Permit Fact Sheet

1 General Information

Permit Number:	WI-0002381-07-0
Permittee Name:	WPL - Nelson Dewey Generating Station
Address:	11999 Cty Hwy VV
City/State/Zip:	Cassville WI 53806-9722
Discharge Location:	Mississippi River Watershed (GP07) of the Grant-Platte River Basin
Receiving Water:	Mississippi River
StreamFlow ($Q_{7,10}$):	10,400 cfs
Stream Classification:	Warm water sport fish and is not classified as a public water supply (s. NR 102.04(3)(b), Wis. Adm. Code)

2 Facility Description

The WPL - Nelson Dewey Generating Station consists of two coal-fired electric generating units. Discharges are to the Mississippi River via four outfalls and to the groundwater via one outfall. Recently the permittee has complied with a consent order by retiring the coal fired units at the facility. The reissuance application as submitted in 2015 reflected operations prior to retirement. This review is based in part on the reissuance application but for certain aspects is based on the status of operation after retirement.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
701	Design: 167,000,000 gpd; Winter: 110 MGD; Summer: 167 MGD; expected maximum flow rate during retirement is 81 MGD. Withdrawals at the intake are expected to cease when warm weather occurs in 2016.	Mississippi River cooling water intake structure requirements.
703	Not applicable.	Sample point for establishing background/ambient river temperature.
704	Not applicable.	Sample point for establishing background/ambient river pH.
705	Not applicable.	Sample point for establishing background/ambient river mercury.
001	Annual Average: 130.5 MGD Peak Daily: 167 MGD Withdrawals at the intake are expected to cease when warm	Once through water for noncontact cooling. No chlorination or other water additives are part of the wastewater.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
	weather occurs in 2016.	
002	Annual Average: 2.56 MGD Peak Daily: 3.65 MGD	NCCW (service water), bearing seal water, floor drains, water treatment, WPDES pond system, slag pond overflow, boiler blowdown (units 1 and 2: 15,000 gpd; new package boiler: 5,000 gpd). These will be reduced or eliminated as retirement is implemented.
003	Annual Average: 11.66 MGD Withdrawals at the intake are expected to cease when warm weather occurs in 2016.	Intake screen deicing (redirected condenser cooling water)
004	Annual Average: 0.0079 MGD Withdrawals at the intake are expected to cease when warm weather occurs in 2016.	Intake screen washing (recirculated river water)
005	Historical data is not available.	Seepage ponds receiving various wastewaters. WPDES ponds (1, 2 and 3) and slag pond. Total 1.52 MGD infiltration equal to hydraulic conductivity of 1.699 10e-4 cm2/sec per 2015 report.
102	Historical data is not available.	Water is pumped from the WPDES pond system to the east end of the slag pond. The pump house is north of Pond 2 and consists of two pumps.

3 Influent - Proposed Monitoring

3.1 Sample Point Number: 701- Cooling water intake structure

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

3.1.1 Changes from Previous Permit:

Added new section to the permit. Flow monitoring and the standard water intake requirements are included.

Moved language of condition 1.1 of the current permit regarding approval of BTA. This language is now included in section 1.2.1 of permit.

3.1.2 Explanation of Limits and Monitoring Requirements

The previous permit issued in 2010 allowed the use of the existing intake structure as best technology available (BTA). The review of BTA for this permit is based on the expected operation under retirement status. The permit includes a

requirement that the permittee obtain approval prior to discharging under scenario different then the retirement status. Refer to attached "Water Intake Structure BTA Determination" for more details.

3.2 Sample Point Number: 703- Influent Temperature

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Temperature		deg F	Daily	Grab	Daily grab if withdrawal occurs.

3.2.1 Changes from Previous Permit:

Changed monitoring from continuous to daily grab if withdrawal occurs. Flows are expected to be eliminated or very infrequent. No heat is added so the permit will allow temperature to be monitored as a daily grab if withdrawal occurs.

3.2.2 Explanation of Limits and Monitoring Requirements

This data is useful for evaluation of thermal discharge impacts.

Deleted condition 1.3.4, Sample Point Locations. The permit no longer needs to require the permittee to specify sample point locations.

3.3 Sample Point Number: 704- Background pH

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
pH Field		su	Monthly	Grab	Sample on the same day that pH is sampled at outfall 002. Monthly sample frequency should discharge occur.

3.3.1 Changes from Previous Permit:

Changed frequency from weekly to monthly should discharge occur.

3.3.2 Explanation of Limits and Monitoring Requirements

This data is useful for review of discharge and reporting of pH of discharge. Infrequent excursions of pH above the limit of 9.0 s.u. in the effluent from outfall 002 have always been traceable to high ambient pH values during low river flow periods. The standard requirements of all WPDES permits include a noncompliance notification when a permit limitation is exceeded. The notification of pH exceedances is an unnecessary administrative burden on both the Department and the permittee, in light of the fact that the permittee has not been responsible for the exceedances. Under the permit, the permittee will not be required to monitor for effluent pH when background/ambient river pH exceeds 9.0 s.u. Recent monitoring has shown that these excursions have not occurred in the last five years. Because flows are expected to be eliminated or very infrequent less frequent monitoring is allowed.

Deleted condition 1.3.4, Sample Point Locations. The permit no longer needs to require the permittee to specify sample point locations.

3.4 Sample Point Number: 705- Background mercury

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Grab	Sample on the same day that mercury is sampled at outfall 002. Monthly sample frequency should discharge occur.

3.4.1 Changes from Previous Permit:

Added note that sampling is needed only if discharge occurs.

3.4.2 Explanation of Limits and Monitoring Requirements

This data is useful for evaluation of mercury discharge.

Deleted condition 1.3.4, Sample Point Locations. The permit no longer needs to require the permittee to specify sample point locations.

4 Inplant - Proposed Monitoring and Limitations

4.1 Sample Point Number: 102- Pump from WPDES to slag pond

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total	Daily Max	50 mg/L	Weekly	Grab	Weekly sample frequency should discharge occur.

4.1.1 Changes from Previous Permit:

Moved language of condition 2.2.1.1, Intake Structure Evaluation, to the new section 1.2.1 of the permit where intake requirements are addressed. Added note that sampling is needed only if discharge occurs.

4.1.2 Explanation of Limits and Monitoring Requirements

These limits are in the current permit and reflect the previous operation as a fossil fuel fired facility. There are three seepage/detention ponds in series that provide sedimentation and seepage of various wastewaters. Previously wastewaters included metal cleaning wastewater and coal pile runoff. Pumping from the ponds system was used to provide necessary freeboard. The suspended solids limitation was based on a requirement in ch. NR 290, Wis. Adm. Code, which establishes

a limitation of 50 mg/L for coal pile runoff. The permit will retain this limit, but as retirement is implemented, the permittee will no longer have coal at this facility.

5 Surface Water - Proposed Monitoring and Limitations

5.1 Sample Point Number: 001- Condenser Cooling Water

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Temperature Maximum	Daily Max	120 deg F	Daily	Grab	Daily grab should a withdrawal occur.
Flow Rate		MGD	Daily	Estimated	
Temperature Average	Weekly Avg	104 deg F	Weekly	Calculated	Applicable only in month of June.

5.1.1 Changes from Previous Permit

Made temperature maximum limit applicable to all months. Added temperature limit of 104 F as a weekly average for June. Allow daily grab sample of temperature if discharge occurs. Allow flow rate to be estimated.

5.1.2 Explanation of Limits and Monitoring Requirements

Water Quality Based Limits and WET Requirements and Disinfection (if applicable)

Refer to attached water quality based effluent limits memo for details on how the limits were calculated.

The thermal limitation is based on subch. V of NR 106, Wis. Adm. Code. The Qs:Qe ratio for this outfall is 12.0:1 and therefore acute WQBEL are not needed and sub lethal WQBEL were calculated. Limits were needed only for the month of June. The daily maximum limit of 120 F is retained because maximum temperatures were as high as 115 F.

As noted throughout this document, flow is expected to be reduced or eliminated and no heat will be added from operation of condensers.

Categorical Limits

No categorical limits are applied at this sample point.

5.2 Sample Point Number: 002- Slag Pond

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total	Daily Max	100 mg/L	Monthly	Grab	Monthly sample frequency should discharge occur.
Suspended Solids,	Monthly Avg	30 mg/L	Monthly	Grab	Monthly sample frequency

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Total					should discharge occur.
Oil & Grease (Hexane)	Daily Max	20 mg/L	Monthly	Grab	Monthly sample frequency should discharge occur.
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Monthly	Grab	Monthly sample frequency should discharge occur.
~~Phosphorus, Total~~	~~Rolling 12 Month Avg~~	~~1.0 mg/L~~	~~Monthly~~	~~Grab~~	~~See standard conditions.~~
pH Field	Daily Max	9.0 su	Monthly	Grab	pH monitoring is not required when background/ambient river pH exceeds 9.0 s.u. Monthly sample frequency should discharge occur.
pH Field	Daily Min	6.0 su	Monthly	Grab	pH monitoring is not required when background/ambient river pH exceeds 9.0 s.u. Monthly sample frequency should discharge occur.
Mercury, Total Recoverable	Daily Max	4.68 ng/L	Monthly	Grab	Refer to the Pollutant Minimization Plan requirements of section 5. Monthly sample frequency should discharge occur.
Aluminum, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.
Barium, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.
Boron, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.
Iron, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.
Magnesium, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.
Manganese, Total Recoverable		mg/L	Annual	Grab	Annual sample frequency should discharge occur.

5.2.1 Changes from Previous Permit

Changed sample type and frequency for Suspended Solids, Total from 24 Hr Composite weekly sample to monthly grab sample.

Allow pH and Oil & Grease (Hexane) to be sampled monthly should discharge occur.

Renewed the variance for mercury and reduced the limit from 9.01 ng/L to 4.68 ng/L.

The phosphorus limit is removed. Also, no new limits are proposed. Note that this is different from what was proposed in the effluent limits memo.

Deleted flow monitoring.

For metals added note regarding sampling during discharge.

5.2.2 Explanation of Limits and Monitoring Requirements

Water Quality Based Limits and WET Requirements and Disinfection (if applicable)

Refer to attached water quality based effluent limits memo for details on how the limits were calculated.

A mercury variance was approved in permit 0002381-06-0 issued December 22, 2010. The variance limit for mercury was a 1-day P99 daily maximum based on the provisions of s. NR 106.145(5), Wis. Adm. Code. An application was made for the reissuance of the mercury variance. A mercury pollutant minimization program (PMP) was required under the current permit as a condition of receiving a variance, in accordance with s. NR 106.145(7), Wis. Adm. Code. The PMP was implemented and reports were submitted. Refer to the supplemental mercury variance documents for more details. Schedule 5.1 requires the continued implementation of the mercury PMP. Based on recent effluent data the revised variance limit is reduced to 4.68 ng/L daily maximum (1-day P99).

Limits based on the phosphorus water quality criteria and the technology based limit in the previous permit are not needed because the permittee no longer has additives that contain phosphorus that affect this discharge. The coal at the facility will be removed and decommissioned. Therefore there will be no sources of phosphorus at the facility.

No WET testing is required because the dilution from the river flow exceeds 1000:1.

The monitoring required by the current permit for aluminum, barium, boron, iron, magnesium, and manganese is retained in this permit. This data will be useful for continued operation of the pond systems and retirement procedures and activities.

Monitoring for TSS, O&G and pH is less frequent because the retirement will eliminate or reduce discharges.

Categorical Limits

The parameters that carried over from the current permit for Suspended Solids, Total; Oil & Grease (Hexane); and pH are categorical, with limitations specified in ch. NR 290, Wis. Adm. Code. The exemption for monitoring effluent pH during periods of low river pH was previously discussed in this fact sheet. Note that with implementation of retirement the facility will no longer be subject to the categorical standards because it will no longer be a steam electric facility.

The permittee requested change of sample type and frequency for Suspended Solids, Total; and Oil & Grease (Hexane) from 24 Hr Composite weekly sample to monthly grab sample. There are two main reasons that justify this reduction in monitoring. First, because of the significant reduction in both volume of wastewater and amount of pollutants added to the pond system there is much less need for rigorous evaluation of this wastewater. The wastewater discharge is expected to decrease both in volume rate and in total mass discharged. Second, the rate of discharge and the frequency of discharge will be so low that operating a 24 Hr Composite weekly sample will be problematic. In conclusion, the Department has determined that reduced monitoring is reasonable and appropriate.

5.3 Sample Point Number: 003- Deice water

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

5.3.1 Changes from Previous Permit

No changes.

5.3.2 Explanation of Limits and Monitoring Requirements

Water Quality Based Limits and WET Requirements and Disinfection (if applicable)

Not applicable.

Categorical Limits

No categorical limits are applicable, but flow monitoring is used to allow accurate evaluation of water balance data.

5.4 Sample Point Number: 004- Intake screen washing

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

5.4.1 Changes from Previous Permit

Moved language of condition 3.2.4.1, Intake Screen Discharge, to the new section 1.2.1 of the permit where intake requirements are addressed.

5.4.2 Explanation of Limits and Monitoring Requirements

Water Quality Based Limits and WET Requirements and Disinfection (if applicable)

Not applicable.

