Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

ORIGINAL

March 28, 2000

FERC Project Nos. 2525, 2595, 2522, 2560, & 2581

030 026
041 049 025

Mr. David P. Boergers, Secretary
Federal Energy Regulatory Commission
Mail Code DTCA, HL 21.3
888 First Street, N.E.
Washington D.C. 20426

Dear Secretary Boergers:

Peshtigo River Hydroelectric Projects Dissolved Oxygen Deficiencies

The following is information is in response to a November 15, 1999 Federal Energy Regulatory Commission (FERC) letter concerning dissolved oxygen (DO) deficiencies identified during the summer of 1999 at the Wisconsin Public Service Corporation (WPSC) Caldron Falls (FERC #2525), High Falls (FERC #2595), Johnson Falls (FERC #2522), Potato Rapids (FERC #2560), and Peshtigo (FERC #2581) Hydroelectric Projects. An extension to the assigned February 11, 2000 response date (to March 31, 2000) was requested by WPSC on January 28,2000 (see Appendix 1).

As per FERC response requirements, enclosed in Appendix 1 is consultation correspondence with the U.S. Fish & Wildlife Service and Wisconsin Department of Natural Resources (WDNR) regarding our proposed water quality compliance plan. The U.S. Fish & Wildlife Service provided no comments on the proposed plan. WPSC responses to the comments provided by WDNR are also included in Appendix 1.

WPSC has completed an in-depth analysis of the identified DO deficiencies and potential project modifications to ensure compliance with standards in the future. Following are the subject areas included in this response:

- Documentation of the investigation results concerning the accuracy of data previously submitted. Methods for minimizing future calibration and/or equipment operation problems are also addressed.
- Discussion concerning the minimal effects the Caldron Falls peaking operation has on downstream DO levels.

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- Responses to additional Federal Energy Regulatory Commission (FERC) conclusions in the November 15, 1999 letter.
- A plan to ensure compliance with DO standards in the future.

Data Collection Accuracy and Improvements

A more in-depth analysis of the DO monitoring data for the Peshtigo River Hydroelectric Projects for the summer of 1999 resulted in the following conclusions:

1) The precision of the instruments utilized in the monitoring for the summer of 1999 is plus or minus 0.2 Mg/L (See Appendix 2).

2) Much of the data collected in the summer of 1999 is erroneous due to calibration errors and degradation of the dissolved oxygen sensors due to age (See Appendix 2).

Erroneous data can be distinguished by comparing the last datasonde reading for each monitoring period with the first reading of the next monitoring period taken by a newly calibrated and cleaned datasonde. If the two readings vary by more than 0.2 Mg/L (the precision of the instrument according to Hydrolab) the datasonde has lost calibration. As a result, for future monitoring WPSC will also conduct a post-calibration of the datasonde at the end of each monitoring period to determine if the equipment has lost calibration. If loss of calibration occurs, erroneous data can be adjusted utilizing the post calibration data.

To minimize the potential for future field measurement, equipment, and/or calibration caused data inaccuracies in the future, WPSC will:

- Replace and upgrade monitoring equipment to ensure more accurate data recovery.
- Adapt calibration protocol practices to exceed standard equipment supplier procedures.
- Adjust and add additional monitoring locations to gather data that more accurately reflects the DO levels found in the Peshtigo River system.
- Evaluate field data and make warranted adjustments before submittal.

Caldron Falls Downstream Effects

The November 15, 1999 FERC letter included the following conclusions regarding the potential effects the Caldron Falls Project was having on downstream hydroelectric project water quality:

A review of your data indicates water is drawn into the Caldron Falls intake that is well below the 5 Mg/L State DO standard. The low DO water is passed through the turbines and released downstream. As such, you have low DO water entering the next reservoir. This creates a situation similar to the Caldron Falls intake where low DO water is drawn into the intake at the High Falls Project and released downstream. This scenario is similar at the downstream project reservoirs and the intakes.

Since the Caldron Falls Project is operated in a peaking mode during the summer months, restraining the natural flow of water for peaking operations for power purposes has obviously had an effect on downstream water quality.

Operating the Caldron Falls Project in a peaking mode did not result in any material difference to the water quality of downstream hydroelectric projects during the summer of 1999 when compared to a run-of-river operation. In fact, 66% of the DO deficiencies occurred when the Caldron Falls Project was being operated run-of-river due to low river flows. According to the graphs enclosed as Appendix 3, an average of 154 cubic feet per second (cfs) was being passed during run-of-river operations. A minimum dissolved oxygen content of 4.3 Mg/L was measured during the run-of-river operation periods.

