Permit Fact Sheet

General Information

Permit Number	WI-0002780-10-0
Permittee Name and Address	Wisconsin Power and Light Co Columbia Energy Center W8375 Murray Road, Pardeeville, WI 53954
Permitted Facility Name and Address	Wisconsin Power and Light Co Columbia Energy Center W8375 Murray Rd, Pardeeville, Wisconsin
Permit Term	April 01, 2026 to March 31, 2031
Discharge Location	Section 27, T12N, R9E, Columbia County
Receiving Water	Wisconsin River, groundwaters of the Lower Wisconsin River Basin in Duck and Rocky Run Creeks of Wisconsin River (lower) in Columbia County
Stream Flow ($Q_{7,10}$)	0 cfs
Stream Classification	Warm Water Sport Fish community and non-public water supply
Discharge Type	Existing and Continuous

Facility Description

Wisconsin Power and Light Co Columbia Energy Center (WPL Columbia) is a base-load facility (2 units, 510 MWe each) using steam from coal combustion to drive electrical generators. The facility utilizes a 480-acre cooling pond and cooling towers to recirculate cooling water removed from the Wisconsin River. Outfall 401 refers to the discharge of this recirculated cooling tower wastewater to the cooling pond. Three internal sampling points including treated domestic wastewater (Outfall 101), oil/water separator system effluent (Outfall 301), and leachate from the onsite coal-ash landfill(s) (Outfall 501) are discharged into the cooling pond.

The WPDES permit continues to authorize one surface water discharge outfall for the facility, Outfall 001, which is the cooling water overflow discharge from the cooling pond. However, there has been no overflow since 2010. WPL Columbia has requested to retain Outfall 001 as a contingency for a possible cooling pond overflow discharge related to a large rainfall event, so discharge would only occur in an emergency event. WPL Columbia also has two other outfalls (Outfalls 003 and 010) which are considered seepage systems.

Since the most recent permit modification (June 2022), the facility has ceased discharge of ash transport water to the Ash Ponds (Outfall 005), and legacy material from the seepage area was moved into the onsite lined landfill. Bottom ash wastewater is now treated within the plant in a closed-loop unit. Additionally, Outfall 010 has been removed from this permit issuance, with all parameters associated with 010 added to the existing outfall 110, which both have historically referenced the Coal Pile Runoff seepage area.

Substantial Compliance Determination

WPL Columbia has maintained a record of consistent substantial compliance and has responded to all previously requested actions for compliance with the permit.

Enforcement in the previous permit term included a Notice of Noncompliance (NON) issued October 2025 regarding a small unauthorized discharge of treated bottom ash wastewater to a paved area and stormwater ditch contained to the site. WPL Columbia responded immediately to this discharge, reported it appropriately, and voluntarily completed corrective actions requiring no additional response from the department.

After a desk top review of all discharge monitoring reports, compliance schedule items, and inspection site visits on 8/31/2023 and 5/19/2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Jordan Main, Wastewater Compliance Engineer on January 13, 2025.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
702	43.2 MGD Maximum Design Intake 14.3 MGD Average Intake	INFLUENT: Wisconsin River water intake structure for non-contact cooling water located on the east bank of the Wisconsin River. At Sampling Point 702, the permittee shall calculate the total daily intake flow rate prior to use in the facility. The permittee shall collect representative grab samples of the intake water for total recoverable mercury and total phosphorus from a sampling location prior to use in the facility.
001	No discharge during previous permit term	EFFLUENT: Discharge of recycled cooling water from the cooling pond to the floodplain marsh of the Wisconsin River. Monitoring is not required when outfall is not in use.
003	44100 gal/ac/day Maximum Day	EFFLUENT: Seepage from the cooling pond to groundwater. Representative grab sample taken within the cooling pond, along the western shoreline. Seepage rate is reported as a representative calculated value.
110	21097 gal/ac/day Maximum Day	EFFLUENT: Seepage of coal pile runoff from Settling Basin. A representative grab sample of coal pile material is analyzed using the SPLP procedure. See permit section 4.2.3.1 Sampling Procedure. Seepage rate volume is reported as a representative calculated value.
101	7233 gpd Maximum Day 2896 gpd Maximum 7-Day Average 1957 gpd Maximum 30-Day Average 1535 gpd Maximum Annual Average	IN-PLANT: Domestic Sewage Treatment Plant Effluent to Cooling Pond. A 24-hr flow proportional composite sampler is located after the media filter bed. Grab samples are taken after UV disinfection prior to discharge to the cooling pond. Flow is measured at the composite sampler
102	N/A	BLANK: Field blank sample needed to check for contamination of the samples collected from the discharge outfalls and/or the intake
301	0.78 MGD Maximum Day 0.60 MGD Maximum 7-Day Average 0.36 MGD Maximum 30-Day Average	IN-PLANT: Oil/water separator effluent and wastewater from the Units 1 and 2 air heater wash sumps, chemical waste sumps, and on-site coal ash landfill leachate to the cooling pond. Flow is measured by magnetic meter prior to discharge to the cooling pond.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
	0.17 MGD Maximum Annual Average	
401	308 MGD Maximum Day 231 MGD Maximum Annual Average	IN-PLANT: Discharge of Recycled Cooling Tower Wastewater to Cooling Pond. A representative grab sample is taken prior to discharge to the cooling pond. Reported flow is calculated using pump run times.
501	New sample point	IN-PLANT: On-site landfill leachate and landfill contact water discharging to Sample Point 301. A representative grab sample of leachate and contact water is taken prior to discharge to the oil water separator. Sample point is included to report leachate and contact water specific parameters prior to the combined wastewater Sample Point 301.

Permit Requirements

1 Influent – Cooling Water Intake Structure – Monitoring

1.1 Sample Point Number: 702- WIS. RIVER INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total		mg/L	Quarterly	Grab	Only required if there is a discharge from Outfall 001
Mercury, Total Recoverable		ng/L	1/ 6 Months	Grab	
Flow Rate		MGD	Daily	Calculated	Flow rate is calculated based on pump runtime

1.1.1 Changes from Previous Permit

The department has determined that no changes to this section are required.

1.1.2 Explanation of Limits and Monitoring Requirements

Cooling Water Intake Structure (CWIS)- The Department believes that the facility's intake structure **does** represent BTA for minimizing adverse environmental impact in accordance with the requirements in section 283.31 (6), Wis. Stats. and section 316 (b) of the Clean Water Act. The basis for this determination can be found in the attached Cooling Water Intake Structure Best Technology Available Determination (CWIS BTA) dated **3/20/2025.**

Future BTA- BTA determinations made in future permit reissuances will be made in accordance with ch. NR 111, Wis. Adm. Code. In subsequent permit reissuance applications, the permittee shall provide all the information required in ss. NR 111.41(1) through (7) and (13), Wis. Adm. Code.

Also include an alternatives analysis report for compliance with the entrainment BTA requirements with the permit application. This alternatives analysis for entrainment BTA shall examine the options for compliance with the entrainment BTA requirement and propose a candidate entrainment BTA to the Department for consideration during its next BTA determination. The analysis must, at least narratively, address and consider the factors listed in s. NR 111.41(13)(a), Wis. Adm. Code, and may consider the factors listed in s. NR 111.41(13)(b), Wis. Adm. Code. The analysis must evaluate, at a minimum, closed-cycle recirculating systems, fine mesh screens with a mesh size of 2mm or smaller, variable speed pumps, water reuse or alternate sources of cooling water, and any additional technology identified by the department at a later date.

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.

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.

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.

Endangered Species Act- This permit does not authorize take of threatened or endangered species. Section NR 111.16(4)(a), Wis. Adm. Code, requires the inclusion of this provision in all permits subject to the requirements of 316(b) of the Clean Water Act. 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 - Monitoring and Limitations

2.1 Sample Point Number: 101- SEWAGE TRT SYSTEM EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		gpd	3/Week	Total Daily	
E. Coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Comp	
BOD5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Comp	
BOD5, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Comp	

2.1.1 Changes from Previous Permit:

In-plant limitations and monitoring requirements were evaluated for this permit term and the following changes were made:

E. Coli – Monthly limit added

2.1.2 Explanation of Limits and Monitoring Requirements

The monitoring requirements and limitations are typical of WPDES permits issued for domestic wastewater treatment facilities and are derived from ch. NR 210, Wis. Adm. Code, Sewage Treatment Works. The domestic sewage treatment plant is required to achieve a monthly average 85% removal of the influent BOD and suspended solids prior to discharge into the cooling pond. Also, disinfection of the sanitary treatment system effluent shall be provided from May 1 through September 30, each year.

E. Coli - Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying *E. coli* WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for *E. coli* while facilities are disinfecting during the recreation period, and establish effluent limitations for *E. coli* established in s. NR 210.06 (2), Wis. Adm Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to *E. coli* to protect recreation in ch. NR 102, Wis. Adm. Code.; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code.; revised permit requirements for publicly and privately owned sewage treatment works in ch. NR 210, Wis. Adm. Code.; and, updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code**.**

2.2 Sample Point Number: 102- Effluent Field Blank

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	1/ 6 Months	Blank	

2.2.1 Changes from Previous Permit:

In-plant limitations and monitoring requirements were evaluated for this permit term and no changes were required in this permit section.

2.2.2 Explanation of Limits and Monitoring Requirements

Mercury Field Blank- Monitoring is included in the permit pursuant to s. NR 106.145, Wis. Adm. Code. Field blanks must meet the requirements under s. NR 106.145(9) and (10), Wis. Adm. Code. The permittee shall collect a mercury field blank for each set of mercury samples (a set of samples may include a combination of influent, effluent or other samples all collected on the same day). Field blanks are required to verify a sample has not been contaminated during collection, transportation or analysis.

2.3 Sample Point Number: 301- OIL/WATER SEPARATOR

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Total Daily	
Suspended Solids, Total	Daily Max	100 mg/L	Weekly	Grab	
Suspended Solids, Total	Monthly Avg	30 mg/L	Weekly	Grab	
Oil & Grease (Hexane)	Daily Max	20 mg/L	Weekly	Grab	
Oil & Grease (Hexane)	Monthly Avg	10 mg/L	Weekly	Grab	
pH Field	Daily Max	9.0 su	Weekly	Grab	
pH Field	Daily Min	6.0 su	Weekly	Grab	

2.3.1 Changes from Previous Permit:

In-plant limitations and monitoring requirements were evaluated for this permit term and the following changes were made:

Flow Rate – Sample frequency changed from weekly to daily

2.3.2 Explanation of Limits and Monitoring Requirements

A portion of the plant floor drains and specific storm water collection areas are directed through the oil/water separator for treatment prior to discharge into the cooling pond. All limitations are a direct application of the low volume waste and combustion residual leachate requirements of ch. NR 290, Wis. Adm. Code, Steam Electric Power Generation and its federal counterpart, 40 CFR Part 423

Flow Rate – The sample frequency was changed from weekly to daily in order to bring it in line with the standard sample frequency for flow rate and to align it with how flow rate is monitored at the facility.

2.4 Sample Point Number: 401- COOLING TOWER WW TO POND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Calculated	
Chlorine, Free Available	Daily Max	0.5 mg/L	Monthly	Grab	Monitoring applies in months where chlorine is used
Chlorine, Free Available	Monthly Avg	0.2 mg/L	Monthly	Grab	Monitoring applies in months where chlorine is used

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Zinc, Total Recoverable	Daily Max	1.0 mg/L	Monthly	Grab	Monitoring applies in months where chemicals containing zinc are used
pH Field	Daily Max	9.0 su	Weekly	Grab	
pH Field	Daily Min	6.0 su	Weekly	Grab	

2.4.1 Changes from Previous Permit:

In-plant limitations and monitoring requirements were evaluated for this permit term and no changes were required in this permit section.

2.4.2 Explanation of Limits and Monitoring Requirements

Chlorine - The chlorine concentration and discharge time limits are treatment technology-based limits from ch. NR 290.12 (1) and (2), Wis. Adm. Code. Neither free available chlorine nor total residual chlorine shall be discharged from any unit for more than 2 hours in any one day and not more than one unit in any plant may discharge free available nor total residual chlorine at any one time, except when chlorinating for macro-invertebrate control (as allowed in s. NR 290.12(2)(c), Wisconsin Adm. Code) in accordance with a department approved macro-invertebrate management plan. The Columbia cooling water system has not needed a macro-invertebrate management plant to date. The time of free available chlorine or total residual chlorine discharge shall be evaluated and summed for each unit and each day that chlorine is present in the discharge.

2.5 Sampling Point 501 - LANDFILL LEACHATE LP-1

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Volume		gal	2/Year	Calculated	
Arsenic, Total Recoverable		µg/day	2/Year	Grab	
BOD_5, Total		mg/L	2/Year	Grab	
Conductivity		µmhos/cm	2/Year	Grab	
pH Field		su	2/Year	Grab	
Alkalinity, Total as $CaCO_3$ Dissolved		mg/L	2/Year	Grab	
Boron, Total Recoverable		µg/L	2/Year	Grab	

Cadmium, Total Recoverable		µg/L	2/Year	Grab	
Chloride		mg/L	2/Year	Grab	
Hardness, Total as $CaCO_3$		mg/L	2/Year	Grab	
Iron, Total Recoverable		µg/L	2/Year	Grab	
Lead, Total Recoverable		µg/L	2/Year	Grab	
Manganese, Total Recoverable		µg/L	2/Year	Grab	
Mercury, Total Recoverable		µg/L	2/Year	Grab	
Selenium, Total Recoverable		µg/L	2/Year	Grab	
Suspended Solids, Total		mg/L	2/Year	Grab	
Antimony, Total Recoverable		µg/L	2/Year	Grab	
Beryllium, Total Recoverable		µg/L	2/Year	Grab	
Cobalt, Total Recoverable		µg/L	2/Year	Grab	
Fluoride		mg/L	2/Year	Grab	
Molybdenum, Total Recoverable		µg/L	2/Year	Grab	
Radium 226 & 228 Total		pCi/L	2/Year	Grab	
Sulfate, Total		mg/L	2/Year	Grab	
Thallium, Total Recoverable		µg/L	2/Year	Grab	

2.5.1 Changes from Previous Permit:

Sample Point – Sample point and all associated monitoring requirements added

2.5.2 Explanation of Limits and Monitoring Requirements

These monitoring requirements are included to capture the leachate sampling occurring under WDNR Solid Waste License #3025. More information on the monitoring requirements can be found in the Groundwater Evaluation for Wisconsin Power and Light Co Columbia Energy Center dated August 22, 2025.

3 Surface Water - Monitoring and Limitations

3.1 Sample Point Number: 001- RECYCLED COOLING WTR TO MARSH

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Calculated	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Halogen, Total Residual as Cl2	Daily Max	19 ug/L	Monthly	Grab	
Halogen, Total Residual as Cl2	Weekly Avg	7.3 ug/L	Monthly	Grab	
Zinc, Total Recoverable	Daily Max	240 ug/L	Quarterly	Grab	
Zinc, Total Recoverable	Weekly Avg	125 ug/L	Quarterly	Grab	
Zinc, Total Recoverable	Daily Max	6.1 lbs/day	Quarterly	Grab	
Zinc, Total Recoverable	Weekly Avg	3.2 lbs/day	Quarterly	Grab	
Mercury, Total Recoverable		ng/L	1/ 6 Months	Grab	
Phosphorus, Total		mg/L	Monthly	Grab	
Temperature Maximum	Daily Max	75 deg F	Daily	Continuous	Limit applies in January and February
Temperature Maximum	Daily Max	77 deg F	Daily	Continuous	Limit applies in March and November
Temperature Maximum	Daily Max	79 deg F	Daily	Continuous	Limit applies in April
Temperature Maximum	Daily Max	82 deg F	Daily	Continuous	Limit applies in May and September
Temperature Maximum	Daily Max	84 deg F	Daily	Continuous	Limit applies in June and August
Temperature Maximum	Daily Max	85 deg F	Daily	Continuous	Limit applies in July

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Temperature Maximum	Daily Max	80 deg F	Daily	Continuous	Limit applies in October
Temperature Maximum	Daily Max	76 deg F	Daily	Continuous	Limit applies in December
Temperature Maximum	Weekly Avg	73 deg F	Daily	Continuous	Limit applies in September
Temperature Maximum	Weekly Avg	49 deg F	Daily	Continuous	Limit applies in November, December, and January
Temperature Maximum	Weekly Avg	50 deg F	Daily	Continuous	Limit applies in February
Temperature Maximum	Weekly Avg	52 deg F	Daily	Continuous	Limit applies in March
Temperature Maximum	Weekly Avg	55 deg F	Daily	Continuous	Limit applies in April
Temperature Maximum	Weekly Avg	65 deg F	Daily	Continuous	Limit applies in May
Temperature Maximum	Weekly Avg	76 deg F	Daily	Continuous	Limit applies in June
Temperature Maximum	Weekly Avg	81 deg F	Daily	Continuous	Limit applies in July and August
Temperature Maximum	Weekly Avg	61 deg F	Daily	Continuous	Limit applies in October
PFOS		ng/L	Once	Grab	
PFOA		ng/L	Once	Grab	

3.1.1 Changes from Previous Permit

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

PFOs and PFOA – One time grab samples added

3.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated March 10, 2025.

