Xcel Energy™

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

December 22, 2003

ORIGINAL

Office of the Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

047

Subject: **Monitoring Results of the 2003 Surveys of Water Quality Conditions at the Big Falls (FERC Project No. 2390) and Thornapple (FERC Project No. 2475) Hydro Projects.** - 053

Dear Secretary:

Enclosed is an original and eight copies of the results of the water quality monitoring performed at the above-mentioned projects in 2003 as directed by the Federal Energy Regulatory Commission's (Commission) license orders. The license orders require Northern States Power Company – Wisconsin (d.b.a. Xcel Energy) to perform water quality sampling on the two flowages after ice-out, in mid-July, and mid-August to monitor long-term changes in water quality.

An attempt has been made to summarize all of the water quality data that has been collected three times annually since 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 2003 appears consistent to the sampling that has been completed to date and well within the normal ranges expected for natural environments.

The sampling results were filed with the Wisconsin Department of Natural Resources (WDNR) on October 8, 2003 and they were allowed time to provide comments on the sampling results (*see attached letter*). The WDNR provided comments in their December 1, 2003 e-mail (*see attached e-mail*) although none were specific to this year's monitoring effort.

If you have any questions in regards to the monitoring results or to this filing, please feel free to give me a call at (715) 839-2692 or Mr. Robert Olson of my staff at (715) 839-1353.

Very truly yours,

Lloyd Everhart

Lloyd Everhart
Administrator, Hydro Licensing

Attachment: Water quality monitoring results

c: Mr. Jeff Scheirer (Wisconsin DNR)

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Summary of 2003 Water Quality Data for the Big Falls and Thornapple Flowages

Instrumental Research, Inc.

7800 Main St. Fridley, MN 55432 763-571-3698

LABORATORY ANALYSIS REPORT
MDH CERTIFIED LABORATORY 027-003-130

August 11, 2003

COPY

Northern States Power Company
Xcel Energy
Chestnut Service Center
1518 Chestnut Ave.
Minneapolis, MN 55403 US
Attn: Tom Leverentz

Collection Date: 07-28-03
Date Received: 07-29-03

Sample Description	Chlorophyll-a mg/cu meter	Pheophytin-a mg/cu meter	Analysis Date
Big Falls Flowage	9.4	2.0	07-29-03
Thornapple Flowage	5.0	1.5	07-29-03

All analyses were performed using method 10200 H. Standard Methods for the Examination of Water and Wastewater, 19th edition approved methodologies.

Report submitted by,

Suzanne M. Melchior

SUZANNE MELCHIOR, LABORATORY SUPERVISOR

SM/ch

Minnesota Department of Health Certified Laboratory No. 027-003-130

Instrumental Research, Inc.
7800 Main St. Fridley, MN 55432 763-571-3698

LABORATORY ANALYSIS REPORT
MDH CERTIFIED LABORATORY 027-003-130

August 29, 2003

COPY

Northern States Power Company
Xcel Energy
Chestnut Service Center
1518 Chestnut Ave.
Minneapolis, MN 55403 US
Attn: Tom Leverentz

Collection Date: 08-13-03
Date Received: 08-15-03

Sample Description	Chlorophyll-a mg/cu meter	Pheophytin-a mg/cu meter	Analysis Date
Big Falls Flowage	5.9	1.9	08-18-03
Thornapple Flowage	10.7	4.1	08-18-03

All analyses were performed using method 10200 H. Standard Methods for the Examination of Water and Wastewater, 19th edition approved methodologies.

Report submitted by,

Suzanne M. Melchior

SUZANNE MELCHIOR, LABORATORY SUPERVISOR

SM/ch

Minnesota Department of Health Certified Laboratory No. 027-003-130

DATE June 18, 2003

FROM T M Leverentz LOCATION CSC-1

TO Rob Olson LOCATION EAU CLR SC

SUBJECT ANALYSIS OF BIG FALLS AND THORNAPPLE RIVERS

1.0 Purpose of Testing

The Testing Lab analyzed samples of water from the Big Falls and Thornapple rivers.

