



1414 West Hamilton Avenue  
PO Box 8  
Eau Claire, WI 54702-0008

January 13, 2021

*VIA Electronic Filing*

Ms. Kimberly D. Bose, Secretary  
Federal Energy Regulatory Commission  
888 First Street, NE  
Washington, D.C. 20426

**Subject: 2020 Water Quality Monitoring Report – Articles 404 & 406  
Big Falls Hydro (P-2390-01) and Thornapple Hydro (P-2475)**

Dear Secretary:

Enclosed is the 2020 Water Quality Monitoring Report for the Big Falls and Thornapple hydroelectric projects. The report is being filed pursuant to license articles 404 (Big Falls) and 406 (Thornapple). The results are summarized for the past five years. Northern States Power Company – Wisconsin (NSPW), licensee for the projects, has also confirmed that the water quality monitoring results for Turtle Flambeau Reservoir (P-2390-02) have been posted on the WDNR's website.

Licensee provided a copy of the report to the WDNR and USFWS for comment via e-mail on December 14, 2020. The WDNR responded that they had no comments on the report; however, they are reviewing water monitoring protocols statewide for FERC regulated projects and may contact the licensee to discuss potential changes. The USFWS responded that they had no comments. Documentation of agency correspondence is included in Appendix D of the enclosed report.

Should you have any questions, feel free to contact Matthew Miller at (715) 737-1353 or by e-mail at [matthew.j.miller@xcelenergy.com](mailto:matthew.j.miller@xcelenergy.com).

Sincerely,

James M. Zyduck  
Director, Hydro Plants

Enclosure: Water Quality Monitoring Report

c: Cheryl Laatsch – WDNR (cover letter only – via email)  
Nick Utrup – USFWS (cover letter only – via e-mail)  
Project Files

**2020 Water Quality Monitoring Report for Big Falls Flowage  
(P-2390-01) and Thornapple Flowage (P-2475)**

Northern States Power Company – WI  
An Xcel Energy Company

December 2020

## **APPENDIX A**

### **2020 Water Quality Lab Analysis For Big Falls and Thornapple Flowages**



Minneapolis Testing Laboratory  
1518 Chestnut Ave N  
Minneapolis, MN 55043  
Certification # MN-027-053-197  
WI-999071150  
Christine Keefe, Manager (612) 630-4506

|                        |  |                  |
|------------------------|--|------------------|
| <b>Big Falls Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| 1400 Western Ave       |  | <b>Reported:</b> |
| Eau Claire WI, 54701   | Project Manager: Matt J Miller           | 09/04/2020 08:09 |

### ANALYTICAL REPORT FOR SAMPLES

| Sample ID                        | Sample Qualifier | Laboratory ID | Matrix | Sampled                 | Received        |
|----------------------------------|------------------|---------------|--------|-------------------------|-----------------|
| <b>Big Falls Flowage Surface</b> |                  | MFH0233-01    | Water  | <b>08/18/2020</b> 10:58 | 08/21/2020 9:25 |
| <b>Big Falls Flowage Bottom</b>  |                  | MFH0233-02    | Water  | <b>08/18/2020</b> 11:10 | 08/21/2020 9:25 |



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|                        |  |                  |
|------------------------|--|------------------|
| <b>Big Falls Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| 1400 Western Ave       |  | <b>Reported:</b> |
| Eau Claire WI, 54701   | Project Manager: Matt J Miller           | 09/04/2020 08:09 |

**Big Falls Flowage Surface**  
**MFH0233-01 (Water) - Chain of Custody Number: 238404**

| Analyte                      | Result        | LOD     | LOQ     | Units | Analyte   |          | Batch   | Prepared     | Analyzed     | Method    | Analyst |
|------------------------------|---------------|---------|---------|-------|-----------|----------|---------|--------------|--------------|-----------|---------|
|                              |               |         |         |       | Qualifier | Dilution |         |              |              |           |         |
| <b>Phosphate, Total as P</b> | <b>0.0360</b> | 0.00200 | 0.00667 | mg/L  |           | 1        | BFI0066 | 9/2/20 15:16 | 9/3/20 10:32 | EPA 365.1 | HRD     |

**Wet Chemistry**



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 Christine Keefe, Manager (612) 630-4506

|                        |  |                  |
|------------------------|--|------------------|
| <b>Big Falls Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| 1400 Western Ave       |  | <b>Reported:</b> |
| Eau Claire WI, 54701   | Project Manager: Matt J Miller           | 09/04/2020 08:09 |

**Big Falls Flowage Bottom**  
**MFH0233-02 (Water) - Chain of Custody Number: 238404**

| Analyte                      | Result        | LOD     | LOQ     | Units | Analyte   |          | Batch   | Prepared     | Analyzed     | Method    | Analyst |
|------------------------------|---------------|---------|---------|-------|-----------|----------|---------|--------------|--------------|-----------|---------|
|                              |               |         |         |       | Qualifier | Dilution |         |              |              |           |         |
| <b>Phosphate, Total as P</b> | <b>0.0530</b> | 0.00200 | 0.00667 | mg/L  |           | 1        | BFI0066 | 9/2/20 15:16 | 9/3/20 10:35 | EPA 365.1 | HRD     |

**Wet Chemistry**



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|                         |  |                  |
|-------------------------|--|------------------|
| <b>Thornapple Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| W 5506 Dam Road         |  | <b>Reported:</b> |
| Glen Flora WI, 54563    | Project Manager: Matt J Miller           | 09/04/2020 08:12 |