4 Land Treatment – Monitoring and Limitations

4.1 Sample Point Number: 003- COOLING POND SEEPAGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		gal/ac/day	Annual	Calculated	
Zinc Dissolved		mg/L	Annual	Grab	Sample taken within the cooling pond, along the western shoreline
Mercury Dissolved		mg/L	Annual	Grab	Sample taken within the cooling pond, along the western shoreline
Arsenic, Total Recoverable		mg/L	Annual	Grab	Sample taken within the cooling pond, along the western shoreline

4.1.1 Changes from Previous Permit:

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

Arsenic – Annual grab sample added

4.1.2 Explanation of Limits and Monitoring Requirements

More information on the monitoring requirements can be found in the Groundwater Evaluation for Wisconsin Power and Light Co Columbia Energy Center dated August 22, 2025.

4.2 Sample Point Number: 110- COAL PILE RUNNOFF SEEPAGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Arsenic, Total Recoverable		mg/L	Annual	Grab	See Sampling Procedure section
Sulfate Dissolved		mg/L	Annual	Grab	See Sampling Procedure section
Mercury, Total Recoverable		ng/L	Annual	Grab	See Sampling Procedure section
Iron, Total Recoverable		mg/L	Annual	Grab	See Sampling Procedure section

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Copper, Total Recoverable		mg/L	Annual	Grab	See Sampling Procedure section
Chloride Dissolved		mg/L	Annual	Grab	See Sampling Procedure section
Molybdenum, Total Recoverable		ug/L	Annual	Grab	See Sampling Procedure section
Selenium, Total Recoverable		ug/L	Annual	Grab	See Sampling Procedure section
Flow Rate		gal/ac/day	Annual	Calculated	See Sampling Procedure section

4.2.1 Changes from Previous Permit:

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

Chloride, Molybdenum, and Selenium – Annual grab samples added

Flow Rate – Annual calculated monitoring added

4.2.2 Explanation of Limits and Monitoring Requirements

More information on the limitations can be found in the Groundwater Evaluation for Wisconsin Power and Light Co Columbia Energy Center dated August 22, 2025.

Flow Rate – This monitoring requirement previously was included under sample point 010, which has been combined with this sample point.

5 Schedules

5.1 Annual Certification Statements and Reports

Submit an annual certification statement and report by January 31st of each year as specified by the Annual Certification Statements and Reports section, in accordance with the following schedule.

Required Action	Due Date
Submit Annual Certification Statement and Report #1: Submit an annual certification statement signed by the authorized representative with information on the following for the previous year: (a) Water intake structure technologies are being maintained and operated as set forth in this permit, or a justification to allow a modification of practices. Include a summary of the inspections required under paragraph 1.3.2.	01/31/2027

(b) If there are substantial modifications to the operations of any unit that impacts the cooling water withdrawals or operation of the water intake structure, provide a summary of those changes. (c) If the information contained in the previous year's annual certification is still applicable, the certification may simply state as such.	
Submit Annual Certification Statement and Report #2: Submit second annual certification statement	01/31/2028
Submit Annual Certification Statement and Report #3: Submit third annual certification statement	01/31/2029
Submit Annual Certification Statement and Report #4: Submit fourth annual certification statement	01/31/2030
Submit Annual Certification Statement and Report #5: Submit fifth annual certification statement	01/31/2031
Ongoing Annual Certification Statements and Reports: Continue to submit Annual Certification Statements and Reports until permit reissuance has been completed	

5.2 Land Treatment Management Plan

A management plan is required for the land treatment system.

Required Action	Due Date
Land Treatment Management Plan: Submit a management plan to optimize the land treatment system performance and demonstrate compliance with Wisconsin Administrative Code NR 214.	08/01/2026

5.3 Land Treatment Annual Report

Required Action	Due Date
Submit Annual Land Treatment Report #1: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2027
Submit Annual Land Treatment Report #2: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2028
Submit Annual Land Treatment Report #3: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2029
Submit Annual Land Treatment Report #4: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2030
Submit Annual Land Treatment Report #5: Submit the Annual Land Treatment Report by January 31st for the previous calendar year.	01/31/2031
Ongoing Annual Land Treatment Reports: Continue to submit the Annual Land Treatment Report by January 31st for the previous calendar year until permit reissuance has been completed	

5.4 Combustion Residual Leachate ELG

Required Action	Due Date
Feasibility Report: The permittee shall submit a report investigating the feasibility of ceasing the discharge of combustion residual leachate by the date required by this schedule is investigated.	01/01/2027
Progress Report #1: The permittee shall submit a report detailing any progress that has been made in complying with the federal ELGs for combustion residual leachate.	01/01/2028
Progress Report #2: The permittee shall submit a report detailing any progress that has been made in complying with the federal ELGs for combustion residual leachate.	01/01/2029
Progress Report #3: The permittee shall submit a report detailing any progress that has been made in complying with the federal ELGs for combustion residual leachate.	01/01/2030
Progress Report #4: The permittee shall submit a report detailing any progress that has been made in complying with the federal ELGs for combustion residual leachate.	01/01/2031
Compliance With Federal ELG: Unless the department concurs that ceasing the discharge of combustion residual leachate by this date is infeasible and has provided the permittee with an alternative date, or the permittee has submitted a signed affidavit stating that they will cease coal combustion by December 31, 2034, the permittee shall cease the discharge of combustion residual leachate by this date.	03/31/2031

Explanation of Schedules

Annual Certification Statements and Reports – Pursuant to s. NR 111.15(1)(c), Wis. Adm. Code, the permittee must submit an annual certification statement and report on their cooling water intake structure.

Land Treatment Management Plan and Land Treatment Annual Report – Since the permittee utilizes a land treatment system they are required to submit annual land treatment reports and a Land Treatment Management Plan.

Combustion Residual Leachate ELG – The revised version of 40 CFR 423.13(l)(1)(i)(A) is effective starting March 2, 2026, and requires the discharge of combustion residual leachate to cease as soon as possible beginning July 8, 2024, but no later than December 31, 2034. In the absence of information indicating that the permittee cannot cease discharge during the permit term, the department is requiring that discharge cease by the end of this permit term. To allow for the permittee to demonstrate that a longer time period is necessary, the department is requiring submittal of a Feasibility Report.

Attachments

Attachment #1: Water Quality Based Effluent Limits

Attachment #2: Groundwater Evaluation

Attachment #3: Cooling Water Intake Structure BTA Determination

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance

Prepared By: Sawyer Hanson Wastewater Engineer **Date: Enter Date**

Appendix A – Technology Based Effluent Limits

Background Information

WPL Columbia is a steam electric generating facility that discharged to surface water and constructed prior to 1982, therefore it is subject to the requirements for the best practicable technology (BPT) under 40 CFR 423.12 and s. NR 290.12(1), Wis. Adm. Code, as well as the requirements for best available technology (BAT) under 40 CFR 423.13 and s. NR 290.12(2).

BPT Limits

Sample Point 702

No TBELs apply at this sample point.

Sample Point 101

No TBELs apply at this sample point.

Sample Point 102

No TBELs apply at this sample point.

Sample Point 301

The TBELs for combustion residual leachate and low volume wastewater apply at this sample point. These limits are provided in the table below:

Parameter	Daily Maximum	Monthly Average
Total Suspended Solids	100 mg/L	30.0 mg/L
Oil and Grease	20.0 mg/L	15.0 mg/L

40 CFR 423.13(l)(1)(i)(A) requires the discharge of combustion residual leachate to cease as soon as possible beginning July 8, 2024, but no later than December 31, 2034.

Sample point 401

The TBELs for cooling tower blowdown do not apply at this sample point since the cooling towers are not operated in a way that produces blowdown. The TBELs for once-through cooling water do not apply since the water used for cooling is discharged to the cooling pond, where it mixes with the water already in the cooling pond as well as water withdrawn from the Wisconsin River, and is then withdrawn from the pond to be used as cooling water again.

Sample Point 501

The TBELs for combustion residual leachate would apply at this, however this sample point is only being used to capture the leachate sampling occurring under WDNR Solid Waste License #3025. The TBELs for combustion residual leachate have instead been included under sample point 301.

Sample Point 001

All applicable TBELs are applied at sample points upstream of this sample point.

Sample Point 003

No TBELs apply at this sample point.

Sample Point 110

The TBELs for coal pile runoff are applicable at this sample point. These limits are provided in the table below:

Parameter	Daily Maximum
Total Suspended Solids	50 mg/L

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: March 10, 2025

TO: Sawyer Hanson – WY/3

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for Wisconsin Power and Light Co Columbia Energy Center
WPDES Permit No. WI-0002780-10-0

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 Wisconsin Power and Light Co Columbia Energy Center (WPL Columbia) in Columbia County. This steam electric power generation facility discharges to an Unnamed Tributary to the Wisconsin River, located in the Duck and Rocky Run Creeks Watershed in the Lower Wisconsin River Basin. This discharge does not have an assigned wasteload allocation in the Wisconsin River TMDL (which was approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020) but is within the TMDL area. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
pH	9.0 su	6.0 su			2
Halogens, Total Residual as Cl_2	19 µg/L		7.3 µg/L		2
Zinc	240 µg/L 6.1 lbs/day		125 µg/L 3.2 lbs/day		2
Mercury					1,2
Phosphorus					1,2
PFOS and PFOA					3
Temperature					2,4

Footnotes:

1. Monitoring only.
2. No changes from the current permit.
3. One PFOA and PFOS grab sample is required during the permit term if discharge occurs.
4. The following thermal limits apply:

	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	49	75
FEB	50	75
MAR	52	77
APR	55	79

	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
MAY	65	82
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82
OCT	61	80
NOV	49	77
DEC	49	76

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

No technology-based effluent limits in accordance with ch. NR 290, Wis. Adm. Code, are needed for this outfall.

Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are not required due to the non-continuous nature of the discharge.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Sarah Luck (Sarah.Luck@wisconsin.gov) or Diane Figiel (Diane.Figiel@wisconsin.gov).

Attachments (2) – Narrative and Site Map

PREPARED BY: Sarah Luck _____ Date: March 10, 2025

Sarah Luck
Water Resources Engineer

E-cc: Jordan Main, Wastewater Engineer – SCR/Fitchburg
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Wisconsin Power and Light Co Columbia Energy Center

WPDES Permit No. WI-0002780-10-0

PART 1 – BACKGROUND INFORMATION

Facility Description

Wisconsin Power and Light Co Columbia Energy Center (WPL Columbia) is a base-load facility (2 units, 510 MWe each) using steam from coal combustion to drive electrical generators. The facility utilizes a large cooling pond and cooling towers to recirculate cooling water removed from the Wisconsin River. Outfall 401 refers to the discharge of this recirculated cooling tower wastewater to the cooling pond. Two internal sampling points including treated sanitary wastewater from the plant bathroom facilities (Outfall 101) and oil/water separator system effluent (Outfall 301) are discharged into the cooling pond.

The WPDES permit continues to authorize one surface water discharge outfall for the facility, Outfall 001, which is the cooling water overflow discharge from the 480-acre cooling pond. However, there has been no overflow since 2010. WPL Columbia has requested to retain Outfall 001 as a contingency for a possible cooling pond overflow discharge related to a large rainfall event, so discharge would only occur in an emergency event.

WPL Columbia also has two other outfalls (Outfalls 003 and 010) which are considered seepage systems and are outside the scope of this memo.

Since the most recent permit modification (June 2022), the facility has ceased discharge of ash transport water to the Ash Ponds (Outfall 005), and ash was moved into the onsite lined landfill. Additionally, Outfall 002, which was an overflow surface water discharge from the Outfall 005 ash ponds to the Wisconsin River floodplain, was abandoned and removed from the permit in the -09 reissuance. Outfall 007, which was a potential surface water discharge of cooling pond water to the main channel of the Wisconsin River, was never utilized and removed in the -09 reissuance.

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

Existing Permit Limitations

The current permit, which expired on August 31, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
pH	9.0 s.u.	6.0 s.u.			-
Halogens, Total Residual as Cl_2	19 µg/L		7.3 µg/L		-
Zinc, Total Recoverable	240 µg/L 6.1 lbs/day		125 µg/L 3.2 lbs/day		-

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Mercury, Total Recoverable					1
Temperature, Maximum					2

Footnotes:

1. Monitoring only.
2. The following thermal limits apply:

	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	49	75
FEB	50	75
MAR	52	77
APR	55	79
MAY	65	82
JUN	76	84
JUL	81	85
AUG	81	84
SEP	73	82
OCT	61	80
NOV	49	77
DEC	49	76

Receiving Water Information

- Name: Unnamed Tributary to the Wisconsin River
  The discharge from Outfall 001 discharges from the east riverbank into a floodplain open water area and then to a channelized backwater that is part of the Wisconsin River floodplain. The Wisconsin River is approximately 0.5 miles west of the outfall structure (lineally) or 2 miles in a southwesterly direction through the floodplain/channelized backwater ecosystem.
- Waterbody Identification Code (WBIC): 1265200
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply. It was reported in the previous WQBEL memo that Department fishery staff have determined the floodplain backwaters at this location support a variety of aquatic life, including spawning fish, in the open water channels.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are estimated for the Unnamed Tributary where Outfall 001 discharges.
  7-Q_{10} = 0 cubic feet per second (cfs)
  7-Q_2 = 0 cfs
- Hardness = 258 mg/L as $CaCO_3$. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they

don't impact the calculated WQBEL when the receiving water low flows are equal to zero.

- Multiple dischargers: Not applicable.
- Impaired water status: Unknown at the point of discharge, but the Wisconsin River, located approximately 0.5 miles (lineally) west of the outfall, is 303d listed as impaired and has an EPA-approved TMDL to address the phosphorus impairment in the waterbody.

Effluent Information

- Flow rate:
  Maximum annual average = 3.026 million gallons per day (MGD)
  There has been no discharge from Outfall 001 since 2010. Outfall 001 operates as an emergency spillway from the cooling pond. The flow rate listed above (3.026 MGD) is from the 2010 permit application.
- Hardness = 258 mg/L as $CaCO_3$. This value represents the geometric mean of four samples collected in September and October 2023 which were reported on the permit application.
- 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: Wisconsin River and high-capacity wells.
- Additives: Two biocides and eleven water quality conditioners were listed on the permit application. These additives are discharged to a large cooling pond with high retention times and in which fish are stocked. It is unlikely any toxicity is occurring due to the additives and would be removed if discharge were to occur from Outfall 001. Additives reported on the permit application are listed in Part 7 for reference, but no evaluation or use restrictions are necessary.
- Effluent characterization: This facility is categorized as a primary 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. Since there is no active discharge from Outfall 001, these were analyzed from grab samples from the pond.
- 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.

Copper Effluent Data

Sample Date	Result (µg/L)
09/21/2023	<5.2
09/25/2023	<5.2
09/28/2023	<5.2
10/02/2023	<5.2

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

Monitoring for all parameters with limits in the current permit was required only when there was an overflow discharge from the cooling pond to the Wisconsin River floodplain marsh during the reporting period. Since no discharge occurred, no monitoring was completed and therefore there is nothing to report in order to meet the requirements of s. NR 201.03(6), Wis. Adm. Code.