2.0 Test Methods

The samples were analyzed for Total Phosphorus according to EPA Method 365.3. Chlorophyll a was analyzed by PACE Labs.

3.0 Test Results

Lab No	Location	Sample Description	Date Sampled	Chlorophyll A	Total Phosphorus
Method				PACE Labs	EPA 365.3
Units				mg/m3	mg/L PO4
EE57017	BIG FALLS	SURFACE	5/12/2003	0.7	0.03
EE57018	BIG FALLS	BOTTOM	5/12/2003		0.03
EE57019	THORNAPPLE	SURFACE	5/12/2003	0.5	0.04
EE57020	THORNAPPLE	BOTTOM	5/12/2003		0.04

"Less than" values indicate the result is less than the Reporting Limit.

T. M. LEVERENTZ, SENIOR CHEMIST
BY T M Leverentz

T.M Leverentz
Systems Chemist

Analysis of Big Falls and Thornapple Flowages

Lab No	Sample Description	Date Sampled	Chlorophyll a	Total Phosphorus
Method			Instrumental Research	EPA 365.3
Units			mg/m3	mg/L PO4
EE63519	BIG FALLS SURFACE	7/28/2003	9.4	0.06
EE63520	BIG FALLS BOTTOM	7/28/2003		0.05
EE63521	THORNAPPLE SURFACE	7/28/2003	5.0	0.06
EE63522	THORNAPPLE BOTTOM	7/28/2003		0.05
EE66513	BIG FALLS SURFACE	8/13/2003	5.9	0.03
EE66514	BIG FALLS BOTTOM	8/13/2003		0.06
EE66515	THORNAPPLE SURFACE	8/13/2003	10.7	0.07
EE66516	THORNAPPLE BOTTOM	8/13/2003		0.06

Water Quality Sampling - Big Falls Flowage

Date: 5/19/03
Temperature: 65°F
Weather Conditions: Heavy overcast - South wind @ ~10mph
Depth of Bottom Sample: 12 M - 37ft.
Secchi Disk Reading: 4.5 ft.

Dissolved Oxygen and Temperature Profile

Surface	16.1	8.50
2	16.1	8.61
4	16.1	8.73
6	16.1	8.68
8	16.1	8.68
10	16.1	8.68
12	16.1	8.66
14	16.1	8.65
16	16.1	8.65
18	16.1	8.68
20	16.1	8.63
22	16.1	8.65
24	16.1	8.65
26	16.1	8.66
28	16.1	8.66
30	16.1	8.65
32	16.1	8.67
34	16.1	8.67
36	16.1	8.67
38	16.1	8.63
40	Bottom	-
42		
44		
46		

Remarks:
* Samples were taken at the third platform buoy from the spillway side of the flowage;
* Flows are ~6,000 cfs (spillway gate * 2 open)
* Heavy debris load on boat restraining barrier due to extremely high flows the previous week - barrier still intact
* Checked bald eagle nest and found a mature eagle at tree site although nest has collapsed. Unclear whether eagle was rebuilding nest. No sign of any other nest.
* [illegible] - debris on barrier will be

Water Quality Sampling - Big Falls Flowage

Date: 7/28/03 - 11:00 A.M.
Temperature: 78°F
Weather Conditions: Clear, calm
Depth of Bottom Sample: 11.5 M
Secchi Disk Reading: 6 ft.

Dissolved Oxygen and Temperature Profile

Surface	26.3	7.83
2	25.8	7.82
4	25.2	7.58
6	25.0	7.42
8	25.0	7.35
10	24.9	7.28
12	24.8	7.06
14	24.8	6.91
16	24.1	6.91
18	24.6	6.88
20	24.5	6.78
22	24.4	6.70
24	24.3	6.62
26	24.2	6.44
28	23.7	6.12
30	23.1	5.67
32	22.8	5.44
34	22.6	4.95
36	21.9	4.45
38	21.3	3.95
40 39	Bottom	—
42		
44		
46		

Remarks:
* Sample was taken at the third platform buoy from the west side of the spillway
* Lower segment of flowage was surveyed for navigational hazards and no obvious hazards were observed.
* Eagle nest was checked and it is now entirely removed from the tree. No eagles were observed on the flowage.
* Trash was cleaned up at all public recreation areas

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Water Quality Sampling - Big Falls Flowage

Date: 8/13/03
Temperature: 80°F
Weather Conditions: Sunny, Calm
Depth of Bottom Sample: 11m
Secchi Disk Reading: 6 ft.

