



January 20, 2009

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

SECRETARY OF THE
COMMISSION
2009 JAN 26 A 10:12
FEDERAL ENERGY
REGULATORY COMMISSION

1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

Subject: 2008 Water Quality Monitoring Report For The Big Falls Flowage (FERC Project #2390) And Thornapple Flowage (FERC Project #2475)

Dear Secretary:

Enclosed is an original and eight copies of the results of the water quality monitoring that Northern States Power Company – Wisconsin (NSPW), an Xcel Energy Company, conducted during the 2008 field season on the Big Falls and Thornapple Flowages. The samples were obtained after ice-out, in late July, and late August per the Federal Energy Regulatory Commission's (FERC) license requirement to monitor long-term changes in water quality. Although different personnel performed the monitoring last year, along with the use of a new dissolved oxygen meter, the same procedures were followed. Also of note was a change in the laboratory that performs the Chlorophyll A analysis. Northern Lake Service, Inc. of Crandon, WI performed the chlorophyll analysis in 2008 and will continue to do so in the future.

Included in the report is a summary of water quality data for the two sites since sampling began in 1998. While there appears to be variability in some of the parameters analyzed, overall, the results have been relatively consistent. The data collected in 2008 is consistent with data from the previous years' sampling. However, the Chlorophyll A samples taken last year in July and August at Big Falls yielded the highest concentrations since sampling began. The only other year with comparable results was 2003.

This report was filed with the Wisconsin Department of Natural Resources (WDNR) on December 18, 2008. The WDNR was provided 30 days to submit comments and to date no correspondence has been received. Should you have any questions regarding this report, feel free to contact Mr. Matthew Miller of this office at (715) 737-1353 or by electronic mail at matthew.j.miller@xcelenergy.com.

Sincerely,

William Zawacki
Director, Hydro Plants

Enclosure: Water Quality Monitoring Report

C: Mr. Jeff Scheirer (WDNR)

AGENCY CORRESPONDENCE



1414 West Hamilton Avenue
P.O. Box 8
Eau Claire, WI 54702-0008

December 17, 2008

Mr. Jeff Scheirer
Wisconsin DNR
875 South 4th Avenue
Park Falls, WI 54552

Subject: 2008 Water Quality Monitoring Report For The Big Falls Flowage (FERC Project #2390) And Thornapple Flowage (FERC Project #2475)

Dear Mr. Scheirer:

Enclosed are the results of the water quality sampling that Northern States Power Company – Wisconsin, an Xcel Energy Company (NSPW), conducted during the 2008 field season on the Big Falls and Thornapple Flowages. The samples were taken after ice-out and in late July and August. The samples were acquired from the deepest point of the reservoirs immediately upstream from the boat restraining barriers. Although different personnel performed the monitoring this year, using a new dissolved oxygen meter, the same procedures were followed. Also of note was a change in the laboratory that performs the Chlorophyll – A analysis. Northern Lake Service, Inc. of Crandon, WI performed the chlorophyll analysis this year and will continue to do so in the future.

I have summarized all of the water quality data for the two sites since sampling began in 1998. While there appears to be some variability in some of the parameters analyzed, for the most part, the results have been relatively consistent. The data collected in 2008 is consistent with data from the previous years' sampling. However, the Chlorophyll A sample taken this year in July and August at Big Falls was the highest level recorded since sampling began. The only other year with comparable results was 2003. Whether this variability is normal or due to a change in the vendor performing the analysis should be determined with future sampling.

Please provide me with any comments that you might have concerning the sampling results by January 18, 2009 so that I can transmit the water quality data and any comments that you might have to the Federal Energy Regulatory Commission by the end of January. You can provide your response either by telephone call, e-mail, or written letter. NSPW will work with the WDNR in 2009 to begin entering water quality data directly into the state database thus eliminating the need to file a hard copy of the results. Should you have any questions concerning this report, feel free to give me a call at (715) 737-1353 or email me at matthew.j.miller@xcelenergy.com.

Sincerely,

A handwritten signature in cursive script that reads 'Matthew J. Miller'.

Matthew J. Miller
Hydro Licensing Specialist

Enclosure: Water quality monitoring results

**2008 Water Quality Fieldwork Data Sheets For
The Big Falls And Thornapple Flowages**

Water Quality Sampling - Big Falls Flowage

Date: 4/30/08 - 10:30 A.M.

Temperature: 50°F, S wind @ 10 mph

Weather Conditions: Sunny

Depth of Bottom Sample: 12M

Secchi Disk Reading: 4.5 feet

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	5.8	11.8
2	5.9	11.8
4	5.7	11.9
6	5.7	11.9
8	5.7	11.9
10	5.7	11.9
12	5.7	11.9
14	5.7	11.9
16	5.7	11.9
18	5.7	11.9
20	5.7	11.9
22	5.7	11.9
24	5.7	11.9
26	5.7	11.9
28	5.7	11.9
30	5.7	11.9
32	5.7	11.9
34	5.7	11.8
36	5.7	11.8
38	5.7	6.0
40	Bottom	Bottom
42		
44		
46		

Remarks:

- * Sample was taken at third buoy from west side of dam
- * Spillway gate open (~6,500 cfs)
- * Checked for navigational hazards near dam - none found
- * checked eagle nest - no birds at nest but one adult in tree nearby - nest is likely being used.

Water Quality Sampling - Thornapple Flowage

Date: 4/30/08

Temperature: 55°F

Weather Conditions: Sunny - South wind @ 10 mph

Depth of Bottom Sample: 6.5 M

Secchi Disk Reading: 4.0 Ft.

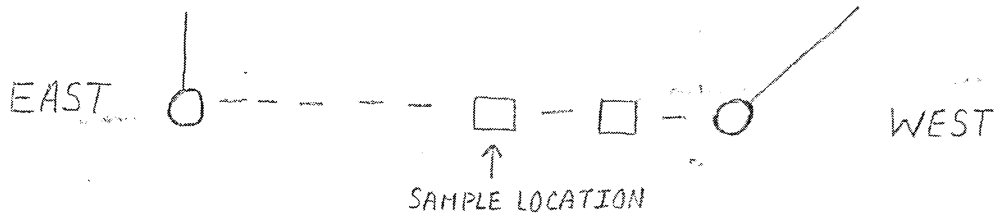
Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface		
2		
4		
6		
8		
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

DO/temperature profile was not taken due to problems with the water.

Remarks:

- * No navigational hazards noted near dam
- * Spillway gates open (flow ~ 6,500 cfs)
- * checked eagle nest
- * adult eagle spotted in tree near eagle - no eagles at nest site



Water Quality Sampling - Big Falls Flowage

Date: 7-23-08

Temperature: 73°

Weather Conditions: MASTLY SUNNY, WIND S @ 5

Depth of Bottom Sample: 34 FT

Secchi Disk Reading: 5.5'

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	24.7	7.60
2	24.4	7.58
4	24.2	7.58
6	24.1	7.50
8	24.0	7.36
10	23.9	7.31
12	23.8	7.27
14	23.7	7.27
16	23.7	7.19
18	23.7	7.09
20	23.5	6.95
22	23.5	6.84
24	23.5	6.75
26	23.3	6.06
28	23.3	6.05
30	23.2	5.61
32	23.1	5.34
34	23.1	4.82
36	BOTTOM	
38		
40		
42		
44		
46		

Remarks: - SPOTTED ONE MATURE BALD EAGLE SOARING AND ONE IMMATURE EAGLE PERCHED ON BRANCH NEXT TO NEST
 - NO NAVIGATIONAL HAZARDS PRESENT
 - SURFACE NUTRIENT SAMPLE COLLECTED AT 1115 HRS