### ANALYTICAL REPORT FOR SAMPLES

| Sample ID                         | Sample Qualifier | Laboratory ID | Matrix | Sampled                | Received        |
|-----------------------------------|------------------|---------------|--------|------------------------|-----------------|
| <b>Thornapple Flowage Surface</b> |                  | MFH0234-01    | Water  | <b>08/18/2020</b> 8:57 | 08/21/2020 9:25 |
| <b>Thornapple Flowage Bottom</b>  |                  | MFH0234-02    | Water  | <b>08/18/2020</b> 9:04 | 08/21/2020 9:25 |



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|                         |  |                  |
|-------------------------|--|------------------|
| <b>Thornapple Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| W 5506 Dam Road         |  | <b>Reported:</b> |
| Glen Flora WI, 54563    | Project Manager: Matt J Miller           | 09/04/2020 08:12 |

**Thornapple Flowage Surface**  
**MFH0234-01 (Water) - Chain of Custody Number: 238404**

| Analyte | Result | LOD | LOQ | Units | Analyte<br>Qualifier | Dilution | Batch | Prepared | Analyzed | Method | Analyst |
|---------|--------|-----|-----|-------|----------------------|----------|-------|----------|----------|--------|---------|
|---------|--------|-----|-----|-------|----------------------|----------|-------|----------|----------|--------|---------|

**Wet Chemistry**

|                              |               |         |         |      |  |   |         |              |              |           |     |
|------------------------------|---------------|---------|---------|------|--|---|---------|--------------|--------------|-----------|-----|
| <b>Phosphate, Total as P</b> | <b>0.0420</b> | 0.00200 | 0.00667 | mg/L |  | 1 | BFI0066 | 9/2/20 15:16 | 9/3/20 10:36 | EPA 365.1 | HRD |
|------------------------------|---------------|---------|---------|------|--|---|---------|--------------|--------------|-----------|-----|



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|                         |  |                  |
|-------------------------|--|------------------|
| <b>Thornapple Hydro</b> | Project Name/Location: <b>Phosphorus</b> |                  |
| W 5506 Dam Road         |  | <b>Reported:</b> |
| Glen Flora WI, 54563    | Project Manager: Matt J Miller           | 09/04/2020 08:12 |

**Thornapple Flowage Bottom**  
**MFH0234-02 (Water) - Chain of Custody Number: 238404**

| Analyte                      | Result        | LOD     | LOQ     | Units | Analyte<br>Qualifier | Dilution | Batch   | Prepared     | Analyzed     | Method    | Analyst |
|------------------------------|---------------|---------|---------|-------|----------------------|----------|---------|--------------|--------------|-----------|---------|
| <b>Phosphate, Total as P</b> | <b>0.0420</b> | 0.00200 | 0.00667 | mg/L  |                      | 1        | BFI0066 | 9/2/20 15:16 | 9/3/20 10:37 | EPA 365.1 | HRD     |

**Wet Chemistry**

NORTHERN LAKE SERVICE, INC.  
 Analytical Laboratory and Environmental Services  
 400 North Lake Avenue - Crandon, WI 54520  
 Ph: (715)-478-2777 Fax: (715)-478-3060

# ANALYTICAL REPORT

WDNR Laboratory ID No. 721026460  
 WDATCP Laboratory Certification No. 105-330  
 EPA Laboratory ID No. WI00034

Printed: 09/14/20 Page 1 of 1

Client: Xcel Energy  
 Attn: Matt Miller (reports)  
 1414 W. Hamilton Ave  
 P.O. Box 8  
 Eau Claire, WI 54702

NLS Project: 351332  
 NLS Customer: 96708  
 Phone: 715 737 1353

Project: Big Falls - Thornapple

Big Falls Flowage NLS ID: 1208612

COC: 230164:1 Matrix: SW

Collected: 08/18/20 10:59 Received: 08/20/20

| Parameter                      | Result       | Units | Dilution | LOD | LOQ | Analyzed | Method  | Lab       |
|--------------------------------|--------------|-------|----------|-----|-----|----------|---------|-----------|
| Chlorophyll, all species       | See Attached |       |          |     |     | 09/11/20 | 10200-H | 721026460 |
| Lab filtration for Chlorophyll | yes          |       |          |     |     | 08/20/20 | NA      | 721026460 |

Thornapple Flowage NLS ID: 1208613

COC: 230164:2 Matrix: SW

Collected: 08/18/20 08:56 Received: 08/20/20

| Parameter                      | Result       | Units | Dilution | LOD | LOQ | Analyzed | Method  | Lab       |
|--------------------------------|--------------|-------|----------|-----|-----|----------|---------|-----------|
| Chlorophyll, all species       | See Attached |       |          |     |     | 09/11/20 | 10200-H | 721026460 |
| Lab filtration for Chlorophyll | yes          |       |          |     |     | 08/20/20 | NA      | 721026460 |

Values in brackets represent results greater than or equal to the LOD but less than the LOQ and are within a region of "Less-Certain Quantitation". Results greater than or equal to the LOQ are considered to be in the region of "Certain Quantitation". LOD and/or LOQ tagged with an asterisk(\*) are considered Reporting Limits. All LOD/LOQs adjusted to reflect dilution and/or solids content.

ND = Not Detected (< LOD)    LOD = Limit of Detection    LOQ = Limit of Quantitation    NA = Not Applicable  
 DWB = Dry Weight Basis    %DWB = (mg/kg DWB) / 10000    1000 ug/L = 1 mg/L  
 MCL = Maximum Contaminant Levels for Drinking Water Samples.    Shaded results indicate >MCL.