Dissolved Oxygen and Temperature Profile

Surface	25.9	8.30
2	25.6	8.33
4	25.0	8.39
6	24.8	7.96
8	24.6	7.19
10	24.4	6.86
12	24.3	6.71
14	24.2	6.58
16	24.1	6.44
18	23.9	6.16
20	23.9	6.03
22	23.8	6.23
24	23.8	6.20
26	23.7	5.83
28	23.5	5.81
30	23.5	5.78
32	23.5	5.75
34	23.4	5.18
36	22.9	3.55
38	Bottom	Bottom
40		
42		
44		
46		

Remarks:
* Sample was taken at the fourth buoy from the spillway side of the flowage;
* Surveyed lower portion of the flowage for navigational hazards and one log was removed from the boat launch area;
* Surveyed eagle nest site and there were no signs of rebuilding
* Checked remainder of flowage for eagle nests and none were located- one adult was observed on a large white pine on the upper end of the flowage.

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Water Quality Sampling - Thornapple Flowage

Date: 5/19/03
Temperature: 65°F Heavy overcast
Weather Conditions: South wind ~ 10 mph
Depth of Bottom Sample: 19 ft. - 6m
Secchi Disk Reading: 4.5 ft.

Dissolved Oxygen and Temperature Profile

Surface	13.8	9.72
2	13.7	9.75
4	13.7	9.77
6	13.7	9.77
8	13.7	9.71
10	13.7	9.71
12	13.7	9.72
14	13.7	9.69
16	13.7	9.69
18	13.7	9.67
20	13.7	9.67
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks:
* Samples were taken at the fourth buoy on boat restricting barrier from the powerhouse side of the river.
* Water was still spilling (~6,000cfs) after extremely high flows the previous week.
* water column was thoroughly mixed
* No navigational hazards were observed

Water Quality Sampling - Thornapple Flowage

Date: 7/28/03 - 9 A.M.
Temperature: 70°F
Weather Conditions: Clear, calm
Depth of Bottom Sample: 6M
Secchi Disk Reading: 6.5 ft.

Dissolved Oxygen and Temperature Profile

Surface	24.5	6.73
2	24.4	7.00
4	24.3	6.97
6	24.3	6.89
8	24.3	6.79
10	24.3	6.79
12	24.0	6.29
14	23.9	5.43
16	22.6	5.18
18	22.3	4.71
20	21.9	3.75
~~22~~ 21	Bottom	-
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks:
* Sample was taken at the fourth buoy from the powerhouse side
* A slight algal bloom was occurring
* No navigational hazards were observed.
* Trash was cleaned up at all public recreation areas;

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Water Quality Sampling - Thornapple Flowage

Date: 8/13/03 9:00 A.M.
Temperature: 75°F, Calm
Weather Conditions: Clear
Depth of Bottom Sample: 6m
Secchi Disk Reading: 5 ft

Dissolved Oxygen and Temperature Profile

Surface	24.5	8.73
2	24.3	8.78
4	24.2	8.68
6	24.0	8.00
8	23.7	7.55
10	23.4	5.95
12	23.4	5.79
14	23.2	6.03
16	23.0	4.68
18	22.5	2.62
20	22.1	1.34
22	Bottom	Bottom
24		
26		
28		
30		
32		
34		
36		
38		
40		
42		
44		
46		

Remarks:
* Sample was taken at the fourth buoy from the powerhouse side
* a moderate algal bloom was occurring
* Natural inflows on the river are very low
* Checked for navigational hazards near the dam and none were found
* Performed purple loosestrife survey on flowage
* Located a new eagle nest in large white pine near the large wetland complex in the middle part of the flowage - two adult

Summary of Total Phosphorus and Chlorophyll A Data for the Big Falls and Thornapple Flowages, 1998-2003

Summary of Water Quality Data for the Big Falls and Thornapple Flowages (1998 - 2003).