H:\excel5\bigfalls\wqsheets - BOTTOM NUTRIENT SAMPLE COLLECTED AT 1130 HRS
 - SAMPLES COLLECTED AT THIRD BUOY FROM WEST
 (SEE DIAGRAM ABOVE)

Water Quality Sampling - Thornapple Flowage

Date: 7-23-08Temperature: 78°Weather Conditions: PT. CLOUDY, WINDS S @ 5Depth of Bottom Sample: 5.5 MSecchi Disk Reading: 5 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	25.1	7.56
2	24.7	7.43
4	24.2	7.27
6	23.5	6.95
8	23.1	6.70
10	23.1	6.70
12	22.9	6.46
14	22.4	5.48
16	21.8	4.36
18	21.6	4.12
20	BOTTOM	
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: - SAMPLE TAKEN @ 3RD BODY FROM WEST
 - SURFACE NUTRIENT SAMPLE COLLECTED AT 1345 HRS
 - BOTTOM NUTRIENT SAMPLE COLLECTED AT 1355 HRS
 - NO BALD EAGLE ACTIVITY WAS OBSERVED AT THE NEST

H:\excel5\thornapplwqsheet - SPOTTED 1 LOON DOWNSTREAM OF EAGLE'S NEST
 - NO NAVIGATIONAL HAZARDS PRESENT

Water Quality Sampling - Big Falls Flowage

Date: 8-26-08Temperature: 71°Weather Conditions: MOSTLY SUNNY, WINDS SE 5-10Depth of Bottom Sample: 37 FTSecchi Disk Reading: 5.5 FT

Dissolved Oxygen and Temperature Profile

Depth	Temperature (C)	Dissolved Oxygen (ml/l)
Surface	22.7	7.04
2	22.5	6.95
4	22.3	6.91
6	22.3	6.77
8	22.3	6.31
10	22.2	6.39
12	21.9	6.71
14	21.8	6.82
16	21.8	6.93
18	21.7	6.91
20	21.7	6.80
22	21.6	6.80
24	21.6	6.82
26	21.6	6.91
28	21.6	6.91
30	21.5	6.82
32	21.5	6.81
34	21.4	6.83
36	21.4	6.71
38	BOTTOM	
40		
42		
44		
46		

Remarks: - OBSERVED 1 MATURE BALD EAGLE PERCHED AT NORTH END OF FLOWAGE
 - NO NAVIGATIONAL HAZARDS PRESENT NEAR DAM + 7 DOWNSTREAM OF PROJECT
 - SURFACE NUTRIENT SAMPLE COLLECTED AT 1120 HRS
 - BOTTOM NUTRIENT SAMPLE COLLECTED AT 1130 HRS
 - SAMPLES COLLECTED AT THIRD BOUY FROM WEST
 - PURPLE LOOSESTRIFE WAS SURVEYED AND NONE WAS FOUND

Water Quality Sampling - Thornapple Flowage

Date: 8-26-08Temperature: 76°Weather Conditions: HOSTLY SUNNY, WIND SE 5-10Depth of Bottom Sample: 17.5'Secchi Disk Reading: 5'

Dissolved Oxygen and Temperature Profile @ 1400 HRS

Depth	Temperature (C)	Dissolved Oxygen (mg/l)
Surface	22.3	9.64
2	22.0	9.46
4	21.8	9.25
6	21.6	8.99
8	21.5	8.82
10	21.4	8.73
12	21.4	8.70
14	21.3	8.65
16	21.3	8.62
18	21.3	8.60
20	BOTTOM	—
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks: - OBSERVED 1 MATURE BALD EAGLE ON EAST SIDE OF FLOWAGE + 1 LOON
 IN BACK BAY NEAR COUNTY HWY P
 - NO NAVIGATIONAL HAZARDS PRESENT NEAR DAM
 - BOTTON NUTRIENT SAMPLE COLLECTED AT 1330 HRS.
 - SURFACE NUTRIEN SAMPLE COLLECTED AT 1315 HRS

H:\excel5\thornapplwqsheet

- SAMPLES COLLECTED AT THIRD BUOY FROM WEST
 - PURPLE LOOSESTRIFE WAS SURVEYED AND RESULTS ARE
 CONTINAR TO PREVIOUS YEARS

**2008 Water Quality Laboratory Analysis
For The Big Falls And Thornapple Flowages**


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverenz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matthew Miller

Work Request # TABF0408

Date of Report 6/9/2008

 Sample Description: BOTTOM
 Location: BIG FALLS FLOWAGE
 Customer Sample I.D.:

 LabWorks I.D. EG10953
 Laboratory I.D.: 169.06
 Collection Date: 4/30/2008
 Date Submitted: 5/2/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.031	mg/L P	0.001	EPA 365.3	5/7/2008

Comments related to sample number EG10953:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD-WI
Hydro Regulatory-WI

Attention: Leroy Wilder
Matthew Miller

Work Request # TABF0408
Date of Report 6/9/2008

Sample Description: SURFACE

Location: BIG FALLS FLOWAGE

Customer Sample I.D.:

LabWorks I.D. EG10952

Laboratory I.D.: 169.05

Collection Date: 4/30/2008

Date Submitted: 5/2/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	0.579	ug/L	0.041	SM 19th 10200 H	5/2/2008
Send Chlorophyll A	Completed				5/2/2008
Total Phosphorus	0.024	mg/L P	0.001	EPA 365.3	5/7/2008

Comments related to sample number EG10952:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD- WI
 Hydro Regulatory-WI

Attention: Leroy Wilder
 Matthew Miller

Work Request # TABF0408
 Date of Report 6/9/2008

Sample Description: BOTTOM
 Location: THORNAPPLE FLOWAGE
 Customer Sample I.D.:

LabWorks I.D. EG10951
 Laboratory I.D.: 169.04
 Collection Date: 4/30/2008
 Date Submitted: 5/2/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.029	mg/L P	0.001	EPA 365.3	5/7/2008

Comments related to sample number EG10951:


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matthew Miller

Work Request # TABF0408

Date of Report 6/9/2008

Sample Description: SURFACE

Location: THORNAPPLE FLOWAGE

Customer Sample I.D.:

LabWorks I.D. EG10950

Laboratory I.D.: 169.03

Collection Date: 4/30/2008

Date Submitted: 5/2/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	0.961	ug/L	0.041	SM 19th 10200 H	5/2/2008
Send Chlorophyll A	Completed				5/2/2008
Total Phosphorus	0.030	mg/L P	0.001	EPA 365.3	5/7/2008

Comments related to sample number EG10950:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
System Chemist
612-630-4506


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matt Miller

 Work Request # BFNP0708
 Date of Report 8/13/2008

 Sample Description: BOTTOM
 Location: BIG FALLS FLOWAGE
 Customer Sample I.D.:

 LabWorks I.D. EG17809
 Laboratory I.D.:
 Collection Date: 7/28/2008
 Date Submitted: 7/28/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.043	mg/L P	0.001	EPA 365.3	7/28/2008

Comments related to sample number EG17809:


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matt Miller

Work Request # BFNP0708

Date of Report 8/13/2008

Sample Description: SURFACE

Location: BIG FALLS FLOWAGE

Customer Sample I.D.:

LabWorks I.D. EG17810

Laboratory I.D.:

Collection Date: 7/28/2008

Date Submitted: 7/28/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	2.8	ug/L		SM 19th 10200 H	7/30/2008
Send Chlorophyll A	Completed				7/25/2008
Total Phosphorus	0.032	mg/L P	0.001	EPA 365.3	7/28/2008

Comments related to sample number EG17810:



Minneapolis Testing Laboratory Report

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 Minneapolis, MN 55403

Phone: (612)630-4439

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Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD- WI
 Hydro Regulatory-WI