Attachment #1

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

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

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

Acute Limits based on 1-Q_{10}

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

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

Where:

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

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

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

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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT*	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chlorine		19.0	19.0	3.81	<20

Attachment #1

SUBSTANCE	REF. HARD. mg/L	ATC	MAX. EFFL. LIMIT*	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic		340	339.8	68.0	1.9
Cadmium	258	30.5	30.5	6.1	<0.41
Chromium	258	3913	3913.5	783	<1.1
Copper	258	37.9	37.9	7.6	<5.2
Lead	258	267	266.8	53.4	<1.4
Nickel	258	1045	1044.7	209	<1.5
Zinc	258	275	275.4	55.1	<10
Chloride (mg/L)		757	757.0	151	60

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	REF. HARD.* mg/L	CTC	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chlorine		7.28	7.28	1.46	<20
Arsenic		152.2	152	30.4	1.9
Cadmium	175	3.82	3.82	0.8	<0.41
Chromium	258	286.74	287	57.3	<1.1
Copper	258	23.26	23.3	4.65	<5.2
Lead	258	69.87	69.9	14.0	<1.4
Nickel	258	116.22	116	23.2	<1.5
Zinc	258	275.36	275	55.1	<10
Chloride (mg/L)		395	395	79.0	60

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

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	370	74.0	<0.41
Chromium (+3)	3818000	3818000	763600	<1.1
Lead	140	140	28.0	<1.4
Nickel	43000	43000	8600	<1.5

Attachment #1

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3	13.3	2.66	1.9

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, **no effluent limitations are required.**

Halogens, Total Residual as Chlorine – Limits for halogens went into effect on April 01, 2013 since chlorine and bromine are added to control bio-fouling in the condensers. **Since these halogens are still used, total residual halogens** (instead of total residual chlorine) **limits are required to continue.**

Zinc – A zinc anode system was installed at the facility in 2011 (and confirmed with facility in 2025 to still be in use) to reduce corrosion in the Unit 1 condenser, and the current limits for zinc went into effect on April 01, 2013. The need for these limits is not based on effluent data at Outfall 001, but rather because of a less restrictive categorical limit based on ch. NR 290, Wis. Adm. Code, which regulates zinc at an internal sampling point. **Surface water quality concentration and mass limits for total recoverable zinc are required to continue.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge and frequency of discharge, **one PFOA and PFOS grab sample is required during the permit term if discharge occurs.**

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for this substance effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that the WPL Columbia does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time. Four samples for ammonia nitrogen were taken in 2023, and the results are as follows:

Ammonia Nitrogen Effluent Data

Sample Date	mg/L
09/21/2023	<0.2
09/25/2023	<0.2
09/28/2023	<0.2
10/02/2023	<0.2

Ammonia was not detected in the effluent, and the limit of detection is much lower than the most restrictive ammonia limits that would be calculated. **No ammonia limits or monitoring are recommended** in the reissued permit.

PART 4 – PHOSPHORUS

Technology-Based Effluent Limit (TBEL)
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. WPL Columbia does not current have a TBEL but **did not exceed the 60 pounds of total phosphorus per month threshold this permit term since there was no discharge from Outfall 001. Therefore, no TBEL is recommended.**

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

Water Quality-Based Effluent Limits (WQBEL)
A Total Maximum Daily Load (TMDL) for the Wisconsin River Basin was approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. The TMDL addresses phosphorus water quality impairments within the basin and provides wasteload allocations (WLA) required to meet water quality standards. The document, along with the referenced appendices, can be found at: https://dnr.wisconsin.gov/topic/TMDLs/WisconsinRiver/index.html.

Even though WPL Columbia is located with the TMDL area, the discharge was not assigned a WLA in the TMDL area since the facility does not contribute a phosphorus load. According to the footnote in Appendix K of the TMDL document, WPL Columbia is considered a "pass through system" meaning that the discharge is not contributing phosphorus beyond what is present in the intake. Therefore, **no TMDL-derived phosphorus limits are required.**

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

Phosphorus monitoring is recommended during any period of active discharge.

PART 5 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new 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. Because there is no dilution available at the point of discharge, limits are set equal to the water quality criteria.

No new effluent temperature data has been collected; the table below summarizes the maximum temperatures reported at Outfall 001 during monitoring from March 2007 to May 2011.

Attachment #1

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	69	75	**49**	**75**
FEB	70	70	**50**	**75**
MAR	80	80	**52**	**77**
APR	80	83	**55**	**79**
MAY	95	95	**65**	**82**
JUN	96	96	**76**	**84**
JUL	-	95	**81**	**85**
AUG	95	95	**81**	**84**
SEP	-	-	**73**	**82**
OCT	88	88	**61**	**80**
NOV	83	86	**49**	**77**
DEC	76	79	**49**	**76**

Temperature limits became effective January 2016 and therefore must be retained unless the requirements in ch. NR 207, Wis. Adm Code, are met.

If discharge resumes in the future, the following general options are available to explore potential relief from the temperature limits:

- Effluent monitoring data: Verification or additional effluent monitoring (flow and/or temperature) may be appropriate if there were questions on the representativeness of the current effluent data.
- The limit in January and February is 75°F using the criteria for the Wisconsin River. The discharge is to a tributary to the Wisconsin River and therefore the criteria for a small warm water community should have been used. Because of this error, the limit may be increased if need is demonstrated in accordance with ch. NR 207, Wis. Adm. Code.
- Monthly low receiving water flows: Contract with USGS to generate monthly low flow estimates for the receiving water to be used in place of the annual low flow.
- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the defaults used in the calculations.
- A variance to the water quality standard: This is typically considered to be the least preferable and most complex option as it requires the evaluation of the other alternatives.

These options are explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards* which is linked at this webpage: https://dnr.wisconsin.gov/topic/Wastewater/Thermal.html.

Attachment #1

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.

The WET Checklist and *WET Program Guidance Document* (2022) were created to help staff complete a thorough WET analysis, but there are times when the recommendations given may not be appropriate for the situation. The WET Checklist was designed to evaluate process waters from a continuous municipal or industrial discharge, not intermittent or overflow discharges. The standard WET Checklist doesn't fit this discharge situation, and best professional judgment (BPJ) should be used to determine if WET testing is appropriate. WET testing at Outfall 001 is not necessary because the discharge is from a large cooling pond with high retention times, in which fish are stocked. Also, the periodic unpredictable nature of the discharge would make getting a representative sample for the Acute WET test improbable. Considering all of these factors, **WET testing is not recommended for Outfall 001.**

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. Guidance related to conducting an additive review can be found in *Water Quality Review Procedures for Additives* (2022) https://dnr.wisconsin.gov/topic/Wastewater/Additives.html.

Two biocides and eleven water quality conditioners were listed on the permit application. Since these additives are not discharged directly into a surface water without receiving treatment (or are expected to be removed prior to discharge to the cooling pond), a review of the additives is not needed. Furthermore, since the discharge is from a large cooling pond with high retention times, in which fish are stocked, it is unlikely any toxicity is occurring due to the usage of additives. **Additives reported on the permit application are listed in the table below for reference, but no further evaluation or use restrictions are necessary.**

Additives

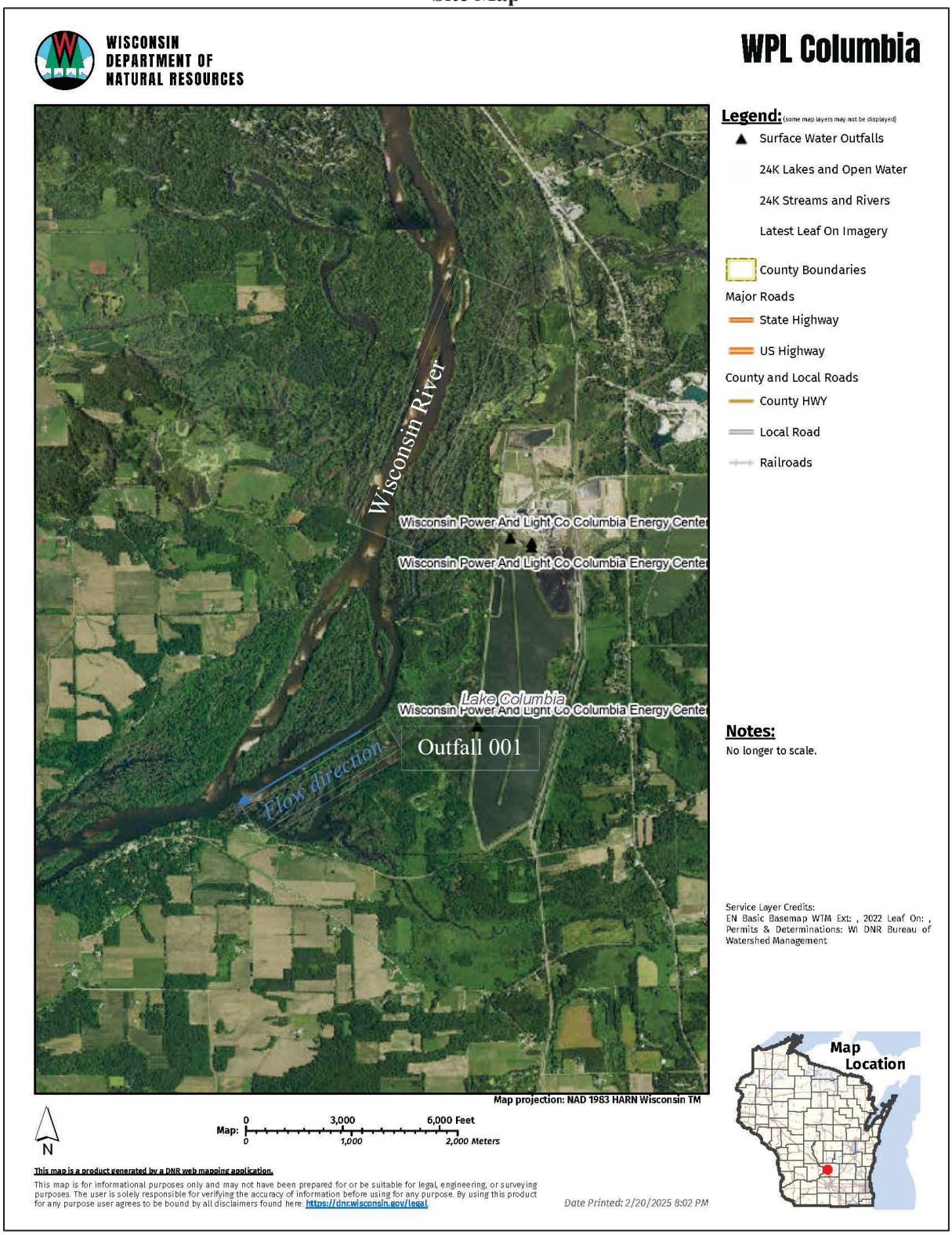
Additive Name	Manufacturer	Purpose of Additive including where added	Intermittent or Continuous Feed	Frequency of Use		Estimated Effluent Concentration (mg/L)
				Months per/yr.	Days/ week	
Acti-Brom 1318	NALCO	Condenser Biocide	I	12	7	0
Sodium Hypochlorite	KA Steel Chemicals Inc.	Condenser/ cooling Biocide	I	12	7	0
Carbon Dioxide (liq)	Airgas, Inc.	Cooling pond pH control	C	12	7	0
Sulfuric Acid 66 deg	Hydrite Chemical Co.	Demineralizer Regeneration	I	12	7	0

Attachment #1

Additive Name	Manufacturer	Purpose of Additive including where added	Intermittent or Continuous Feed	Frequency of Use		Estimated Effluent Concentration (mg/L)
				Months per/yr.	Days/ week	
Sodium Hydroxide	KA Steel Chemicals Inc.	Demineralizer Regeneration	I	12	7	0
Sodium Hydroxide 25%	KA Steel Chemicals Inc.	Interstage Caustic Injection	C	12	7	0
PC87-15	Ecolab	Reverse Osmosis Clean-in-Place Chemical	I	3	1	0
PC98-15	Ecolab	Reverse Osmosis Clean-in-Place Chemical	I	3	1	0
PC-1850T	NALCO	Reverse Osmosis Antiscalant	C	12	7	0
ECODEX P-202-H Resin	Graver Technologies	Cation/ Anion Exchange Resin	C	12	7	0
Powdex Premix 42N	Graver Technologies	Resin for Condensate Polisher	C	12	7	0
Ammonium Hydroxide	Hydrite Chemical Co.	Boiler Water pH control	C	12	7	0
Tri-sodium phosphate	Hydrite Chemical Co.	Boiler Water pH/chemistry control	C	12	7	0

Attachment #2

Site Map



CORRESPONDENCE/MEMORANDUM

DATE: August 22, 2025 FILE REF: FIN 5712

TO: File

FROM: Zach Watson Hydrogeologist - SCR

SUBJECT: Groundwater Evaluation for Wisconsin Power and Light Co Columbia Energy WI-0002780-09-1

Site Description

The Wisconsin Power & Light Columbia Energy Center (CEC) is a base-load facility (2 units, 510 MWe each) using steam from coal combustion to drive electrical generators. CEC is located south of Portage, Wisconsin to the east of Duck Creek and the Wisconsin River. A site map of the facility and the location of the specific sample points and outfalls is provided as **Figure 1**.

CEC generates wastewater from the sanitary systems at the plant (sample point 101), the coal pile dust control irrigation and precipitation (sample point 010/110), coal ash landfill leachate (contributor to sample point 301), precipitation/site runoff/miscellaneous building floor drains directed to the oil/water separator (contributors to sample point 301), cooling water derived from the Wisconsin River (sample point 702) and recycled cooling tower waters (sample point 401). **Figure 2** is a flow diagram outlining all the individual wastewater streams.

All wastewater is eventually directed to the Cooling Water Pond (Outfall 003), except for sample point 010/110 which infiltrates to shallow groundwater adjacent to the Cooling Water Pond. The Cooling Water Pond is a 480-acre pond that recirculates wastewater and Wisconsin River water. The main purpose of the Cooling Water Pond is for thermal cooling of the condenser non-contact cooling water. The water in the Cooling Water Pond is continuously infiltrating to groundwater and replenished by the intake of 14 MGD of Wisconsin River water. Infiltration of the cooling water into groundwater was estimated to be approximately 25,000 – 45,000 gal/ac/day (12 – 21 MGD) for 2020 – 2024 as calculated by the permittee and submitted to the department.

In late 2023, CEC completed construction activities to remove all ash material from the Ash Settling Pond (Sample Point 005). A storm water pond was built in the footprint of the former Ash Settling Pond. This absorption pond is no longer receiving wastewater, and therefore, 2023 was the final year of hydraulic application to this unit. Sample Point 005 will be removed from the upcoming permit.

Geology and Hydrogeology

Soils at the site are primarily glacial and river sand to a depth of approximately 50 to 100 feet. Bedrock underlying the unconsolidated sand is the Cambrian-Ordovician sandstone aquifer. The ground surface elevation at the site is around 800 – 810 feet above mean sea level (famsl), except for the landfills and other stockpiles. The elevation of the Cooling Water Pond is typically around 788 famsl and the Wisconsin River and Duck Creek are around 780 famsl. The regional water table flows towards the Wisconsin River (**Figure 3**).

There are no groundwater monitoring wells associated with any of the sample points or outfalls in this WPDES permit. Groundwater elevations as measured at the groundwater monitoring wells in 2024 for the landfills to the north of the Cooling Water Pond typically fall between 780 – 785 famsl (**Figure 4**). Groundwater flow directions as measured by the landfill groundwater monitoring wells are variable but generally to the north and west towards the Wisconsin River and Duck Creek. Groundwater vertical gradients are zero to slightly downward at the groundwater monitoring wells ranging from -0.001 ft/ft to -0.088 ft/ft (**Appendix A**). The highest downward gradients were observed at the MW-217/MW-220RR well nest which is

the closest well nest to the Wisconsin River/Duck Creek. The Cooling Water Pond is considered a short flow path to surface water.

Sample Point 101 – Sewage Treatment System Effluent
This sample point is for treated sanitary wastewater generated at the facility. Domestic wastewater is sent through septic settling tanks, recirculating media filter, and disinfected prior to discharge into the Cooling Water Pond. The average discharge from this sample point was 1,085 gallons per day in 2024. The treated effluent discharged to the Cooling Water Pond is significantly diluted by the cooling pond total volume and potential contaminants are expected to be attenuated as the discharge enters the Cooling Water Pond.

Sample Point 301 – Oil/Water Separator
This outfall is for the wastewater discharged from the oil/water separator to the Cooling Water Pond. The oil/water separator removes solids and non-soluble petroleum products from the wastewater prior to discharging into the Cooling Water Pond. Wastewater directed to the oil/water separator comes from multiple sources within the plant and from the site, including stormwater draining to the manhole upstream of the oil/water separator, miscellaneous thermal wastewaters, equipment drains, floor drains, RO reject, demineralizer wastewaters, and leachate from the on-site ash landfills. Additives are in use within the plant that contribute to the Outfall 301 wastewaters. As reported by Alliant, these additives are not expected to have residual concentration at the outfall.

Leachate was directed to the Cooling Water Pond following the abandonment of the Ash Settling Ponds (Sample Point 005) in 2023. Leachate from the ash landfills, via the landfill sumps and Duck Pond, is pumped into trucks and discharged to the manhole upstream of the oil/water separator. Approximately 11.78 MG of landfill leachate was discharged to the Cooling Water Pond in 2024, an average of approximately 32,000 gallons per day. This leachate is monitored semiannually as part of the WDNR Solid Waste License #3025. The results from the semi-annual samples collected in 2024 are provided as **Appendix B**. The sampling plan for the leachate is provided as **Appendix C**.

Table 1 - Landfill Leachate LP-1 directed to Sample Point 301 (2023 – 2025)

Month	2023 (MG/month)	2024 (MG/month)	2025 (MG/month)
January	0	0	0
February	0	0	0
March	0	0.82	0
April	0	1.48	1.78
May	0	1.21	2.87
June	0	1.48	0.24
July	3.53	3.34	0.25
August	0	0.78	Not Yet Occurred
September	0	0.20	
October	0	0.93	
November	0	1.23	
December	0	0	

The data in this table was provided by the facility to the department in August 2025.