	Big Falls Flowage			Thornapple Flowage		
Date	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**
Average (Ice-out sample)	**0.03**	**2.38**	**0.05**	**0.04**	**1.12**	**0.04**
Average (July sample)	**0.05**	**5.38**	**0.07**	**0.05**	**3.83**	**0.05**
Average (August sample)	**0.04**	**7.70**	**0.06**	**0.05**	**4.35**	**0.06**

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Summary of Dissolved Oxygen and Temperature Data for the Big Falls Flowage, 1998-2003

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

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

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

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

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	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: cloudy, 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 2001.

Date: 5/7/2001
Secchi Disk (ft.): 4
Depth of Bottom Sample: 12.5 m
Weather Conditions: prtly cloudy, W wind, 19C

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	14.6	9.5
2.0	14.5	9.4
4.0	14.2	9.4
6.0	14.1	9.4
8.0	14.0	9.4
10.0	14.0	9.4
12.0	14.0	9.4
14.0	14.0	9.4
16.0	14.0	9.3
18.0	14.0	9.3
20.0	14.0	9.3
22.0	14.0	9.3
24.0	14.0	9.2
26.0	14.0	9.2
28.0	14.0	9.2
30.0	14.0	9.2
32.0	14.0	9.2
34.0	14.0	9.2
36.0	14.0	9.2
38.0	14.0	9.1

Date: 7/24/2001
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 11.5 m
Weather Conditions: ptly cloudy, 78 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.0	7.10
2.0	27.0	7.00
4.0	26.9	6.90
6.0	26.3	6.50
8.0	26.2	7.10
10.0	26.1	6.70
12.0	26.1	6.20
14.0	26.1	5.80
16.0	26.0	5.40
18.0	25.9	5.50
20.0	25.9	5.80
22.0	25.9	5.90
24.0	25.9	6.00
26.0	25.9	6.00
28.0	25.8	6.00
30.0	25.8	5.50
32.0	25.7	5.20
34.0	25.6	5.00
36.0	25.6	3.60
38.0	25.5	3.10

Date: 8/22/2001
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 11.5 m
Weather Conditions: cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.5	8.0
2.0	22.4	7.8
4.0	22.4	7.8
6.0	22.3	7.7
8.0	22.3	7.7
10.0	22.3	7.7
12.0	22.3	7.7
14.0	22.3	7.6
16.0	22.2	7.6
18.0	22.2	7.5
20.0	22.1	7.3
22.0	22.0	7.2
24.0	21.9	7.2
26.0	21.8	7.1
28.0	21.8	7.0
30.0	21.7	7.0
32.0	21.2	6.7
34.0	21.1	6.6
36.0	21.0	6.6
38.0	20.9	6.4

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

Could not sample earlier due to excessively high river flows

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

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Summary of Dissolved Oxygen and Temperature Data for the Thornapple Flowage, 1998-2003

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

Date: 4/22/1998
Secchi Disk (ft.): 6
Depth of Bottom Sample: 8 meters
Weather Conditions: sunny, calm, 55 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	11.0	10.5
1.0	10.5	10.5
2.0	10.0	10.5
3.0	10.0	10.4
4.0	10.0	10.2
5.0	10.0	10.2
6.0	10.0	10.2
7.0	9.5	10.2
8.0	9.5	10.2
9.0	9.5	10.2
10.0	9.5	10.2

Date: 7/27/1998
Secchi Disk (ft.): 5
Depth of Bottom Sample: 19 ft.
Weather Conditions: sunny, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.0	8.9
2.0	24.0	8.8
4.0	24.0	8.7
6.0	23.0	8.3
8.0	22.5	7.8
10.0	22.5	7.4
12.0	22.5	6.9
14.0	22.0	6.5
16.0	22.0	6.3
18.0	22.0	5.9

