Availability of groundwater to meet the cooling water needs of the facility

For these reasons, the department has rejected high-capacity groundwater wells as an entrainment BTA for DLP Alma at this time.

### Unit Retirements

Previously the permittee operated Alma units 1-5 as well as the J.P. Madgett Unit, but the final Alma units were taken offline in October 2014. The unit retirements resulted in a 311 cfs (201 MGD) or 38.4 reduction in water intake. The department has determined that these past unit retirements are part of BTA for this facility, in accordance with s. NR 111.13(3)(c), Wis. Adm. Code.

The department has considered the following factors:

a) FACTOR s. NR 111.13(2)(a)1., Wis. Adm. Code: Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species and designated critical habitat (e.g., prey base).

The department finds that the number of organisms entrained was likely reduced by this technology due to the decrease in intake flow required.

b) FACTOR s. NR 111.13(2)(a)2., Wis. Adm. Code: Impact of changes in particulate emissions or other pollutants associated with entrainment technologies.

The department finds that the particulate emissions and other pollutants may have been reduced by use of this technology.

c) FACTOR s. NR 111.13(2)(a)3., Wis. Adm. Code: Land availability inasmuch as it relates to the feasibility of entrainment technology.

The department finds that there was adequate land available for this technology.

d) FACTOR s. NR 111.13(2)(a)4., Wis. Adm. Code: Remaining useful plant life

The department finds that the useful plant life was a reason this technology was implemented.

e) FACTOR s. NR 111.13(2)(a)5., Wis. Adm. Code: Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The department finds that due to the energy needs of the region and the fact that this facility has taken up additional energy generation demand due to other facilities closing, that the social benefits and costs do not make this a viable option.

f) FACTOR s. NR 111.13(3)(d)., Impacts on the reliability of energy delivery within the immediate area.

The department finds that additional unit closures would have a negative impact on the reliability of energy delivery within the immediate area.

Conclusion:

The department finds that the previous unit retirements at this facility have likely reduced entrainment at this facility; however the practicality of this technology is limited due to the following factors:

- The impact on energy delivery within the immediate area and region

For this reason, the department has rejected Unit Retirement as an entrainment BTA for DLP Alma at this time.

## 4. BTA standards for impingement mortality

In accordance with s. NR 111.12(1)(a), DLP must comply with one of the alternatives in subs. 1 through 7 except as provided in sub. (b)1. or 2., when approved by the department. In addition, a facility may also be subject to the requirements of s. NR 111.12(2), Wis. Adm. Code if the department requires such additional measures.

The facility has selected Modified Traveling Screens as their Impingement mortality technology and is currently in the process of completing the optimization study. The facility will be required to operate the modified traveling screen in a manner consistent with the department's findings after the department's review of the study.

**Commented [KJRD1]:** We have now reviewed the completed study, so we should just update this to say what the operational requirements are that reflect optimized performance.

## 5. Conclusion

The Department reviewed available information regarding the location, design, operation, and capacity of the water intake structure. Based on the lack of any known or suspected adverse environmental impacts caused or contributed by the water intake structure, the Department has determined accordance with ch. NR 111, Wis. Adm. Code, using its best professional judgment, that the existing DLP Alma water intake structure, **does meet BTA for entrainment and, under optimized performance, does meet impingement mortality BTA**. The department will be including operational requirements reflecting optimized operating constraints as identified in the facility's impingement mortality optimization study: This water intake structure is required to be reevaluated at each permit reissuance.