Categorical Limits

No categorical limits are applicable, but flow monitoring is used to allow accurate evaluation of water balance data. The permit requirements 1.2.1 include the requirements of s. NR 205.07(3)(a), Wis. Adm. Code.

6 Land Treatment – Proposed Monitoring and Limitations

6.1 Sample Point Number: 005- Pond Infiltration

6.1.1 Changes from Previous Permit:

No changes.

6.1.2 Explanation of Limits and Monitoring Requirements

The seepage pond system previously discussed in this fact sheet receives the following waste streams: coal pile runoff; runoff from other areas, and boiler wash water. The discharge from the seepage ponds to the slag pond is regulated at sample point 102. The portion of the seepage ponds wastewater volume which discharges, via seepage, to the groundwater is regulated by this section of the permit, and is designated as outfall 005.

The current Department-approved seepage ponds management plan is the BT2, Inc. document, dated June 21, 1999. As discussed in the management plan, if the ponds' treatment capacity is compromised as a result of solids deposition, the permittee shall evaluate solids removal options to restore treatment capacity.

The proposed permit does not authorize any waste streams other than the aforementioned to be discharged into the seepage ponds without prior approval from the Department. The permittee must submit, for Department approval, proposed modifications to the management plan.

At some time in the future the permittee will probably start closure of the ponds. The Department will evaluate pond closure requirements of ch. NR 213, Wis. Adm. Code, at that time.

7 Schedules

7.1 Mercury Pollutant Minimization Program

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

Required Action	Due Date
Annual Mercury Progress Reports: Submit an annual mercury progress report. The annual mercury progress report shall: Indicate which mercury pollutant minimization activities or activities outlined in the approved Pollutant Minimization Plan have been implemented; Include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling; and Include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury such as loads from activities, procedures or operations at the facility. The first annual mercury progress report is to be submitted by the Due Date.	06/30/2017
Annual Mercury Progress Report #2: Submit a mercury progress report as defined above.	06/30/2018
Annual Mercury Progress Report #3: Submit a mercury progress report as defined above.	06/30/2019
Annual Mercury Progress Report #4: Submit a mercury progress report as defined above.	06/30/2020

Final Mercury Report: Submit a final report documenting the success in reducing mercury concentrations in the effluent, as well as the anticipated future reduction in mercury sources and mercury effluent concentrations. The report shall summarize mercury pollutant minimization activities that have been implemented during the current permit term and state which, if any, pollutant minimization activities from the approved pollutant minimization plan were not pursued and why. The report shall include an analysis of trends in monthly and annual total effluent mercury concentrations based on mercury sampling during the current permit term. The report shall also include an analysis of how influent and effluent mercury varies with time and with significant loading of mercury from activities, actions and operations at the facility. Additionally, the report shall include a proposed variance limit and pollutant minimization activities for negotiations with the department if the permittee intends to seek a renewed mercury variance per s. NR 106.145, Wis. Adm. Code, for the reissued permit.	06/30/2021
Annual Mercury Reports After Permit Expiration: In the event that this permit is not reissued on time, the permittee shall continue to submit annual mercury reports each year covering pollutant minimization activities implemented and mercury concentration trends.	

7.2 Annual Certification Statement and Report for Intake

The permittee shall submit an annual certification statement as set forth in the permit.

Required Action	Due Date
Submit report: As specified in permit condition 1.2.1.4.3.2 for the preceding calendar year.	03/01/2017
Submit report: As specified in permit condition 1.2.1.4.3.2 for the preceding calendar year.	03/01/2018
Submit report: As specified in permit condition 1.2.1.4.3.2 for the preceding calendar year.	03/01/2019
Submit report: As specified in permit condition 1.2.1.4.3.2 for the preceding calendar year.	03/01/2020
Submit report: As specified in permit condition 1.2.1.4.3.2 for the preceding calendar year.	03/01/2021

7.3 Explanation of Schedules

The PMP for mercury is mainly the same as has been required for the last five years of the current permit term. The Department requires some additional considerations to emphasize that the process of retirement should be specifically identified for any effects on PMP activities. Both mass and concentration are expected to be decreased significantly as retirement proceeds.

8 Special Reporting Requirements

None

9 Other Comments:

Deleted 6.3.4 (current permit no. 0002381-06-0), “Compliance with Phosphorus Limitation”, because there is no need for phosphorus limitations.

10 Attachments:

Substantial Compliance Determination

Water Flow Schematic(s)

Water Quality Based Effluent Limits

Water Intake Structure BTA Determination

Facility Specific Standard Variance Data Sheet

11 Proposed Expiration Date:

June 30, 2021

Prepared By: /signed/Keith W. Pierce

Keith Pierce Wastewater Engineer

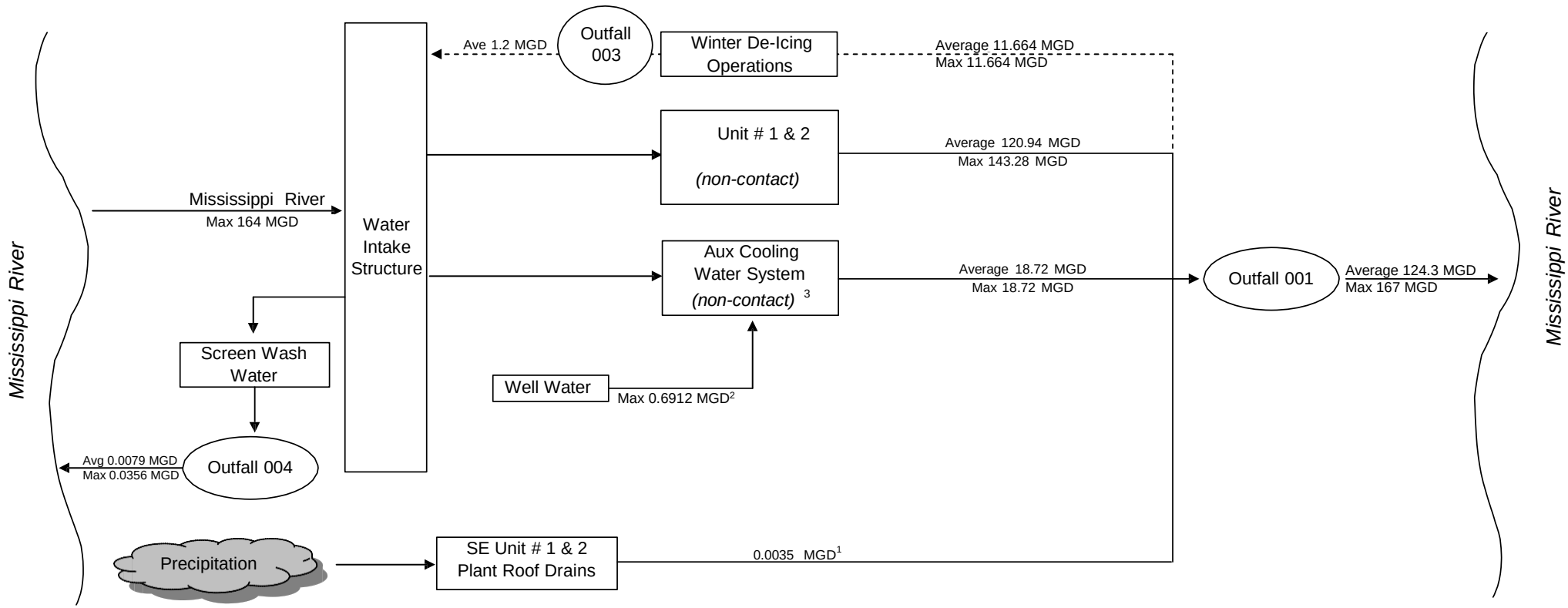
Date: /dated/ 03/23/2016

cc: **Tim Ryan**

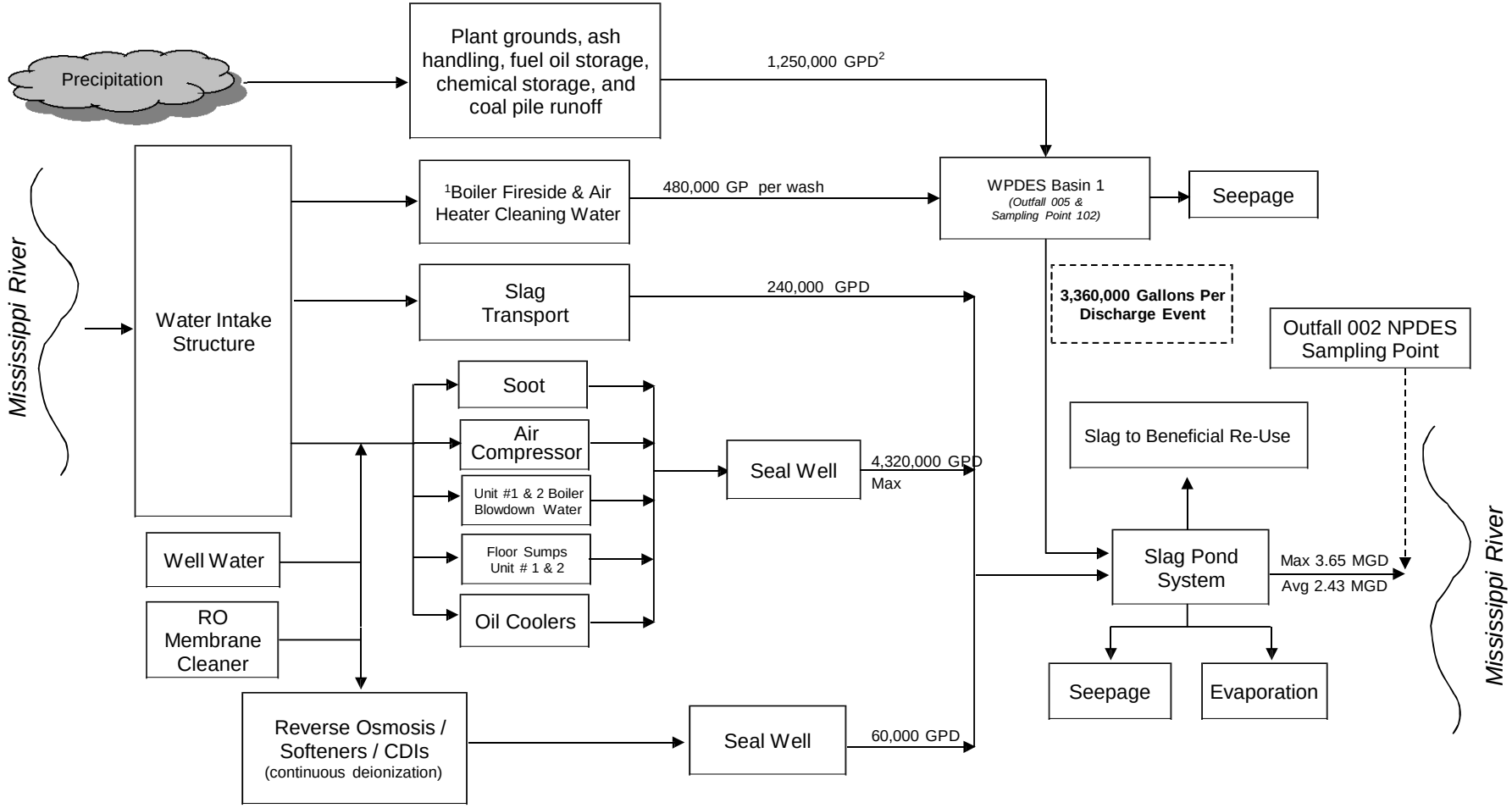
Substantial Compliance Determination

Permittee Name: WPL - Nelson Dewey Generating Station		Permit Number: 0002381-06-0
	Compliance?	Comments
Discharge Limits	Yes	01/01/2011 to 03/31/2016 no violations per SWAMP report
Sampling/testing requirements	Yes	01/01/2011 to 03/31/2016 shows only under-reporting (8) and out-of-range results (1362). Under-report instances are assumed to be associated with periods of no flow. Range was incorrectly specified for outfall 001. Range was set at less than 100 MGD for the discharge of non contact cooling water.
Groundwater standards	NA	
Reporting requirements	Yes	All reports were submitted timely. Reports were as follows: -Mercury PMP: reports for years 2011 - 2015 -Sample point location report -Thermal plan for compliance -Thermal report of final compliance
Compliance schedules	NA	
Management plan	NA	
Other:	NA	
Enforcement Considerations	None needed.	
In substantial compliance?	Yes Comments: This determination is made based on the previous determination from 2010, the inspection maded in 2014 and a review of monitoring data in the SWAMP system Signature: Keith Pierce Date: 03/30/2016 Concurrence: Date:	

WPL - Nelson Dewey Generating Station



1 - Denotes storm water runoff from a rain event on 8/11/05 in which 1.99 inches of rain recorded in Dubuque, IA. Over a 5 hour rain event
2 - Denotes maximum amount of well water used to supplement river to provide cooling of equipment. This water is not in addition to river water.
3 - Per WPL to WDNR dated 12/17/01, this non-contact cooling water is used in the following systems: lube oil coolers; hydrogen coolers; boiler feed pump coolers coolers; and air exhausters



[1] - Denotes water flow during boiler water clean (no chemicals used) based on BT[2] Inc June 21, 1999 Management Plan.
Boiler cleaning takes place 3-4 times per year and occurs during a boiler outage.