Date: 8/23/1998
Secchi Disk (ft.): 3.5
Depth of Bottom Sample: 19
Weather Conditions: sunny, light wind, 90 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.5	9.3
2.0	22.5	9.1
4.0	22.0	8.5
6.0	22.0	8.1
8.0	21.5	7.4
10.0	21.5	7.3
12.0	21.5	7.3
14.0	21.5	7.2
16.0	21.5	7.1
18.0	20.5	5.8

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

Date: 4/26/1999
Secchi Disk (ft.): 4
Depth of Bottom Sample: 22.5 ft.
Weather Conditions: sunny, N wind, 23 C

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	12.0	11.4
2.0	11.5	11.2
4.0	11.5	11.2
6.0	11.0	11.2
8.0	10.5	11.0
10.0	10.5	10.9
12.0	10.5	10.9
14.0	10.0	10.9
16.0	9.5	10.9
18.0	8.5	9.8
20.0	8.5	8.6

Date: 7/23/1999
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 23 ft.
Weather Conditions: sunny, SW wind, 85 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.0	6.32
2.0	25.6	6.24
4.0	25.1	5.99
6.0	24.9	5.85
8.0	24.8	5.83
10.0	24.8	5.82
12.0	24.7	5.78
14.0	24.7	5.72
16.0	24.7	5.67
18.0	24.7	5.63
20.0	24.7	5.62
22.0	24.7	5.58

Date: 8/19/1999
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 22
Weather Conditions: cloudy, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	21.1	6.9
2.0	20.6	6.5
4.0	20.5	6.4
6.0	20.4	6.3
8.0	20.3	6.3
10.0	20.3	6.3
12.0	20.4	6.3
14.0	20.3	6.2
16.0	20.3	6.2
18.0	20.3	6.2
20.0	20.3	6.2

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

Date: 4/12/2000
Secchi Disk (ft.): 5
Depth of Bottom Sample: 23 ft.
Weather Conditions: sunny, NE wind, 45F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	7.8	11.7
2.0	7.3	11.5
4.0	6.5	11.3
6.0	6.2	11.2
8.0	6.1	11.3
10.0	6.1	11.4
12.0	6.1	11.4
14.0	6.1	11.6
16.0	6.1	11.5
18.0	6.1	11.4
20.0	6.1	11.4

Date: 7/26/2000
Secchi Disk (ft.): 4
Depth of Bottom Sample: 19.5 ft.
Weather Conditions: cloudy, S wind, 80 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.6	6.80
2.0	23.3	6.80
4.0	22.9	6.81
6.0	22.8	6.79
8.0	22.8	6.69
10.0	22.8	6.74
12.0	22.8	6.73
14.0	22.7	6.69
16.0	22.7	6.59
18.0	22.7	6.56
20.0	22.7	6.56
22.0	22.7	6.40
24.0	22.6	1.8
26.0	22.6	<1

Date: 8/22/2000
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 17 ft.
Weather Conditions: cloudy, 78 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	23.1	6.99
2.0	22.5	7.05
4.0	22.3	7.03
6.0	21.8	7.03
8.0	21.7	6.94
10.0	21.6	6.89
12.0	21.6	6.87
14.0	21.6	6.87
16.0	21.6	6.79
18.0	21.6	6.72
20.0	21.4	6.38

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

Date: 5/7/2001
Secchi Disk (ft.): 4
Depth of Bottom Sample: 6 m
Weather Conditions: cloudy, W wind, 15 C

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	14.5	8.9
2.0	14.5	8.9
4.0	14.4	9.0
6.0	14.4	9.0
8.0	14.4	9.0
10.0	14.4	9.0
12.0	14.4	9.0
14.0	14.3	9.0
16.0	14.3	8.9
18.0	14.3	8.9
20.0	14.3	8.1

Date: 7/24/2001
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 5 m
Weather Conditions: partly cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.7	6.20
2.0	25.5	6.20
4.0	25.2	6.40
6.0	25.1	6.40
8.0	25.0	9.80
10.0	25.0	7.20
12.0	25.0	5.60
14.0	25.0	5.40
16.0	24.9	5.40
18.0	24.4	4.60
20.0	24.0	4.10