Discharge from Sample Point 301 to the Cooling Water Pond averaged 117,000 gallons per day in 2024. This discharge is approximately 0.5 – 1.0% of the total daily volume entering groundwater via the Cooling Water Pond. Given the significant dilution within the Cooling Water Pond, the leachate and other Sample Point 301

wastewaters are expected to be attenuated as the discharge enters the Cooling Water Pond and migrates into shallow groundwater.

Sample Point 401 – Cooling Towers to Cooling Water Pond
The cooling towers are utilized to reduce the temperature of the Cooling Water Pond water prior to use in the facility. These cooling towers are generally only utilized May through October annually. The average daily discharge from the cooling towers in May – October 2024 was 257 MGD. Additives are in use to control bacteria growth and pH in the towers, see **Figure 2** for additive location.

Sample Point 010/110 – Coal Runoff Settling Basin
A coal stockpile is kept at the northeast end of the Cooling Water Pond (**Figure 1**). A 1.06-acre stormwater/absorption pond is located downgradient of the stockpile to manage the runoff from precipitation and irrigation used to mitigate dust from the coal stockpile and the washing of tractors and conveyors. Sample point 010 is the measurement of the irrigation water discharged on a daily basis, also known as the daily coal yard water use factor. The facility generates the annually reported value of gallons/acre/day by measuring the total water used on a given day and dividing by the acreage of the absorption pond (i.e., 1.06 acres). The average irrigation to the coal pile to mitigate coal dust was 21,097 gallons/acre/day for 2020 through 2024.

To assess the impact of this seepage, the stockpiled coal (i.e., Sample Point 110) is tested annually for arsenic, copper, iron, mercury and sulfate using the synthetic precipitation leaching procedure (SPLP). SPLP is a laboratory test used to determine how readily contaminants leach from soil or waste materials when exposed to simulated precipitation. This method is utilized in part due to difficulties in analyzing the run-off water itself due to matrix interferences. The results for arsenic, copper and iron are routinely non-detect (**Figure 5**). The results for sulfate are approximately 10 mg/l with one high outlier result at 89.6 mg/l during the past five years. Based upon these results, the seepage from this coal stockpile should not result in the exceedance of the groundwater standards for sulfate. The results for mercury are variable and range from non-detect to 110 ng/l. Similarly, the seepage from the coal stockpile is not expected to be causing exceedances of the groundwater standards for mercury.

Sample point 003 - Cooling Water Seepage
The water in the Cooling Water Pond is primarily water derived from the Wisconsin River (sample point 702). As mentioned above, the cooling water is also comprised of the aforementioned wastewaters. This cooling water is recycled in the plant and replenished by the sample point 702 as needed. Approximately 14 MGD of Wisconsin River water is brought into the cooling water system. As mentioned above, CEC calculates the infiltration rate from the Cooling Water Pond into groundwater on an annual basis. The original memo outlining the calculation of infiltration is provided for reference as **Appendix D**.

A sample of the water in the Cooling Water Pond was collected and analyzed as part of the permit application (**Appendix E**). No VOCs or phenols were detected in this sample. Chloride was reported at 60 mg/l, below the NR 140 PAL of 125 mg/l. Total nitrogen was less than 1 mg/l. Arsenic was the only metal detected above its respective detection limit. The concentration of arsenic was 1.9 µg/l, above the NR 140 PAL of 1 µg/l. Arsenic was reported at a concentration of 1.6 µg/l in the sample collected for the prior permit application in 2017. Some of the arsenic is expected to bind with the sediments at the base of the Cooling Water Pond as it infiltrates and migrates into groundwater. Some of this arsenic is also expected to migrate directly into groundwater and eventually into Duck Creek and the Wisconsin River as much of the shallow sediments are comprised of sand which has limited cation exchange capacity.

Sample Point 005 – Ash Settling Ponds

The current permit included a compliance schedule (i.e., Section 5.1) that requested the permittee either submit a certification statement that the facility will cease discharge of bottom ash transport water to waters of the state (via Sample Point 005) by December 31, 2023 or perform a hydrologic connection study that determines whether or not pollutants reach the Wisconsin River. WPL Columbia ultimately chose to cease discharge to the ash settling ponds and all discharge was permanently ended on March 31, 2023. Both the secondary and primary ash ponds were substantially abandoned, including dewatering and removal of ash material, by 2024. The ash that was once directed to these ponds is now sent to the Columbia Dry Ash Disposal Facility (WDNR Solid Waste License #3025) that is specifically designed to contain the pollutants in coal ash and prevent leaching into waters of the state.

Conclusions, Recommendations and Schedule Requirements

- The permittee must develop and submit a Land Treatment Management Plan to the department for review and approval.
- The calculation or measurement of the seepage rates for each land treatment outfall must be included in the Land Treatment Management Plan. Additionally, the specific calculation for each year must be included in the Land Treatment Annual Reports.
- Sample point 101
    - No suggested changes in monitoring.
- Create a new sample point for the leachate trucked to the manhole upstream of the oil/water separator Outfall 301. This sample point could be identified "Sample Point 501 – Landfill Leachate LP-1"
    - The addition of the following parameters is intended to capture the monitoring already occurring for compliance with the WDNR Solid Waste License #3025 so that it is also directly reported to the Wastewater Program. The new leachate-specific Sample Point 501 should include the following parameters to be monitored semi-annually in April and October of each year:
        - Volume (Calculated)
        - Arsenic
        - BOD
        - Field Conductivity
        - Field pH
        - Alkalinity
        - Boron
        - Cadmium
        - Chloride
        - COD
        - Hardness
        - Iron
        - Lead
        - Manganese
        - Mercury
        - Selenium
        - TSS
        - Antimony
        - Beryllium
        - Cobalt
        - Fluoride
        - Lithium
        - Molybdenum
        - Radium 226 + 228
        - Sulfate
        - Thallium
        - SVOC Compound Scan
- Sample Point 301
    - Sample point description must be changed to reflect the inclusion of Sample Point 501 volumes being counted in the 301 flow measurement.
- Sample Point 401
    - No suggested changes in monitoring.
- Sample Point 110 and 010

    - These sample points should be combined into one sample point/outfall or there should be more description in the permit fact sheet so that staff, the permittee and the public are clear on how these outfalls are configured.
    - Monitoring for the following parameters should be added. The SPLP procedure could be utilized.
        - Chloride
        - Lithium
        - Molybdenum
        - Selenium
- Sample Point 003
    - Add monitoring for Arsenic.

Figure 1 – Site Map

WPL Columbia Energy Center

2023 WPDES Permit Renewal Application
Site Map

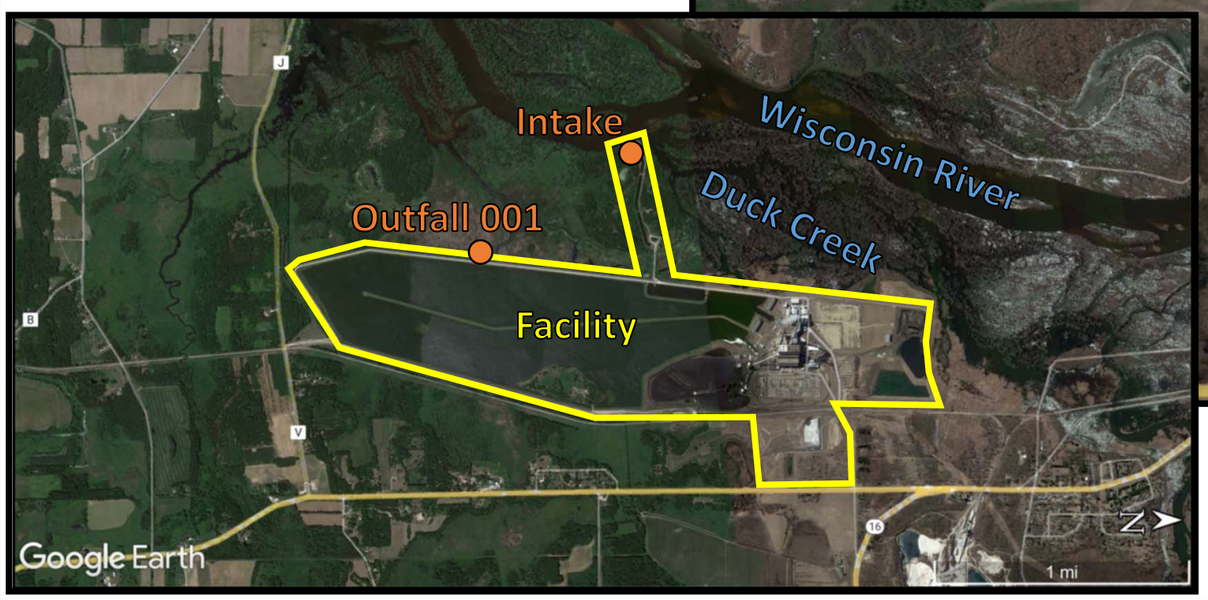
Outfall 001 – Cooling Pond Emergency Overflow
Outfall 101 – Sewage Treatment Plant Discharge
Outfall 301 – Oil/Water Separator Discharge
Outfall 401 – Cooling Tower Effluent
Sample Point 702 – Wisconsin River Influent
Sample Point 003 – Cooling Pond
Sample Point 010 – Coal Pile Runoff Pond
Sample Point 110 – Coal Pile Runoff Pond

This figure is intended to meet the requirements of the Site Map for the 2023 Wisconsin Pollutant Discharge Elimination System (WPDES) Permit Renewal Application for Wisconsin Power and Light (WPL) Columbia Energy Center (WPDES Permit No. 0002780).

Outlines and locations shown are approximate.

The facility is adjacent to Duck Creek and the Wisconsin River. Outfall 001 is approximately 1.2 miles from the main plant area.

No groundwater monitoring is conducted for compliance with the WPDES Permit. Site groundwater is monitored in compliance with Federal and Wisconsin Department of Natural Resources Solid Waste Disposal requirements.



Alliant Energy®

Figure 2 – Flow Diagram

Flow metering: calculated via pump run time

Flow metering: calculated via pump run time

Flow metering: Calibrated Flow Meter (Magnetrol Echotel 345)

Flow metering: Weir with Ruler

Makeup Pump House

Wisconsin River

Sampling Point 702

Cooling Pond

Outfall 001

Marsh

169,229

Pump House

169,229

Cooling Tower 1B & 2B

569

Evaporation & Drift

168,660

Outfall 401

168,660

34,113

Precipitation

2,544

Site Runoff

696

1,848

Oil/Water Separator (Note 9)

2,046

Outfal 301

2,046

294,306

171

5

3,200

Evaporation

8,794

Infiiltration

Outfall 003 Seepage

Flow metering: calculated

Site Name and Location: Columbia Generating Station

1. SELECT 24-HR RAINFALL EVENT

1 yr
2 yr
10 yr
25 yr
50 yr
100 yr

4.91 inches of rainfall

or Exclude Rainfall

2. UNIT OPERATION

Low Load Operation — Low Load

3. MISCELLANEOUS FLOWS

Bottom Ash Flows — Include

Screenhouse

Sodium Hypochlorite

Acti-Brom 1318

CO2

272,056

Unit 1 & 2 Condenser

272,056

Seal Well

294,306

198 (1,334)

Low Pressure Service Water Users

575

59 (117)

Lime System

59 (117)

SDA

610

Evaporation

22,250

Precipitation

2,592

207

26

Frog Pond

2,384

Coal Pile

181

26

Coal Pile Runoff Pond

2,384

3

Evaporation

16

16

Infiiltration

Outfall 010/110 Seepage

Manhole where contact water is hauled from Landfill to OWS

Green: Grab or Composite Sampling Location.
Blue: Process Additive Addition
Red: Flow Metering note.
Orange: LF contact water note

AQCS Potable Users (Restrooms Discharge to Holding Tank)

Saftey Shower / Eye wash Drains

516 (1,404)

Recycle Ash Slurry System

551 (1,404)

35

1

4

Misc Equipment Cooling and Turbine Bldg Floor Drains

4

Condenser Pit Sumps

4 (1,334)

194

22,250

Aux Equipment Cooling

22,250

16

Reclaim Hopper & Misc Fuel Yard Usage

47

HPSW System

47

14

Fire Protection

14

1

Bunker Sump

5 (300)

6

(300)

Evaporation

1

Ash Removal

6

331

Ash Hopper Area Misc Flow (Leaks and Drains)

10

Condenser Priming

10

7

Tripper Floor Washdown

Overflow

Ash Hopper Seals

Ash Hopper Refractory Cooling System

331

362 (2,644)

Clarifiers

850

Overflow

Mobile Max SFC

(300)

Sludge

35

183

672

Bottom Ash Sluice

672

852

852

1,211

Effluent

Surge Tank

126

Ash Hopper Flush Nozzles

126

852

12

171

80

18

Economizer Hopper

18

Evaporation

1

Precipitation

8

Boiler Blowdown Tempering System

Fly Ash Exhauster Seal Water

171

7

36

Pyrite Hoppers

36

Pyrite Transfer Tank

Window & Seal Water

12

0

1,183 (2,560)

Bottom Ash Water Recirculation

Building Heating Cooling Water

80

Sodium Hydroxide, PC87-15, PC98-15 PC-1850T

129

RO System

100

Makeup Demineralizer

95

Unit 1 & 2 Boiler

68

Boiler Blowdown

160

AH Wash Sumps

160 (4,659)

Precipitation

517

429

Landfill (Runoff and Leachate)

Evaporation

Sulfuric Acid & Sodium Hydroxide

29

Demin Waste

5

ECODex Resin, Powdex Premix 42N

5

27

Sootblowing/ Evaporation

Boiler Draining

150k per Unit

88

429

Duck Pond (Note 8)

RO Reject

29

Chemical Waste Sump

34 (642)

Misc Equip Drains

Ammonium Hydroxide, Tri-sodium phosphate, Sodium Hydroxide

1

Deep Wells 1, 2, 3

6

Sanitary and Potable Water System

5

Sewage Treatment System

5

Outfall 101

5

Flow metering: Flow meter on sampler (900 Sigma Max)

NOTES:

1. Flows are shown in gallons per minute (gpm) and rounded to the nearest gpm.
2. Flows are based on average daily conditions. Max process flows shown in parentheses. Max flows do not balance.
3. Precipitation calculated by using SCS curve number method for the different runoff areas. Flow shown is the rain event chosen, averaged over a 24 hour period.
4. Dashed lines represent intermittent process flows or atypical paths.
5. Flow paths not dictated by a flow value were not measured or enough data was not present to make a reasonable estimation for the value.
6. Infiltration values provided by Alliant Energy and were not calculated by BMcD.
7. In general, flows do not balance around pond systems. Precipitation or intermittent flows are expected to be captured in storage capacity of existing ponds.
8. Duck Pond water is hauled via truck to the surge tank for evaporation in the SDA or routed to Outfall 301. This wastewater could also be used for dust control but only within lined areas of the landfill. Flows are based on previous hauling records.
9. OWS has continuous flow capacity of 1,800 gpm and a surge flow of 2,940 gpm that should not exceed 4 minutes in duration.