[2] - Denotes storm water runoff from a rain event on 8/11/05 in which 1.99 inches of rain recorded in Dubuque, IA. Over a 5 hour rain event

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: February 25, 2016 FILES REF: 3200

TO: Keith Pierce – WY/3

FROM: Nasrin Mohajerani - SCR *N. Mohajerani*

SUBJECT: Updated Water Quality-based Effluent Limitations for **Alliant Energy Nelson Dewey Generating Station-Cassville** (WI- 0002381) - in Grant County.

This is in response to your request for a re-evaluation of the need for water quality-based effluent limitations using Chapters NR 102, 104, 105, 106, 207, 209, 210 and 217 of the Wisconsin Administrative Code (where applicable), for a discharge to Mississippi River near Cassville. Outfall is located in the Mississippi River Watershed (GP07) of the Grant-Platte River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made for each surface water outfall for permit reissuance.

Monitoring Requirements and Limitations for Outfall 001					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily/weekly	Continuous	
Temperature		120 deg F 104 deg	Daily Max. Weekly Avg.	Grab Grab	

Monitoring Requirements and Limitations for Outfall 002					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Oil & Grease (Hexane)*	Daily Max.	20 mg/L	Weekly	Grab	
Oil & Grease (Hexane)*	Monthly Avg.	15 mg/L	Weekly	Grab	
Suspended Solids, Total*	Daily Max.	100 mg/L	Weekly	24-Hr Comp	
Suspended Solids, Total*	Monthly Avg.	30 mg/L	Weekly	24-Hr Comp	
Phosphorus, Total	Rolling 12 Monthly Avg.	1.0 mg/L		24-Hr Comp	
Mercury WQBEL**	Monthly Avg.	1.3 ng/L	Monthly	Grab	
Mercury variance**	Daily Max.	4.68 ng/L			PMP
pH Field	Daily Max.	9.0 su.	Weekly	Grab	
pH Field	Daily Min.	6.0 su.	Weekly	Grab	
Aluminum Total Recoverable		mg/L	annual	Grab	Monitoring
Barium Total Recoverable		mg/L	annual	Grab	Monitoring
Boron Total Recoverable		mg/L	annual	Grab	Monitoring
Iron Total Recoverable		mg/L	annual	Grab	Monitoring
Magnesium Total Recoverable		mg/L	annual	Grab	Monitoring
Manganese Total Recoverable		mg/L	annual	Grab	Monitoring

Outfall 003 and 004 are for intake deicing and intake screen wash these outfalls are not monitored and do not need limits review.

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Monitoring Requirements and Limitations for Outfall 003 (Intake screen deicing)					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

Monitoring Requirements and Limitations for Outfall 004 (Intake screen Backwash)					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

*- These substances are not being evaluated as part of this review since these are categorical limits from NR 290 where no water quality criteria or associated limits exist.

**- Alliant Energy Nelson Dewey has requested a mercury variance, if sufficient supporting documentation is submitted to the Department to warrant a variance, an alternative daily maximum mercury limit of 4.68 ng/L may be included in the WPDES permit in lieu of the mercury WQBEL for outfall 002.

Along with the chemical-specific recommendations mentioned above, the need for acute and chronic whole effluent toxicity testing is also evaluated for this discharge. Following the guidance provided in the Department's January 27, 2014 *Whole Effluent Toxicity Program Guidance Document - Revision #10*,

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nasrin Mohajerani by telephone at (608) 275-3239 or by email at nasrindoknt.mohajerani@wisconsin.gov.

Attachments (1) – Thermal calculation table

Attachments (2) - Map

PREPARED BY:

N. Mohajerani

Nasrin Mohajerani
Water Resources Engineer, P.E.

cc: Brenda Howald _- SCR
Diane Figiel – WY/3

Water Quality-Based Effluent Limitations for
Alliant Energy Nelson Dewey Generating Station-Cassville

WPDES Permit No. WI-0002381

Prepared by: Nasrin Mohajerani – SCR
PART 1 – BACKGROUND INFORMATION

Facility Description:
Wisconsin Power & Light (WPL) owns and operates the Nelson Dewey Generating Station (NED) located in Cassville, Wisconsin. The Station is located on the northeast bank of the Mississippi River at river mile 608 in Pool 11 (Figure 1-1). This 200-megawatt facility uses once-through cooling with the Mississippi River as the source and receiver of cooling system circulating water. The NED has three circulating water pumps available to service the cooling requirements of Units 1 and 2. Two pumps are rated at 25,000 gallons per minute (gpm) and one is rated at 50,000 gpm for a total design intake rate of 100,000 gpm or 144 million gallons per day (MGD). Additionally, there are three low head pumps located within the intake structure. Two of the low head pumps are rated at 6,000 gpm (8.64 MGD) each and one is rated at 4,000 gpm (5.76 MGD) for a total design intake rate of 16,000 gpm (23.04 MGD). The facility's total design intake rate is 167.04 MGD. All of the pumps are located in a single intake structure behind two ⅜-inch mesh traveling screens. The intake structure is connected to the river by a 120-foot long flume.

Alliant Energy operates a two unit coal fired electric generating station near Cassville, Wisconsin, that is commonly referred to as the Nelson Dewey Plant. The power Plant is located in the NW ¼ of Section 19, T3N-R5W in Grant County. Discharges are to the Mississippi River via four outfalls and to the groundwater via one outfall.

Sampling Points and Outfalls Designation		
Sample Point Outfall	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)**
001	Annual Average: 130.5 MGD Peak Daily: 167 MGD	Condenser cooling water effluent
002	Annual Average: 2.56 MGD Peak Daily: 3.65 MGD	Slag pond overflow
003	Annual Average: 11.66 MGD	Intake screen deicing (redirected condenser cooling water)
004	Annual Average: 0.0079 MGD	Intake screen washing (recirculated river water)

Existing Permit Limitations: The current permit, which expired on June 30, 2015, includes the following effluent limitations.

Monitoring Requirements and Limitations for Outfall 001					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Temperature Maximum		120 deg F	Daily	Grab	Limit is effective in July and August of 2014 and each year after.

Monitoring Requirements and Limitations for Outfall 002					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
Oil & Grease (Hexane)	Daily Max	20 mg/L	Weekly	Grab	
Oil & Grease (Hexane)	Monthly Avg	15 mg/L	Weekly	Grab	
Suspended Solids, Total	Daily Max	100 mg/L	Weekly	24-Hr	

Monitoring Requirements and Limitations for Outfall 002					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
				Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Weekly	24-Hr Comp	
Phosphorus, Total	Rolling 12 Month Avg	1.0 mg/L	Annual	24-Hr Comp	
Mercury	Daily Max	9.01 ng/L	Monthly	Grab	PMP
pH Field	Daily Max	9.0 su	Weekly	Grab	
pH Field	Daily Min	6.0 su	Weekly	Grab	
Aluminum Total Recoverable		mg/L	annual	Grab	
Barium Total Recoverable		mg/L	annual	Grab	
Boron Total Recoverable		mg/L	annual	Grab	
Iron Total Recoverable		mg/L	annual	Grab	
Magnesium Total Recoverable		mg/L	annual	Grab	
Manganese Total Recoverable		mg/L	annual	Grab	

Monitoring Requirements and Limitations for Outfall 003 (Intake screen deicing)					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

Monitoring Requirements and Limitations for Outfall 004 (Intake screen Backwash)					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Estimated	

Receiving Water Information

- Name: Mississippi River
- Classification: warm water sport fish according to s. NR 102.04(3) (b) and is not classified as a public water supply
- Low Flow: Date estimated, 9-6-1991
- 7-Q_{10} = 10,400 cfs (cubic feet per second)
- 7-Q_2 = 16,000 cfs
- 90Q10 = 14,700 cfs
- Harmonic Mean = 26,200 cfs
- % of Flow used to calculate limits: 25%
- Hardness = 167 mg/L as $CaCO_3$ from STORET

Effluent Information

- Effluent Flows reported in permit application
- Outfall 001 – consists of condenser cooling water
- Maximum Annual average design flow = 130.5 MGD, this is the actual average flow from 2013
- Effluent characterization: This facility is categorized as a secondary industrial discharge
- Hardness =140 mg/L as $CaCO_3$ from their application
- Monitoring data: Data submitted by the facility to the department was used in this evaluation.
- Water Sources: 86% from the Mississippi River

Effluent concentration data for phosphorus and mercury are summarized here. Because of the large number of results, only the statistics are being summarized below. In the following tables, "P99" refers to the 99th upper percentile calculated using the procedures in s. NR 106.05 when 11 or more detected results are available.

Statistics	Phosphorus(mg/L) Outfall - 002	Mercury (ng/L) Outfall - 002
Date	02/04/14 - 03/26/15	01/12/11- 10/06/15
1-day P_{99}	0.33	4.68
4-day P_{99}	0.22	3.08
30-day P_{99}	0.160	2.26
Mean	0.133	1.87
Std	0.060	0.85
Sample Size	11	58
Range	0.0657-0.26	0.14 - 4.6

Effluent data for substances for which a single sample was analyzed and if detected are shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

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

The following tables list the water quality-based effluent limitations for this discharge along with the results of testing effluent samples. All concentrations are expressed in term of micrograms per Liter (µg/L) except for Hardness and Chloride. Following the tables, permit recommendations are made where appropriate, based on a comparison between the effluent concentrations and the calculated limits pursuant to ss. NR 106.04 and 106.05.

The effluent limit summaries will include only those substances that were detected. Concentrations are indicated in units of ug/L except for chloride and hardness (mg/l). These evaluations are for summer and winter.

EFFLUENT LIMIT CALCULATIONS FOR:			**Alliant Nelson Dewey**		**Outfall 002**
RECEIVING WATER:	**Mississippi River**				
RECEIVING WATER INFORMATION:					
CLASSIFICATION: Warmwater Sport Fish, Warm Water Forage,					
					Harmonic
FLOWS (cfs):		7Q10	7Q2	90Q10	Mean
	=	10400	16000	14700	26200
HARDNESS (mg/L)	=	167			
EFFLUENT INFORMATION:		DAILY FLOW			
OUTFALL NUMBER	f	(mgd)	(cfs)		
001	0	2.56	3.961		
EFFLUENT HARDNESS (mg/L)	=	140		From application	

CALCULATION OF EFFLUENT LIMITATIONS BASED ON ATC (ug/L)							
	REF.			MAX.	1/5 OF	MEAN	
	HARD.			EFFL.	EFFL.	EFFL.	1-day
SUBSTANCE	or pH	ATC		LIMIT	LIMIT	CONC.	P99
Chlorine		19.03		38.06	7.61		
Arsenic		339.80		679.60	135.92	1.8	
Chromium (+3)	140	2375.12		4750.24	950.05	0.85	
Copper	140	21.31		42.62	8.52	4.6	
Lead	140	148.00		296.00	59.20	1.3	
Mercury		0.83		1.66			0.00468

Nickel	140	605.55		1211.10	242.22	3.9	
Zinc	140	161.56		323.12	64.62	28	
Cyanide		45.78		91.56	18.31	1.9	
Chloride		7.57E+05		1.51E+06	3.03E+05	64	

CALCULATION OF EFFLUENT LIMITATIONS BASED ON CTC (ug/L)							
RECEIVING WATER		Flow	2600 cfs				
	REF.		MEAN	WEEKLY	1/5 OF	MEAN	
	HARD.		BACK-	AVE.	EFFL.	EFFL.	4-day
SUBSTANCE	or pH	CTC	GRD.	LIMIT	LIMIT	CONC.	P99
Chlorine		7.28		4785.86	957.17		
Arsenic		152.20		100056.04	20011.21	1.8	
Chromium (+3)	167	201.07		132183.10	26436.62	0.85	
Copper	167	16.05	1.86	9330.34	1866.07	4.6	
Lead	167	45.97	0.841	29668.58	5933.72	1.3	
Mercury		0.44	0.00469	286.18	57.24		0.00308
Nickel	167	80.55		52953.44	10590.69	3.9	
Zinc	167	188.50	2.35	122377.07	24475.41	28	
Cyanide		11.47		7540.36	1508.07	1.9	
Chlorides		3.95E+05		2.60E+08	5.19E+07	64	

CALCULATION OF EFFLUENT LIMITATIONS BASED ON WC (ug/L)							
RECEIVING WATER FLOW =			3675 cfs				
			MEAN	MO'LY	1/5 OF	MEAN	
			BACK-	AVE.	EFFL.	EFFL.	30-day
SUBSTANCE		WC	GRD.	LIMIT	LIMIT	CONC.	P99
Mercury		1.30E-03	4.69E-01	1.30E-03			0.00226

CALCULATION OF EFFLUENT LIMITATIONS BASED ON HTC (ug/L)							
RECEIVING WATER FLOW			cfs	6550			
			MEAN	MO'LY	1/5 OF	MEAN	
			BACK-	AVE.	EFFL.	EFFL.	30-day
SUBSTANCE		HTC	GRD.	LIMIT	LIMIT	CONC.	P99
Chromium (+3)		3.82E+06		6317335879	1263467176	0.85	
Lead		140	0.841	230256	46051	1.3	
Mercury		0.0015	0.00469	0.0015			0.00226
Nickel		43000		71148623	14229725	3.9	
Cyanide		9300		15387958	3077592	1.9	

CALCULATION OF EFFLUENT LIMITATIONS BASED ON HCC (ug/L)							
RECEIVING WATER FLOW =			cfs	6550			
			MEAN	MO'LY	1/5 OF	MEAN	
			BACK-	AVE.	EFFL.	EFFL.	30-day
SUBSTANCE		HCC	GRD.	LIMIT	LIMIT	CONC.	P99
Arsenic		13.3		22006.4	4401.3	1.8	
Beryllium		0.33		546.024	109.205	0.25	

Back ground low level metals are from Mississippi River at site 24.