Date: 8/22/2001
Secchi Disk (ft.): 5.5
Depth of Bottom Sample: 17 ft.
Weather Conditions: cloudy, 78 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	27.4	8.4
2.0	25.5	8.5
4.0	24.3	8.5
6.0	23.8	8.1
8.0	23.3	7.8
10.0	23.1	7.0
12.0	22.9	6.7
14.0	22.8	7.1
16.0	22.5	6.0
18.0	22.4	5.9
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
Secchi Disk (ft.): 4
Depth of Bottom Sample: 5.5 m
Weather Conditions: cloudy, W wind, 52 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	8.7	12.6
2.0	8.6	12.6
4.0	8.6	12.6
6.0	8.6	12.6
8.0	8.6	12.6
10.0	8.6	12.6
12.0	8.6	12.6
14.0	8.6	12.6
16.0	8.6	12.6
18.0	8.6	12.5
20.0	8.6	12.1

Could not sample earlier due to high river flows

Date: 7/24/2002
Secchi Disk (ft.): 4.5
Depth of Bottom Sample: 5.5 m
Weather Conditions: partly cloudy, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	25.2	6.1
2.0	25.1	6.1
4.0	24.9	5.9
6.0	24.6	5.9
8.0	24.5	5.8
10.0	24.4	5.7
12.0	24.4	5.6
14.0	24.4	5.7
16.0	24.4	5.7
18.0	24.4	5.7

Date: 8/28/2002
Secchi Disk (ft.): 5
Depth of Bottom Sample: 17 ft.
Weather Conditions: cloudy, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	22.5	7.5
2.0	22.5	7.6
4.0	22.5	7.6
6.0	22.5	7.5
8.0	22.4	7.4
10.0	22.4	7.4
12.0	22.4	7.4
14.0	22.4	7.4
16.0	22.4	7.4
18.0	22.3	7.3

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

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

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	13.8	9.72
2.0	13.7	9.75
4.0	13.7	9.77
6.0	13.7	9.77
8.0	13.7	9.71
10.0	13.7	9.71
12.0	13.7	9.72
14.0	13.7	9.69
16.0	13.7	9.69
18.0	13.7	9.67
20.0	13.7	9.67

Date: 7/28/2003
Secchi Disk (ft.): 6.5
Depth of Bottom Sample: 6 m
Weather Conditions: clear, calm, 70 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.5	6.73
2.0	24.4	7.00
4.0	24.3	6.97
6.0	24.3	6.89
8.0	24.3	6.79
10.0	24.3	6.79
12.0	24.0	6.29
14.0	22.9	5.43
16.0	22.6	5.18
18.0	22.3	4.71
20.0	21.9	3.75

Date: 8/13/2003
Secchi Disk (ft.): 5
Depth of Bottom Sample: 6 m
Weather Conditions: clear, calm, 75 F

Depth (ft.)	Temperature (celsius)	Dissolved Oxygen (mg/l)
Surface	24.5	8.73
2.0	24.3	8.78
4.0	24.2	8.68
6.0	24.0	8.00
8.0	23.7	7.55
10.0	23.4	5.95
12.0	23.4	5.79
14.0	23.2	6.03
16.0	23.0	4.68
18.0	22.5	2.62
20.0	22.1	1.34

Could not sample earlier due to high river flows

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Agency Correspondence

Xcel Energy℠

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

October 8, 2003

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

Subject: **Results of the 2003 Water Quality Monitoring Performed On The Big Falls and Thornapple Flowages Pursuant To Article 404 of the Big Falls License (FERC Project No. 2390) and Article 406 of the Thornapple License (FERC Project No. 2475).**

Dear Mr. Scheirer:

Enclosed are the results of the water quality sampling that Northern States Power Company – Wisconsin (d.b.a. Xcel Energy) personnel conducted during the 2003 field season on the Big Falls and Thornapple Flowages. The samples were taken after ice-out and during July and August, in the deepest point of the reservoirs, immediately upstream from the boat restraining barriers. The ice-out samples were again taken later than normal this year due to safety concerns with the high flows that were experienced during the normal sample period and the absence of boat-restraining barriers at the two sites.