When operating in a peaking mode the periods of low DO measurements occurred when the units were not generating (See Appendix 3). During these periods, the only water that was passed downstream is approximately 25-cfs leakage through the wicket gates and 25-cfs being passed through a sluice gate.

The High Falls Reservoir has a volume of 15,810 acre-feet. Assuming, a continuous run-of-river 154 cfs flow from Caldron Falls Project, it would take 52 days to completely exchange the water in the High Falls reservoir. Once all of the water was exchanged in the reservoir, with an inflow dissolved oxygen level at a minimum of 4.3 Mg/L, assuming no aeration, the inflow alone could not significantly reduce the dissolved oxygen levels in the reservoir to the levels measured (<3 Mg/L) in the outflow of High Falls. (Note: Most of the Caldron Falls DO measurements recorded for the monitoring period were above State standards.) In addition, when the lowest period of dissolved oxygen levels for the High Falls reservoir were measured (August 3, 1999), the outflow DO levels from the Caldron Falls Project was measured at 5.21 Mg/L or above.

Therefore, it was not physically possible for the water with low DO levels released during Caldron Falls Project peaking operations to materially influence the water quality in High Falls reservoir to the levels recorded in the summer of 1999. This conclusion is further justified by the results of periodic dissolved oxygen readings

taken by WPSC approximately ¾ mile downstream from the Caldron Falls Project tailwater monitoring point at the Parkway Road Bridge. The DO readings taken at the Parkway Road bridge were all above State standards when DO measurements in the High Falls Project tailwater area were as low as 2.7 Mg/L.

At this time it is unclear why the DO measurements in the High Falls reservoir were low. The low flow in the Peshtigo River system could have contributed. Another possible contributing factor may be because of the large increase in weed growth in the reservoir areas near the High Falls dam. Prior to the 1990s the reservoir was drawn down in the spring. The annual spring drawdown was eliminated at the request of the Wisconsin Department of Natural Resources prior to issuance of the new High Falls FERC license. The High Falls reservoir drawdowns prior to spring ice out helped keep weed growth in the shallow bay areas under control. These bays are now heavily infested with weeds and detritus that may be contributing to a higher biochemical oxygen demand and subsequently a lowering of the DO in the vicinity of the dam. This phenomenon will be investigated by WPSC during the periods of high temperatures and low river flows during the next two years.

Responses to Additional 11/15/99 Letter Conclusions

Following are responses to additional conclusions included in the November 15, 1999 letter:

> *Based upon our review of the available information, we have concluded the following for each project during the 1999-monitoring season:*
>
> *Potato Rapids Project: violated article 406 for 24 days (July 26; August 1, 4, 19-24, 26-28, and 30-31; and September 1-10)*

Only the DO deficiencies identified on July 26, August 1, and August 9 were measured in the Potato Rapids tailwater area. The remaining deficiencies were measured in the Potato Rapids reservoir and therefore, were not the result of hydroelectric project operations.

> *According to water column profiles taken in several of the reservoirs, it appears many of the reservoirs stratify creating situations where the DO concentration of water just 3 meters below the surface is typically below 5 mg/L.*

Water column profiles were taken in 1999 only in the High Falls reservoir. Previous information submitted in an August 25, 1999 WPSC letter was confusing and most likely led to this incorrect conclusion.

Dissolved Oxygen Compliance Plan

The water quality monitoring plan for the Peshtigo River hydroelectric projects will continue to be implemented with the following enhancements:

All Projects:

- Improve monitoring equipment/implement refined calibration practices - WPSC will continue to use upgraded and new Hydrolab Equipment for water quality data gathering. In addition, WPSC will supplement the use of continuous monitoring equipment with handheld monitor data gathering by hydro operations personnel. Hydro operations personnel will sample the monitoring location each day at two or three day intervals (corresponding to their scheduled work at the hydroelectric projects.) The supplemental data will be gathered to identify drastic changes in DO levels that could occur during the seven to ten day Hydrolab placement periods.
- Complete DO monitoring for two more years.
- Implement activities annually to mitigate low DO levels based on calendar dates to be established by the monitoring that will take place over the next two years - Mitigation activities will be implemented during 2000 and 2001 when a downward trend of DO levels is observed during monitoring activities. WPSC will implement proposed mitigation measures when DO levels continually reach 5.5 Mg/L for the Caldron Falls, High Falls, Potato Rapids, and Peshtigo Projects and 6.5 Mg/L for the Johnson Falls Project (DO standards are 5 Mg/L and 6 Mg/L respectively.