Reviewed by:



Authorized by:  
 R. T. Krueger  
 President

Northern Lake Service, Inc.  
Chlorophyll Results

Customer: Xcel Energy

Project: 351332

Big Falls - Thornapple

| <u>Sample</u> | <u>Description</u> | <u>CC a</u> | <u>Pheo a</u> | <u>TC a</u> | <u>TC b</u> | <u>TC c</u> |
|---------------|--------------------|-------------|---------------|-------------|-------------|-------------|
| 1208612       | Big Falls Flowage  | 2.8         | 0.71          | 3.3         | 0.093       | 0.47        |
| 1208613       | Thornapple Flowage | 0.4         | 0.54          | 0.75        | 0.028       | 0.11        |

CC a = Corrected Chlorophyll a

Pheo a = Pheophytin a

TC a = Trichromatic Chlorophyll a

TC b = Trichromatic Chlorophyll b

TC c = Trichromatic Chlorophyll c

Units = ug/L for Water, ug/cm<sup>2</sup> for periphyton samplers

\*: The complex calculations used to differentiate the various chlorophyll species magnify error at low concentrations and sometimes produce negative values, which are reported as 0.0 on this report.

## **APPENDIX B**

**Summary Of Total Phosphorous And Chlorophyll A  
Data For Big Falls And Thornapple Flowages  
2016 - 2020**

## Summary of Water Quality Data for Big Falls and Thornapple Flowages (2016-2020)

| Date                     | <u>Big Falls Flowage</u>     |                               |                              | <u>Thornapple Flowage</u>    |                               |                              |
|--------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|------------------------------|
|                          | Surface                      | Surface                       | Bottom                       | Surface                      | Surface                       | Bottom                       |
|                          | Total Phosphorus<br>(mg/L P) | Chlorophyll-A (CCa)<br>(ug/L) | Total Phosphorus<br>(mg/L P) | Total Phosphorus<br>(mg/L P) | Chlorophyll-A (CCa)<br>(ug/L) | Total Phosphorus<br>(mg/L P) |
| 5/3/2016                 | 0.02                         | 1.9                           | 0.02                         | 0.02                         | 2.1                           | 0.02                         |
| 7/19/2016                | 0.03                         | 2.0                           | 0.06                         | 0.03                         | 0.6                           | 0.03                         |
| 8/30/2016                | 0.02                         | 4.7                           | 0.03                         | 0.03                         | 1.3                           | 0.03                         |
| 4/24/2017                | 0.02                         | 3.6                           | 0.03                         | 0.02                         | 2.5                           | 0.03                         |
| 7/24/2017                | 0.03                         | 1.6                           | 0.05                         | 0.03                         | 1.3                           | 0.04                         |
| 8/29/2017                | 0.02                         | 3.1                           | 0.06                         | 0.03                         | 1.1                           | 0.03                         |
| 5/8/2018                 | 0.03                         | 7.8                           | 0.03                         | 0.02                         | 2.5                           | 0.02                         |
| 7/24/2018                | 0.04                         | 7.8                           | 0.04                         | 0.04                         | 13.0                          | 0.04                         |
| 8/29/2018                | 0.04                         | 8.1                           | 0.04                         | 0.03                         | 0.9                           | 0.03                         |
| 5/7/2019                 | 0.03                         | 2.1                           | 0.02                         | 0.02                         | 2.9                           | 0.03                         |
| 7/23/2019                | 0.05                         | n/a*                          | 0.06                         | 0.04                         | n/a*                          | 0.05                         |
| 8/27/2019                | 0.03                         | 2.3                           | 0.04                         | 0.04                         | 1.7                           | 0.04                         |
| April**                  | n/a                          | n/a                           | n/a                          | n/a                          | n/a                           | n/a                          |
| July**                   | n/a                          | n/a                           | n/a                          | n/a                          | n/a                           | n/a                          |
| 8/18/2020                | 0.04                         | 2.8                           | 0.05                         | 0.04                         | 0.4                           | 0.04                         |
| Average (Ice-out sample) | 0.03                         | 3.85                          | 0.03                         | 0.02                         | 2.50                          | 0.03                         |
| Average (July sample)    | 0.04                         | 3.80                          | 0.05                         | 0.04                         | 4.97                          | 0.04                         |
| Average (August sample)  | 0.03                         | 4.20                          | 0.04                         | 0.03                         | 1.08                          | 0.03                         |

\* Lab lost samples during analysis - see analytical report

\*\* Sampling suspended due to COVID-19 restrictions

## **APPENDIX C**

**Summary Of Dissolved Oxygen and Temperature  
Data for Big Falls Flowage and Thornapple Flowage  
2016-2020**

**Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2016.**

Date: 5/3/2016  
 Secchi Disk (ft.): 4.5  
 Depth of Bottom Sample (ft): 35  
 Weather Conditions: hazy sun, wind west @ 10  
 Temperature (F): 55

Date: 7/19/2016  
 Secchi Disk (ft.): 4.0  
 Depth of Bottom Sample (ft): NA  
 Weather Conditions: Sunny, calm wind  
 Temperature (F): 74

Date: 8/30/2016  
 Secchi Disk (ft.): 4.0  
 Depth of Bottom Sample: 34  
 Weather Conditions: cloudy, calm wind  
 Temperature (F): 60