FINAL

Date 9/23/2021	Detailed D. Elliott
Designed D. Elliott	Checked B. Hansen

Alliant Energy

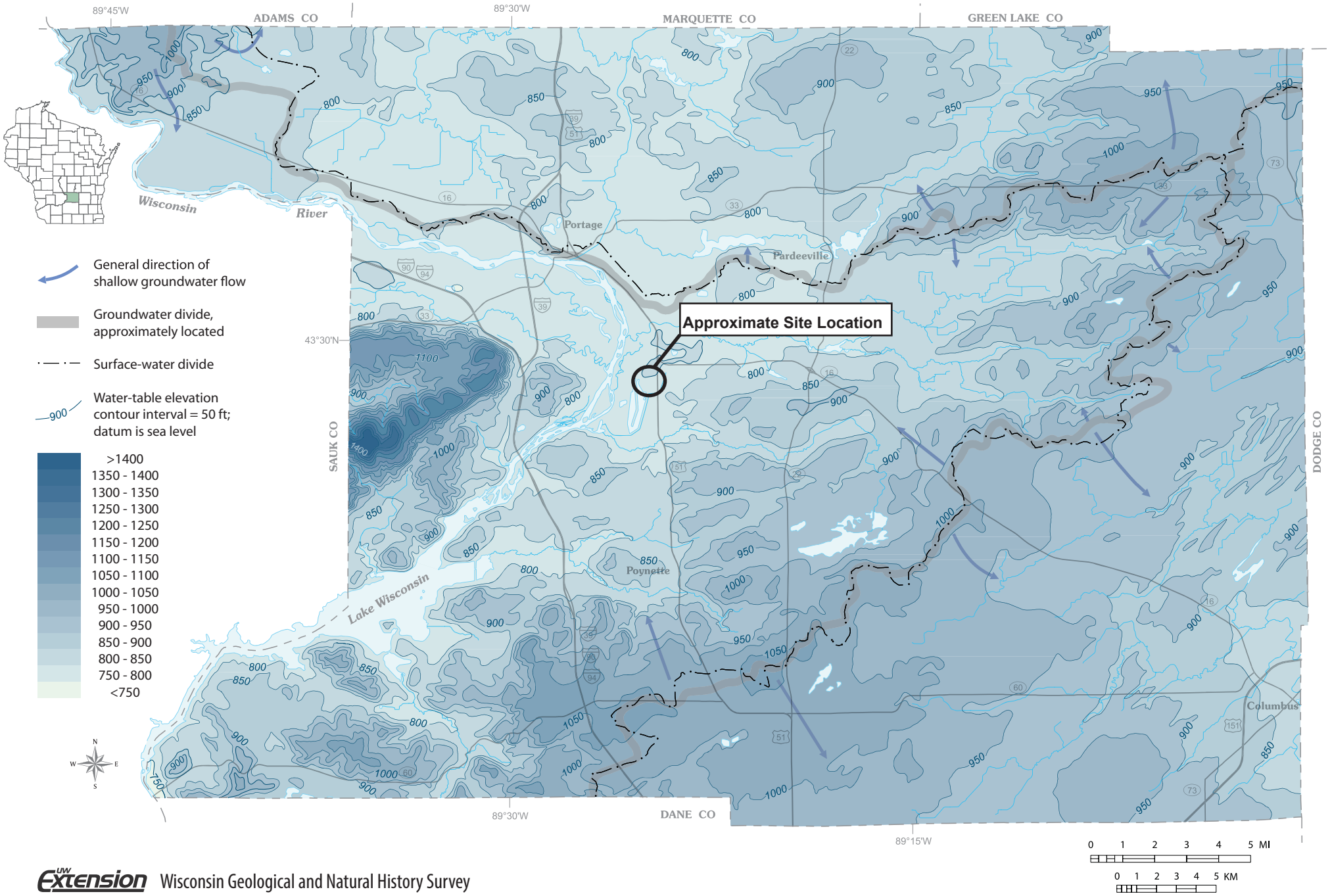
BURNS McDONNELL

Alliant - Columbia Generating Station
Water Balance

Project 114958	Contract
Drawing **WMB - 01**	Rev **D**

Figure 3 – Columbia County Water Table Map

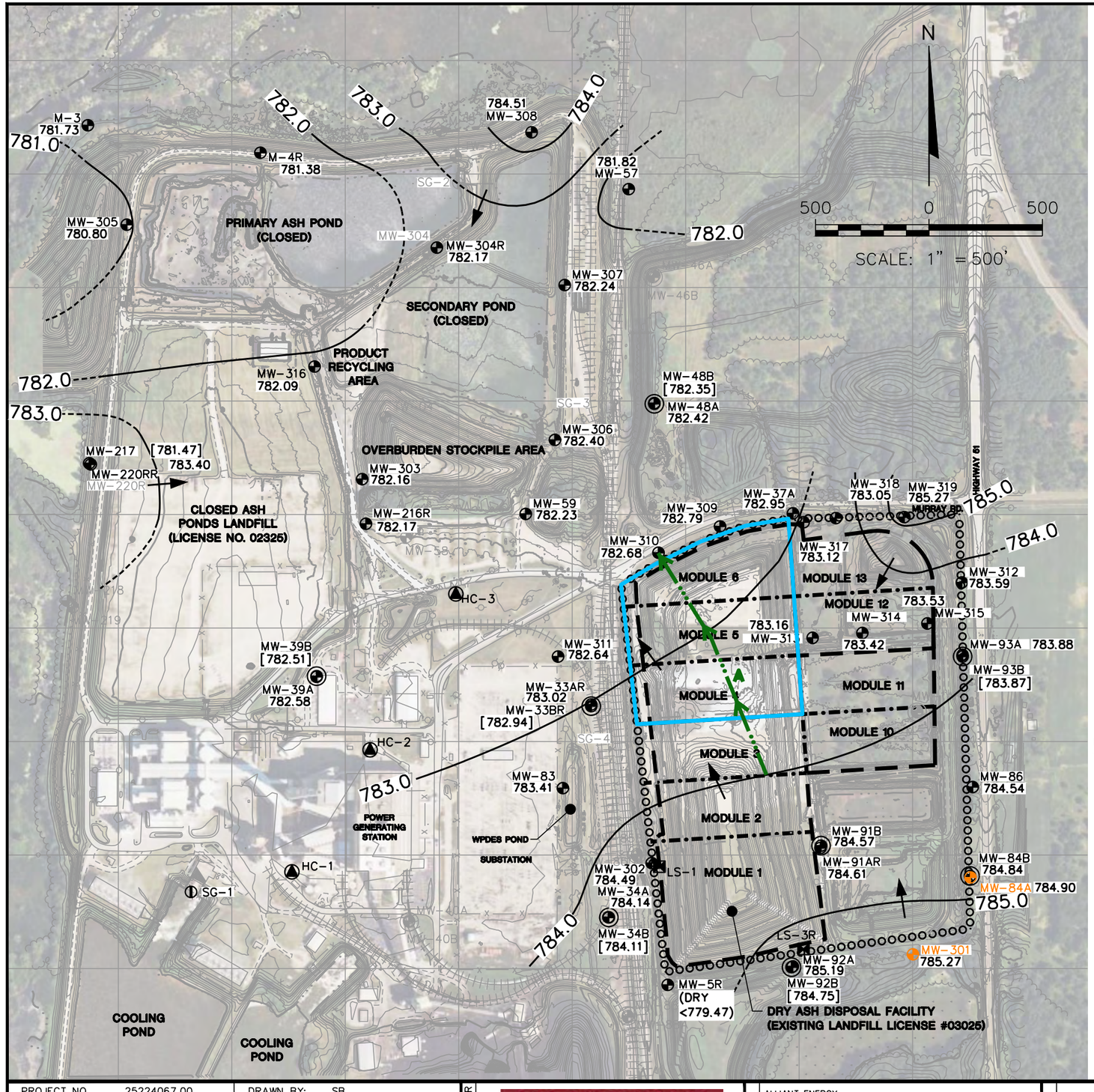
Generalized water-table elevation in Columbia County, Wisconsin



Wisconsin Geological and Natural History Survey

Source: Sellwood, Stephen M., Wisconsin Geologic and Natural History Survey, Water Table Elevation, Groundwater Resources of Columbia County Wisconsin,

Figure 4 – Landfill Groundwater Monitoring System Water Table Maps April and August 2024



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- EXISTING FENCELINE
- EXISTING TRACKS
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EDGE OF WATER
- DRY ASH DISPOSAL FACILITY LIMITS
- LINER PHASE/MODULE LIMITS
- WATER SUPPLY WELL
- STAFF GAUGE
- WATER TABLE WELL
- PIEZOMETER
- LYSIMETER
- ABANDONED WATER TABLE WELL
- ABANDONED PIEZOMETER
- CCR MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- 783.88 — WATER TABLE ELEVATION
- [781.47] — POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
- (DRY) — SURFACE WATER ELEVATION (NOT CONTOURED)
- WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 4)
- CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. BACKGROUND MONITORING WELLS FOR THE PRIMARY ASH POND ARE: MW-301 AND MW-84A.
8. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON DECEMBER 12 AND 19, 2022.
9. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
10. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK (01/06/2025)
REVISED:	12/06/2024	APPROVED BY:	TK (01/06/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

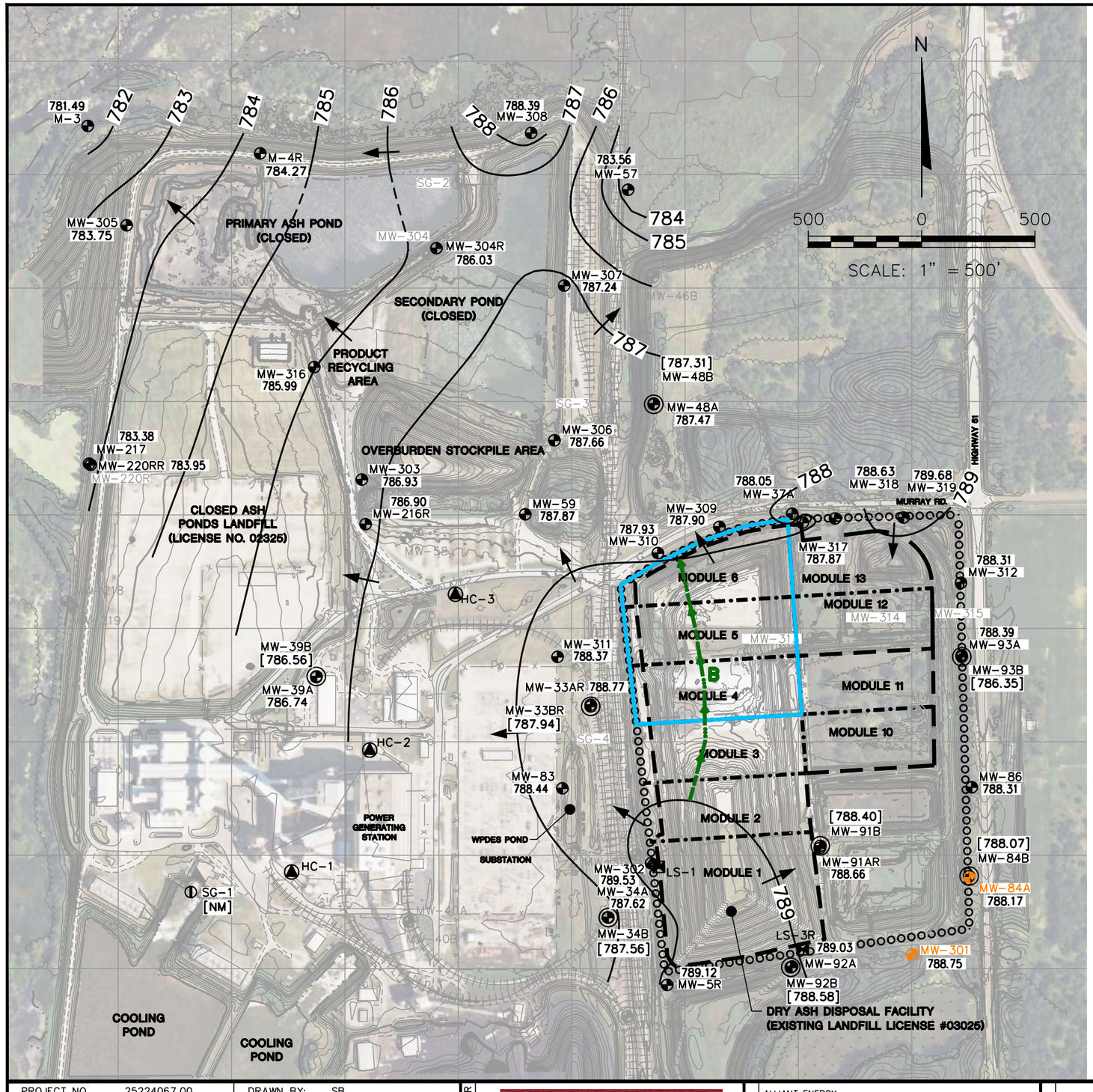
CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PRIMARY ASH POND
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
APRIL 15-17, 2024
MODULES 4-6

FIGURE
3

I:\25224067.00\Drawings\COL April 2024 WTBL CCR Units.dwg, 1/6/2025 10:56:17 AM



LEGEND

- EXISTING MAJOR CONTOUR (10' INTERVAL)
- EXISTING MINOR CONTOUR (2' CONTOUR)
- EXISTING FENCELINE
- EXISTING TRACKS
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EDGE OF WATER
- DRY ASH DISPOSAL FACILITY LIMITS
- LINER PHASE/MODULE LIMITS
- WATER SUPPLY WELL
- STAFF GAUGE
- WATER TABLE WELL
- PIEZOMETER
- LYSIMETER
- ABANDONED WATER TABLE WELL
- ABANDONED PIEZOMETER
- CCR MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- 788.75 — WATER TABLE ELEVATION
- [781.47] — POTENTIOMETRIC SURFACE ELEVATION (NOT CONTOURED)
- [NM] — NOT MEASURED
- WATER TABLE CONTOUR (1-FOOT CONTOUR INTERVAL) (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- FLOW PATH FOR VELOCITY CALCULATION (SEE TABLE 4)
- CCR UNIT

NOTES:

1. BASE MAP CREATED FROM AERIAL SURVEY BY KBM, FLOWN DECEMBER 1, 2014, AND GROUND SURVEYS BY SCS ENGINEERS IN MAY 2019, DECEMBER 2020, NOVEMBER 2021, AND DECEMBER 2021, AND BY DRONE SURVEY BY AMES IN NOVEMBER 2022.
2. MONITORING WELL LOCATIONS AND ELEVATIONS SURVEYED BY WISCONSIN POWER AND LIGHT, INC. IN DECEMBER 1994, NOVEMBER 1996, APRIL 2003, AND JANUARY 2016 AND BY SCS ENGINEERS IN FEBRUARY 2018.
3. SUPPLY WELL LOCATIONS ARE APPROXIMATE AND ASSUMED BASED ON JANUARY 2013 DRAWINGS BY TRC.
4. MONITORING WELLS MW-301 THROUGH MW-305 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 11-13, 2015.
5. MONITORING WELLS MW-306 THROUGH MW-308 INSTALLED BY BADGER STATE DRILLING ON NOVEMBER 14-15, 2016.
6. MONITORING WELLS MW-309 THROUGH MW-311 INSTALLED BY BADGER STATE DRILLING ON FEBRUARY 13-14, 2018.
7. MONITORING WELLS MW-93A, MW-93B, AND MW-312 INSTALLED BY CASCADE ENVIRONMENTAL ON MARCH 25-28, 2022.
8. MONITORING WELL MW-316 WAS INSTALLED BY HORIZON CONSTRUCTION & EXPLORATION ON APRIL 27, 2023.
9. MONITORING WELLS MW-317, MW-318 AND MW-319 WERE INSTALLED BY HORIZON CONSTRUCTION 7 EXPLORATION ON APRIL 9 THROUGH 11, 2024. MONITORING WELLS MW-313, MW-314, AND MW-315 WERE ABANDONED BY HORIZON CONSTRUCTION AND EXPLORATION ON MAY 22-23, 2024.
10. BACKGROUND MONITORING WELLS FOR THE PRIMARY ASH POND ARE: MW-301 AND MW-84A.