Caldron Falls

- Aerate powerhouse intake to improve DO levels being passed from the reservoir into the turbines - WPSC will aerate at the Caldron Falls head gate, into the access tunnel of the penstocks. This will be accomplished with two air compressors (one for each penstock) that are each capable of injecting 14 cubic feet per minute of air. Piping will deliver the air to a depth of 27 feet or three feet from the bottom of the penstock and approximately three feet within the opening of the penstock. Existing air compressor equipment that is used in the winter to prevent dam icing will be modified to allow aeration operation beginning June 15, 2000.
- Install a second tailwater area monitor at the Parkway Road Bridge.
- Upon identification of continuing low DO levels (if they occur after the initiation of aeration) release water from Caldron Falls dam until an alternative solution can be implemented.

High Falls

- Relocate the tailwater monitor to the High Falls Road Bridge.
- Implement a monitoring program to assess the potential low DO problems and causes in the reservoir.
- Investigate and develop a turbine venting procedure by June 15, 2000 to satisfy identified DO deficiencies.
- As part of a turbine replacement project, evaluate, design, and develop costs for an aeration turbine by the end of year 2000 - Based upon the monitoring results and engineering studies determine effectiveness and feasibility of the new aeration turbine installation.
- Upon identification of continuing low DO levels (if they occur after the initiation of turbine venting) pass water from the High Falls dam until an alternative solution can be implemented.

Johnson Falls

- Investigate and develop a turbine venting procedure by June 15, 2000 to satisfy identified DO deficiencies.
- Upon identification of continuing low DO levels (if they occur after initiation of turbine venting) pass water from the Johnson Falls dam until an alternative solution can be implemented.

Potato Rapids

- Investigate and develop a turbine venting procedure by June 15, 2000 to satisfy identified DO deficiencies.
- Upon identification of continuing low DO levels (if they occur after initiation of turbine venting) monitor DO levels at the confluence of the powerhouse and spillway channels, if low DO levels exist at that location, pass water from the Potato Rapids dam until an alternate solution can be implemented.

Peshtigo

- Investigate and develop a turbine venting procedure by June 15, 2000 to satisfy identified DO deficiencies.
- Upon identification of continuing low DO levels (if they occur after initiation of turbine venting) pass water from the Peshtigo dam until an alternative solution can be implemented.

If you have any questions, please contact Greg Egtvedt at (920) 433-5713.

Sincerely,

Charles A. Schrock
Senior Vice President – Energy Supply
Telephone (920) 433-5515

Enclosure

Appendix 1

Documentation of Consultation

bcc - B E Crocker - CRI
R W Edwards - D2
G W Egtvedt - A2

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700 North Adams Street
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FERC Project Nos. 2525,
2595, 2522, 2560, 2581

January 28, 2000

Mr. David P. Boergers, Secretary
Federal Energy Regulatory Commission
Mail Code: DTCA, HL 21.3
888 First Street, N.E.
Washington, D.C. 20426

Dear Secretary Boergers:

Peshtigo River Hydroelectric Projects Dissolved Oxygen Deficiencies

This is to request a time extension for responding to your November 15, 1999 request for Wisconsin Public Service Corporation (WPSC) to file a plan to ensure dissolved standards will be met for the Caldron Falls, High Falls, Johnson Falls, Potato Rapids, and Peshtigo Hydroelectric Projects. The current response deadline is February 11, 2000. WPSC requests the response deadline be extended to March 31, 2000.

WPSC has determined the dissolved oxygen problems associated with the Peshtigo River hydroelectric projects are more complicated than what was initially presented in our earlier response letters. The preliminary results of our investigations were presented to Bob Fletcher of Federal Energy Regulatory Commission (FERC) staff on January 20, 2000. Following are the subject areas being evaluated by WPSC as part of the Peshtigo River dissolved oxygen issue:

- 1999 data verification and evaluation.
- Monitoring equipment reliability, calibration, and locations.
- Mitigation (operations and/or equipment) alternatives investigations.
- Monitoring plan amendments.