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 13.2                  | 10.18                   |
| 2           | 13.0                  | 10.21                   |
| 4           | 12.9                  | 10.17                   |
| 6           | 12.8                  | 10.15                   |
| 8           | 12.8                  | 10.13                   |
| 10          | 12.8                  | 10.12                   |
| 12          | 12.8                  | 10.11                   |
| 14          | 12.8                  | 10.11                   |
| 16          | 12.8                  | 10.10                   |
| 18          | 12.8                  | 10.10                   |
| 20          | 12.8                  | 10.10                   |
| 22          | 12.8                  | 10.08                   |
| 24          | 12.8                  | 10.05                   |
| 26          | 12.7                  | 10.03                   |
| 28          | 12.8                  | 10.04                   |
| 30          | 12.7                  | 10.03                   |
| 32          | 12.7                  | 10.04                   |
| 34          | 12.7                  | 10.0                    |
| 36          | Bottom                | Bottom                  |

Depth (ft.)      Temperature (celsius)      Dissolved Oxygen (mg/l)

Surface

**No sampling - DO meter malfunctioned**

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 22.9                  | 7.80                    |
| 2           | 22.9                  | 7.77                    |
| 4           | 22.7                  | 7.74                    |
| 6           | 22.7                  | 7.73                    |
| 8           | 22.7                  | 7.71                    |
| 10          | 22.7                  | 7.71                    |
| 12          | 22.7                  | 7.69                    |
| 14          | 22.6                  | 7.66                    |
| 16          | 22.6                  | 7.66                    |
| 18          | 22.6                  | 7.64                    |
| 20          | 22.6                  | 7.64                    |
| 22          | 22.6                  | 7.60                    |
| 24          | 22.6                  | 7.53                    |
| 26          | 22.5                  | 7.46                    |
| 28          | 22.5                  | 7.31                    |
| 30          | 22.5                  | 7.29                    |
| 32          | 22.3                  | 7.35                    |
| 34          | 22.0                  | 7.35                    |
| 36          | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2017.**

Date: 4/24/2017  
 Secchi Disk (ft.): 4.0  
 Depth of Bottom Sample (ft): 34  
 Weather Conditions: Overcast, south wind @ 15  
 Temperature (F): 55

Date: 7/24/2017  
 Secchi Disk (ft.): 4.0  
 Depth of Bottom Sample (ft): 36  
 Weather Conditions: Partly cloudy, light winds  
 Temperature (F): 62

Date: 8/29/2017  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample: 34  
 Weather Conditions: Overcast, calm winds  
 Temperature (F): 58

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 11.6                  | 11.09                   |
| 2           | 11.4                  | 11.06                   |
| 4           | 11.3                  | 11.05                   |
| 6           | 11.3                  | 11.02                   |
| 8           | 11.3                  | 11.00                   |
| 10          | 11.3                  | 10.98                   |
| 12          | 11.3                  | 10.98                   |
| 14          | 11.2                  | 10.97                   |
| 16          | 11.2                  | 10.96                   |
| 18          | 11.2                  | 10.95                   |
| 20          | 11.2                  | 10.95                   |
| 22          | 11.2                  | 10.94                   |
| 24          | 11.2                  | 10.94                   |
| 26          | 11.2                  | 10.93                   |
| 28          | 11.1                  | 10.92                   |
| 30          | 11.1                  | 10.90                   |
| 32          | 11.1                  | 10.89                   |
| 34          | 11.1                  | 10.87                   |
| 36          | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 24.5                  | 6.27                    |
| 2           | 24.1                  | 6.23                    |
| 4           | 24.1                  | 6.23                    |
| 6           | 24.1                  | 6.25                    |
| 8           | 24.1                  | 6.26                    |
| 10          | 24.0                  | 6.26                    |
| 12          | 24.0                  | 6.26                    |
| 14          | 24.0                  | 6.25                    |
| 16          | 24.0                  | 6.24                    |
| 18          | 23.9                  | 6.25                    |
| 20          | 23.9                  | 6.27                    |
| 22          | 23.8                  | 6.26                    |
| 24          | 23.7                  | 6.28                    |
| 26          | 23.7                  | 6.28                    |
| 28          | 23.7                  | 6.25                    |
| 30          | 23.7                  | 6.27                    |
| 32          | 23.7                  | 6.25                    |
| 34          | 23.7                  | 6.22                    |
| 36          | 23.7                  | 6.13                    |
| 38          | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 18.7                  | 8.25                    |
| 2           | 18.7                  | 8.23                    |
| 4           | 18.5                  | 8.20                    |
| 6           | 18.5                  | 8.18                    |
| 8           | 18.4                  | 8.17                    |
| 10          | 18.4                  | 8.13                    |
| 12          | 18.4                  | 8.09                    |
| 14          | 18.4                  | 8.08                    |
| 16          | 18.4                  | 8.08                    |
| 18          | 18.4                  | 8.07                    |
| 20          | 18.4                  | 8.07                    |
| 22          | 18.4                  | 8.07                    |
| 24          | 18.4                  | 8.05                    |
| 26          | 18.4                  | 8.04                    |
| 28          | 18.3                  | 8.01                    |
| 30          | 18.3                  | 8.01                    |
| 32          | 18.3                  | 8.01                    |
| 34          | 18.2                  | 7.84                    |
| 36          | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2018.**

Date: 5/8/2018  
 Secchi Disk (ft.): 4.5  
 Depth of Bottom Sample (ft): 34  
 Weather Conditions: overcast, calm wind  
 Temperature (F): 73

Date: 7/24/2018  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft): 36  
 Weather Conditions: mostly sunny, winds NW @ 5-10  
 Temperature (F): 72