PROJECT NO.	25224067.00	DRAWN BY:	SB
DRAWN:	11/05/2024	CHECKED BY:	NLB/BRK (01/09/2025)
REVISED:	01/09/2025	APPROVED BY:	TK (01/09/2025)

ENGINEER: SCS ENGINEERS
2830 DAIRY DRIVE MADISON, WI 53718-6751
PHONE: (608) 224-2830

CLIENT: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
W8375 MURRAY ROAD
PARDEEVILLE, WI 53954

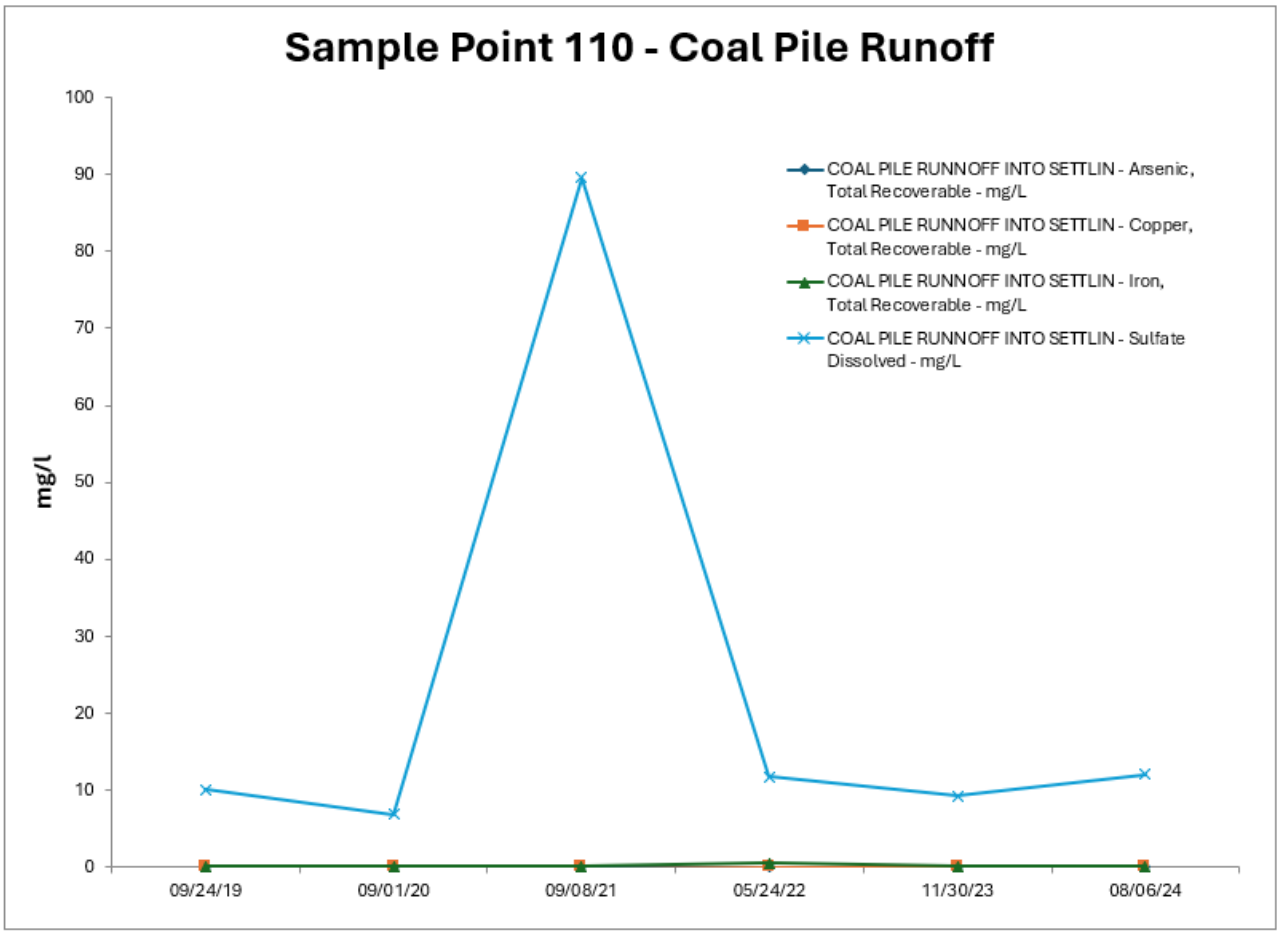
SITE: ALLIANT ENERGY
COLUMBIA ENERGY CENTER
PRIMARY ASH POND
PARDEEVILLE, WI

WATER TABLE CONTOUR MAP
AUGUST 15, 2024
MODULES 4-6

FIGURE
4

I:\25224067.00\Drawings\COL August 2024 WTBL CCR Units.dwg, 1/9/2025 2:20:41 PM

Figure 5 – Coal Pile Runoff Sample Results



Appendix A – Groundwater Vertical Gradients

Table 1. Summary of Calculated Vertical Hydraulic Gradients
Wisconsin Power and Light - Columbia Ash Ponds and Dry Ash Disposal Facilities
Licenses #2325 and 3025
2023 - 2024

	Ash Ponds				Dry Ash Diposal Facility			
Date	**MW-92A/MW-92B**	**W-39A/W-39B**	**MW-48A/MW-48B**	**MW-220RR/W-217**	**MW-33AR/MW-33BR**	**MW-34A/MW-34B**	**MW-84A/MW-84B**	**MW-91AR/MW-91B**
April 24-27, 2023	-0.017	-0.004	-0.002	-0.066	-0.016	-0.0037	-0.007	-0.007
October 9-11, 2023	-0.023	-0.005	-0.010	-0.026	-0.007	-0.006	-0.006	-0.012
April 15-17, 2024	-0.019	-0.002	-0.003	-0.088	-0.003	-0.001	-0.004	-0.002
October 1-3, 2024	-0.019	-0.003	-0.005	-0.084	-0.024	-0.001	-0.005	-0.012

Note:
A positive vertical gradient indicates upward flow potential, and a negative vertical gradient indicates downward flow potential.
NM = Groundwater elevation at one or both wells was not measured during this sampling event.

Created by: MDB Date: 1/7/2015
Last revision by: EMS Date: 12/16/2024
Checked by: KMV Date: 12/23/2024

Appendix B – Leachate Basin LP-1 2024 Sampling Results

2023-2024 CCR Monitoring Results - Leachate Basin LP-1
Wisconsin Power and Light - Columbia Dry Ash Disposal Facility
License #3025

Monitoring Point	Monitoring Period	Temperature, Field (deg C)	pH, Field (Std. Units)	Specific Conductance, Field (µmhos/cm)	Chloride, Total (mg/L)	Fluoride, Total (mg/L)	Sulfate, Total (mg/L)	Alkalinity, Total as CaCO3 (mg/L)	Total Hardness by 2340B (mg/L)	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Biological Oxygen Demand, 5 Day (mg/L)	Chemical Oxygen Demand (mg/L)	SVOCs	Antimony, Total (µg/L)	Beryllium, Total (µg/L)	Boron, Total (µg/L)	Cadmium, Total (µg/L)	Cobalt, Total (µg/L)	Iron, Total (µg/L)	Lead, Total (µg/L)	Lithium, Total (µg/L)	Manganese, Total (µg/L)	Mercury, Total (µg/L)	Molybdenum, Total (µg/L)	Selenium, Total (µg/L)	Thallium, Total (µg/L)	Radium 226 + 228 (pCi/L)
LP-1	Apr-24	15.0	6.54	2,951	565	<4.8	1,130	78.6	821	2,810	18.0	3.7^	95.2	--	0.39 J	<0.25	1,980	<0.15	0.88 J	592	0.68 J	101.0	40.1	<0.066	264	13.8	<0.14	1.03
	Oct-24	16.5	7.00	3,260	493	<1.9	1,300	77.3	885	<0.15	4.3	3.0	--	ND	0.34 J	<0.25	2,190	<0.15	0.41 J	79.5 J	<0.24	84.1	59.3	0.091 J	149	6.8	<0.14	0.319

Abbreviations:
µg/L = micrograms per liter or parts per billion (ppb)
mg/L = milligrams per liter or parts per million (ppm)
-- = not analyzed
µmhos/cm = micromhos/centimeter
N = none observed
-- = not analyzed
SVOCs = Semivolatile Organic Compoun

Notes:
J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.
^: The BOD sample collected on 4/16/2024 was received by the laboratory outside of the sample hold time. LP-1 was resampled for BOD on 4/23/2024, and that results is included in this table.

Created by: EMS Date: 12/20/2024
Last revision by: MDB Date: 1/8/2025
Checked by: Date:

\\Mad-fs01\data\Projects\25224067.00\Deliverables\2024 Biennial Report (2023-2024)\Appendix D_Results\working files\[Dry Ash_Results_CCR Wells__2023-2024.xlsx]LP1

Appendix C – Leachate Basin LP-1 Sampling Plan

Table 1. NR 507.15(3) Groundwater Monitoring Program
CCR Monitoring Program
Wisconsin Power and Light - Columbia Ash Disposal Facility

Landfill Modules and Monitoring Points		Parameters - Detection Monitoring	Frequency
Leachate			
All Modules*	LP-1*	BOD_5	Semiannual (April/October)
		Field conductivity (at 25 deg C)	
All Modules*	Leachate Collection Tank*	Field pH	
		Alkalinity	
		Boron	
		Cadmium	
		Chloride	
		COD	
		Hardness	
		Iron	
		Lead	
		Manganese	
		Mercury	
		Selenium	
		Total suspended solids	
		Antimony	
		Beryllium	
		Cobalt	
		Fluoride	
		Lithium	
		Molybdenum	
		Radium 226 and 228, combined	
		Sulfate	
		Thallium	
		Semivolatile organic compound scan	Annual

^: MW-313, MW-314, and MW-315 will be abandoned prior to construction of Module 12.
*: At a later date, the leachate collection system will be converted to discharge all leachate to the Leachate Collection Tank.

Created by:	MDB	Date:	1/11/2023
Last revision by:	MDB	Date:	8/10/2023
Checked by:	ACW	Date:	8/17/2023

\\Mad-fs01\data\Projects\25222260.00\Deliverables\Plan Modification Addendum\Appendicies\H_Groundwater Sampling an

Appendix D – Cooling Water Pond Seepage Calculation Memo

ALLIANT ENERGY

RECEIVED

DEC 26 2013

WT/3 - WY/3 - OGL/3

Wisconsin Power and Light Company
An Alliant Energy Company

Corporate Headquarters
4902 North Biltmore Lane
Madison, WI 53718

Office: 1.800.862.6222
www.alliantenergy.com

December 20, 2013

Submitted Electronically and US Mail

Mr. Jeff Brauer
Wastewater Engineer
Wisconsin Department of Natural Resources/GEF 2
101 South Webster
Madison, WI 53707-7921

Re: WPL – Columbia Energy Center *WPDES Permit Number 0002780-08-0*
Basin Seepage Calculation

Dear Mr. Brauer:

Wisconsin Power and Light Company *(WPL)* hereby submits the Basin Seepage Report for Section 4.2.1 as required on Page 13; Section 4.0 of WPDES Permit Number WI-0002780-08-0 for the WPL – Columbia Energy Center, located in Pardeeville, Wisconsin. As noted on Page 13 of the WPDES Permit, the facility is to provide the method used to determine basin seepage and seek approval from the Department to utilize the methods described in the attached document.

We believe the submittal of the enclosed fulfills this permit requirement. Should the Department require additional information or have any questions, please do not hesitate to contact me at (608) 458-3108.

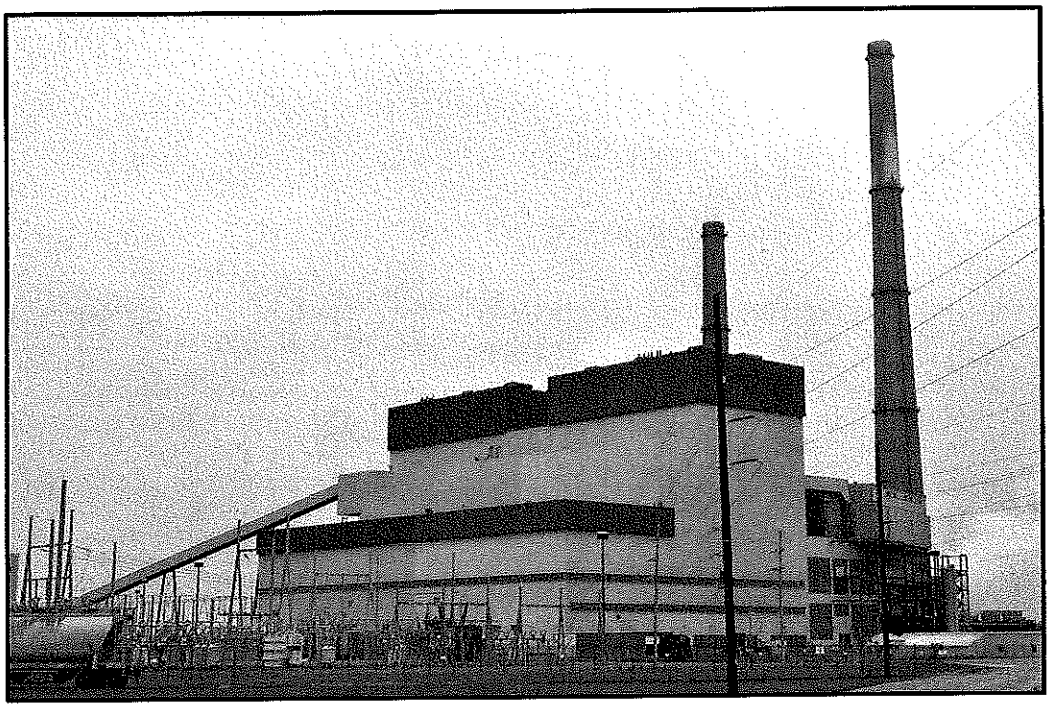
Sincerely,

William P. Skalitzky
Lead Environmental Specialist
Alliant Energy Corporate Services, Inc.
On Behalf of WPL

Attachments: WPL – Columbia Temperature Limits Action Plan

cc: J. Lokenvitz
T. Morse
J. Hanson
D. Mosher WDNR South Central Office

SEEPAGE CALCULATIONS FOR THE
WISCONSIN POWER AND LIGHT COMPANY *(WPL)* – COLUMBIA ENERGY CENTER



Submitted to

Wisconsin Department of Natural Resources
(Jeff Brauer – Madison Office)
(David Mosher- South Central Office)

By

Alliant Energy
Corporate Environmental Services, Inc.
(on behalf of WPL)

December 20, 2013

INTRODUCTION

The Columbia Energy Center *(CEC)* is a 1,023-megawatt *(MW)*, coal-fired, steam-electric generating station jointly owned by Wisconsin Power and Light Company *(WPL)*, Madison Gas and Electric *(MGE)*, and Wisconsin Public Service Corporation *(WPS)*. WPL is the operator of the CEC. There are two *(2)* coal-fired generating units that comprise CEC, with nameplate ratings of 512 and 511 MW. The CEC is located southeast of Portage, Wisconsin on the left descending bank of the Wisconsin River approximately 3.7 river miles downstream from Portage, Wisconisn *(Figure 1)*.

At the CEC, water is withdrawn from the Wisconin River and pumped to the 480-acre cooling pond. Water is then withdrawn from the cooling pond and is used for once-through condenser cooling and other purposes. The once-through condenser cooling water is ultimately returned back to the cooling pond for eventual re-use. During summer operations *(approximately from April 1 to mid-November, depending on weather conditions)*, cooling towers are used to reduce the temperature of the cooling pond water prior to use within the condenser.

On April 01, 2013, the CEC was re-issued a Wisconsin Pollutant Discharge Elimination System *(WPDES)* Permit *(No. WI-0002780-08-0)*. The re-issued WPDES permit *("Permit")* contains a requirement to estimate the amount of seepage on a daily basis from the coal yard retention basin, cooling pond, and ash settling basin. This estimated amount of seepage is required to be reported annually to the Wisconsin Department of Natural Resources *(WDNR)*.

Seepage Estimated Test Conditions

In order to get a true estimate of the amount of seepage, the facility controlled a number of variables that could impact the seepage calculations. The cooling pond and retention basins are equipped with level-gauges that record or electronically track on a daily basis. For the cooling pond, the facility started the test when the cooling towers were not operating due to the cooler weather. For the ash settling basins, operations were informed to use the existing ash recirculation system *(water from the ash settling basins that is brought back to the plant for re-use)* to reduce the amount of cooling pond water that could enter the basins if the ash recirculation system was not used. By controlling various operating scenarios, we believe the amount of seepage being reported provides a good estimate that should be reflective of year-round operations.

Coal Yard Retention Basin

All precipitation events that produce a runoff event drain towards the coal yard retention basin. Some precipitation is retained within the coal pile. In addition to runoff events, water used to wash equipment *(tractors and conveyors)* or to control fugitive dust per the sites Title V Air Permit, may drain to the runoff basin. The source water for these washings is a low-head service water system which is equipped with a pump runtime meter which is tracked on a monthly basis. For additional information, please see Exhibit A for the documentation used to determine the seepage from the coal yard basin.

Cooling Pond Seepage

Since the construction of the cooling pond, and up until the early 1990's, CEC was required to estimate the amount of seepage that was occuring. As a result, Sargent and Lundy *(S&L)* developed a LAKET Model that would estimate the amount of seepage from the cooling pond. CEC will continue to use this model for our estimated seepage.

The model contains the following elements to determine the amount of seepage:

- Outfall 702 Wisconsin River influent
- Precipitation
- Ash sluice pumps *(if ash recirculating water pumps not utilized)*
- Freeze protection for piping *(if ash recirculating pumps not utilized)*
- Outfall 002 discharge *(if a discharge event occurred)*
- Outfall 001discharge *(if an overflow took place from the cooling pond)*
- Forced evaporation from the cooling pond
- Natural evaporation of the cooling pond
- Cooling tower drift *(when the cooling towers are operating)*
- Future input for when the semi-dry scrubbers are placed online

The S&L model provides estimated monthly seepage rates, by calendar month, for the cooling pond and cooling tower drift. Please see Exhibit A for these calculations.

Ash Settling Basin Seepage

Similar to the cooling pond, CEC was previously required to determine the amount of seepage taking place in the ash settling basins. CEC proposes to utilize the same equation that accounts for the following:

- Ash sluice system sumps *(if ash recirculating system is not operating)*
- Ash sluice sumps *(if ash recirculating system is not operating)*
- Air heater sumps *(if the blow downtanks if the ash recirculating system is not operating)*
- Demineralizer dump
- Precipitation

As with the cooling pond, there is an electronic gauge that measures the level of the pond at the ash recirculating water pumphouse. During the mid 2000's, the ash basins were surveyed for depth and surface area. The value of depth and surface area are incorporated into the equation. Please note that since CEC utilizes the ash recirculating water system, the discharge through Outfall 002 has been elminated. In addition, water from the primary ash basin to the secondary ash basin (Outfall 002) has been eliminated but can be used if the water levels in the primary ash basin are high. The basin levels in the secondary ash basin are low and primarily contains only precipitation. Seepage calculations for the secondary ash basin were not determined as there is very little water in the basin. See Exhibit A for these calculations

Conclusion

CEC believes the information collected and the calculations used to estimate the seepage from the cooling pond and basins at CEC are acceptable and should be used throughout the permit term to estimate the seepage.