Permit Recommendations:

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

1. Maximum effluent concentration exceeds the limit (only applies to daily maximum unless there are at least 4 consecutive days with data, which isn't the case here.
2. If 11 or more detected results are available in the effluent, the 99th upper percentile (or P99) value exceeds

the comparable calculated limit.

3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit.

With that in mind, the following permit limits are recommended:

Conclusions and Recommendations:
Based on the above evaluation and the information from the WPDES permit application, the following water quality-based effluent limitations are recommended.

Mercury:
Of the substances listed above, the only potentially needing a limit is mercury. The monthly average limit for mercury in the above two tables are set equal to the criterion, in wildlife (WC) and human threshold (HTC) accordance with s. NR 106.06(6) because typically in Wisconsin surface waters, the background concentration exceeds the criterion. And since the effluent concentration exceeds the criterion, it may appear that effluent limitations for mercury are required.

Based on comparison of effluent data and calculated effluent limitations based on wildlife and human threshold , effluent limitations are apparently needed for mercury because the upper 99th percentile of 30-day average effluent concentrations, as determined by the procedure specified in NR106.145(5) is 2.26 ng/L, which exceeds monthly average limit of 1.3 ng/L therefore, a monthly average limit of 1.3 ng/L for mercury is recommended.

Section NR 106.145(4) allows for eligibility for an alternative mercury effluent limitation if the permittee submits an application for an alternative mercury limit, which includes the submittal of a pollutant minimization plan. Nelson Dewey in their application requested for mercury variance. Section NR 106.145(5) specifies that an alternative limitation shall equal the 1-day P_{99} of the effluent data, and shall be expressed as a daily maximum concentration. Using this approach, Nelson Dewey may be eligible for an alternative mercury limitation of 4.68 ng/L if these documents are submitted.

Chlorine: If chlorine is used for disinfection, a chlorine limit is applicable. The permittee's ability to comply with those limits will determine if these additives can be used and at which rate they can be applied.

Chlorine Recommendation: Daily maximum limit of 38 ug/L and no weekly average limit are recommended in the reissued permit.

PART 3 –PHOSPHORUS

Phosphorus – Technology Based Limit:
A 1.0 mg/L monthly average phosphorus limit is required under chapter NR 217 for industries if the discharge (averaged over the entire year) exceeds 60 pounds per month. Nelson Dewey has an annual rolling average phosphorus limit of 1.0 mg/L in their permit for outfall 002. This limit remains applicable unless a more stringent water quality concentration limit is given.

Water Quality Based Effluent Limit:
Revisions to the administrative rules for phosphorus discharges took effect on December 1, 2010. These revisions require an evaluation of the need for water quality based effluent limits.

Water quality-based effluent limitations are evaluated in this report for phosphorus using the procedures in s. NR 217.13. For discharges of phosphorus to flowing streams and rivers, the water quality based effluent limitation shall be calculated using the following conservation of mass equation:

Limitation = [(WQC) (Qs+ (1-f) Qe) - (Qs- fQe) (Cs)] / Qe
Where:
Limitation = Water quality based effluent limitation (in ug/L)

WQC = The applicable water quality criterion (0.1 mg/L = 100 ug/L)

Qs = Receiving water flow (Q7,2) = 16,000 cfs

Qe = Effluent flow = 130.5 mgd / 202.27 cfs

f = Fraction of the effluent flow that is withdrawn from the receiving water (86%)

Cs = Background concentration of the substance (0.102 mg/L) is from intake water phosphorus data

Based on available background data it is believed that the receiving water concentration exceeds criterion (0.1 mg/L). Therefore, it is recommended that water quality based effluent limit be set equal to criterion (s. NR 217.13(7)).

Pursuant to s. NR 217.14(2), Wis. Adm. Code, a monthly average limit equal to three times the calculated limit, or 0.3 mg/L, should be included in the permit when the calculated water quality based limit is less than 0.3 mg/L. The 0.1 mg/L limit shall be expressed in the permit as a six-month seasonal average limit (May-October and November – April).

Effluent phosphorus data were collected during permit term. Those data as shown in the following table indicate that the 30-day p99 (0.12 mg/L) is slightly above the calculated water quality based limitation, therefore a limit is warranted per s. NR 217.15(1).

Statistics	Phosphorus (mg/L)
Date	01/12/11 - 10/05/15
1-day P_{99}	0.25
4-day P_{99}	0.16
30-day P_{99}	0.12
Mean	0.098
Std	0.047
Sample Size	58
Range	0.01-0.243

Phosphorus Interim Limit:
Compliance with an effluent phosphorus concentration limit as stringent as 100 ug/L may not be technically or economically feasible; but the new rules allow alternatives for achieving comparable reductions in phosphorus loading. Options for the facility to consider may include requesting an alternate phosphorus limitation (APL) with compliance schedule, pollutant trading with other phosphorus discharges (point and/or nonpoint sources) that may be controlled more effectively, stream monitoring above and below the outfall to document actual instream changes related to the effluent discharge, and development of an adaptive management strategy that combine a broader range of efforts to reduce phosphorus loading.

The calculated water quality based limitation is stringent enough that a compliance schedule extending beyond the five year permit term is appropriate. In such instances an interim limit is required under per s. NR 217.17.

Since the permit contains technology-based limit of 1.0 mg/L, the recommended interim limit is equal to the existing effluent limit of 1.0 mg/L for outfall 002.

PART 4 – 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. The following table is used to screen the need to calculate limitations for temperature:

Warm Water and Limited Forage Fish designated Waters	Effluent Temperature Limitation
$Q_s:Q_e \geq 20:1$	120 ^{o}F (no calculation needed)
$20:1 > Q_s:Q_e > 2:1$	120 ^{o}F or the sub-lethal WQBEL (calculation needed), whichever is lower
$Q_s:Q_e \leq 2:1$	Sub-Lethal and Acute WQBELs (calculation needed)

In accordance with s. NR 106.53(2)(b), the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off of actual effluent flow reported by this facility from 01/01/2011-07/31/2015.

The following table summarizes the maximum temperatures reported during monitoring at this facility from 01/02/2011- 10/31/2015 and the calculated weekly average and daily maximum effluent limitations calculated based on the water quality standards for temperature.

	Representative Highest Monthly Effluent Temperature		Effluent Limitations	
Month	**Weekly Avg.**	**Daily Max.**	**Weekly Avg.**	**Daily Max.**
	(°F)	(°F)	(°F)	(°F)
JAN	65	75	-	120
FEB	70	89	-	120
MAR	75	80	-	120
APR	80	89	-	120
MAY	96	101	113	120
JUN	**108**	111	**104**	120
JUL	111	115	118	120
AUG	106	110	108	120
SEP	102	107	-	120
OCT	85	90	-	120
NOV	72	80	-	120
DEC	67	71	-	120

The only outfall with effluent limit and monitoring data is outfall 001. The discharge from other outfalls are very small and infrequent compared to nearby flow from outfall 001. The Qs:Qe ratio for outfall 002 is 2600, for outfall 003 558 and outfall 004 is 852 well above to 20:1 cutoff where the need for other temperature limits must be evaluated.

Recommendations:
The current WPDES permit has a daily maximum temperature limit of 120 °F for outfall 001 and calculated daily maximum limitation based on water quality and provided effluent data are 120 °F as shown in the above table. Since the highest reported value for temperature during the permit term is 115 °F, which is close to 120 F daily maximum limit, it is recommended that a daily maximum limit of 120 °F remain in the reissued permit in addition it is appears that a weekly average limit of 104 degrees in June for outfall 001 is necessary.

While there are a lot of dilution available for outfalls 002,003 and 004 there is no reasonable potential of exceeding the 120 °F water quality based limitations. Therefore, no temperature limitations or monitoring are recommended for either outfall at this time.

The calculated limits and data summary are provided in Attachment #2

PART 4 : ADDITIVES

Evaluation of Additives:

Alliant Energy Nelson Dewey proposed to use the following additives at outfall 002.

Outfall	Chemical Name	Description/use	Maximum Quantity Used/day	Frequency of use days/week
002	Trisodium Phosphate	Boiler pH Control	130 oz. / 0.038 mg/L	7
002	Optisperse Hp 9420	Boiler Phos. Control	24 oz. / 0.07 mg/L	1
002	RLT-355	Feed Water pH Control	80 oz. / 0.234 mg/L	7
002	Hydrazine Solution	Oxygen Scavenger	60 oz. / 0.175 mg/L	7
002	Caustic Soda	Boiler pH Control	20 oz. / 0.058 mg/L	1
002	IWT P-11 Sodium Hydroxide	Reverse Osmosis Clean-in-place Chemical	5 lbs / 0.234 mg/L	1
002	Caustic Soda	Reverse Osmosis pH Control	7.5 gal / 3.9 mg/L	7
002	Hydrochloric Acid	Deionization Clean-in-place Chemical	4 gal / 1.86 mg/L	1
002	Sodium Chloride (Nacl)	Water softener Regeneration	1200 lbs / 56.17 mg/L	7

The following table shows the evaluation results

Outfall	Chemical Name	Secondary Acute value ug/L	Secondary Chronic value ug/L
002	Trisodium Phosphate	221.25	1229
002	Optisperse Hp 9420	327625	18201
002	RLT-355(1)	pH control	
002	Hydrazine Solution	57.5	3.2
002	Caustic Soda(2)	used in current permit	
002	IWT P-11(3) Sodium Hydroxide	pH control	
002	Caustic Soda (2)	used in current permit	
002	Hydrochloric Acid (3)		
002	Sodium Chloride (2) (NaCl)	used in current permit	

1- there is no toxicity data available since used for pH control the potential toxicity of this additive will be address via pH limitation.
2- Sodium chloride and caustic soda was used during the current permit and it was found that no limits were needed therefore, no additional evaluation is needed at this time.
3- Evaluation are not necessary for additives that have active ingredients consisting only of chlorine, caustic soda (sodium hydroxide), hypochlorite, sulfuric acid, hydrochloric acid, as the use of these products will be restricted by the inclusion of chlorine and pH effluent limits.

For all other products, the secondary acute and chronic values are calculated according to the guidance. Then, water quality based effluent limits (WQBELs) for these additives are established; depending on the receiving water, both acute and chronic limits may be needed.

CALCULATION OF EFFLUENT LIMITATIONS BASED ON ATC (ug/L)					
		MAX.	1/5 OF	MEAN	
		EFFL.	EFFL.	EFFL.	

	ATC	LIMIT	LIMIT	CONC.	
Trisodium Phosphate	221.25	221.25	44.25	38	
Optisperse Hp 9420	327625	327625	65525.00	70	
Hydrazine Solution	57.5	57.5	11.5	175	

Recommendations: Based on the comparison of calculate daily maximum limits using secondary values with effluent concentrations **a** effluent limit of 58 ug/L is recommended for Hydrazine Solution if they use between 20-60 oz.

Evaluating of secondary chronic values and calculation the limits

CALCULATION OF EFFLUENT LIMITATIONS BASED ON CTC (ug/L)						
RECEIVING WATER Flow		2600 cfs				
	REF.		MEAN	WEEKLY	1/5 OF	MEAN
	HARD.		BACK-	AVE.	EFFL.	EFFL.
SUBSTANCE	or pH	CTC	GRD.	LIMIT	LIMIT	CONC.
Trisodium Phosphate		1229		8.08E+05	1.62E+05	38
Optisperse Hp 9420		18201		1.20E+07	2.39E+06	70
Hydrazine Solution		3.2		2.10E+03	4.21E+02	175

Recommendation for Additives: Based on the comparison of calculate weekly average limits using secondary values for these additives with effluent concentrations no effluent limits are recommended because of the large amount of dilution available Q7,10 : Qe >1000.

Part 5 - Whole Effluent Toxicity (WET) Evaluation

WET testing is not required at outfall 002 because available dilution is (Qs: Qe) greater than 1000:1.

Attachment # 1

Outfall 001 is located in the SW ¼ of NE ¼ of Section 33, T2N_R7E in Monroe in Green County (see the following map).