Date: 8/29/2018  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft): 36  
 Weather Conditions: partly sunny, winds N @ 5-10  
 Temperature (F): 59

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|
| Surface     | 17.6                  | 9.88                    | Surface     | 24.0                  | 8.35                    | Surface     | 21.6                  | 7.33                    |
| 2           | 16.6                  | 10.00                   | 2           | 23.7                  | 8.34                    | 2           | 21.6                  | 7.31                    |
| 4           | 16.6                  | 9.97                    | 4           | 23.4                  | 8.22                    | 4           | 21.6                  | 7.30                    |
| 6           | 16.4                  | 9.96                    | 6           | 23.3                  | 8.20                    | 6           | 21.6                  | 7.29                    |
| 8           | 16.2                  | 9.92                    | 8           | 23.3                  | 8.16                    | 8           | 21.6                  | 7.27                    |
| 10          | 16.2                  | 9.92                    | 10          | 23.3                  | 8.15                    | 10          | 21.5                  | 7.23                    |
| 12          | 16.2                  | 9.92                    | 12          | 23.3                  | 8.14                    | 12          | 21.5                  | 7.24                    |
| 14          | 16.2                  | 9.92                    | 14          | 23.1                  | 7.95                    | 14          | 21.4                  | 7.27                    |
| 16          | 16.2                  | 9.91                    | 16          | 23.0                  | 7.94                    | 16          | 21.4                  | 7.28                    |
| 18          | 16.2                  | 9.91                    | 18          | 23.0                  | 7.90                    | 18          | 21.4                  | 7.26                    |
| 20          | 16.2                  | 9.90                    | 20          | 23.0                  | 7.77                    | 20          | 21.4                  | 7.22                    |
| 22          | 16.2                  | 9.90                    | 22          | 22.7                  | 7.74                    | 22          | 21.4                  | 7.22                    |
| 24          | 16.2                  | 9.89                    | 24          | 22.5                  | 7.60                    | 24          | 21.4                  | 7.23                    |
| 26          | 16.2                  | 9.91                    | 26          | 22.5                  | 7.57                    | 26          | 21.4                  | 7.23                    |
| 28          | 16.2                  | 9.90                    | 28          | 22.4                  | 7.51                    | 28          | 21.4                  | 7.24                    |
| 30          | 16.2                  | 9.90                    | 30          | 22.3                  | 7.47                    | 30          | 21.4                  | 7.21                    |
| 32          | 16.2                  | 9.89                    | 32          | 22.2                  | 7.29                    | 32          | 21.4                  | 7.15                    |
| 34          | 16.1                  | 9.91                    | 34          | 22.2                  | 7.24                    | 34          | 21.4                  | 6.92                    |
| 36          | Bottom                | Bottom                  | 36          | 22.2                  | 7.18                    | 36          | 21.3                  | 6.7                     |
|             |                       |                         | 38          | Bottom                | Bottom                  |             | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2019.**

Date: 5/7/2019

Secchi Disk (ft.): 5.5

Depth of Bottom Sample (ft): 36

Weather Conditions: mostly sunny, wind NW @ 5 mph

Temperature (F): 47

Date: 7/23/2019

Secchi Disk (ft.): 4.5

Depth of Bottom Sample (ft): 34

Weather Conditions: mostly sunny, wind NW @ 5 mph

Temperature (F): 73

Date: 8/27/2019

Secchi Disk (ft.): 5.0

Depth of Bottom Sample (ft): 30

Weather Conditions: partly sunny, winds SW @ 5-10

Temperature (F): 60

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 12.3                  | 10.65                   |
| 2           | 12.2                  | 10.64                   |
| 4           | 12.1                  | 10.66                   |
| 6           | 11.9                  | 10.63                   |
| 8           | 11.8                  | 10.62                   |
| 10          | 11.8                  | 10.61                   |
| 12          | 11.8                  | 10.60                   |
| 14          | 11.7                  | 10.59                   |
| 16          | 11.4                  | 10.60                   |
| 18          | 11.4                  | 10.59                   |
| 20          | 11.4                  | 10.59                   |
| 22          | 11.4                  | 10.58                   |
| 24          | 11.4                  | 10.58                   |
| 26          | 11.4                  | 10.57                   |
| 28          | 11.4                  | 10.57                   |
| 30          | 11.4                  | 10.57                   |
| 32          | 11.4                  | 10.56                   |
| 34          | 11.3                  | 10.56                   |
| 36          | 11.3                  | 10.54                   |
| 38          | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 23.4                  | 7.77                    |
| 2           | 23.3                  | 7.65                    |
| 4           | 23.1                  | 7.58                    |
| 6           | 23.0                  | 7.64                    |
| 8           | 23.0                  | 7.68                    |
| 10          | 23.0                  | 7.68                    |
| 12          | 23.0                  | 7.68                    |
| 14          | 23.0                  | 7.68                    |
| 16          | 23.0                  | 7.67                    |
| 18          | 23.0                  | 7.67                    |
| 20          | 23.0                  | 7.67                    |
| 22          | 23.0                  | 7.66                    |
| 24          | 23.0                  | 7.57                    |
| 26          | 23.0                  | 7.55                    |
| 28          | 23.0                  | 7.52                    |
| 30          | 23.0                  | 7.50                    |
| 32          | 22.9                  | 7.44                    |
| 34          | 22.9                  | 7.44                    |
| 36          | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 19.8                  | 8.06                    |
| 2           | 19.8                  | 8.08                    |
| 4           | 19.8                  | 8.06                    |
| 6           | 19.8                  | 8.04                    |
| 8           | 19.8                  | 8.05                    |
| 10          | 19.8                  | 8.05                    |
| 12          | 19.8                  | 8.04                    |
| 14          | 19.8                  | 8.04                    |
| 16          | 19.8                  | 8.05                    |
| 18          | 19.8                  | 8.03                    |
| 20          | 19.8                  | 8.04                    |
| 22          | 19.8                  | 8.03                    |
| 24          | 19.8                  | 8.03                    |
| 26          | 19.8                  | 8.01                    |
| 28          | 19.8                  | 7.99                    |
| 30          | 19.7                  | 7.88                    |
| 32          | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2020.**