FIGURE 1

Facility Diagram

EXHIBIT A

November 2013 Seepage Calculations

43
-6
-3
+27
61

COOLING POND SEEPAGE

month		10
year		2013
DATE START		10/25/2013 10:25
DATE FINISH		10/28/2013 10:40
COOLING POND LEVEL START	FEET	788.53
COOLING POND LEVEL FINISH	FEET	788.36
COOLING POND LEVEL DEVIATION	FEET	0.17
OUTFALL 702 Wisconsin River Influent	GALLONS	43200000
COOLING TOWER	GPM	0
COOLING TOWER	TOTAL	0
FORCED LAKE EVAPORATION	GPM	1570
FORCED LAKE EVAPORATION	TOTAL	6805950
NATURAL LAKE EVAPORATION	GPM	620
NATURAL LAKE EVAPORATION	TOTAL	2687700
COOLING POND LEVEL DEVIATION	GALLONS	26587630
OUTFALL 002 ASH SETTLING BASIN EFFLUENT	GALLONS	0
OUTFALL 001 RECYCLED COOLING WATER DISCHARGE	GALLONS	0
PRECIPITATION	INCHES	0
PRECIPITATION	GALLONS	0
SCRUBBER OPERATION	GALLONS	0
FREEZE PROTECTION	GALLONS	0
ASH SLUICE PUMPS	GALLONS	0
TOTAL SUBTRACTIONS (LOSS OR GAIN)	GALLONS	9493650
TEST PERIOD TOTAL HOURS	HOURS	72.25

NET SEEPAGE FOR TIME PERIOD	GALLONS	60293980
AVERAGE HOURLY SEEPAGE RATE	GALLONS	834519
SEEPAGE gal/ac/day		**41726**

43 mg - 9.5 mg ?

cooling pond acreage	sq ft / acre	cu ft/gal
480	43560	7.48

OUTFALL 702 Wisconsin River Influent				
pump #1	pump #2	pump # 3	pump # 4	
OOS	2519	958	2651	TOTAL
OOS	2530	958	2712	HOURS
	11	0	61	72

Sargent and Lundy's LAKET model for cooling ponds and COTOPER program for cooling towers

	FORCED	NATURAL	COOLING TOWER
1	1910	380	
2	2240	340	
3	2740	330	
4	1710	730	2020
5	1880	1150	2230
6	3310	1250	2420
7	3510	1290	2480
8	3400	1270	2440
9	1980	1020	2280
10	1570	620	2110
11	2580	390	
12	2080	310	

NOTES

There was zero discharge from outfall 001 and 002
Freeze protection was off for duration of test
Ash Sluice system using ash Recirc system for source water
Scrubber not in operation

INITIALS	AV	DATE	10/30/13

ASH SETTLING BASIN SEEPAGE

primary pond acreage	primary pond (sq ft)	cu ft/gal
8.5	371400	7.48

date/time	primary pond level to water surface	"B" reverse osmosis reject flow	demineralizer operation	ash system sumps	air heater sumps
11/25/13 10:00	14.60	5,046,433	0	0	0
11/26/13 0:00	14.70	5,051,471	0	0	0
11/27/13 10:00	14.90	5,106,066	0	0	0
level deviation as loss	0.30	59,633	0	0	0
sampling duration (hours)	48				
net pond loss	833,421.60				
output from chemical, ash, and chemical sumps (gallons)	59,633				
Precipitation (inches)	0				
Precipitation (gallons)	0				
seepage gallons per hour	18605.30417				

SEEPAGE gal/ac/day **52419**

NOTES:
operations informed of test. Nothing reported unusual. No washdown of floors during test. Demineralizer operation normal - No rinses or regens performed. tw

ASH SYSTEM OPERATIONS

ash sluice pumps source	lowhead	ash recirc
bottom ash system source	lowhead	ash recirc
other		
AIR HEATER SUMPS		
blow downs closed	yes	no
attempuration water source	lowhead	ash recirc

SECONDARY ASH POND LEVEL	Low

too low to measure. Verified ash recirc operation, tw

INITIALS	tw	tw	DATE	12/3/13

COAL RUN OFF BASIN SEEPAGE

primary pond acreage	primary pond (sq ft)	cu ft/gal
1.06	46173.6	7.48

Precipitation (inches)	0
Precipitation (gallons)	0
daily coal yard water use factor	22363

SEEPAGE gal/ac/day **21097**

Coal yard personnel informed of test - Nothing reported unusual. tw

INITIALS	tw	DATE	12/3/13

$\frac{833\ lb}{8\ lb/gal} \simeq 104\ gal$

100 gallons
104
+ 60
164

$\frac{371,400 \times 0.3}{7.48}$

$= \frac{164}{48} \sim \frac{16}{5} \sim 3.2 = 3,200\ gph$

$\frac{4 \times 10^5 \times 3 \times 10^{-1}}{7} = \frac{12}{7} \times 10^4 \simeq 20,000\ gallons$

FIGURE 1: WPL—Columbia Energy Center Facility Diagram

12/19/2013

Appendix E – Cooling Water Pond sample results for 2023 WPDES Permit Application

001-22. Required Effluent Monitoring for Outfall 001 - Primary Industry Outfall

Primary industry outfalls include discharges of process wastewater, other than noncontact cooling water, from primary industries. Primary industries are categorized by EPA and listed in Table 4 of the instructions.

Permittees are required to monitor and record results in the attached set of Monitoring Grids for each substance listed. You must sample the discharge and test for the parameters listed in the 'Common Pollutants' grid and the 'Metals, Cyanide, Hardness & Total Phenols' grid. You are also required to test for the parameters under each of the remaining grids as specified for your industrial category in Table 4 of the instructions. If you test any parameter more frequently than indicated by the number of rows in the Grid(s), use the Additional Values Grid to report the results. See Table 1 of the instructions for appropriate sample types, recommended analytical methods and proper sample preservation and holding times. All samples should be representative of normal operating conditions.

001-22.1 From Table 4 of the instructions, list below the industrial category or categories that contribute process wastewaters to the discharge from this outfall and place a check mark in the box of each pollutant group that you must test.

Industrial: Steam electric power plants

- ☒ Volatile Organics
- ☒ Acid Extractable Compounds
- ☒ Base/Neutral Compounds
- ☒ Pesticides

001-22.2 You may not be required to provide monitoring results of this outfall discharge. Indicate if one of the following conditions apply, please show which one applies and leave all or parts of the monitoring table blank.

- ● I am required to provide monitoring results.
- ○ I am NOT required to provide monitoring results because one of the following conditions apply.
  - ○ I have two or more outfalls that discharge substantially identical wastewaters and I have received permission by contacting the responsible DNR staff person to only sample one of them. I am providing results for another substantially identical outfall.
  - ○ This is a first-time permit application for a facility that does not yet have a discharge.
  - ○ This outfall is no longer in use.
  - ○ This outfall has a seasonal discharge that I was unable to sample prior to submitting the application. I will take the required samples once discharge resumes and send in the results as soon as possible.
  - ○ I have received instructions in the application notification letter that I am exempt from certain standard monitoring requirements.
  - ○ I have received instructions in the application notification letter that I may submit alternative copies of the test results. I will submit them with application attachments.

Monitoring Results for Outfall 001

Parameter Name	Sample Result	Units	QC Flag	LOD	LOQ	Analytical Method	Sample Collect Date	Sample Type	Lab ID
Common Pollutants									
BOD5, Total	7.7	mg/L				SM 5210B	2023-09-21	GRAB	157066030
COD	31	mg/L				EPA 410.4	2023-09-21	GRAB	157066030
Chloride	60	mg/L				EPA 300.1	2023-09-21	GRAB	157066030
Chlorine, Total Residual	<0.02	ug/L	Y	0.02	0.06	Hach 8167	2023-10-26	GRAB	
Nitrogen, Ammonia (NH3-N) Total	<0.2	mg/L		0.2	0.7	EPA 350.1	2023-09-21	GRAB	157066030
	<0.2	mg/L		0.2	0.7	EPA 350.1	2023-09-25	GRAB	157066030
	<0.2	mg/L		0.2	0.7	EPA 350.1	2023-09-28	GRAB	157066030
	<0.2	mg/L		0.2	0.7	EPA 350.1	2023-10-02	GRAB	157066030
Nitrogen, Nitrite + Nitrate Total	<0.05	mg/L		0.05	0.2	EPA 353.2	2023-09-21	GRAB	157066030
Nitrogen, Total Kjeldahl	0.87	mg/L				EPA 351.2	2023-09-21	GRAB	157066030
Nitrogen, Total	0.9	mg/L				EPA 351.2/300.0	2023-09-21	GRAB	

Oil & Grease (Hexane)	<1.4	mg/L		1.4	5.0	EPA 1664A	2023-09-21	GRAB	157066030
Suspended Solids, Total	8.0	mg/L				SM 2540D-1997	2023-09-21	GRAB	111003090
Temperature	31	deg F					2023-09-21	GRAB	
Copper, Total Recoverable	<5.2	ug/L		5.2	20	EPA 200.7	2023-09-21	GRAB	157066030
	<5.2	ug/L		5.2	20	EPA 200.7	2023-09-25	GRAB	157066030
	<5.2	ug/L		5.2	20	EPA 200.7	2023-09-28	GRAB	157066030
	<5.2	ug/L		5.2	20	EPA 200.7	2023-10-02	GRAB	157066030
Metals, Cyanide, Hardness and Phenols									
Antimony, Total Recoverable	<0.77	ug/L		0.77	2.6	EPA 200.9	2023-09-21	GRAB	157066030
Arsenic, Total Recoverable	1.9	ug/L		0.55	2.0	EPA 200.9	2023-09-21	GRAB	157066030
Beryllium, Total Recoverable	<0.75	ug/L		0.75	3.0	EPA 200.7	2023-09-21	GRAB	157066030
Cadmium, Total Recoverable	<0.41	ug/L		0.41	1.4	EPA 200.7	2023-09-21	GRAB	157066030
Chromium +6	<6.8	ug/L		6.8	23	SM 3500CR B	2023-09-21	GRAB	157066030
Chromium, Total Recoverable	<1.1	ug/L		1.1	3.7	EPA 200.7	2023-09-21	GRAB	157066030
Cyanide, Total	<11	ug/L		11	36	4500-CN-E-1999	2023-09-21	GRAB	721026460
Cyanide, Amenable	<11	ug/L		11	36	4500-CN-G-1999	2023-09-21	GRAB	721026460
Lead, Total Recoverable	<1.4	ug/L		1.4	5.0	EPA 200.7	2023-09-21	GRAB	157066030
Nickel, Total Recoverable	<1.5	ug/L		1.5	5.0	EPA 200.7	2023-09-21	GRAB	157066030
Selenium, Total Recoverable	<0.95	ug/L		0.95	3.2	EPA 200.9	2023-09-21	GRAB	157066030
Silver, Total Recoverable	<1.1	ug/L		1.1	5.0	EPA 200.7	2023-09-21	GRAB	157066030
Thallium, Total Recoverable	<6.8	ug/L		6.8	23	EPA 200.7	2023-09-21	GRAB	157066030
Hardness, Total as CaCO3	244	mg/L				SM2340B	2023-09-21	GRAB	157066030
	264	mg/L				SM2340B	2023-09-25	GRAB	157066030
	256	mg/L				SM2340B	2023-09-28	GRAB	157066030
	267	mg/L				SM2340B	2023-10-02	GRAB	157066030
Phenols, Total	14	ug/L	Y	12	41	EPA 420.4	2023-09-21	GRAB	721026460
Volatile Organics									
Acrolein	<6.2	ug/L		6.2	21	EPA 624	2023-09-29	GRAB	157066030
Acrylonitrile	<1.5	ug/L		1.5	5.0	EPA 624	2023-09-29	GRAB	157066030
Benzene	<0.40	ug/L		0.40	1.6	EPA 624	2023-09-29	GRAB	157066030
Dichlorobromo- methane (bromo-dichloromethane)	<0.76	ug/L		0.76	2.6	EPA 624	2023-09-29	GRAB	157066030
Bromoform	<0.50	ug/L		0.50	1.7	EPA 624	2023-09-29	GRAB	157066030
Carbon tetrachloride	<0.37	ug/L		0.37	1.3	EPA 624	2023-09-29	GRAB	157066030
Chlorobenzene	<0.37	ug/L		0.37	1.3	EPA 624	2023-09-29	GRAB	157066030
Chlorodibromo-methane	<0.36	ug/L		0.36	1.2	EPA 624	2023-09-29	GRAB	157066030
Chloroethane	<1.1	ug/L		1.1	3.7	EPA 624	2023-09-29	GRAB	157066030
Chloroform	<0.46	ug/L		0.46	1.6	EPA 624	2023-09-29	GRAB	157066030
1,3-Dichloropropylene	<0.34	ug/L		0.34	1.2	EPA 624	2023-09-29	GRAB	157066030
1,2-Dichloro- benzene	<0.36	ug/L		0.36	1.2	EPA 624	2023-09-29	GRAB	157066030
1,3-Dichloro- benzene	<0.30	ug/L		0.30	1.0	EPA 624	2029-09-29	GRAB	157066030
1,4-Dichloro- benzene	<0.33	ug/L		0.33	1.1	EPA 624	2023-09-29	GRAB	157066030
1,1-Dichloro- ethane	<0.28	ug/L		0.28	1.0	EPA 624	2023-09-29	GRAB	157066030
1,2-Dichloro- ethane	<0.69	ug/L		0.69	2.3	EPA 624	2023-09-29	GRAB	157066030
1,1-Dichloro- ethylene	<0.49	ug/L		0.49	1.7	EPA 624	2023-09-29	GRAB	157066030
1,2-trans Dichloroethylene	<0.35	ug/L		0.35	1.2	EPA 624	2023-09-29	GRAB	157066030
1,2-Dichloropropane	<0.37	ug/L		0.37	1.3	EPA 624	2023-09-29	GRAB	157066030
2-Chloroethyl vinyl ether	<10	ug/L		10	34	EPA 624	2023-09-29	GRAB	157066030
Ethylbenzene	<0.42	ug/L		0.42	1.4	EPA 624	2023-09-29	GRAB	157066030
Methyl bromide	<0.72	ug/L		0.72	2.4	EPA 624	2023-09-29	GRAB	157066030
Chloromethane	<1.3	ug/L		1.3	4.4	EPA 624	2023-09-29	GRAB	157066030
Methylene chloride	<1.2	ug/L		1.2	4.0	EPA 624	2023-09-29	GRAB	157066030
1,1,2,2-Tetrachloro- ethane	<0.36	ug/L		0.36	1.2	EPA 624	2023-09-29	GRAB	157066030
Tetrachloroethylene	<0.55	ug/L		0.55	1.9	EPA 624	2023-09-29	GRAB	157066030
Toluene	<0.27	ug/L		0.27	1.0	EPA 624	2023-09-29	GRAB	157066030
1,1,1-Trichloro- ethane	<0.38	ug/L		0.38	1.3	EPA 624	2023-09-29	GRAB	157066030
1,1,2-Trichloro- ethane	<0.27	ug/L		0.27	1.0	EPA 624	2023-09-29	GRAB	157066030
Trichloro- ethylene	<0.39	ug/L		0.39	1.3	EPA 624	2029-09-29	GRAB	157066030
Vinyl chloride	<0.15	ug/L		0.15	0.50	EPA 624	2023-09-29	GRAB	157066030
Acid Extractable Compounds (Phenols)									
2-Chlorophenol	<1.3	ug/L		1.3	9.5	EPA 8270D	2023-09-21	GRAB	157066030
2,4-Dichlorophenol	<1.2	ug/L		1.2	9.5	EPA 8270D	2023-09-21	GRAB	157066030
2,4-Dimethyl- phenol	<1.5	ug/L		1.5	9.5	EPA 8270D	2023-09-21	GRAB	157066030
2,4-Dinitrophenol	<3.1	ug/L		3.1	10	EPA 8270D	2023-09-21	GRAB	157066030
P-Chloro-m-Cresol (3-methyl-4-chlorophenol)	<1.2	ug/L		1.2	9.5	EPA 8270D	2023-09-21	GRAB	157066030

2-Methyl-4,6- dinitrophenol	<1.2	ug/L		1.2	9.5	EPA 8270D	2023-09-21	GRAB	157066030
2-Nitrophenol	<1.2	ug/L		1.2	9.5	EPA 8270D	2023-09-21	GRAB	157066030
4-Nitrophenol	<1.9	ug/L		1.9	9.5	EPA 8270D	2023-09-21	GRAB	157066030
Pentachloro- phenol	<1.5	ug/L		1.5	9.5	EPA 8270D	2023-09-21	GRAB	157066030
Phenol	<1.9	ug/L		1.9	6.7	EPA 8270D	2023-09-21	GRAB	157066030
2,4,6-Trichloro- phenol	<1.6	ug/L		1.6	9.5	EPA 8270D	2023-09-21	GRAB	157066030

001-23 Additional Values

If you know or have reason to believe that any parameter listed in Tables 1 and 2 of the instructions is present in the discharge from this outfall at a concentration greater than 10 microgram/L AND you have not already provided a sample result in the Monitoring Grid or a recent Discharge Monitoring Report, you must list the parameter in the Additional Values Grid and either provide at least one sample result for the parameter or indicate if you believe the parameter to be present in the discharge solely as a result of its presence in your intake water.