Temperature limits for receiving waters with unidirectional flow

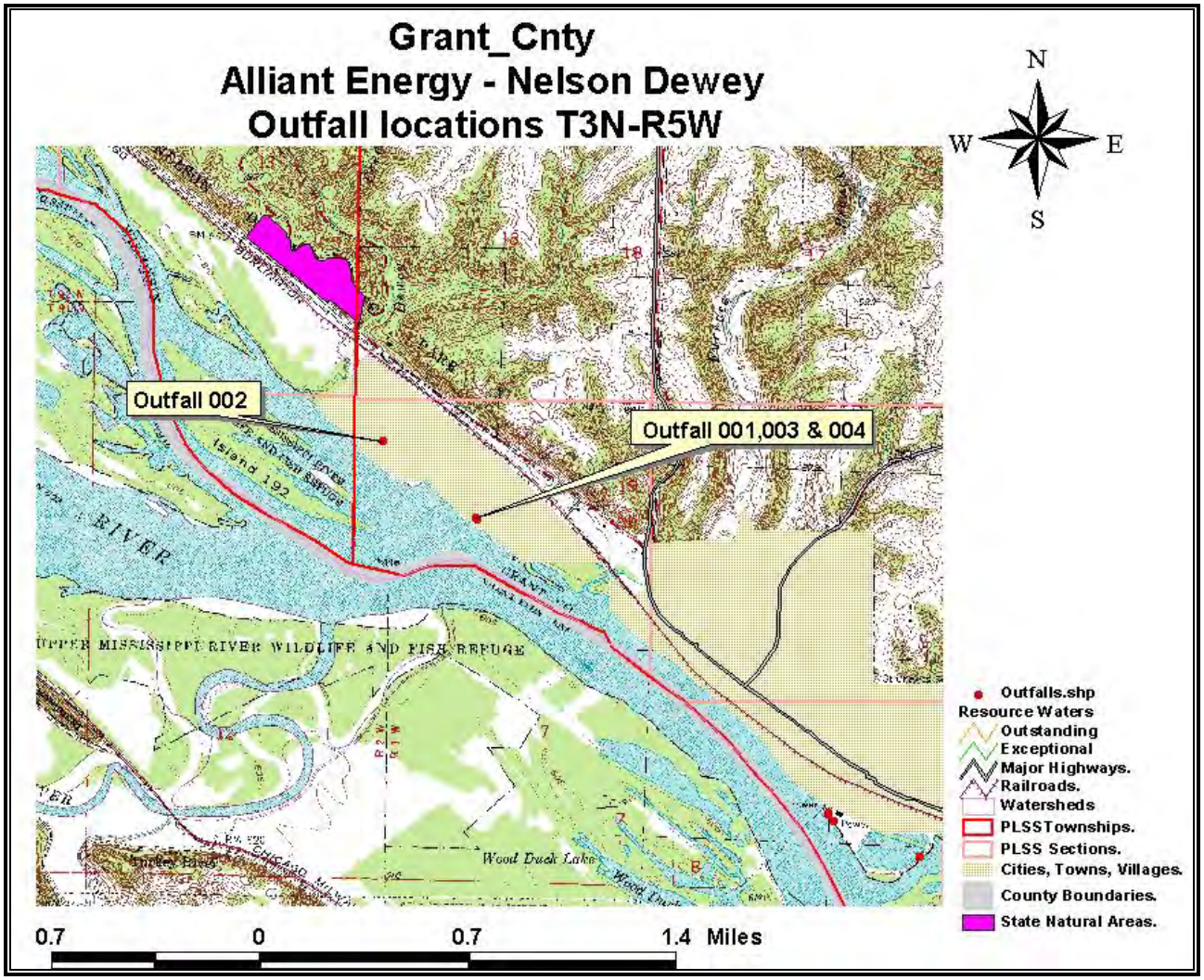
(calculation using default ambient temperature data)

Facility:	Nelson Dewey				**Data Range**	**7Q10 or 4B3:**	10400	cfs				
Outfall(s):	001			**Start:**	01/02/11	**Dilution:**	25%					
Date Prepared:	1-Dec-15			**End:**	10/31/15	**f:**	0					
Design Flow (Qe):	130.5	mgd				**Stream type:**	Mississippi River					
Region:	**SC**					**Qs:Qe ratio:**	12.9	:1				
						Calculation Needed?	**YES**					

	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		Representative Highest Monthly Effluent Temperature		99th Percentile of Representative Data		**Calculated Effluent Limits**	
Month	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Ave (Qesl)	Daily Max Flow Rate (Qea)	Weekly Ave	Daily Max	Weekly Ave	Daily Max*	**Weekly Ave Limit**	**Daily Max Limit**
	(°F)	(°F)	(°F)	(cfs)	(mgd)	(mgd)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
JAN	32	49	75	2600.00	121.100	139.100	65	75	66	NA	-	120
FEB	33	50	76	2600.00	133.314	149.600	70	89	67	NA	-	120
MAR	36	52	76	2600.00	125.271	157.900	75	80	69	NA	-	120
APR	47	55	79	2600.00	183.571	235.600	80	89	77	NA	-	120
MAY	60	65	82	2600.00	174.900	174.900	96	101	91	NA	113	120
JUN	72	75	85	2600.00	174.900	174.900	**108**	111	101	NA	**104**	120
JUL	76	80	86	2600.00	174.900	174.900	111	115	107	NA	118	120
AUG	76	79	86	2600.00	174.900	174.900	106	110	105	NA	108	120
SEP	67	73	84	2600.00	174.900	174.900	102	107	99	NA	-	120
OCT	54	61	81	2600.00	173.857	174.900	85	90	81	NA	-	120
NOV	40	50	77	2600.00	154.414	174.900	72	80	71	NA	-	120
DEC	33	49	76	2600.00	122.486	155.500	67	71	65	NA	-	120

*NA - Indicates that there are greater than 100 daily maximum values, therefore 99th percentile would be a value less than the recorded daily maximum.

Attachment #2



Water Intake Structure BTA Determination
Nelson Dewey Generating Station

March 2016

Background

The facility is not subject to the requirements of 40 CFR 125.94 through 125.99 because only 0.7% of the water the facility withdraws on an actual intake flow basis is used exclusively for cooling purposes. Section 316(b) of the Clean Water Act requires, and s. 283.31(6), Wis. Stats., allows the Department of Natural Resources (hereafter Department) to require that the location, design, construction, and capacity of cooling water intake structures (CWIS) reflect the best technology available (BTA) for minimizing adverse environmental impact.

Wisconsin Power and Light Company (WPL) owns a steam electric power generating facility located on the Mississippi River at Cassville, Wisconsin. The facility is known as the Nelson Dewey Generating Station (NED). The facility historically used the Mississippi River as the source of once-through condenser cooling. NED's design intake flow rate is 167 MGD. However, with the recent retirement of all units, expected intake is greatly reduced. Also, the use of intake water for cooling is greatly reduced.

The expected maximum intake is 81 MGD as follows:

1. Planned usage of one circulating water pump (assuming largest at 50,000 gpm) and one low head service pump (assuming largest at 6,000 gpm) for total of 56,000 gpm or 81 MGD. Once temperatures warm, so that freeze and fire protection of the facility is no longer needed, withdrawals at the intake structure have the potential to cease.
2. Planned maximum non-contact water cooling usage for Station 1A, 2A, and 2B Station air compressors will be 400 gpm (0.7% of total volume intake of 56000 gpm for non-contact cooling water)

Although all pumps are still at the facility and are operational, there is no need for cooling water other than equipment cooling. Water is also needed for fire protection, cleaning (bunker houses, conveyors, etc.). An EPA consent decree (13-cv-266 and 13-cv-265) is part of the legal reason that the units will not be operated to generate electricity. The decree included a requirement that by no later than December 31, 2015, WPL shall Retire, Refuel, or Repower Nelson Dewey Units 1 and 2. The permittee has determined to retire the units. The coal pile will be decommissioned. There is no natural gas supply. A fuel oil tank was used for igniters in the boilers but this system has very small capacity.

The Department will base the review on the operation after the retirement. The regulation of utilities will not allow repowering or other significant change to the use of the intake structure until all submittals and approvals required by 40 CFR Subpart J have been obtained. In conclusion, the facility is not subject to the requirements of 40 CFR 125.94 through 125.99 because only 0.7% of the water the facility withdraws on an actual intake flow basis is used exclusively for cooling purposes (40 CFR 125.90).

In conclusion, the Department will establish BTA based on Best Professional Judgment (BPJ) using the Department's February 2, 20 09 guidance document, Guidance for Evaluating Intake Structures Using Best Professional Judgment (BPJ).

BTA Is Based on BPJ Using the Department's 2009 Guidance.

The NED has three circulating water pumps available to service the cooling requirements of Units 1 and 2; but as noted above, only one pump will be used in post retirement. Two pumps are rated at 25,000 gallons per minute (gpm) and one is rated at 50,000 gpm for a total design intake rate of 100,000 gpm or 144 million gallons per day (MGD). Additionally, there are three low head pumps located within the intake structure; but as noted above, only one pump will be used in post retirement. Two of the low head pumps are rated at 6,000 gpm (8.64 MGD) each and one is rated at 4,000 gpm (5.76 MGD) for a total rate of 16,000 gpm (23.04 MGD). The facility's total design intake rate without accounting for retirement is 167 MGD; as noted above it is 81 MGD in post retirement and once temperatures warm, so that freeze and fire protection of the facility is no longer needed, withdrawals at the intake structure have the potential to cease. All of the pumps are located in a s ingle intake structure behind two ⅜-inch mesh traveling screens. The intake structure is connected to the river by a 120-foot long flume. The intake is a single intake structure, and has two 3/8 inch mesh traveling screens. The through-screen velocity is calculated to be 3.88 fps at design flow rate of 167 MGD and 1.88 fps at 81 MGD.

Evaluation of impingement and through-screen velocity is appropriate at the opening of the flume on the river bank.

The BPJ is based on operation in post retirement. The BPJ is based mainly on the 2009 guidance. It is also based on the estimated costs of improvements.

The 2009 guidance states that in most cases it should be appropriate to determine that the existing intake represents BTA if two or more of five scenarios are met; the following two scenarios are applicable:

- Intake design flow velocity is < 0.5 fps. In post-retirement, velocity of flow into the intake flume at the shore line of the river will be 0.46 fps at low water elevation (125 cfs and Width: 27.1 feet, Bottom elevation: 594 feet, Low water elevation: 604 feet). The permittee's submittal is incorporated with this document at page 7 as figure: "WPL SUBMITTAL OF CALCULATION OF INTAKE VELOCITY AT RIVER BANK; JANUARY 14, 2016 EMAIL."
- Intake design flow is < 5% of the Q7,10 of the source water. Maximum intake flow in post-retirement as percentage of Q7,10 of the source water will be 1.2% (125 cfs/10,400 cfs)

In addition there are biological data and cost estimates submitted by the permittee.

Historical Biological Data
This is a summary of how biological data was submitted and evaluated for the current permit and how the data was considered for evaluation in 2016. The data is from 2005-2006 so it is not possible to make unqualified use of the data for this review because of the potential changes over the last ten years. Also the study is based on flows that are roughly twice the current flows. As flow decreases there will be a nonlinear effect in impingement with impingement dropping off dramatically at velocities around 0.5 fps and less.

In July, 2007, WPL submitted to the Department a report on an Impingement Mortality Characterization Study (IMCS). This study was conducted in 2005-2006 to determine the baseline for NED's cooling water intake structure. An entrainment study was not required of NED because the design intake flow rate was less than 5% of the flow rate of the Mississippi River.

The impingement study protocol was to collect, separate, and record the fish and shellfish in the traveling screen wash water over a period of 24 hours. Sampling was performed every other week over 13 months resulting in a total of 29 sampling events. Annual impingement rates were initially estimated for the actual operation of the NED during the study period and for "baseline" full-load operations. Because NED was a base-load facility, the annual impingement rates under actual and baseline operations were nearly identical. Actual impingement, therefore, was used in 2007 to determine the calculation baseline.

Twenty-nine impingement samples were obtained during the study resulting in the collection of 43,918 live fish from the NED intake. Based on this study the annual (12-month) impingement rate was calculated to be 599,539 fish. The total biomass of fish collected from the NED intake during the 29 sampling events was 1,721.7 kilograms (kg), which translated to an annual estimated biomass impingement of 23,448.4 kg. Forty-five species of fish were impinged alive at the NED intake. Gizzard shad made up 86.7 percent of the catch, followed by emerald shiner at 8.5 percent, and freshwater drum at 3.1 percent. All other species comprised less than 1 percent each of the catch. Most impingement occurred from November through March when water temperatures in the river were coldest. Based on a prior study of gizzard shad winter morbidity and mortality, the Iowa Department of Natural Resources and the Region 7, U.S. EPA issued guidance that 96 percent of gizzard shad impinged from November through March can be considered dead or dying. The Department requested additional information to support the 96% exclusion.

In response to the Department's request, the Burns and McDonnell biologist employed by WPL demonstrated that the gizzard shad exclusion developed from the Quad Cities Nuclear Power Plant was also applicable to the NED facility, due to the almost identical average daily temperatures of the facilities and the reasonable assumption that the physiologies of the gizzard shad populations at the two locations are the same. Applying the 96% exclusion to the baseline impingement at the NED yielded a calculation baseline of 111,375 fish per year.

In order to put the calculated impingement rate into a meaningful context, the fishery population needs to be established. The IMCS report did not do that but did provide the "relative abundance" of each species. Species' relative abundance was portrayed as "strays", "rare", "common", "abundant", etc. While this method of classification is valuable, it is not quantifiable.