Attention: Leroy Wilder
 Matt Miller

Work Request # TANP0708
 Date of Report 8/13/2008

Sample Description: BOTTOM
 Location: THORNAPPLE FLOWAGE
 Customer Sample I.D.:

LabWorks I.D. EG17807
 Laboratory I.D.: 185.05
 Collection Date: 7/23/2008
 Date Submitted: 7/25/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.051	mg/L P	0.001	EPA 365.3	7/28/2008

Comments related to sample number EG17807:



Minneapolis Testing Laboratory Report

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Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD-WI
 Hydro Regulatory-WI

Attention: Leroy Wilder
 Matt Miller

Work Request # TANP0708
 Date of Report 8/13/2008

Sample Description: SURFACE
 Location: THORNAPPLE FLOWAGE
 Customer Sample I.D.:

LabWorks I.D. EG17808
 Laboratory I.D.: 185.06
 Collection Date: 7/23/2008
 Date Submitted: 7/25/2008

Constituent	Result	Units	Detection Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	11	ug/L		SM 19th 10200 H	7/30/2008
Send Chlorophyll A	Completed				7/25/2008
Total Phosphorus	0.041	mg/L P	0.001	EPA 365.3	7/28/2008

Comments related to sample number EG17808:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
System Chemist
612-630-4506


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matt Miller

 Work Request # BFFL0808
 Date of Report 10/22/2008

 Sample Description: BOTTOM
 Location: BIG FALLS FLOWAGE
 Customer Sample I.D.:

 LabWorks I.D. EG20719
 Laboratory I.D.: 189.32
 Collection Date: 8/26/2008
 Date Submitted: 8/28/2008

Constituent	Result	Units	Analyst	Detection Limit	Reporting Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.047	mg/L P	CMK	0.001	0.01	EPA 365.3	9/4/2008

Comments related to sample number EG20719:


Minneapolis Testing Laboratory Report

 1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

 Report To: ERAD-WI
 Hydro Regulatory-WI

 Attention: Leroy Wilder
 Matt Miller

Work Request # BFFL0808

Date of Report 10/22/2008

Sample Description: SURFACE

Location: BIG FALLS FLOWAGE

Customer Sample I.D.:

LabWorks I.D. EG20720

Laboratory I.D.: 189.33

Collection Date: 8/26/2008

Date Submitted: 8/28/2008

Constituent	Result	Units	Analyst	Detection Limit	Reporting Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	3.7	ug/L	NLS	0.041	0.5	SM 19th 10200 H	9/4/2008
Send Chlorophyll A	Completed		MJM				9/5/2008
Total Phosphorus	0.030	mg/L P	CMK	0.001	0.01	EPA 365.3	9/4/2008

Comments related to sample number EG20720:



Minneapolis Testing Laboratory Report

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Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD- WI
 Hydro Regulatory-WI

Attention: Leroy Wilder
 Matt Miller

Work Request # TAFLO808

Date of Report 10/22/2008

Sample Description: BOTTOM
 Location: THORNAPPLE FLOWAGE
 Customer Sample I.D.:

LabWorks I.D. EG20727
 Laboratory I.D.: 189.34
 Collection Date: 8/26/2008
 Date Submitted: 8/28/2008

Constituent	Result	Units	Analyst	Detection Limit	Reporting Limit	Analytical Method	Analysis Start Date
Total Phosphorus	0.034	mg/L P	CMK	0.001	0.01	EPA 365.3	9/4/2008

Comments related to sample number EG20727:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
 Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

Report To: ERAD-WI
 Hydro Regulatory-WI

Attention: Leroy Wilder
 Matt Miller

Work Request # TAFL0808
 Date of Report 10/22/2008

Sample Description: SURFACE
 Location: THORNAPPLE FLOWAGE
 Customer Sample I.D.:

LabWorks I.D. EG20728
 Laboratory I.D.: 189.35
 Collection Date: 8/26/2008
 Date Submitted: 8/28/2008

Constituent	Result	Units	Analyst	Detection Limit	Reporting Limit	Analytical Method	Analysis Start Date
Chlorophyll-a	13	ug/L	NLS	0.041	0.5	SM 19th 10200 H	9/4/2008
Send Chlorophyll A	Completed		MJM				9/5/2008
Total Phosphorus	0.032	mg/L P	CMK	0.001	0.01	EPA 365.3	9/4/2008

Comments related to sample number EG20728:



Minneapolis Testing Laboratory Report

1518 Chestnut Avenue N
Minneapolis, MN 55403

Phone: (612)630-4439

Fax: (612) 630-4367

Contact: Tom Leverentz

Lab Certification MN ID: 027-053-197

Lab Certification WI ID:999071150

I certify that this analysis report was prepared under my direction or supervision under a system designed to assure that qualified personnel analyzed the submitted samples. All protocols for analysis were followed as required by Minnesota Rules and the Applicable Management Plan.

Christine M. Keefe

Christine M. Keefe
System Chemist
612-630-4506

**Summary Of Total Phosphorous And Chlorophyll A
Data For The Big Falls And Thornapple Flowages
1998-2008**

Summary of Water Quality Data for the Big Falls and Thornapple Flowages (1998 - 2008).

Date	<u>Big Falls Flowage</u>			<u>Thornapple Flowage</u>		
	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)	Surface Total Phosphorus (mg/L P)	Surface Chlorophyll-A (ug/L)	Bottom Total Phosphorus (mg/L P)
4/22/1998	0.037	5.9	0.04	0.034	0.8	0.032
7/27/1998	0.04	2.0	0.05	0.03	7.0	0.04
8/25/1998	0.04	24.0	0.07	0.04	8.0	0.05
4/26/1999	0.04	0.5	0.13	0.04	0.5	0.05
7/23/1999	0.05	10.0	0.10	0.04	5.2	0.06
8/20/1999	0.04	7.6	0.06	0.07	0.6	0.10
4/14/2000	0.03	5.0	0.04	0.04	2.0	0.04
7/26/2000	0.05	5.0	0.12	0.05	3.9	0.07
8/25/2000	0.04	4.8	0.06	0.04	0.5	0.05
5/7/2001	0.04	0.6	0.05	0.04	1.3	0.05
7/24/2001	0.04	4.3	0.06	0.04	1.4	0.05
8/22/2001	0.04	2.2	0.06	0.04	4.8	0.04
5/13/2002	0.03	1.6	0.03	0.03	1.6	0.03
7/24/2002	0.04	1.6	0.06	0.05	0.5	0.05
8/28/2002	0.04	1.7	0.04	0.03	1.5	0.04
5/12/2003	0.03	0.7	0.03	0.04	0.5	0.04
7/28/2003	0.06	9.4	0.05	0.06	5.0	0.05
8/13/2003	0.03	5.9	0.06	0.07	10.7	0.06
5/5/2004	0.053	1.55	0.031	0.035	1.80	0.036
7/28/2004	0.037	3.10	0.084	0.050	4.60	0.049
8/25/2004	0.024	3.35	0.042	0.029	4.10	0.027
4/19/2005	0.050	0.50	0.057	0.055	0.70	0.051
7/25/2005	0.031	0.60	0.044	0.031	1.50	0.045
8/31/2005	0.020	1.50	0.092	0.029	2.75	0.030
4/26/2006	0.023	0.94	0.035	0.026	2.35	0.024
7/24/2006	0.029	0.50	0.099	0.035	4.03	0.041
8/23/2006	0.048	1.50	0.035	0.050	2.11	0.040
4/30/2007	0.028	1.95	0.067	0.039	4.50	0.033
7/31/2007	0.029	4.81	0.043	0.037	3.35	0.032
8/29/2007	0.052	4.45	0.027	0.049	2.93	0.033
4/30/2008	0.024	0.579	0.031	0.030	0.961	0.029
7/23/2008	0.032	2.80	0.043	0.041	11.0	0.051
8/26/2008	0.030	3.70	0.047	0.032	13.0	0.034
<i>Average (Ice-out sample)</i>	0.04	1.98	0.05	0.04	1.70	0.04
<i>Average (July sample)</i>	0.04	4.41	0.08	0.05	4.75	0.05
<i>Average (August sample)</i>	0.04	6.07	0.06	0.05	5.10	0.05

**Summary Of Dissolved Oxygen And Temperature
Data For The Big Falls Flowage
1998-2008**

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 1998.