Date: April  
No Sampling due to Covid-19 Restrictions

July  
No Sampling due to Covid-19 Restrictions

Date: August  
No Sampling due to faulty DO/temp. meter

**Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2016.**

Date: 5/3/2016  
 Secchi Disk (ft.): 4.5  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: overcast, wind west @ 15-20  
 Temperature (F): 65

Date: 7/19/2016  
 Secchi Disk (ft.): 4.5  
 Depth of Bottom Sample (ft): NA  
 Weather Conditions: mostly sunny, s wind @ 5-10  
 Temperature (F): 79

Date: 8/30/2016  
 Secchi Disk (ft.): 4.5  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: partly sunny, light winds  
 Temperature (F): 80

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 11.0                  | 10.65                   |
| 2.0         | 10.9                  | 10.58                   |
| 4.0         | 10.8                  | 10.59                   |
| 6.0         | 10.8                  | 10.59                   |
| 8.0         | 10.5                  | 10.60                   |
| 10.0        | 10.5                  | 10.63                   |
| 12.0        | 10.5                  | 10.61                   |
| 14.0        | 10.4                  | 10.59                   |
| 16.0        | 10.4                  | 10.58                   |
| 18.0        | 10.4                  | 10.59                   |
| 20.0        | 10.4                  | 10.57                   |
| 22.0        | Bottom                | Bottom                  |

**No Sampling - DO meter malfunctioned**

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 24.3                  | 6.99                    |
| 2.0         | 23.9                  | 6.88                    |
| 4.0         | 23.6                  | 6.85                    |
| 6.0         | 23.4                  | 6.77                    |
| 8.0         | 23.4                  | 6.76                    |
| 10.0        | 23.3                  | 6.72                    |
| 12.0        | 23.2                  | 6.66                    |
| 14.0        | 23.2                  | 6.66                    |
| 16.0        | 23.2                  | 6.65                    |
| 18.0        | 23.2                  | 6.64                    |
| 20.0        | 23.2                  | 6.57                    |
| 22.0        | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2017.**

Date: 4/24/2017  
 Secchi Disk (ft.): 4.0  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: overcast, windy  
 Temperature (F): 60

Date: 7/24/2017  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: mostly sunny, light winds  
 Temperature (F): 72

Date: 8/29/2017  
 Secchi Disk (ft.): 6.0  
 Depth of Bottom Sample (ft): 18  
 Weather Conditions: cloudy, light winds  
 Temperature (F): 62

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 10.1                  | 11.15                   |
| 2.0         | 10.1                  | 11.05                   |
| 4.0         | 10.1                  | 10.95                   |
| 6.0         | 10.0                  | 10.97                   |
| 8.0         | 10.0                  | 10.94                   |
| 10.0        | 10.0                  | 10.97                   |
| 12.0        | 10.0                  | 10.95                   |
| 14.0        | 10.0                  | 10.90                   |
| 16.0        | 10.0                  | 10.95                   |
| 18.0        | 10.0                  | 10.90                   |
| 20.0        | 10.0                  | 10.9                    |
| 22.0        | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 24.5                  | 6.82                    |
| 2.0         | 23.4                  | 6.84                    |
| 4.0         | 23.1                  | 6.83                    |
| 6.0         | 23.0                  | 6.80                    |
| 8.0         | 22.9                  | 6.79                    |
| 10.0        | 22.9                  | 6.79                    |
| 12.0        | 22.9                  | 6.77                    |
| 14.0        | 22.9                  | 6.76                    |
| 16.0        | 22.9                  | 6.73                    |
| 18.0        | 22.9                  | 6.72                    |
| 20.0        | 22.9                  | 6.69                    |
| 22.0        | Bottom                | Bottom                  |

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|
| Surface     | 21.6                  | 7.59                    |
| 2.0         | 21.3                  | 7.47                    |
| 4.0         | 21.2                  | 7.42                    |
| 6.0         | 21.1                  | 7.39                    |
| 8.0         | 21.1                  | 7.35                    |
| 10.0        | 21.0                  | 7.33                    |
| 12.0        | 21.0                  | 7.30                    |
| 14.0        | 21.0                  | 7.24                    |
| 16.0        | 21.0                  | 7.23                    |
| 18.0        | 20.9                  | 7.21                    |
| 20.0        | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2018.**

Date: 5/8/2018  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: cloudy, south wind @ 5-10  
 Temperature (F): 73

Date: 7/24/2018  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft): 18  
 Weather Conditions: mostly sunny, wind NW @ 5-10  
 Temperature (F):

Date: 8/29/2018  
 Secchi Disk (ft.): 5.5  
 Depth of Bottom Sample (ft) 20  
 Weather Conditions: partly cloudy, light winds  
 Temperature (F):