I have made an attempt to summarize all of the water quality data that we have collected three times annually since 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 2003 appears consistent to the sampling that has been completed to date.

Please provide me with any comments that you might have concerning the sampling results by November 8, 2003 so that I can transmit the water quality data and any comments that you might have to the Federal Energy Regulatory Commission by January 1, 2003. You can provide your response either by telephone call, e-mail, or written letter. If you have any questions concerning the water quality sampling or the results provided to you, please feel free to give me a call at (715) 839-1353.

Sincerely,

Robert W. Olson
Hydro Licensing Specialist

Enclosure: Water quality monitoring results

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Olson, Robert W

From: Scheirer, Jeffrey W [Jeffrey.Scheirer@dnr.state.wi.us]
Sent: Monday, December 01, 2003 10:18 AM
To: Olson, Robert W
Subject: RE: Water Quality Monitoring Report for Big Falls and Thornapple


RE: Water quality monitoring


RE: Total ıosphorus for Ramb

Rob, I sent the reports to our Water Quality Biologist for review and comment. Since he did not reply, I assume that he had no comments. You may recall earlier this year I asked about the detection limit (LOD) for the phosphorus analysis (see 1st e-mail attached below). We originally requested a detection limit of 0.005 mg/l for phosphorus, but because most commercial labs cannot attain that standard, we have revised our recommendation. An LOD of 0.007 mg/l on the total phosphorus analysis will be satisfactory for the objective of this water quality monitoring effort. Please consult with your lab about modifying its procedures for future samples. The second e-mail attached below outlines several alternatives to achieve the lower detection limit. These comments can be included in next year's filing, if you have already submitted the 2003 monitoring results to the FERC. Thanks. Jeff Scheirer

-----Original Message-----
From: Olson, Robert W
Sent: Monday, November 24, 2003 4:00 PM
To: Scheirer, Jeffrey W
Subject: Water Quality Monitoring Report for Big Falls and Thornapple

Hi Jeff,

I sent you a copy of the results of the 2003 monitoring of water quality at Big Falls and Thornapple on October 8, 2003. Were you planning on sending me any comments on the results? If not, I will forward the results to FERC. Let me know.

Rob

Robert W. Olson
Hydro Licensing Specialist
Northern States Power Company - Wisconsin (d.b.a Xcel Energy)
1414 W. Hamilton Ave.
P.O. Box 8
Eau Claire, WI 54702
Phone #: (715) 839-1353
Fax #: (715) 839-1478
E-Mail: robert.w.olson@xcelenergy.com

Olson, Robert W

From: Roesler, Craig P [Craig.Roesler@dnr.state.wi.us]
Sent: Wednesday, March 26, 2003 9:21 AM
To: Scheirer, Jeffrey W
Subject: RE: Total phosphorus for Flambeau Hydro LLC

I think the 0.007 LOD would be o.k.

Craig Roesler
Water Quality Biologist, Upper Chippewa Basin
Wisconsin Dept. of Natural Resources
10220N State Hwy. 27
Hayward, WI 54843
phone: 715-634-9658 ext. 3522
fax: 715-634-9232
e-mail: roeslc@dnr.state.wi.us

-----Original Message-----
From: Scheirer, Jeffrey W
Sent: Tuesday, March 25, 2003 1:10 PM
To: Roesler, Craig P
Subject: FW: Total phosphorus for Flambeau Hydro LLC

Craig, More on the LOD for P analysis... (see message below from State Lab of Hygiene). My original recommendation for LOD = 0.005 mg/l was intended for consistency in reporting annual results of total phosphorus analyses at the 7 Flambeau River hydropower projects owned by Flambeau Hydro, Dairyland Power, and Xcel Energy. Xcel is the only licensee monitoring phosphorus at this time, and you should have those lab reports submitted to date for Big Falls and Thornapple.

SLH outlined three options:

1. accept an LOD = 0.007 mg/l (presently attainable by one commercial lab).