Date: 4/22/1998
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 11 meters
 Weather Conditions: sunny, calm, 50 F

Date: 7/27/1998
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 33 ft.
 Weather Conditions: sunny, calm, 75 F

Date: 8/23/1998
 Secchi Disk (ft.): 3
 Depth of Bottom Sample: 35 ft.
 Weather Conditions: sunny, light wind, 85 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	10.5	10.8
1.0	10.5	10.7
2.0	10.0	10.7
3.0	10.0	10.6
4.0	10.0	10.6
5.0	10.0	10.6
6.0	10.0	10.6
7.0	10.0	10.6
8.0	10.0	10.6
9.0	10.0	10.6
10.0	10.0	10.6

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.5	8.6
2.0	23.5	8.6
4.0	23.5	8.6
6.0	23.5	8.6
8.0	22.5	7.8
10.0	22.0	7.4
12.0	22.0	7.3
14.0	22.0	7.3
16.0	22.0	7.3
18.0	22.0	7.3
20.0	22.0	7.2
22.0	22.0	7.2
24.0	22.0	7.1
26.0	22.0	7.0
28.0	21.5	6.8
30.0	21.5	6.6
32.0	21.5	6.2

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.0	9.2
2.0	22.0	9.2
4.0	22.0	9.0
6.0	22.0	8.6
8.0	22.0	8.3
10.0	22.0	7.9
12.0	21.5	7.7
14.0	21.5	7.6
16.0	21.5	7.4
18.0	21.5	7.2
20.0	21.5	6.7
22.0	21.0	6.3
24.0	21.0	6.3
26.0	21.0	6.1
28.0	21.0	5.9
30.0	21.0	5.8
32.0	21.0	5.7
34.0	20.5	5.4

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 1999.

Date: 4/26/1999
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 36 ft.
 Weather Conditions: sunny, N wind, 23 C

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	11.0	11.6
2.0	11.0	11.5
4.0	10.5	11.2
6.0	10.5	11.2
8.0	10.5	11.0
10.0	10.0	11.0
12.0	10.0	11.0
14.0	10.0	11.0
16.0	10.0	11.0
18.0	9.5	11.0
20.0	9.0	11.0
22.0	9.0	11.0
24.0	9.0	11.0
26.0	8.0	10.8
28.0	8.0	10.8
30.0	7.5	9.4
32.0	7.5	1.5
34.0	7.0	1.2

Date: 7/23/1999
 Secchi Disk (ft.): 4.5
 Depth of Bottom Sample: 45 ft.
 Weather Conditions: sunny, SW wind, 80 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.8	7.21
2.0	26.4	7.06
4.0	26.2	6.82
6.0	26.0	6.78
8.0	25.8	6.66
10.0	25.8	6.62
12.0	25.8	6.57
14.0	25.8	6.56
16.0	25.7	6.35
18.0	25.6	6.33
20.0	25.2	6.24
22.0	25.1	6.13
24.0	24.8	5.84
26.0	24.7	5.74
28.0	24.7	5.74
30.0	24.5	5.71
32.0	24.5	5.71
34.0	24.5	5.71
36.0	24.4	5.33
38.0	24.3	5.16
40.0	24.3	5.02

Date: 8/19/1999
 Secchi Disk (ft.): 3.5
 Depth of Bottom Sample: 46 ft.
 Weather Conditions: cldy, light wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	20.9	7.2
2.0	20.8	7.2
4.0	20.7	7.1
6.0	20.5	7.0
8.0	20.4	7.0
10.0	20.4	7.0
12.0	20.4	7.0
14.0	20.4	7.1
16.0	20.1	7.1
18.0	20.1	7.1
20.0	20.0	7.1
22.0	20.0	7.1
24.0	20.0	7.1
26.0	20.0	7.1
28.0	19.9	7.2
30.0	19.9	7.2
32.0	19.9	7.2
34.0	19.9	7.2
36.0	19.9	7.1
38.0	19.9	7.1
40.0	19.9	7.1
42.0	19.9	7.1

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2000.

Date: 4/12/2000
 Secchi Disk (ft.): 5.5
 Depth of Bottom Sample: 46 ft.
 Weather Conditions: sunny, E wind, 40 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	7.2	11.3
2.0	7.0	11.4
4.0	6.7	11.5
6.0	6.6	11.7
8.0	6.5	11.6
10.0	6.5	11.6
12.0	6.5	11.6
14.0	6.4	11.7
16.0	6.4	11.2
18.0	6.4	11.3
20.0	6.4	11.2
22.0	6.4	11.1
24.0	6.4	11.2
26.0	6.4	11.2
28.0	6.4	11.2
30.0	6.4	11.1
32.0	6.4	10.9
34.0	6.4	10.9
36.0	6.4	10.9
38.0	6.4	10.8
40.0	6.4	10.8

Date: 7/26/2000
 Secchi Disk (ft.): 4.5
 Depth of Bottom Sample: 37 ft.
 Weather Conditions: cloudy, S wind, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.9	7.38
2.0	22.8	7.36
4.0	22.8	7.36
6.0	22.8	7.36
8.0	22.7	7.35
10.0	22.7	7.35
12.0	22.7	7.33
14.0	22.7	7.31
16.0	22.7	7.30
18.0	22.7	7.23
20.0	22.7	7.18
22.0	22.7	7.17
24.0	22.6	7.16
26.0	22.6	7.15
28.0	22.6	7.14
30.0	22.6	7.14
32.0	22.6	7.12
34.0	22.6	7.10
36.0	22.4	6.91
38.0	22.2	1.89

Date: 8/22/2000
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 33 ft.
 Weather Conditions: sunny, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.1	7.84
2.0	20.4	7.82
4.0	20.3	7.96
6.0	20.3	7.97
8.0	20.3	7.98
10.0	20.2	7.95
12.0	20.2	7.95
14.0	20.2	7.91
16.0	20.0	7.99
18.0	19.8	7.92
20.0	19.7	7.91
22.0	19.6	7.91
24.0	19.6	7.91
26.0	19.6	7.94
28.0	19.6	7.94
30.0	19.6	7.94
32.0	19.6	7.94
34.0	19.6	7.92
36.0	19.6	7.92
38.0	19.6	7.89

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2002.