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|
| Surface     | 12.5                  | 11.55                   | Surface     | 26.2                  | 7.90                    | Surface     | 21.5                  | 6.20                    |
| 2.0         | 12.1                  | 11.62                   | 2.0         | 25.7                  | 7.67                    | 2.0         | 21.5                  | 6.18                    |
| 4.0         | 12.0                  | 11.61                   | 4.0         | 25.6                  | 7.48                    | 4.0         | 21.4                  | 6.17                    |
| 6.0         | 12.0                  | 11.59                   | 6.0         | 25.4                  | 7.26                    | 6.0         | 21.4                  | 6.16                    |
| 8.0         | 11.9                  | 11.58                   | 8.0         | 25.3                  | 7.14                    | 8.0         | 21.4                  | 6.17                    |
| 10.0        | 11.8                  | 11.59                   | 10.0        | 25.3                  | 7.19                    | 10.0        | 21.4                  | 6.16                    |
| 12.0        | 11.7                  | 11.58                   | 12.0        | 25.3                  | 7.16                    | 12.0        | 21.4                  | 6.14                    |
| 14.0        | 11.7                  | 11.56                   | 14.0        | 25.3                  | 7.16                    | 14.0        | 21.4                  | 6.15                    |
| 16.0        | 11.7                  | 11.55                   | 16.0        | 25.0                  | 7.16                    | 16.0        | 21.4                  | 6.14                    |
| 18.0        | 11.7                  | 11.53                   | 18.0        | 23.8                  | 6.78                    | 18.0        | 21.4                  | 6.13                    |
| 20.0        | 11.6                  | 11.5                    | 20.0        | Bottom                | Bottom                  | 20.0        | 21.4                  | 6.1                     |
| 22.0        | Bottom                | Bottom                  |             |                       |                         | 22.0        | Bottom                | Bottom                  |

**Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2019.**

Date: 5/7/2019  
 Secchi Disk (ft.): 6  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: sunny, winds N @ 5 mph  
 Temperature (F): 56

Date: 7/23/2019  
 Secchi Disk (ft.): 6  
 Depth of Bottom Sample (ft): 20  
 Weather Conditions: mostly sunny, NW wind @ 5 mph  
 Temperature (F): 74

Date: 8/27/2019  
 Secchi Disk (ft.): 5.0  
 Depth of Bottom Sample (ft) 18  
 Weather Conditions: partly sunny, SW wind at 15 mph  
 Temperature (F):

| Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) | Depth (ft.) | Temperature (celsius) | Dissolved Oxygen (mg/l) |
|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|-------------|-----------------------|-------------------------|
| Surface     | 9.4                   | 12.23                   | Surface     | 25.3                  | 6.45                    | Surface     | 20.8                  | 7.33                    |
| 2.0         | 9.3                   | 12.28                   | 2.0         | 24.6                  | 6.36                    | 2.0         | 20.8                  | 7.30                    |
| 4.0         | 9.2                   | 12.26                   | 4.0         | 24.3                  | 6.25                    | 4.0         | 20.8                  | 7.29                    |
| 6.0         | 9.2                   | 12.25                   | 6.0         | 24.2                  | 6.21                    | 6.0         | 20.7                  | 7.26                    |
| 8.0         | 9.2                   | 12.23                   | 8.0         | 24.2                  | 6.20                    | 8.0         | 20.7                  | 7.25                    |
| 10.0        | 9.2                   | 12.22                   | 10.0        | 24.2                  | 6.20                    | 10.0        | 20.7                  | 7.24                    |
| 12.0        | 9.2                   | 12.23                   | 12.0        | 24.2                  | 6.19                    | 12.0        | 20.7                  | 7.28                    |
| 14.0        | 9.2                   | 12.22                   | 14.0        | 24.2                  | 6.18                    | 14.0        | 20.7                  | 7.31                    |
| 16.0        | 9.1                   | 12.21                   | 16.0        | 24.2                  | 6.18                    | 16.0        | 20.6                  | 7.26                    |
| 18.0        | 9.1                   | 12.20                   | 18.0        | 24.2                  | 6.16                    | 18.0        | 20.6                  | 7.21                    |
| 20.0        | 9.1                   | 12.1                    | 20.0        | 24.2                  | 6.10                    | 20.0        | Bottom                | Bottom                  |
| 22.0        | Bottom                | Bottom                  | 22.0        | Bottom                | Bottom                  |             |                       |                         |

**Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2020.**

Date: **April**  
**No Sampling due to Covid-19 Restrictions**

**July**  
**No Sampling due to Covid-19 Restrictions**

**August**  
No Sampling due to faulty DO/temp. meter

## **APPENDIX D**

### **Agency Correspondence**



1414 West Hamilton Avenue  
PO Box 8  
Eau Claire, WI 54702-0008

December 15, 2020

*VIA Electronic Mail*

Cheryl Laatsch – Statewide FERC Coordinator  
WI Dept. of Natural Resources  
N7725 Hwy 28  
Horicon, WI 53032

Nick Utrup  
U.S. Fish and Wildlife Service  
Wisconsin/Minnesota Ecological Services Field Office  
4101 American Boulevard East  
Bloomington, MN 55425

**Subject: 2020 Water Quality Monitoring Report  
Big Falls (P-2390-01), Thornapple (P-2475) & Turtle-Flambeau (P-2390-02)**

Dear Ms. Laatsch and Mr. Utrup:

Enclosed is the 2020 Water Quality Sampling Report for Big Falls and Thornapple flowages. Water sampling was not conducted in April or July due to restrictions from COVID-19. Therefore, the report only includes data from our August sampling (phosphorous and chlorophyll) as well as the results from the previous four years. Additionally, no dissolved oxygen (DO) or temperature profiles were obtained in August due to a faulty DO meter. Comprehensive sampling will resume in 2021.