The Department's Mississippi River fisheries experts have enormous volumes of raw fish data from 1987 to 2007, from numerous sampling projects. Unfortunately, no common sampling protocol was employed. Some data is from shocking and some is from fyke netting. Most of the data is from McCartney Lake, river mile 601.00, which is a backwater. Some of the data is from Cassville Slough, upstream of NED at river mile 613.60. Some is from Cassville Slough at NED, river mile 608.00. Furthermore, gamefish population estimates are not possible in the winter, when they move into the backwaters to over-winter; and therefore the NED intake will have no effect on them.

The Department also requested WPL to query the various agencies as to the existence of population estimates. WPL's consultant determined that a population estimate did not exist.

The Department concluded that a current population estimate for Pool 11 did not exist. Absent such an estimate, it was not possible to quantify the relative impact the NED intake was having on the fishery.

Shortly after the start of impingement sampling, the Department brought to WPL's attention the fact that the Higgins Eye mussel, a federally endangered species, is present in Pool 11 of the Mississippi River (where NED is located). Glochidia are the parasitic larval stage of freshwater unionid mussels (such as the Higgins Eye mussel) that are attached to the gills of fish. The Department requested that WPL assess the impact of impingement of fish hosts on the propagation of the Higgins Eye.

In consultation with the Department and the Iowa DNR, WPL developed a protocol for collecting and preserving the gills from host species. Visual examination of gills can establish whether glochidia of mussels are present. Sixty-four fish representing two host species were collected at the NED during April through June 2006. Unfortunately, it was later determined that it would take DNA testing to determine whether the glochidia are those of the Higgins Eye mussel and not some other non-endangered species of bi-valve.

At the time, in 2009, the Department Mississippi River biologists understood the apparent dilemma of not having quantifiable numbers. Nevertheless, with many years of experience observing and sampling this river stretch, and after their review of the IMCS and other reports, it was their best professional judgment that NED was not adversely affecting the aquatic community. In an e-memo to Dan Joyce, dated December 9, 2008, Mississippi River Fisheries Biologist Patrick Short stated that "…from the information that was provided we do not believe that NED is having a negative impact on the fishery

in Pool 11, at this time." In conclusion, although the data is approximately 10 years old, the Department assumes it is still relevant. Therefore, these conclusions are still basically correct. These conclusions support the Department's determination on BTA.

Cost Estimates

This is a summary of how cost estimates was submitted and evaluated for the current permit and how the data was considered for evaluation in 2016. In January 2005, WPL conducted a study to evaluate impingement mortality reduction measures. In addition to that study, the Department suggested some additional measures for WPL to evaluate. Here is a list of measures that were evaluated and associated costs (excluding the fish stocking/habitat restoration measure). These cost estimates were made in 2005 (with an update in 2009) based on the operation prior to retirement of units 1 and 2. Using these estimates for the current facility is complicated because costs today will be greater because of inflation but will also be less because of reduced intake flow in post-retirement. These two factors probably cancel to a large degree and therefore these costs still provide a rough value for assessment. The Department has determined that today's costs would be similar to previous estimates. In conclusion, these costs are significant especially considering that impacts will be much lower in post-retirement. These conclusions support the Department's determination on BTA.

2009 COST ESTIMATES FOR IMPINGEMENT MORTALITY REDUCTION

IMPINGEMENT MORTALITY REDUCTION MEASURES	COST (in 2009 based on operation prior to retirement)
Modify screen operation to reduce latent mortality including the feasibility of sequenced backwashing.	This measure was dropped from consideration for various reasons including potential for plugging of pumps and piping.
Install cooling towers.	The capital cost alone was estimated as several million dollars.
Expand or replace the existing intake to increase screen area and achieve a through-screen velocity of 0.5 fps or less (e.g., dual-flow screen conversion, adding bays, increasing traveling screen size).	A preliminary cost figure to increase the size of the water intake structure or to build a new structure further downstream was approximately $30 million dollars.
Install submerged cylindrical wedge-wire screens, with a through-screen velocity of 0.5 fps or less, outside of the intake.	The estimated annualized cost was $2,058,000/yr
Install passive screen barriers in front of the intakes to reduce impingement (e.g., rigid screens, net, or filter fabric).	The estimated annualized cost was $2,130,000/yr
Install new traveling screens equipped with a fish handling system (new traveling screens with the Modified Ristroph bucket system).	The estimated annualized cost was $5,690,00/yr
Curtail operations at specific times to avoid episodic occurrences of high fish and shellfish density in the vicinity of the intake.	Costs were deemed not viable because of the prohibitive cost of replacement power.

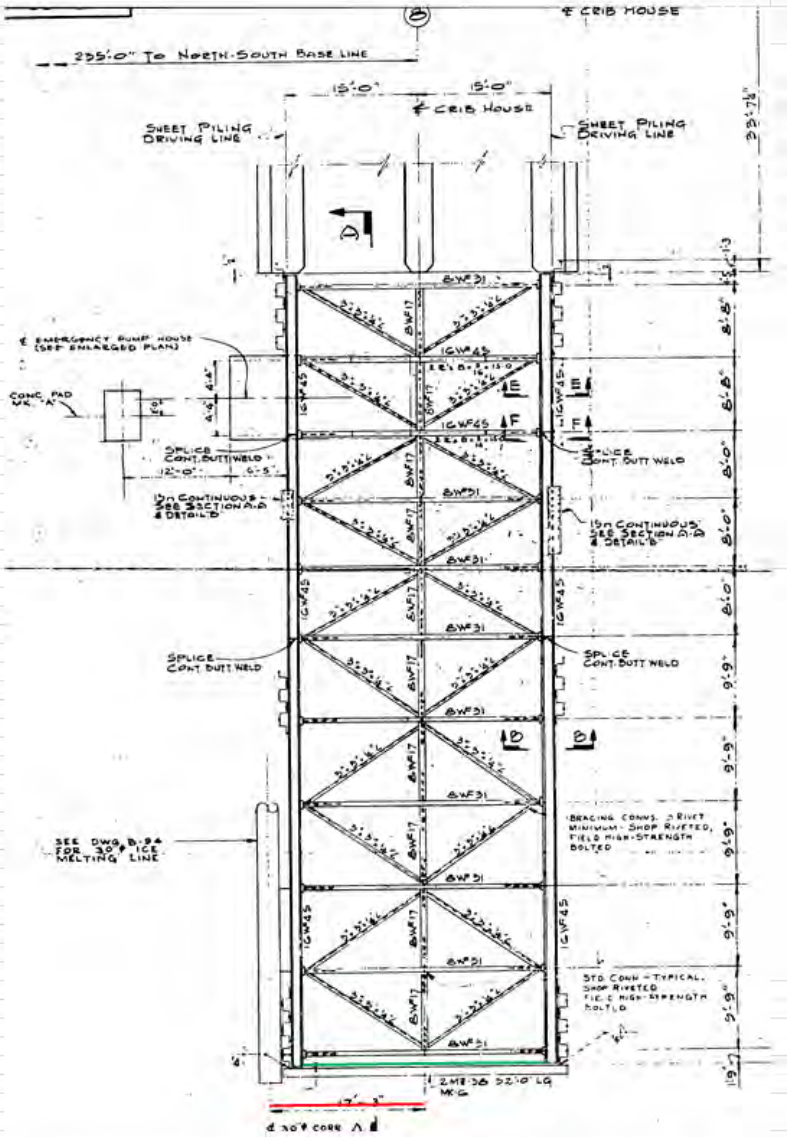
BTA Determination

The 2009 "Guidance for Evaluating Intake Structures Using Best Professional Judgment (BPJ)", describes the steps that must be followed to determine if the facility meets BTA for impingement and entrainment. The Department believes the existing water intake structure meet the requirements of s. 283.31 (6), Wis. Stats.; and has determined, using its best professional judgment, the water intake is BTA.

WPL SUBMITTAL OF CALCULATION OF INTAKE VELOCITY AT RIVER BANK
JANUARY 14, 2016 EMAIL

Velocity at End of Flume

Value	Unit	Note
27.1	feet	from drawing
594	feet	assumed same a screen well
604	feet	Flat pool elevation
10	feet	
271.4	feet²	
50,000	gpm	
6,000	gpm	
56,000	gpm	
124.8	cfs	
0.46	fps	



1.430 inches = 17.25 feet
2.250 inches = 27.14 feet

Facility Specific Standard Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Wisconsin Power and Light Company

B. Facility Name: WPL Nelson Dewey Generating Station

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Mercury **Date completed:** March 24, 2016

E. Permit #: WI-0002381-07 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** July 1, 2016 **End Date:** June 30, 2021

G. Date of Variance Application: December 30, 2015

H. Is this permit a:
☐ **First time submittal for variance**
☒ **Renewal of a previous submittal for variance** *(Complete Section X)*

I. Description of proposed variance:
The proposed effluent mercury variance is 4.68 ng/L daily maximum. This will replace the WQBEL limit of 1.3 ng/L monthly average and is a reduction from the current variance limit of 9.01 ng/L daily maximum.

Citation: An alternative mercury effluent limitation under s. NR 106.145, Wis. Adm. Code, represents a variance to water quality standards authorized by s. 283.15, Wis. Stats.

J. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Keith Pierce	Keith.Pierce@Wisconsin.gov	608-266-1198	All sections
Nasrin Mohajerani	Nasrindokht.Mohajerani@Wisconsin.gov	retired	Effluent limits, data analysis

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: 1.3 ng/L Wildlife Criterion

B. List other criteria likely to be affected by variance: 1.5 ng/L Human Threshold Criterion

C. Source of Substance: Source of substance is unknown. The approach taken in this variance request is to focus on the most likely set of sources (see Section IX.B) and evaluate the result.

D. Ambient Substance Concentration: 2.12 ng/L mean, 2.89 ng/L 30-day P99 (see attached calculations). The river site number 24 near Buffalo approximately 100 miles north has a mean background level of 4.69 ng/L (see WQBEL memo).
☒ **Measured** ☐ **Estimated**
☐ **Default** ☐ **Unknown**

E. If measured or estimated, what was the basis? Include citation.
Based on 58 grab samples measured by permittee at facility intake monthly from January 2011 through October 2015 (Sampling Point 705). The 30-day P99 was calculated using the reasonable potential evaluation procedures in s. NR 106.05, Wis. Adm. Code (see attached calculations).

F. Average effluent discharge rate: 2.56 MGD (annual average) **Maximum effluent discharge rate:** 3.65 MGD (peak daily)

The implementation of retirement will affect flow rates.

G. Effluent Substance Concentration: 2.26 ng/L 30-day P99 and 1.87 ng/L mean
☒ **Measured** ☐ **Estimated**
☐ **Default** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation.
The concentrations were calculated using the permit required monitoring for mercury from January 2011 through October 2015. See the WQBEL memo dated February 25, 2016.

I. Level currently achievable (LCA): 4.68 ng/L daily maximum

J. Variance Limit: 4.68 ng/L daily maximum

What data were used to calculate the LCA, and how was the LCA derived? The LCA was calculated using the permit required monitoring for mercury. The permittee collected 58 valid test results for mercury from January 2011 through October 2015. The LCA is set at the 1-day P99 as a daily maximum. See the WQBEL memo dated January 20, 2016.

Citation: s. NR 106.145(5), Wis. Adm. Code.

K. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.
The variance limit is set at the LCA using the 1 Day P99 as a daily maximum limit. The limit is established in accordance with s. NR 106.145(5), Wis. Adm. Code.

L. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☒ 6

Section NR 106.145(1), Wis. Adm. Code, outlines several findings that justify variances for mercury. The Department considers treating to produce effluent at concentrations to meet the limit to be technically and economically infeasible. The Department intended that this conclusion be generally applicable to all dischargers of mercury which produce large volumes of effluent with extremely low mercury concentrations.
Citation: Assessing the Economic Impacts of the Proposed Ohio EPA Water Rules on the Ohio Economy, April 24, 1997, Ohio Environmental Protection Agency, Division of Surface Water and Foster Wheeler Environmental Corporation and DRI/McGraw-Hill in support of Amended and New Rules in OAC Chapters 3745-1,-2, and -33.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Grant

B. Receiving waterbody at discharge point: Mississippi River

C. Flows into which stream/river? Main stem **How many miles downstream?** N/A

D. Coordinates of discharge point (UTM or Lat/Long): Lat: 42.7257/Long: -91.0159

E. What are the designated uses associated with this waterbody?
Warmwater sportfish, non-public water supply

F. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?
Zero: ambient mercury concentrations in surface water resulting from the variance will be substantially less than levels that result in direct toxicity to aquatic organisms. EPA's current chronic aquatic life criterion for mercury is 0.9081 µg/L, which is approximately three orders of magnitude greater than the wildlife criteria (0.0013 µg/L). Wisconsin's criteria are 0.44 µg/L and 0.83 µg/L for chronic and acute toxicity, respectively.

G. **Provide the equation used to calculate that distance:** See above.

H. **Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody:** None. The nearest variance for mercury is approximately 22 miles upriver at Prairie Du Chien WWTF, permit number 0020257-08, variance limit of 4.6 ng/L daily maximum.

Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet

I. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☒ Yes ☐ No ☐ Unknown

River Mile	Pollutant	Impairment
Mississippi River at River Mile 608 in Pool 11	**PCBs**	Contaminated Fish Tissue
Mississippi River at River Mile 608 in Pool 11	**Phosphorus**	Water Quality Use Restriction
Mississippi River at River Mile 608 in Pool 11	**Mercury**	Contaminated Fish Tissue

Section IV: Pretreatment (Not applicable)

Section V: Public Notice

A. Has a public notice been given for this proposed variance? See below. ☒ Yes ☐ No

B. If yes, was a public hearing held as well? See below. ☐ Yes ☐ No ☒ N/A

C. What type of notice was given? See below. ☒ Notice of variance included in notice for permit ☐ Separate notice of variance

D. Date of public notice: Scheduled April 7, 2016 **Date of hearing:** Scheduled May 25, 2016

E. Were comments received from the public in regards to this notice or hearing? See above. ☐ Yes ☐ No See above.

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☐ Yes ☒ No

B. Applicable criteria affected by variance: 1.5 ng/L Human Threshold Criterion

C. Identify any expected impacts that the variance may have upon human health, and include any citations:

- The proposed variance will not adversely affect human health directly through the drinking water because public water supply is not a designated use for the river.
- Wisconsin's fish consumption advisory program is designed to mitigate the effect of any ambient mercury concentration above the 1.5 ng/L water quality criterion for the protection of the fish-consuming human population by providing advice to the public to guide them on the amount of fish that may be consumed safely.
- Given the lack of wastewater treatment technologies capable of reducing mercury concentrations to achieve a 1.3 ng/L effluent limit, granting a variance in this situation is consistent with protecting the public health, safety and welfare because of the substantial public health and safety benefits of providing wastewater treatment, the continued commitment towards further mercury pollutant minimization, the Wisconsin fish advisory program, and the limited impact of the elevated effluent concentrations given the background mercury concentrations.
- DNR's findings suggest that mercury in walleye from Wisconsin lakes changed in the range of –0.5 to 0.8% per year depending on geographical position in the state during the period of 1982–2005. These trends may reflect geographically differing temporal trends in the amount of mercury deposited to Wisconsin lakes. However, long-term changes in other factors, such as water chemistry, fish growth rates, and lake levels, known to impact mercury bioavailability and accumulation may also be important. (Temporal trends of mercury concentrations in Wisconsin walleye (Sander vitreus), 1982–2005, Paul W. Rasmussen, Candy S. Schrank, Patrick A. Campfield. Ecotoxicology (2007) 16:541–550)

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Warmwater sportfish - s. NR 104.25, Wis. Adm. Code.

B. Applicable criteria affected by variance: Acute = 0.83 µg/L
Chronic = 0.44 µg/L

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:

The discharge at the concentration proposed with this variance is much less than the aquatic life criteria. This variance is not likely to adversely affect aquatic life. Long term monitoring indicates that mercury impacts are decreasing.

- Ambient mercury concentrations resulting from the variance will be substantially less than levels that result in direct toxicity to aquatic organisms. EPA's current chronic aquatic life criterion for mercury is 0.9081 µg/L, which is approximately three orders of magnitude greater than the wildlife criteria (0.0013 µg/L). Wisconsin's criteria are 0.44 and 0.83 µg/L for chronic and acute toxicity, respectively.
- Bald eagles (Haliaeetus leucocephalus) consume fish and waterfowl from surface waters, which puts them at risk of exposure to toxic levels of mercury due to bioaccumulation of mercury in their prey organisms. However, despite the potential for exposure, ambient surface water data show that in recent decades, mercury levels have not increased and bald eagle populations have continued to grow. This indicates that current ambient concentrations of mercury and mercury concentrations in prey organisms do not appear to be limiting recovery of bald eagle populations in Wisconsin. Although this variance will allow additional time to identify and control sources of mercury in discharges, the pollutant minimization component of the variances should result in a net reduction in the amount of mercury discharged to Wisconsin surface waters further reducing any risk to bald eagles. In addition, the pollutant minimization program will encourage other pollution prevention efforts which have a beneficial indirect effect of reducing the use and production of products and processes that use or contribute mercury to the environment. These efforts will also benefit bald eagles.
- Refer also to the discussion about mercury in walleye from Wisconsin lakes (above).

D. List any Endangered (LE) or Threatened (LT) species known or likely to occur within the affected area, and include any citations:

The following species are listed for Grant County:
Aconitum noveboracense, Northern Wild Monkshood, LT, Rare Plants
Cumberlandia monodonta, Spectacle Case, LE, Rare Mussels and Clams
Lampsilis higginsii, Higgins' Eye, LE, Rare Mussels and Clams
Lespedeza leptostachya, Prairie Bush-clover, LT, Rare Plants
Platanthera leucophaea, Prairie White-fringed Orchid, LT, Rare Plants
Plethobasus cyphyus, Bullhead, LE, Rare Mussels and Clams
Somatochlora hineana, Hine's Emerald, LE, Rare Dragonflies and Damselflies

Citation: and National Heritage Index (http://dnr.wi.gov/topic/NHI/Data.asp?tool=county

Section VIII: Economic Impact and Feasibility

A. What modifications would be necessary to comply with the current limits? Include any citations.

The Department did not evaluate what actions or modifications or other changes would be needed to meet limits based on the water quality standard. As discussed below, the Department considers treating to produce effluent at concentrations to meet the limit to be technically and economically infeasible.

B. Identify any expected environmental impacts that would result from further treatment, and include any citations:

Treatment will likely require construction and operation of brick and mortar infrastructure. Most treatments will require the following with associated impacts:

- slightly more water consumption
- slightly more energy use
- use of chemicals
- disposal of waste containing mercury and other pollutants
- brick and mortar and land for infrastructure

C. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the discharge? ☐ Yes ☒ No ☐ Unknown

In general, the Department considers treating to produce effluent at concentrations to meet the limit to be technically and economically infeasible. Specifically, for the Nelson Dewey facility, any evaluation of technical and economic feasibility is complicated by the ongoing retirement. As a result of retirement and continuing implementation of a PMP, mercury concentrations and mass of discharge are expected to continue to decline.

In 2010, another Alliant Energy location ran a two week pilot test with a mercury control technology on an effluent discharge. The pilot test was able to reduce mercury in the effluent by up to 80%. However, the pilot test was not able to achieve the 1.3 ng/L wildlife criterion for mercury. For this facility, if 80% reduction could be obtained the treatment would result in wastewater at around 0.5 ng/L on a 30-day P99 basis [(1 – 0.8) x 2.26 ng/L].

The pilot project treated effluent from a coal combustion residual pond system at 35 gallons per minute ("gpm"). The cost to purchase and install the 35 gpm system was between $750,000 to $1,000,000 dollars (not including inflation). A system that would need to be installed on the discharge of Outfall 002 would be required to treat up to 2,500 gpm based on data from pre-retirement; actual flows after retirement will be less. In addition, a building with heating and electricity to house the treatment system would need to be engineered and constructed. The Department has determined that it is appropriate to determine that treatment is not technically and economically feasible at this time, but during the term of the permit after retirement has been implemented data can be gathered to allow complete evaluation of feasibility of treatment of wastewater after retirement. The data will include concentration, flow rate, flow volume, temporal aspects and other variables.

An analysis of trends of mercury in the discharge and mercury measured in intake shows that the background levels of mercury in the intake water are probably a significant component of any discharge. When discharge data is grouped by calendar quarter the trend indicates there is a seasonal fluctuation in concentration (see attached figure). This is likely caused by Spring weather effects on the Mississippi River. When intake data and discharge data are compared, the trend indicates that discharge concentration is comparable or even less that intake concentration (see

attached figure). In conclusion, the quality of the Mississippi River is expected to be the most significant factor in post-retirement discharges.

D. If treatment is possible, is it possible to comply with the limits on the substance? ☐ Yes ☒ No ☐ Unknown

E. If yes, what prevents this from being done? Include any citations.
See above.

F. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:
Following retirement any remaining mercury discharge will not be the result of continued use of coal or other fuels. Retirement will consist of various steps to clean and stabilize the site. All steps will be part of a normal retirement process; there are no meaningful alternatives to the practices that are followed for a standard retirement of a steam electric power plant. The permittee has addressed additional measures in the PMP for retirement activities.

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

The following actions were taken in the term of the current permit to reduce mercury discharge levels in an effort to meet or make progress towards meeting the mercury water quality based effluent limits (see December 30, 2015 variance application):

CHEMICALS
In 2009, the facility switched from mercury cell sodium hydroxide to membrane-grade sodium hydroxide. The cost of membrane-grade sodium hydroxide is substantially more expensive than that of the mercury cell variant. However, with the use of reverse osmosis, the amount of sodium hydroxide purchased is typically reduced by up to 90%. In the future, the facility will continue to review new chemicals considered for use for mercury.

LABORATORY REAGENTS
Expired reagents are disposed of properly and alternative methods and/or reagents are used. In the future, the facility will continue to use alternative methods or reagents, when practical, that could reduce the use of mercury at the site.

PROCESS MONITORING EQUIPMENT
Alternate monitoring methods and/or equipment, which contain no or lower concentrations of mercury, will continue to be replaced on an as-needed basis, when feasible. Such replaced equipment that did contain mercury will continue to be collected and properly disposed of.

ELECTRICAL EQUIPMENT
Switches and relays are replaced with non-mercury containing devices. Replaced equipment that did contain mercury are collected and properly disposed of.

LIGHTING EQUIPMENT
Light bulbs and batteries are located throughout the facility and may contain small amounts of mercury. As such, the facility utilizes a Used Light Bulb Program that includes the safe handling, storage, and ultimate disposal or recycling of lighting equipment. Recycling activities are employed for lead-acid batteries, NiCad dry batteries, and lamps. Table 1 of the variance application provides a summary of mercury reduction activities from 2011 thru 2014.

FLUE GAS MERCURY REDUCTIONS
In 2012, the facility completed installation and commenced use of a calcium bromide system to reduce mercury emission from Units 1 and 2. This system was designed to reduce mercury emissions from both Units by about one third. This will not applicable after retirement.

MERCURY CONTINUOUS EMISSIONS MONITORING *("CEM")*
A mercury CEM is installed in the stack for both Unit 1 and Unit 2 boilers that continuously monitors the mercury concentration. Once per week, the CEM performs an auto-calibration that utilizes a mercury chloride solution. This solution is ultimately captured and properly disposed of. This will not applicable after retirement.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

- Monitoring of mercury.
- Implementation of the mercury PMP activities.
- Submittal of annual reports to provide the Department with an update of the effluent mercury concentration trends.

Section X: Compliance with Previous Permit *(Variance Reissuances Only)*

A. Date of previous submittal: 12/30/2009 **Date of EPA Approval:** 07/30/2010

B. Previous Permit #: WI-002381-06 **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 0.14 – 4.6 ng/L **Variance Limit:** 9.01 ng/L daily maximum

D. Target Value(s): 9.01 ng/L daily maximum **Achieved?** ☒ Yes ☐ No ☐ Partial

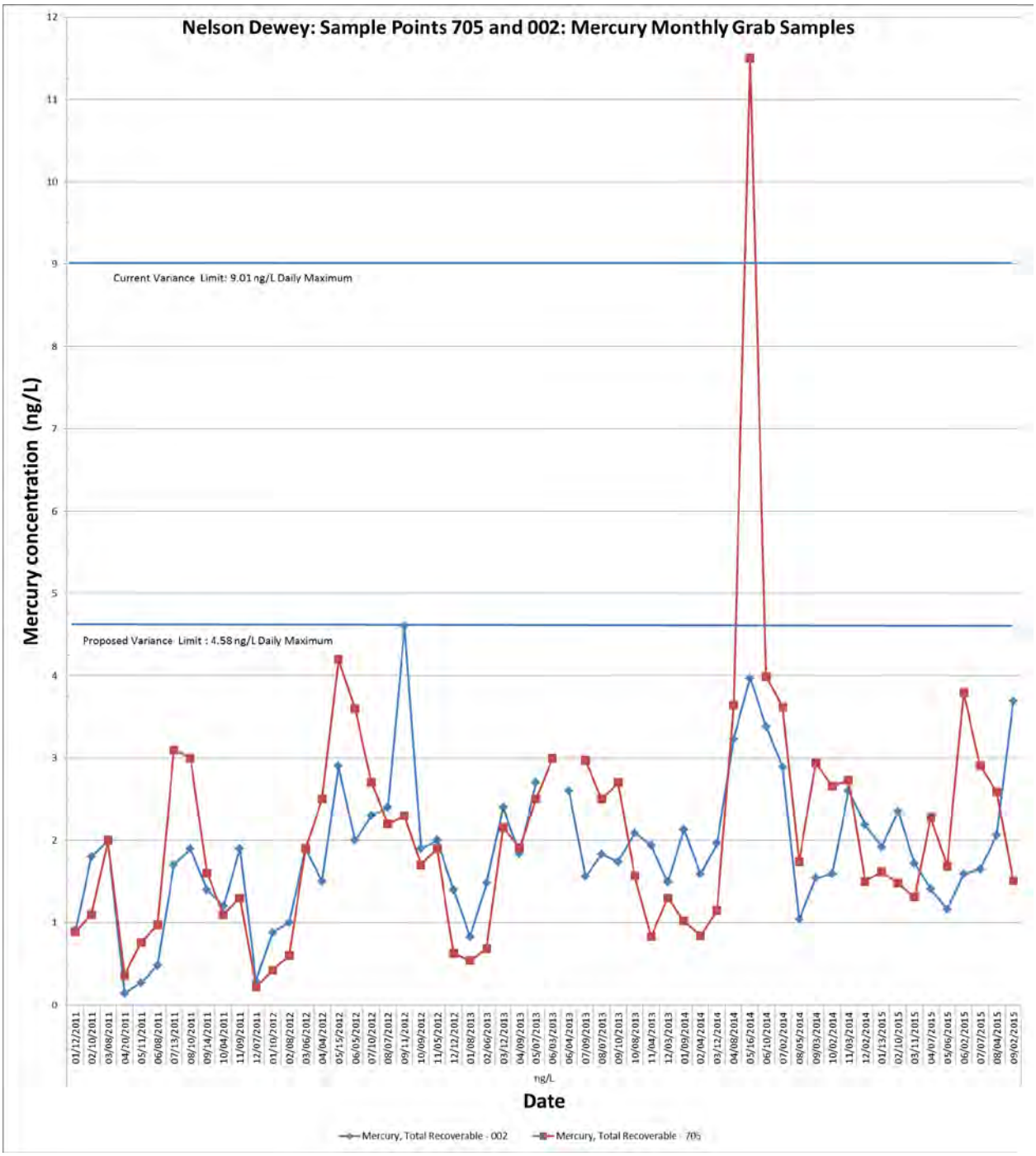
E. For renewals, list previous steps that were to be completed. Show whether these steps have been completed in compliance with the terms of the previous variance permit. Attach additional sheets if necessary.