Date: 5/13/2002
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 6.5 m
 Weather Conditions: cloudy, NW wind, 50F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	7.9	11.4
2.0	7.8	11.5
4.0	7.8	11.5
6.0	7.8	11.5
8.0	7.8	11.5
10.0	7.8	11.5
12.0	7.8	11.5
14.0	7.8	11.5
16.0	7.8	11.5
18.0	7.8	11.5
20.0	7.8	11.5
22.0	7.8	11.4
24.0	7.8	11.4

Could not sample earlier due to excessively high river flows

Date: 7/24/2002
 Secchi Disk (ft.): 5
 Depth of Bottom Sample: 11.5 m
 Weather Conditions: ptly cloudy, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.8	7.3
2.0	24.8	7.3
4.0	24.7	7.2
6.0	24.6	7.2
8.0	24.5	7.2
10.0	24.4	7.1
12.0	24.4	7.1
14.0	24.4	7.1
16.0	24.4	7.1
18.0	24.4	7.1
20.0	24.4	7.1
22.0	24.3	7.1
24.0	24.3	7.1
26.0	24.3	7.1
28.0	24.3	7.1
30.0	24.3	7.1
32.0	24.3	7.0
34.0	24.3	7.0
36.0	24.3	7.0

Date: 8/28/2002
 Secchi Disk (ft.): 4.75
 Depth of Bottom Sample: 37 ft.
 Weather Conditions: cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.8	7.4
2.0	23.3	7.5
4.0	23.1	7.5
6.0	23.1	7.5
8.0	23.0	7.5
10.0	22.9	7.4
12.0	22.8	7.3
14.0	22.8	7.3
16.0	22.8	7.3
18.0	22.8	7.3
20.0	22.8	7.3
22.0	22.8	7.3
24.0	22.7	7.3
26.0	22.7	7.2
28.0	22.6	7.1
30.0	22.4	6.9
32.0	22.3	6.9
34.0	22.3	6.8
36.0	22.2	6.6
38.0	22.1	6.1

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2003.

Date: 5/19/2003
 Secchi Disk (ft.): 4.5
 Depth of Bottom Sample: 37 ft.
 Weather Conditions: cloudy, S wind, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	16.1	8.50
2.0	16.1	8.61
4.0	16.1	8.73
6.0	16.1	8.68
8.0	16.1	8.68
10.0	16.1	8.68
12.0	16.1	8.66
14.0	16.1	8.65
16.0	16.1	8.65
18.0	16.1	8.68
20.0	16.1	8.63
22.0	16.1	8.65
24.0	16.1	8.65
26.0	16.1	8.66
28.0	16.1	8.66
30.0	16.1	8.65
32.0	16.1	8.67
34.0	16.1	8.67
36.0	16.1	8.67
38.0	16.1	8.63

Date: 7/28/2003
 Secchi Disk (ft.): 6
 Depth of Bottom Sample: 11.5 m
 Weather Conditions: clear, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.3	7.83
2.0	25.8	7.82
4.0	25.2	7.58
6.0	25.0	7.42
8.0	25.0	7.35
10.0	24.9	7.28
12.0	24.8	7.06
14.0	24.8	6.91
16.0	24.7	6.91
18.0	24.6	6.88
20.0	24.5	6.78
22.0	24.4	6.70
24.0	24.3	6.62
26.0	24.2	6.44
28.0	23.7	6.12
30.0	23.1	5.67
32.0	22.8	5.44
34.0	22.6	4.95
36.0	21.9	4.45
38.0	21.3	3.95

Date: 8/13/2003
 Secchi Disk (ft.): 6
 Depth of Bottom Sample: 11 m
 Weather Conditions: sunny, calm, 80 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.9	8.30
2.0	25.6	8.33
4.0	25.0	8.39
6.0	24.8	7.96
8.0	24.6	7.19
10.0	24.4	6.86
12.0	24.3	6.71
14.0	24.2	6.58
16.0	24.1	6.44
18.0	23.9	6.16
20.0	23.9	6.03
22.0	23.8	6.23
24.0	23.8	6.20
26.0	23.7	5.83
28.0	23.5	5.81
30.0	23.5	5.78
32.0	23.5	5.75
34.0	23.4	5.18
36.0	22.9	3.55

Could not sample earlier due to excessively high river flows

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2004.

Date: 5/5/2004
 Secchi Disk (ft.): 5.5
 Depth of Bottom Sample: 11.5 m
 Weather Conditions: cloudy, S wind, 50 F

Date: 7/28/2004
 Secchi Disk (ft.): 6.5
 Depth of Bottom Sample: 12 m
 Weather Conditions: clear, S wind, 75 F

Date: 8/25/2004
 Secchi Disk (ft.): 6.5
 Depth of Bottom Sample: 37 ft.
 Weather Conditions: cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.4	10.1
2.0	12.4	10.4
4.0	12.4	10.4
6.0	12.4	10.2
8.0	12.3	10.3
10.0	12.2	10.4
12.0	12.1	10.4
14.0	12.1	10.6
16.0	12.1	10.6
18.0	12.0	10.6
20.0	11.9	10.5
22.0	11.8	10.3
24.0	11.7	10.3
26.0	11.6	10.3
28.0	11.6	10.3
30.0	11.6	10.2
32.0	11.6	10.2
34.0	11.6	10.2
36.0	11.5	10.2
38.0	11.3	10.1
40.0	11.3	9.7

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.2	7.4
2.0	24.2	8.0
4.0	24.1	8.1
6.0	24.0	8.1
8.0	24.0	7.6
10.0	23.9	7.1
12.0	23.9	6.4
14.0	23.7	6.1
16.0	23.5	6.0
18.0	23.3	5.7
20.0	23.1	5.6
22.0	23.0	5.3
24.0	22.8	5.1
26.0	22.7	4.9
28.0	22.5	4.1
30.0	22.4	4.4
32.0	22.2	4.2
34.0	22.0	3.9
36.0	21.7	3.2
38.0	20.4	1.1

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.2	8.9
2.0	21.2	8.9
4.0	19.8	8.8
6.0	19.7	8.8
8.0	19.6	8.7
10.0	19.6	8.7
12.0	19.6	8.6
14.0	19.6	8.5
16.0	19.6	8.4
18.0	19.5	8.3
20.0	19.4	8.4
22.0	19.2	8.3
24.0	19.2	8.2
26.0	19.0	8.2
28.0	18.8	7.8
30.0	18.7	7.8
32.0	18.4	7.4
34.0	18.2	7.2
36.0	17.9	5.4
38.0	17.6	4.4

Could not sample earlier due to excessively high river flows

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2005.

Date: 4/19/2005
 Secchi Disk (ft.): 5.5
 Depth of Bottom Sample: 11 m
 Weather Conditions: prtly cldy, S wind, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.4	10.1
2.0	15.2	10.2
4.0	14.9	10.2
6.0	14.8	10.2
8.0	14.8	10.2
10.0	14.8	10.2
12.0	14.8	10.2
14.0	14.8	10.2
16.0	14.8	10.2
18.0	14.7	10.1
20.0	14.6	10.1
22.0	14.7	9.8
24.0	14.8	9.9
26.0	14.7	10.0
28.0	14.7	10.0
30.0	14.7	10.0
32.0	14.6	10.0
34.0	14.6	10.0
36.0	14.6	10.0
38.0	14.5	9.9
40.0	14.3	9.6

Date: 7/25/2005
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 12.5 m
 Weather Conditions: cloudy, S wind, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	26.5	6.3
2.0	26.4	6.2
4.0	26.2	6.0
6.0	26.1	5.9
8.0	26.1	5.9
10.0	26.0	5.7
12.0	25.9	5.9
14.0	25.7	5.6
16.0	25.5	5.3
18.0	25.4	5.0
20.0	25.2	5.2
22.0	25.1	5.0
24.0	25.1	5.0
26.0	25.1	5.1
28.0	25.1	5.2
30.0	25.0	5.5
32.0	24.9	5.3
34.0	24.9	5.1
36.0	24.8	4.2
38.0	22.4	0.2

Date: 8/31/2005
 Secchi Disk (ft.): 7
 Depth of Bottom Sample: 37 ft.
 Weather Conditions: Mstly sny, 65 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.6	8.2
2.0	21.5	8.2
4.0	21.3	8.3
6.0	21.2	8.1
8.0	21.1	8.0
10.0	21.1	8.0
12.0	21.0	8.0
14.0	21.0	8.0
16.0	21.0	8.0
18.0	20.9	8.0
20.0	20.9	7.9
22.0	20.9	7.7
24.0	20.8	7.5
26.0	20.8	7.4
28.0	20.6	6.9
30.0	20.5	6.7
32.0	20.5	6.6
34.0	20.5	6.5
36.0	20.5	6.4
38.0	20.5	2.3

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2006.