Annual water quality monitoring for the Turtle Flambeau Flowage is conducted by the Citizens Lake Monitoring Program and the results are published on the WDNR's website. The link is: <https://dnr.wi.gov/lakes/clmn/Stations.aspx?location=26>. Should citizen monitoring be discontinued in the future, NSPW shall provide replacement services as stipulated in the 2008 Water Quality Certification for Big Falls Hydro.

Should you have any questions concerning this report, you may contact me at (715) 737-1353 or [matthew.j.miller@xcelenergy.com](mailto:matthew.j.miller@xcelenergy.com). **Please provide any comments you may have by January 15, 2021.**

Sincerely,

Matthew J. Miller  
Hydro License Compliance Consultant

Enclosure

c: General Project Files

## Miller, Matthew J

---

**From:** Haller, Macaulay G - DNR <macaulay.haller@wisconsin.gov>  
**Sent:** Friday, January 8, 2021 2:23 PM  
**To:** Miller, Matthew J  
**Cc:** Laatsch, Cheryl - DNR; Haller, Macaulay G - DNR; Nick Utrup  
**Subject:** RE: Annual Water Quality Report for Big Falls (P-2390-01) and Thornapple Flowages (P-2475)

**EXTERNAL - STOP & THINK** before opening links and attachments.

Hi Matt,

The department does not have any comments to provide on the 2020 Annual Water Quality Monitoring Report for Big Falls and Thornapple, received December 14, 2020.

The department is currently reviewing water quality monitoring protocols for statewide FERC projects. The department may reach out to Xcel in the future to discuss updating Xcel's water quality monitoring protocols for their applicable projects.

Thank you for the opportunity to comment,

**Macaulay Haller**

Wisconsin Department of Natural Resources  
Macaulay.Haller@wisconsin.gov

---

**From:** Miller, Matthew J <[Matthew.J.Miller@xcelenergy.com](mailto:Matthew.J.Miller@xcelenergy.com)>  
**Sent:** Monday, December 14, 2020 9:25 PM  
**To:** Laatsch, Cheryl - DNR <[Cheryl.Laatsch@wisconsin.gov](mailto:Cheryl.Laatsch@wisconsin.gov)>; ([Nick\\_Utrup@fws.gov](mailto:Nick_Utrup@fws.gov)) <[Nick\\_Utrup@fws.gov](mailto:Nick_Utrup@fws.gov)>  
**Subject:** Annual Water Quality Report for Big Falls (P-2390-01) and Thornapple Flowages (P-2475)

Hello Cheryl and Nick,

Attached is the 2020 annual water quality monitoring report for Big Falls and Thornapple. Note that sampling did not occur in April or July due to COVID-19 restrictions. Please provide any comments you may have by **January 15, 2021** so I may file my report with FERC.

**Matthew Miller**

**Xcel Energy | Responsible By Nature**

**Hydro License Compliance Consultant**

1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702

P: 715.737-1353 F: 715.737.1077

E: [matthew.j.miller@xcelenergy.com](mailto:matthew.j.miller@xcelenergy.com)

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**XCELENERGY.COM**

## Miller, Matthew J

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**From:** Utrup, Nick J <nick\_utrup@fws.gov>  
**Sent:** Wednesday, January 13, 2021 8:06 AM  
**To:** Miller, Matthew J  
**Subject:** Re: [EXTERNAL] RE: Annual Water Quality Report for Big Falls (P-2390-01) and Thornapple Flowages (P-2475)

**EXTERNAL - STOP & THINK** before opening links and attachments.

Hi Matt,

We have no comments

Nick

Nick Utrup  
U.S. Fish and Wildlife Service  
4101 American Boulevard East  
Bloomington, MN 55425

Office: (952) 252-0092 ext. 204

Email: [Nick\\_Utrup@fws.gov](mailto:Nick_Utrup@fws.gov)

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**From:** Miller, Matthew J <Matthew.J.Miller@xcelenergy.com>  
**Sent:** Tuesday, January 12, 2021 3:07 PM  
**To:** Utrup, Nick J <nick\_utrup@fws.gov>  
**Subject:** [EXTERNAL] RE: Annual Water Quality Report for Big Falls (P-2390-01) and Thornapple Flowages (P-2475)

**This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.**

Hello Nick,

I hope you are well. Can you please respond to this e-mail regarding any comments you may have on our annual water quality report so I may file the report with FERC.

---

**From:** Miller, Matthew J  
**Sent:** Monday, December 14, 2020 9:25 PM  
**To:** Laatsch, Cheryl - DNR <Cheryl.Laatsch@wisconsin.gov>; (Nick\_Utrup@fws.gov) <Nick\_Utrup@fws.gov>  
**Subject:** Annual Water Quality Report for Big Falls (P-2390-01) and Thornapple Flowages (P-2475)

Hello Cheryl and Nick,

Attached is the 2020 annual water quality monitoring report for Big Falls and Thornapple. Note that sampling did not occur in April or July due to COVID-19 restrictions. Please provide any comments you may have by **January 15, 2021** so I may file my report with FERC.

**Matthew Miller**

**Xcel Energy | Responsible By Nature**

**Hydro License Compliance Consultant**

1414 W. Hamilton Ave., P.O. Box 8, Eau Claire, WI 54702

P: 715.737-1353 F: 715.737.1077

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**XCELENERGY.COM**