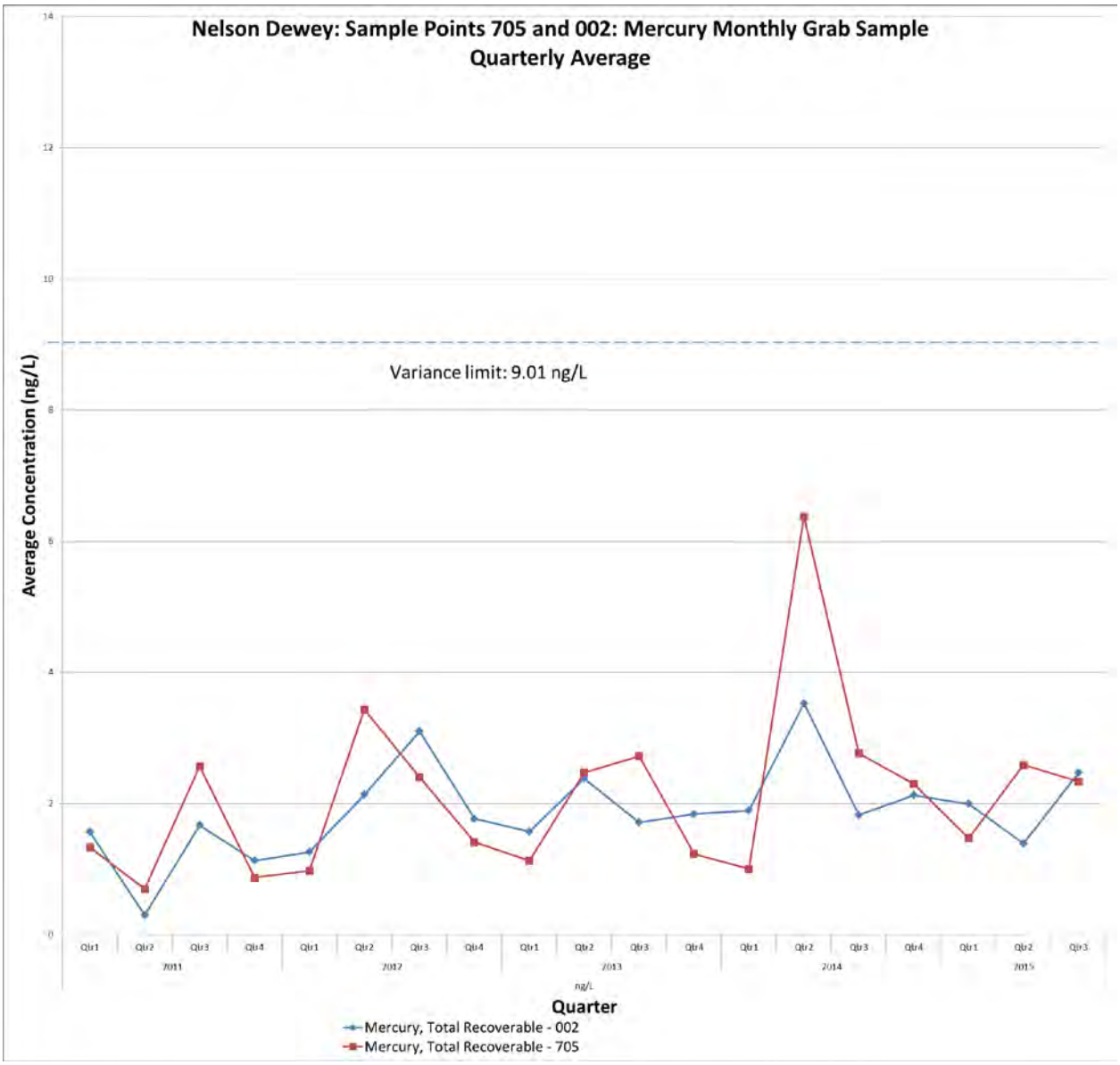
Condition of Previous Variance	Compliance
Monitor with monthly grab samples	☒ Yes ☐ No
Daily maximum limit of 9.01 ng/L	☒ Yes ☐ No
Annual PMP steps and reports	☒ Yes ☐ No

VARIABILITY ANALYSIS - OCER INFLUENT 705

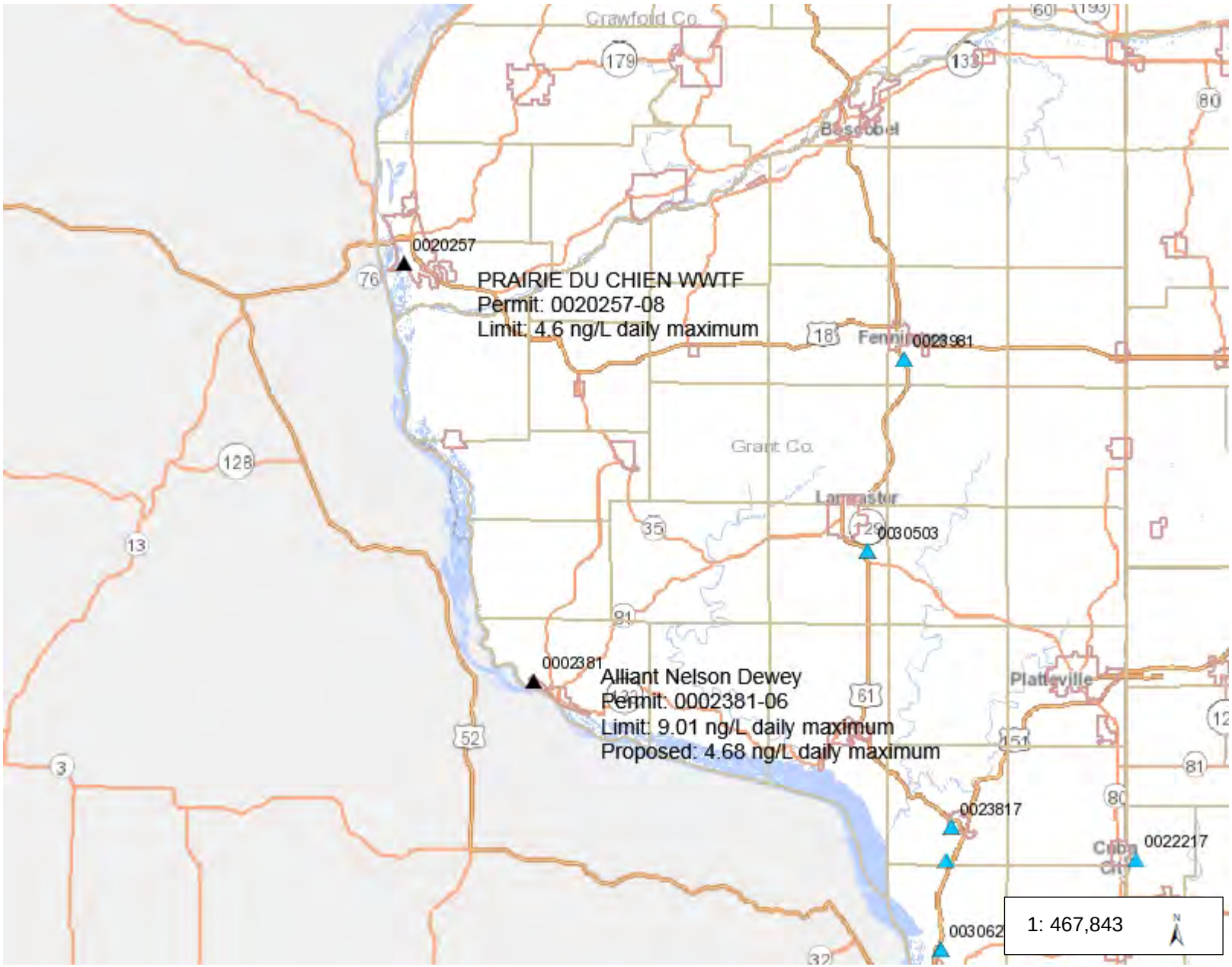
SUBSTANCE:	Mercury		
NUMBER OF VALUES:	---		
TOTAL	58		
DETECTED	58		
NON-DETECTED	0		
d	0		
m	2.116793		
mean of all data			
s	1.60954		
	---	---	---
n	1	4	30
d^n	0	0	0
p	0.99	0.99	0.99
	3.034854	3.034854	3.034854
Z_p	2.326785	2.326785	2.326785
1+(s/m)^2	1.578158	1.578158	1.578158
(sigma_d)^2	0.456259	0.456259	0.456259
mu_d	0.521773	0.521773	0.521773
(sigma_dn)^2	0.456259	0.135002	0.019089
mu_dn	0.521773	0.682401	0.740358
P_99 exponent	2.093445	1.537324	1.06183
	---	---	---
P_99	8.112813	4.652126	2.891658
	---	---	---
minimum	0.22		
maximum	11.5		

Concentration (ng/L)	Date
0.89	01/12/2011
1.1	02/10/2011
2	03/08/2011
0.36	04/20/2011
0.76	05/11/2011
0.97	06/08/2011
3.1	07/13/2011
3	08/10/2011
1.6	09/14/2011
1.1	10/04/2011
1.3	11/09/2011
0.22	12/07/2011
0.42	01/10/2012
0.6	02/08/2012
1.9	03/06/2012
2.5	04/04/2012
4.2	05/15/2012
3.6	06/05/2012
2.7	07/10/2012
2.2	08/07/2012
2.3	09/11/2012
1.7	10/09/2012
1.9	11/05/2012
0.63	12/12/2012
0.54	01/08/2013
0.687	02/06/2013
2.16	03/12/2013
1.91	04/09/2013
2.5	05/07/2013
3	06/03/2013
2.97	07/09/2013
2.5	08/07/2013
2.7	09/10/2013
1.57	10/08/2013
0.828	11/04/2013
1.3	12/03/2013
1.02	01/09/2014
0.839	02/04/2014
1.15	03/12/2014
3.64	04/08/2014
11.5	05/16/2014
3.99	06/10/2014
3.62	07/02/2014
1.74	08/05/2014
2.94	09/03/2014
2.66	10/02/2014
2.73	11/03/2014
1.5	12/02/2014
1.62	01/13/2015
1.48	02/10/2015
1.31	03/11/2015
2.28	04/07/2015
1.69	05/06/2015
3.79	06/02/2015
2.9	07/07/2015
2.59	08/04/2015
1.51	09/02/2015
2.56	10/06/2015


Nelson Dewey: Sample Points 705 and 002: Mercury Monthly Grab Samples
Current Variance Limit: 9.01 ng/L Daily Maximum
Proposed Variance Limit : 4.58 ng/L Daily Maximum
Mercury concentration (ng/L)
ng/L
Date
Mercury, Total Recoverable - 002
Mercury, Total Recoverable - 705


Nelson Dewey: Sample Points 705 and 002: Mercury Monthly Grab Sample
Quarterly Average
Variance limit: 9.01 ng/L
Average Concentration (ng/L)
14
12
10
8
6
4
2
0
Qtr1
Qtr2
Qtr3
Qtr4
2011
2012
2013
2014
2015
ng/L
Quarter
Mercury, Total Recoverable - 002
Mercury, Total Recoverable - 705

WPDES Mercury Variances in SW Wisconsin



Legend

- Cities, Towns & Villages
  - City
  - Village
  - Civil Town
- Other Cities
- Major Roads
  - Interstates
  - US Highways
  - State Highways
- Rivers and Streams
- Open Water
- Current Variances
  - Arsenic (Current)
  - Chloride (Current)
  - Copper (Current)
  - Mercury (Current)

Notes

Showing variances on Mississippi River in vicinity of Wisconsin Power and Light Nelson Dewey Generating Station.

14.8 0 7.38 14.8 Miles

NAD_1983_HARN_Wisconsin_TM

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