Date: 4/26/2006
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 13 m
 Weather Conditions: sunny, west wind @ 10 mph

Date: 7/24/2006
 Secchi Disk (ft.): 6
 Depth of Bottom Sample: 15 m
 Weather Conditions: Prtly cloudy, south wind at 10 mph

Date: 8/23/2006
 Secchi Disk (ft.): 5
 Depth of Bottom Sample: 38 ft.
 Weather Conditions: Cloudy, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.4	9.9
2.0	12.1	10.0
4.0	12.0	10.0
6.0	12.0	10.0
8.0	11.9	10.0
10.0	11.3	10.0
12.0	11.2	10.2
14.0	11.2	10.2
16.0	11.2	10.2
18.0	11.1	10.1
20.0	11.1	10.0
22.0	11.1	9.8
24.0	11.1	9.8
26.0	11.0	9.9
28.0	11.0	9.9
30.0	11.0	9.9
32.0	11.0	9.9
34.0	11.0	9.9
36.0	11.0	9.9
38.0	11.0	9.9
40.0	Bottom	Bottom

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.9	7.6
2.0	25.4	7.5
4.0	25.2	7.3
6.0	25.1	7.2
8.0	25.0	6.9
10.0	24.9	6.8
12.0	24.8	6.4
14.0	24.7	6.1
16.0	24.5	5.8
18.0	24.5	5.6
20.0	24.2	6.1
22.0	24.0	6.4
24.0	24.0	6.4
26.0	23.9	6.3
28.0	23.8	6.3
30.0	23.8	6.2
32.0	23.8	5.9
34.0	23.7	5.5
36.0	21.8	0.6
38.0	Bottom	Bottom
40.0		

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.3	8.3
2.0	23.3	8.3
4.0	23.1	8.2
6.0	23.1	8.1
8.0	23.1	8.1
10.0	23.1	8.1
12.0	23.1	8.0
14.0	23.0	7.9
16.0	22.9	7.5
18.0	22.8	7.1
20.0	22.7	7.0
22.0	22.7	7.0
24.0	22.5	6.8
26.0	22.3	6.3
28.0	22.2	6.0
30.0	22.1	5.8
32.0	22.1	5.8
34.0	22.0	5.6
36.0	22.0	5.3
38.0	22.0	5.1
40.0	Bottom	Bottom

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2007.

Date: 4/30/2007
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: 12 m
 Weather Conditions: Prtly cloudy, light wind

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	15.8	9.40
2.0	15.8	9.59
4.0	15.7	9.74
6.0	15.5	9.82
8.0	15.4	9.76
10.0	15.4	9.74
12.0	15.4	9.66
14.0	15.3	9.54
16.0	15.2	9.47
18.0	15.2	9.39
20.0	15.2	9.35
22.0	15.2	9.33
24.0	15.2	9.28
26.0	15.2	9.23
28.0	15.2	9.08
30.0	15.2	9.05
32.0	14.8	8.99
34.0	13.9	8.85
36.0	12.9	8.75
38.0	Bottom	Bottom
40.0		

Date: 7/31/2007
 Secchi Disk (ft.): 7
 Depth of Bottom Sample: 12 m
 Weather Conditions: Mostly sunny, south wind at 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	28.1	7.43
2.0	27.8	7.46
4.0	27.4	7.41
6.0	27.3	7.30
8.0	27.2	7.28
10.0	27.1	6.82
12.0	27.0	6.68
14.0	26.9	6.47
16.0	26.8	6.26
18.0	26.8	6.08
20.0	26.6	5.45
22.0	26.4	5.18
24.0	26.3	5.15
26.0	26.0	4.85
28.0	25.8	4.78
30.0	25.5	4.27
32.0	25.4	4.00
34.0	24.0	0.43
36.0	Bottom	Bottom
38.0		
40.0		

Date: 8/29/2007
 Secchi Disk (ft.): 6
 Depth of Bottom Sample: 12 m
 Weather Conditions: Mostly sunny N wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/Temperature profile was not taken due to equipment problems	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		
22.0		
24.0		
26.0		
28.0		
30.0		
32.0		
34.0		
36.0		
38.0		
40.0		

Dissolved Oxygen and Temperature Profiles for the Big Falls Flowage in 2008.

Date: 4/30/2008
 Secchi Disk (ft.): 4.5
 Depth of Bottom Sample: 11 m
 Weather Conditions: 50 F, sunny, south wind @ 10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	5.8	11.8
2.0	5.9	11.8
4.0	5.7	11.9
6.0	5.7	11.9
8.0	5.7	11.9
10.0	5.7	11.9
12.0	5.7	11.9
14.0	5.7	11.9
16.0	5.7	11.9
18.0	5.7	11.9
20.0	5.7	11.9
22.0	5.7	11.9
24.0	5.7	11.9
26.0	5.7	11.9
28.0	5.7	11.9
30.0	5.7	11.9
32.0	5.7	11.9
34.0	5.7	11.8
36.0	5.7	11.8
38.0	5.7	6.0
40.0	Bottom	Bottom

Date: 7/23/2008
 Secchi Disk (ft.): 5.5
 Depth of Bottom Sample: 10 m
 Weather Conditions: 73 F, sunny, south wind @ 5 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.7	7.60
2.0	24.4	7.58
4.0	24.2	7.58
6.0	24.1	7.50
8.0	24.0	7.36
10.0	23.9	7.31
12.0	23.8	7.27
14.0	23.7	7.27
16.0	23.7	7.19
18.0	23.7	7.09
20.0	23.5	6.95
22.0	23.5	6.84
24.0	23.5	6.75
26.0	23.3	6.06
28.0	23.3	6.05
30.0	23.2	5.61
32.0	23.1	5.34
34.0	23.1	4.82
36.0	Bottom	Bottom

Date: 8/26/2008
 Secchi Disk (ft.): 5.5
 Depth of Bottom Sample: 11 m
 Weather Conditions: 71 F, sunny, southeast wind 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.7	7.04
2.0	22.5	6.95
4.0	22.3	6.91
6.0	22.3	6.77
8.0	22.3	6.31
10.0	22.2	6.39
12.0	21.9	6.71
14.0	21.8	6.82
16.0	21.8	6.93
18.0	21.7	6.91
20.0	21.7	6.80
22.0	21.6	6.80
24.0	21.6	6.82
26.0	21.6	6.91
28.0	21.6	6.91
30.0	21.5	6.82
32.0	21.5	6.81
34.0	21.4	6.83
36.0	21.4	6.71
38.0	Bottom	Bottom

**Summary Of Dissolved Oxygen And Temperature
Data For The Thornapple Flowage
1998-2008**

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 1998.

Date: 4/22/1998			Date: 7/27/1998			Date: 8/23/1998		
Secchi Disk (ft.): 6			Secchi Disk (ft.): 5			Secchi Disk (ft.): 3.5		
Depth of Bottom Sample: 8 meters			Depth of Bottom Sample: 19 ft.			Depth of Bottom Sample: 19		
Weather Conditions: sunny, calm, 55 F			Weather Conditions: sunny, calm, 70 F			Weather Conditions: sunny, light wind, 90 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	11.0	10.5	Surface	24.0	8.9	Surface	22.5	9.3
1.0	10.5	10.5	2.0	24.0	8.8	2.0	22.5	9.1
2.0	10.0	10.5	4.0	24.0	8.7	4.0	22.0	8.5
3.0	10.0	10.4	6.0	23.0	8.3	6.0	22.0	8.1
4.0	10.0	10.2	8.0	22.5	7.8	8.0	21.5	7.4
5.0	10.0	10.2	10.0	22.5	7.4	10.0	21.5	7.3
6.0	10.0	10.2	12.0	22.5	6.9	12.0	21.5	7.3
7.0	9.5	10.2	14.0	22.0	6.5	14.0	21.5	7.2
8.0	9.5	10.2	16.0	22.0	6.3	16.0	21.5	7.1
9.0	9.5	10.2	18.0	22.0	5.9	18.0	20.5	5.8
10.0	9.5	10.2						

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 1999.