Check the following box to indicate that you have evaluated the potential for these parameters being present in the discharge.

☒ Excluding those parameters that I have reported in either the Monitoring Grid, the Additional Values Grid or a recent Discharge Monitoring Report, I believe the parameters listed in Tables 1 and 2 of the instructions are either absent from this outfall's discharge or are present at concentrations less than 10 microgram/L.

Note that the Additional Values Grid may also be used to report test results for any parameter that is tested more frequently than indicated by the number of rows in the Monitoring Grid.

Additional Monitoring Results for Outfall 001

Parameter Name	Intake Only	Sample Result	Units	QC Flag	LOD	LOQ	Analytical Method	Sample Collect Date	Sample Type	Lab ID
None reported										

Wisconsin Department of Natural Resources

Cooling Water Intake Structure Best Technology Available Determination

Wisconsin Power and Light Company – Columbia Energy Center

S. Hanson – Wastewater Engineer
March 20, 2025

Executive Summary

In conformity with Section 316(b) of the Clean Water Act, the location, design, construction, and capacity of cooling water intake structures should reflect the best technology available (BTA) for minimizing adverse environmental impacts. The department has made a Best Technology Available (BTA) determination for two cooling water intake structures (CWIS) utilized by Wisconsin Power and Light Company (WPL) Columbia Energy Center in accordance with ch. NR 111, Wis. Adm. Code. The BTA for the CWIS is based on the required information submitted for a facility that withdraws greater than 2 MGD Design Intake Flow (DIF) and uses at least 25% of the total water withdrawn for cooling purposes. Columbia Energy Center is considered an existing facility for purposes of the rule because construction of the facility commenced prior January 17, 2002 (s. NR 111.02(3)(a), Wis. Adm. Code). The department has concluded that the existing CWIS is the BTA for achieving the maximum reduction in impingement mortality.

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 the existing technologies employed by Columbia Energy Center represents the best technology available in order 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.

Background Information

Columbia Energy Center is located at W8375 Murray Rd, Pardeeville, WI, which is about 3 miles southwest of the Wildia Landing Strip and 3.7 miles northeast of the Rubin-Guenther Cemetery. The facility uses one CWIS to pull water from the Wisconsin River to the cooling pond and a second that withdraws water from the cooling pond to circulate through the condensers. In 2005 the WDNR determined that the CWIS subject to 316(b) is the initial CWIS that withdraws water from the Wisconsin River. The design intake flow (DIF) is 43.2 million gallons per day (MGD) and the actual intake flow (AIF) is 14.3 MGD.

Intake Velocity Calculation

For the design and configuration of the CWIS (43.2 MGD DIF), the calculated design intake velocity (v) is:

$$v = (total\ pump\ rate\ MGD) \times (1{,}000{,}000) \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1\ hour}{60\ min}\right) \times \left(\frac{1\ min}{60\ sec}\right) \times \left(\frac{0.1337\ ft^3}{gal}\right) \times \left(\frac{1}{smallest\ total\ open\ area\ of\ intake}\right)$$

$$v = (43.2) \times (1{,}000{,}000) \times \left(\frac{1}{24}\right) \times \left(\frac{1}{60}\right) \times \left(\frac{1}{60}\right) \times (0.1337) \times \left(\frac{1}{37.1}\right)$$

$$v = 1.80\ ^{ft}/_{sec}$$

Where:

$smallest\ total\ open\ area\ of\ intake$ = $overall\ area$ × $open\ area\ percentage/100$ × number of screens

$smallest\ total\ open\ area\ of\ intake$ = 6.75 ft×4.5 ft×0.61×2

$smallest\ total\ open\ area\ of\ intake$ = 37.1 ft^2

For the design and configuration of the CWIS and three pump operation (14.3 MGD AIF), the calculated actual intake velocity (v) is:

$$v = (total\ pump\ rate\ MGD) \times (1{,}000{,}000) \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1\ hour}{60\ min}\right) \times \left(\frac{1\ min}{60\ sec}\right) \times \left(\frac{0.1337\ ft^3}{gal}\right) \times \left(\frac{1}{total\ open\ area\ of\ screen}\right)$$

$$v = (14.3) \times (1{,}000{,}000) \times \left(\frac{1}{24}\right) \times \left(\frac{1}{60}\right) \times \left(\frac{1}{60}\right) \times (0.1337) \times \left(\frac{1}{37.1}\right)$$

$$v = 0.596\ ^{ft}/_{sec}$$

Where:

$smallest\ total\ open\ area\ of\ intake$ = $overall\ area$ × $open\ area\ percentage/100$ × number of screens

$smallest\ total\ open\ area\ of\ intake$ = 6.75 ft×4.5 ft×0.61×2

$smallest\ total\ open\ area\ of\ intake$ = 37.1 ft^2

Intake Structure Description

The CWIS used by the Columbia Energy Center withdraws water from the Wisconsin River. Water first passes through a 46 feet long and 8 feet deep bar grate made of 4-inch by 3/8-inch steel bars spaced 2 5/8-inches apart. After the bar grate water travels through a 2,365-feet long canal with a bottom width of 8 feet. At the end of the intake canal water is transferred to the cooling pond through a pumphouse equipped with 3/8-inch mesh static screens and three pumps. The DIF is 43.2 MGD and the design intake velocity is 1.80 feet per second (fps). The AIF is 14.3 MGD and the actual intake velocity is 0.596 fps.

S. NR111.41, Wis. Adm. Code Application Materials Submitted

As part of the WPDES Permit Application, Columbia Energy Center was required to submit information required under s. NR 111.41 (1) through (7) and (13), Wis. Adm. Code. The Columbia Energy Center provided the information required under s. NR 111.41 (1) through (7) and (13). Most of the relevant application materials were included in a report titled "Alternatives Analysis for Candidate Entrainment Best Technology Available at the Columbia Energy Station", dated August 25, 2023, and produced by Burns & McDonnell.

In accordance with s. NR 111.11(1)(a), Columbia Energy Center 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.

BTA Standards for Impingement Mortality

In accordance with s. NR 111.12(1)(a), BGS must comply with one of the alternatives in sub.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 permittee selected "Closed cycle recirculating system" as the option for complying with the BTA standards for impingement mortality. The permittee already operates a CCRS and is therefore in compliance with the selected option.

BTA Standards for Entrainment

The permittee proposes that the design and operation of the intake meets the BTA standards for entrainment mortality reduction. The department has evaluated this proposal under s. NR 111.13 and does not recommend the approval of this proposal. Below is a written explanation of the proposed entrainment determination as required by s. NR 111.13(1).

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 social 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 accordance with s. NR 111.13(2), the following factors must be considered:

1. 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);
2. Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
3. Land availability inasmuch as it relates to the feasibility of entrainment technology;
4. Remaining useful plant life; and
5. 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 proposed determination may be based on consideration of the following factors listed in s. NR 111.13(3):

1. Entrainment impacts on the waterbody;
2. Thermal discharge impacts;
3. Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;
4. Impacts on the reliability of energy delivery within the immediate area;
5. Impacts on water consumption; and
6. 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.

Entrainment reduction technologies and strategies provided in s. NR 111.41(13) include CCRS, fine mesh screens with a mesh size of 2 millimeters or smaller, variable speed pumps, and water reuse or alternate sources of cooling water.

Entrainment Performance Evaluation

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. 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.

No entrainment data collection has been completed recently, however a desktop analysis was completed to determine different species' potential to become entrained. Six species that are the dominant taxa in the vicinity of the intake were analyzed. The species that were analyzed were black crappie, bluegill, common carp, gizzard shad, northern pike, and walleye. All species besides gizzard shad were determined to have a low susceptibility to entrainment. Gizzard shad were however determined to be susceptible to entrainment due to them spawning in environments similar to where the intake is located as well as their eggs and larvae being planktonic.

Evaluation of Candidate Entrainment Control Technologies

Columbia Energy Center currently utilizes a CCRS and therefore use of a CCRS is not evaluated in this section.

TECHNOLOGY: Fine Mesh Screens

1.1. 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).

Fine mesh screens can potentially reduce entrainment by physically preventing eggs and larvae from entering the CWIS. The percent reduction in entrainment from the use of fine mesh screens varies based on many factors including the size of the openings in the mesh.

While entrainment reductions may occur with the use of fine mesh screen impingement will likely increase due to eggs and larvae that would have previously been entrained becoming impinged instead.

1.2. 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 to the emissions of particulates or other pollutants would be expected with the installation and use of fine mesh screens.

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

Land availability is not a concern with the installation of fine mesh screens since the new screens would be put in place of the current screens and there is enough land available for any associated equipment that would need to be added.

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

The two generating units at the Columbia Energy Center were installed in 1975 and 1978 and are therefore close to the average age of retirement for coal fired units, which is 53 years. Since these units are nearing the average retirement age it is anticipated that the remaining useful plant life will be reached in less than 10 years, however it is worth noting that the retirement date of these units has been delayed twice already.

In addition to the uncertainty with the retirement date the permittee is considering switching the facility over to natural gas once the coal fired units are retired, which will likely require the intake to continue operating.

1.5. 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.

Since the permittee has an AIF of less than 125 MGD they were not required to and chose not to complete a study on quantified and qualitative benefits and costs.

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

No changes to the thermal discharge would be expected.

1.7. FACTOR s. NR 111.13(3)(d), Wis. Adm. Code: Impacts on the Reliability of Energy Delivery

The installation of fine mesh screens would be able to occur during a scheduled outage and therefore no impacts to the reliability of energy delivery would occur.

1.8. FACTOR s. NR 111.13(3)(e), Wis. Adm. Code: Impacts on water consumption

No changes to water consumption would occur.

1.9. Summary/Conclusion.

Fine-mesh screens may reduce entrainment by physically excluding fish eggs and larvae from passing through the screen. However due to most individuals that would have formerly passed through the intake becoming impinged and dying on the fine mesh screens the department has determined that the installation and use of fine mesh screens is not BTA for reducing entrainment.

TECHNOLOGY: Variable Speed Pumps

2.1. 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).

VSP's achieve reductions in entrainment by reducing the intake flow when a facility does not require the maximum flow that can be provided by the pumps.

Opportunities for flow reductions from the use of VSPs would primarily occur in winter and early spring. Certain species such as walleye and northern pike spawn in late winter through early spring. Both species however have a low susceptibility to entrainment due to their eggs being adhesive and being deposited on gravel and aquatic vegetation. It can therefore be assumed that entrainment reductions from the use of VSPs would likely be minimal,

2.2. 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 the emissions of particulates or other pollutants would be expected from the installation and use of one or more VSPs.

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

Land availability would not be a concern for the installation of one or more VSP(s) since they would replace on or more of the current pumps.

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

The two generating units at the Columbia Energy Center were installed in 1975 and 1978 and are therefore close to the average age of retirement for coal fired units, which is 53 years. Since these units are nearing the average retirement age it is anticipated that the remaining useful plant life will be reached in less than 10 years, however it is worth noting that the retirement date of these units has been delayed twice already.

In addition to the uncertainty with the retirement date the permittee is considering switching the facility over to natural gas once the coal fired units are retired, which will likely require the intake to continue operating.

2.5. 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.

Since the permittee has an AIF of less than 125 MGD they were not required to and chose not to complete a study on quantified and qualitative benefits and costs.

2.6. FACTOR s. NR 111.13(3)(d), Wis. Adm. Code: Impacts on the Reliability of Energy Delivery

VSPs could be installed during a scheduled outage and would not create a parasitic load, so no impacts to the reliability of energy delivery would be expected

2.7. Summary/Conclusion.

VSPs may reduce entrainment due to lowering intake flow to only the amount necessary at all times, however they will likely be predominantly used during the winter and early spring when biological activity in the source water is low and the species that do spawn during this period have a low susceptibility to entrainment. For this reason the use of one or more VSPs is not considered BTA for achieving the maximum reduction in entrainment.

TECHNOLOGY: Water Reuse or Alternative Sources of Cooling Water

3.1. 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).

Water reuse and alternative sources of cooling water may potentially reduce entrainment by reducing the intake flow from the source water. The entrainment reductions from water reuse or an alternative source of cooling water vary based how much of the cooling water required by the facility can be provided through reuse or an alternative source. The use of another permittee's effluent and the use of a Ranney well are two potential options for alternative sources of cooling water.

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

Using another permittee's effluent or groundwater may introduce higher concentrations of certain pollutants into Columbia's waste stream.

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

In order to use a nearby permittee's effluent a pipeline would need to be constructed between facilities. The length of the pipeline as well as the usage of the land it would need to be constructed through would vary depending on which facility was selected. Only two facilities discharge within 5 miles of the Columbia Energy Center. The closest facility is the Portage Wastewater Treatment Facility, which is approximately 3 miles north of Columbia. A pipeline between facilities would likely need to be longer to avoid crossing through the Wisconsin River. The other facility within 5 miles is Ta Operating LLC, which is located approximately 3.5 miles northwest of the Columbia Energy Center. A pipeline between these facilities would need to cross the Wisconsin River.

In order to provide the full flow needed and have a 10 percent redundancy 34 to 67 vertical wells would be needed. The total amount of land needed to provide the full flow was estimated to be 128 to 136 acres.

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

The two generating units at the Columbia Energy Center were installed in 1975 and 1978 and are therefore close to the average age of retirement for coal fired units, which is 53 years. Since these units are nearing the average retirement age it is anticipated that the remaining useful plant life will be reached in less than 10 years, however it is worth noting that the retirement date of these units has been delayed twice already.

In addition to the uncertainty with the retirement date the permittee is considering switching the facility over to natural gas once the coal fired units are retired, which will likely require the intake to continue operating

3.5. 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.

Since the permittee has an AIF of less than 125 MGD they were not required to and chose not to complete a study on quantified and qualitative benefits and costs. It can however be assumed that based on the amount of land needed and the entrainment reductions already occurring that the costs associated with utilizing an alternative source of cooling water would be greater than the benefits provided by their use.

3.6. Summary/Conclusion.

The use of an alternative source of cooling water would reduce the entrainment by reducing or fully eliminating the withdrawal of water from surface water. In order to use an alternative source of cooling water a pipeline would need to be constructed between the facility and the alternate source of cooling water. In addition to the land needed for the pipeline a large amount of land would also be required in order to withdraw enough groundwater to provide the necessary amount of cooling water. Utilizing another permittee's effluent may require the facility to install additional treatment prior to utilizing it for cooling. For these reasons the department has determined that the use of an alternative source of cooling water is not BTA for achieving the maximum reduction in entrainment.

Entrainment BTA Decision

Since the Columbia Energy Center currently only utilizes a CCRS to reduce entrainment all other technologies listed under s. NR 111.41(13) were considered as part of the BTA determination for the Columbia Energy Center. From these evaluations it was determined that the existing CWIS is considered the best technology available for the Columbia Energy Center to achieve the maximum reduction in entrainment based on the factors specified in s. NR 111.13, Wis. Adm. Code. Various factors went into rejecting the other listed technologies as BTA.

Fine mesh screens have been rejected as BTA for achieving the maximum reduction in entrainment due to most of the individuals that would have become entrained prior to the installation of fine mesh screens becoming impinged and dying while impinged.

VSPs have been rejected as BTA for achieving the maximum reduction in entrainment due to the relatively minor benefits that would be provided by their use compared to the social cost of their installation.

Alternative sources of cooling water have been rejected as BTA for achieving the maximum reduction in entrainment due to the anticipated difference between social costs and benefits as well as adequate land not being available near the facility.

Summary

1. The permittee proposes to comply with a BTA impingement standard in s. NR 111.12, Wis. Adm. Code, through the use of a CCRS.
2. The department has concluded that the current CWIS meets the chosen BTA for impingement mortality.
3. After consideration of the factors listed in s. NR 111.13, Wis. Adm. Code, the department has concluded that existing CWIS is considered the best technology available to achieve the maximum reduction in entrainment.
4. BTA determinations will be reviewed at the next reissuance and at subsequent reissuances in accordance with ch. NR 111, Wis. Adm. Code. In subsequent permit reissuance applications, the permittee shall provide all the information required in s. NR 111.4(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).
5. The BTA includes requirements for monitoring and inspection of the CWIS and other requirements and terms; please see the permit for those requirements.