2. SLH would seek approval from their Board to perform testing for industrial facilities with LOD = 0.005 mg/l (we would clarify that the results are not used "for compliance purposes" related to a discharge permit).

3. a commercial lab may need to adjust their calibration range to achieve LOD = 0.005 mg/l.

Let me know your preference. In any case, I will ask Xcel about LOD and LOQ for the P analyses they've reported since ~1997.

-----Original Message-----
From: Bowman, George [<mailto:gtb@mail.slh.wisc.edu>
mailto:gtb@mail.slh.wisc.edu]
Sent: Tuesday, March 25, 2003 10:47 AM
To: Scheirer, Jeffrey W
Cc: 'Steve Loeffler'; Sonzogni, William
Subject: Total phosphorus for Flambeau Hydro LLC

Jeff,

I spoke to Steve Loeffler today regarding total phosphorus testing. Steve, with the help of US Filter-Enviroscan, has been trying to find a commercial lab in Wisconsin that can achieve the 0.005 mg/L total phosphorus target detection limit (LOD) for his FERC Projects (project #s 2640, 2421, 2395 & 2473). Northern Lake Services can achieve a LOD of 0.007 mg/L, which is the only lab he can find that can come close to the target level. Our total phosphorus LOD at the State Lab of Hygiene is 0.005 mg/L. However, we are not currently authorized by our Board to perform testing for industrial facilities, particularly for compliance purposes. Consequently, we cannot help Flambeau Hydro unless we get permission from our Board.

I suggested that Steve speak with you to see if 0.007 mg/L would satisfactorily meet the data quality objectives for the FERC projects. To the best of my knowledge, Northern Lake Services is using similar technology (flow injection analysis) for the total phosphorus testing as we use here at the SLH. There may be some slight differences between our laboratories in regards to calibration technique. However, for the most part they are very similar.

If you decide you need the 0.005 mg/L LOD, a commercial lab may need to adjust their calibration range to achieve the lower LOD or we will have to seek approval from our Board to accept the samples. Please feel free to contact me at 608-224-6279 if you need any assistance.

George Bowman
Chemist Management Supervisor

Inorganic Chemistry Unit
State Laboratory of Hygiene
2601 Agriculture Drive, P.O. Box 7996
Madison, WI 53707-7996
(608)224-6279

Olson, Robert W

From: Olson, Robert W
Sent: Monday, April 14, 2003 8:48 AM
To: Scheirer, Jeffrey W
Subject: RE: Water quality monitoring

Jeff,

I checked with our lab to determine the detection limit for phosphorus using EPA Method 365.3. The detection limit is 0.01 mg/L P. I was not aware of your recommendation for a detection limit of 0.005 mg/l.

Rob

-----Original Message-----
From: Scheirer, Jeffrey W [mailto:Jeffrey.Scheirer@dnr.state.wi.us]
Sent: Thursday, March 27, 2003 2:44 PM
To: Olson, Robert W
Subject: Water quality monitoring

Rob, DNR and North American Hydro are in post-licensing consultation on water quality monitoring plans for NAH's four hydro projects on the Flambeau River near Park Falls. NAH's license articles are similar to Xcel's requirements at Big Falls and Thornapple. For Xcel's 3 annual phosphorus samples we recommended that a certified laboratory should use analytical procedures that would yield a detection limit of 0.005 mg/l (see my 7/31/1997 letter to Lloyd). We made the same recommendation to NAH so that results would be comparable throughout the river system. NAH could not find a commercial laboratory that is able to report a detection limit of 0.005 mg/l for total phosphorus. This complication prompted us to review the results of the analyses by Xcel's Minneapolis Testing Lab that you submitted to date. The limit of detection for total phosphorus was not included on the internal memos from T. M. Leverentz to you. The memos do include reference to EPA Method 365.3, but I do not have easy access to that procedure manual. Could get back to me with the detection limit that Xcel's lab reports for its total phosphorus analysis. The purpose of the phosphorus is to detect changes in low level nutrient concentrations, but we may need to revise our recommendation if the labs can't achieve that standard. Thanks. Jeff Scheirer.