Date: 4/26/1999			Date: 7/23/1999			Date: 8/19/1999		
Secchi Disk (ft.): 4			Secchi Disk (ft.): 6.5			Secchi Disk (ft.): 4.5		
Depth of Bottom Sample: 22.5 ft.			Depth of Bottom Sample: 23 ft.			Depth of Bottom Sample: 22		
Weather Conditions: sunny, N wind, 23 C			Weather Conditions: sunny, SW wind, 85 F			Weather Conditions: cloudy, calm, 70 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	12.0	11.4	Surface	27.0	6.32	Surface	21.1	6.9
2.0	11.5	11.2	2.0	25.6	6.24	2.0	20.6	6.5
4.0	11.5	11.2	4.0	25.1	5.99	4.0	20.5	6.4
6.0	11.0	11.2	6.0	24.9	5.85	6.0	20.4	6.3
8.0	10.5	11.0	8.0	24.8	5.83	8.0	20.3	6.3
10.0	10.5	10.9	10.0	24.8	5.82	10.0	20.3	6.3
12.0	10.5	10.9	12.0	24.7	5.78	12.0	20.4	6.3
14.0	10.0	10.9	14.0	24.7	5.72	14.0	20.3	6.2
16.0	9.5	10.9	16.0	24.7	5.67	16.0	20.3	6.2
18.0	8.5	9.8	18.0	24.7	5.63	18.0	20.3	6.2
20.0	8.5	8.6	20.0	24.7	5.62	20.0	20.3	6.2
			22.0	24.7	5.58			

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2000.

Date: 4/12/2000			Date: 7/26/2000			Date: 8/22/2000		
Secchi Disk (ft.): 5			Secchi Disk (ft.): 4			Secchi Disk (ft.): 5.5		
Depth of Bottom Sample: 23 ft.			Depth of Bottom Sample: 19.5 ft.			Depth of Bottom Sample: 17 ft.		
Weather Conditions: sunny, NE wind, 45F			Weather Conditions: cloudy, S wind, 80 F			Weather Conditions: cloudy, 78 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	7.8	11.7	Surface	23.6	6.80	Surface	23.1	6.99
2.0	7.3	11.5	2.0	23.3	6.80	2.0	22.5	7.05
4.0	6.5	11.3	4.0	22.9	6.81	4.0	22.3	7.03
6.0	6.2	11.2	6.0	22.8	6.79	6.0	21.8	7.03
8.0	6.1	11.3	8.0	22.8	6.69	8.0	21.7	6.94
10.0	6.1	11.4	10.0	22.8	6.74	10.0	21.6	6.89
12.0	6.1	11.4	12.0	22.8	6.73	12.0	21.6	6.87
14.0	6.1	11.6	14.0	22.7	6.69	14.0	21.6	6.87
16.0	6.1	11.5	16.0	22.7	6.59	16.0	21.6	6.79
18.0	6.1	11.4	18.0	22.7	6.56	18.0	21.6	6.72
20.0	6.1	11.4	20.0	22.7	6.56	20.0	21.4	6.38
			22.0	22.7	6.40			
			24.0	22.6	1.8			
			26.0	22.6	<1			

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2001.

Date: 5/7/2001			Date: 7/24/2001			Date: 8/22/2001		
Secchi Disk (ft.): 4			Secchi Disk (ft.): 4.5			Secchi Disk (ft.): 5.5		
Depth of Bottom Sample: 6 m			Depth of Bottom Sample: 5 m			Depth of Bottom Sample: 17 ft.		
Weather Conditions: cloudy, W wind, 15 C			Weather Conditions: partly cloudy, 75 F			Weather Conditions: cloudy, 78 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	14.5	8.9	Surface	25.7	6.20	Surface	27.4	8.4
2.0	14.5	8.9	2.0	25.5	6.20	2.0	25.5	8.5
4.0	14.4	9.0	4.0	25.2	6.40	4.0	24.3	8.5
6.0	14.4	9.0	6.0	25.1	6.40	6.0	23.8	8.1
8.0	14.4	9.0	8.0	25.0	9.80	8.0	23.3	7.8
10.0	14.4	9.0	10.0	25.0	7.20	10.0	23.1	7.0
12.0	14.4	9.0	12.0	25.0	5.60	12.0	22.9	6.7
14.0	14.3	9.0	14.0	25.0	5.40	14.0	22.8	7.1
16.0	14.3	8.9	16.0	24.9	5.40	16.0	22.5	6.0
18.0	14.3	8.9	18.0	24.4	4.60	18.0	22.4	5.9
20.0	14.3	8.1	20.0	24.0	4.10	20.0	22.3	5.8
						22.0	22.3	5.5

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2002.

Date: 5/13/2002			Date: 7/24/2002			Date: 8/28/2002		
Secchi Disk (ft.): 4			Secchi Disk (ft.): 4.5			Secchi Disk (ft.): 5		
Depth of Bottom Sample: 5.5 m			Depth of Bottom Sample: 5.5 m			Depth of Bottom Sample: 17 ft.		
Weather Conditions: cloudy, W wind, 52 F			Weather Conditions: partly cloudy, 75 F			Weather Conditions: cloudy, 70 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	8.7	12.6	Surface	25.2	6.1	Surface	22.5	7.5
2.0	8.6	12.6	2.0	25.1	6.1	2.0	22.5	7.6
4.0	8.6	12.6	4.0	24.9	5.9	4.0	22.5	7.6
6.0	8.6	12.6	6.0	24.6	5.9	6.0	22.5	7.5
8.0	8.6	12.6	8.0	24.5	5.8	8.0	22.4	7.4
10.0	8.6	12.6	10.0	24.4	5.7	10.0	22.4	7.4
12.0	8.6	12.6	12.0	24.4	5.6	12.0	22.4	7.4
14.0	8.6	12.6	14.0	24.4	5.7	14.0	22.4	7.4
16.0	8.6	12.6	16.0	24.4	5.7	16.0	22.4	7.4
18.0	8.6	12.5	18.0	24.4	5.7	18.0	22.4	7.4
20.0	8.6	12.1				18.0	22.3	7.3

Could not sample earlier due to high river flows

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2003.

Date: 5/19/2003			Date: 7/28/2003			Date: 8/13/2003		
Secchi Disk (ft.): 4.5			Secchi Disk (ft.): 6.5			Secchi Disk (ft.): 5		
Depth of Bottom Sample: 19 ft.			Depth of Bottom Sample: 6 m			Depth of Bottom Sample: 6 m		
Weather Conditions: cloudy, S wind, 65 F			Weather Conditions: clear, calm, 70 F			Weather Conditions: clear, calm, 75 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	13.8	9.72	Surface	24.5	6.73	Surface	24.5	8.73
2.0	13.7	9.75	2.0	24.4	7.00	2.0	24.3	8.78
4.0	13.7	9.77	4.0	24.3	6.97	4.0	24.2	8.68
6.0	13.7	9.77	6.0	24.3	6.89	6.0	24.0	8.00
8.0	13.7	9.71	8.0	24.3	6.79	8.0	23.7	7.55
10.0	13.7	9.71	10.0	24.3	6.79	10.0	23.4	5.95
12.0	13.7	9.72	12.0	24.0	6.29	12.0	23.4	5.79
14.0	13.7	9.69	14.0	22.9	5.43	14.0	23.2	6.03
16.0	13.7	9.69	16.0	22.6	5.18	16.0	23.0	4.68
18.0	13.7	9.67	18.0	22.3	4.71	18.0	22.5	2.62
20.0	13.7	9.67	20.0	21.9	3.75	20.0	22.1	1.34

Could not sample earlier due to high river flows

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2004.