Extension of the response deadline to March 31, 2000 will:

- allow time for WPSC to finalize our draft plan,
- give consulting agencies a 30 day draft plan comment period,
- afford WPSC final proposed plan preparation time, and
- provide FERC staff time to review the proposed plan prior to when it will be needed for implementation in 2000.

If you have any questions, please do not hesitate to call Greg Egtvedt at (920) 433-5713.

Sincerely,

Charles A. Schrock
Senior Vice President - Energy Supply
Telephone: (920) 433-5515

Wisconsin Public Service Corporation
responses to
Wisconsin Department of Natural Resources
February 22, 2000 comments

Comments Pertaining to All Projects

You mention the use of improved monitoring equipment. What type of equipment are you planning on using? Will this equipment allow you to get real time DO data?

Response #1: Wisconsin Public Service Corporation (WPSC) will continue to use upgraded and new Hydrolab Equipment for water quality data gathering. Specifically we will be using eight Hydrolab Model Datasonde 3's and eight Hydrolab Model Minisonde 4a's. Use of Hydrolab equipment is an efficient and effective method for monitoring multiple locations. There is no need and/or added value for using real time equipment as recommended by the Department of Natural Resources (DNR) for the Peshtigo River hydroelectric projects. The Hydrolab equipment measures and records dissolved oxygen (DO) levels when they occur. The remote locations of the monitoring locations would not allow more efficient data retrieval than with continued use of Hydrolab equipment. In addition, acquisition and installation of new equipment is an unnecessary expense and not possible under the project schedule. In response to the DNR's concern regarding the frequency of data retrieval (seven to ten days), WPSC will supplement use of continuous monitoring equipment with handheld monitor data gathering by hydro operations personnel. Hydro operations personnel will sample the monitoring locations each day at two or three day intervals (corresponding to their scheduled work at the hydroelectric projects.)

The proposed plan indicates that mitigation activities will be implemented during 2000 and 2001 when a downward trend of DO levels is observed during monitoring activities. Fluctuations in DO levels occur on a daily basis and a 'downward trend' in DO may not mean that levels are falling below the compliance standard. It is imperative that mitigation measures take place to insure that DO levels do not fall below the compliance standards. Your proposed plan should state that mitigation measures would be implemented to insure that state water quality compliance standards for DO are met at all times. The location of the tailwater-monitoring device for Caldron Falls was insisted upon by the WDNR and does not accurately represent the amount of dissolved oxygen being released into the High Falls reservoir.

Response #2: WPSC concurs with DNR regarding the importance that water quality standards be met continuously met for the Peshtigo River hydroelectric projects. DNR incorrectly assumed in their response that WPSC intends to initiate mitigation activities upon identification of DO levels that are less than standards. Review of the 1999 data demonstrates that (when it occurs) the downward trend of DO levels can be determined. WPSC will implement proposed mitigation measures when DO levels continually reach 5.5 MgL for the Caldron Falls, High Falls, Potato Rapids, and Peshtigo Projects and 6.5 MgL for the Johnson Falls Project (DO standards are 5 MgL and 6 MgL respectively.)

Caldron Falls

The proposed plan states that you will aerate the powerhouse intake to improve DO levels being passed from the reservoir into the turbines. How do you actually plan on doing this aeration? Is the intent of this aeration the destratification of the reservoir are you just tying to aerate the forebay area? We would like to see the plans on how this aeration is actually going to be accomplished. Your proposed plan also needs to include a timeline as to when this aeration system will be online. We do not want to see DO Compliance violations again this year, therefore we want to see any mitigation system in-place and working by the middle of June.

Response #3: WPSC concurs with DNR regarding the importance of compliance with DO standards in 2000. WPSC will aerate at the Caldron Falls head gate, into the access tunnel of the penstocks. This will be accomplished with two air compressors (one for each of penstock) that are capable of injecting 14 cubic feet per minute of air. Piping will deliver the air to a depth of 27 feet or three feet from the bottom of the penstock and approximately three feet within the opening of the penstock. Existing air compressor equipment that is used in the winter to prevent dam icing will be modified to allow aeration operation beginning June 15, 2000.