Date: 5/5/2004		Date: 7/28/2004		Date: 8/25/2004	
Secchi Disk (ft.): 5		Secchi Disk (ft.): 5		Secchi Disk (ft.): 5.5	
Depth of Bottom Sample: 6 m		Depth of Bottom Sample: 19.5 ft		Depth of Bottom Sample: 6 m	
Weather Conditions: cloudy, S wind, 60 F		Weather Conditions: partly sunny, 75 F		Weather Conditions: overcast, 70 F	
Depth (ft.)	Temperature (celsius)	Depth (ft.)	Temperature (celsius)	Depth (ft.)	Temperature (celsius)
Surface	10.0	Surface	23.2	Surface	20.4
2.0	10.0	2.0	23.2	2.0	20.3
4.0	10.0	4.0	22.6	4.0	20.2
6.0	10.0	6.0	22.1	6.0	20.1
8.0	10.0	8.0	21.9	8.0	19.9
10.0	9.9	10.0	21.9	10.0	19.8
12.0	9.9	12.0	21.8	12.0	19.5
14.0	9.9	14.0	21.3	14.0	19.4
16.0	9.8	16.0	21.1	16.0	19.4
18.0	9.8	18.0	20.4	18.0	19.3
20.0	9.8	20.0	19.2	20.0	18.6

Could not sample earlier due to high river flows

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2005.

Date: 4/19/2005		Date: 7/25/2005		Date: 8/31/2005	
Secchi Disk (ft.): 5		Secchi Disk (ft.): 4		Secchi Disk (ft.): 5.5	
Depth of Bottom Sample: 6 m		Depth of Bottom Sample: 6 m		Depth of Bottom Sample: 6 m	
Weather Conditions: cloudy, S wind, 70 F		Weather Conditions: Cldy, S wind, 82 F		Weather Conditions: Sunny, S wind, 70 F	
Depth (ft.)	Temperature (celsius)	Depth (ft.)	Temperature (celsius)	Depth (ft.)	Temperature (celsius)
Surface	10.2	Surface	25.4	Surface	22.4
2.0	10.2	2.0	25.0	2.0	21.9
4.0	10.1	4.0	24.7	4.0	21.5
6.0	10.1	6.0	24.5	6.0	21.4
8.0	10.1	8.0	24.4	8.0	21.3
10.0	10.0	10.0	23.8	10.0	21.3
12.0	9.9	12.0	23.5	12.0	21.3
14.0	9.8	14.0	23.3	14.0	21.2
16.0	9.8	16.0	23.2	16.0	21.2
18.0	9.8	18.0	22.3	18.0	21.2
20.0	9.8	20.0		20.0	21.2

Could not sample earlier due to high river flows

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2006.

Date: 4/26/2006			Date: 7/24/2006			Date: 8/23/2006		
Secchi Disk (ft.): 4			Secchi Disk (ft.): 6			Secchi Disk (ft.): 4		
Depth of Bottom Sample: 6 m			Depth of Bottom Sample: 5 m			Depth of Bottom Sample: 6 m		
Weather Conditions: sunny, W wind @15 mph			Weather Conditions: Mstly sunny, S wind@10mph			Weather Conditions: Cloudy, S wind@5 mph		
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	13.9	10.1	Surface	25.1	7.6	Surface	24.3	9.6
2.0	13.9	10.2	2.0	24.6	7.4	2.0	24.1	9.4
4.0	13.7	10.2	4.0	24.3	7.2	4.0	23.6	8.6
6.0	13.3	10.1	6.0	24.0	6.8	6.0	23.3	7.9
8.0	13.0	10.0	8.0	23.8	6.7	8.0	23.3	7.8
10.0	12.4	9.9	10.0	23.6	6.4	10.0	23.2	7.6
12.0	12.3	9.8	12.0	23.5	6.2	12.0	23.2	7.4
14.0	12.3	9.7	14.0	22.8	5.0	14.0	23.1	7.0
16.0	12.3	9.7	16.0	19.7	0.3	16.0	23.0	6.7
18.0	12.3	9.7	18.0	Bottom	Bottom	18.0	22.9	5.6
20.0	12.3	9.5				20.0	Bottom	Bottom
22.0	Bottom	Bottom						

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2007.

Date: 4/30/2007			Date: 7/31/2007			Date: 8/29/2007		
Secchi Disk (ft.): 5			Secchi Disk (ft.): 5			Secchi Disk (ft.): 5		
Depth of Bottom Sample: 6 m			Depth of Bottom Sample: 6 m			Depth of Bottom Sample: 6 m		
Weather Conditions: cldy, S wind @10 mph			Weather Conditions: Sunny, S wind@5mph			Weather Conditions: Mstly sny, S wind@5 mph		
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	15.3	11.26	Surface	27.1	8.50	Surface		
2.0	14.7	11.27	2.0	26.7	8.31	2.0	DO/Temperatures profiles were not taken due to equipment malfunction	
4.0	14.4	11.33	4.0	25.9	7.54	4.0		
6.0	14.3	11.32	6.0	25.8	7.35	6.0		
8.0	14.3	11.28	8.0	25.8	7.27	8.0		
10.0	14.1	11.28	10.0	25.7	7.22	10.0		
12.0	14.0	11.20	12.0	25.7	7.04	12.0		
14.0	13.9	11.13	14.0	25.5	6.81	14.0		
16.0	13.8	10.90	16.0	25.5	6.79	16.0		
18.0	13.1	10.43	18.0	25.1	6.27	18.0		
20.0	Bottom	Bottom	20.0	24.7	5.78	20.0		
22.0			22.0	Bottom	Bottom			

Dissolved Oxygen and Temperature Profiles for the Thornapple Flowage in 2008.

Date: 4/30/2008
 Secchi Disk (ft.): 4
 Depth of Bottom Sample: NA
 Weather Conditions: 55 F, sunny,
 south wind @ 10 mph

Date: 7/23/2008
 Secchi Disk (ft.): 5
 Depth of Bottom Sample: 5.5 m
 Weather Conditions: 78 F, partly cloudy,
 south wind @ 5 mph

Date: 8/26/2008
 Secchi Disk (ft.): 5
 Depth of Bottom Sample: 5 m
 Weather Conditions: 76 F, sunny,
 southeast wind @ 5-10 mph

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface		
2.0		
4.0		
6.0	DO/temperature profile not taken due to problems with DO meter	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0		
22.0		

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.1	7.56
2.0	24.7	7.43
4.0	24.2	7.27
6.0	23.5	6.95
8.0	23.1	6.70
10.0	23.1	6.70
12.0	22.9	6.46
14.0	22.4	5.48
16.0	21.8	4.36
18.0	21.6	4.12
20.0	Bottom	Bottom
22.0		

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.3	9.64
2.0	22.0	9.46
4.0	21.8	9.25
6.0	21.6	8.99
8.0	21.5	8.82
10.0	21.4	8.73
12.0	21.4	8.70
14.0	21.3	8.65
16.0	21.3	8.62
18.0	21.3	8.60
20.0	Bottom	Bottom