The proposed plan mentions a second tailwater monitor below the Caldron Falls Project at the Parkway Road Bridge. Why do you feel that this gage is needed and how will this data be used? We have no problem with additional monitoring, however, we are interested in why you feel an additional gage is needed in this area.

Response #4: The second monitoring location is in response to comments received in the November 15, 1999 FERC letter. In the letter, FERC commented that the situation occurring in the High Falls reservoir was potentially due to the inflow of low DO water from the Caldron Falls tailwater. Therefore, it is important for WPSC to collect accurate DO data in the area where the tailwater of Caldron Falls meets the High Falls reservoir to document the conditions that occur.

The proposed plan states that upon identification of low DO levels, water will be released from the Caldron Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Response #5: See Response #1

Releases from the Caldron falls Dam may not prevent DO standards violations in the pool immediately below the Caldron Falls Powerhouse. As we have mentioned the past, this pool provides important habitat for fish in this reach of the Peshtigo River. Your proposed plan should include provisions to insure that DO violations do not occur in this area of the river.

Response #6: The DNR has provided no study documentation that demonstrates the Caldron Falls pool area provides fish habitat during the summer season. However, WPSC plans on beginning aeration of the Caldron Falls powerhouse intake aeration system annually on June 15 to prevent the low DO levels that have occurred in the past. The primary cause of past low DO levels in the Caldron Falls tailwater pool area has been from low DO reservoir water leaking through the generating units when they are not operating. The aeration system is proposed to eliminate this problem. Proposed monitoring in the pool area immediately downstream from the Caldron Falls powerhouse will record the DO levels that occur in the pool area.

<u>High Falls</u>

We feel that the High Falls Road Bridge is an acceptable location for the tailwater monitor at this project. The monitoring equipment should be located in an area that will have a continual flow of water over the unit throughout the season.

Response #7: Comment noted.

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

Response #8: WPSC hydro operations personnel will complete investigation and procedure development to implement turbine venting of generating units by June 15, 2000. The vacuum breaker valves will be opened on the turbines to accomplish venting. WPSC plans on using the generating unit used for primary operation during the summer months for turbine venting. Turbine venting procedures will be implemented as per Response #2.

The proposed plan also mentions the possibility of installing an aeration turbine at this project. Please include in the final plan the timeline for this replacement.

Response #9: The aeration turbine is currently being evaluated. Completion of the evaluation is anticipated for the end of the summer 2000. Based upon the data collected during the evaluation, a decision on the feasibility and the effectiveness of installation of an aeration turbine will be made by WPSC by the end of the year 2000.

The proposed plan states that upon identification of low DO levels water will be released from the High Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the

data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Response #10: See Response #1

Johnson Falls

Your proposed plan states that you will investigate and implement turbine venting at this project. The, proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

Response#11: See Response #8.

The proposed plan states that upon identification of low DO levels water will be released from the Johnson Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violation's actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Response #12: See Response #1.

Potato Rapids

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

Response #13: See Response #8.

The proposed plan states that upon identification of low DO levels water will be released from the Potato Rapids Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Response #14: See Response #1.

Peshtigo

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

Response #15: See Response #8.

The proposed plan states that upon identification of low DO levels water will be released from the Peshtigo Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Response #16: See Response #1.

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary
Ronald W. Kazmierczak, Regional Director

P.O. Box 208
101 North Ogden Road
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February 22, 2000

Mr. Greg Egtvedt
Wisconsin Public Service Corporation
P.O. Box 19002
Green Bay, WI 54307-9002

Subject: Comments on Peshtigo River Hydro Projects (FERC Nos. 2525, 2595, 2522, 2560 and 2581) Dissolved Oxygen Deficiencies

Dear Greg:

We have reviewed your proposed compliance plan to correct dissolved oxygen (DO) deficiencies at the Peshtigo River Hydro Projects and have the following comments.

Comments pertaining to all projects

You mention the use of improved monitoring equipment. What type of equipment are you planning on using? Will this equipment allow you to get real time DO data?

The proposed plan indicates that mitigation activities will be implemented during 2000 and 2001 when a downward trend of DO levels is observed during monitoring activities. Fluctuations in DO levels occur on a daily basis and a 'downward trend' in DO may not mean that levels are falling below the compliance standard. It is imperative that mitigation measures take place to insure that DO levels do not fall below the compliance standards. Your proposed plan should state that mitigation measures would be implemented to insure that state water quality compliance standards for DO are met at all times.

Caldron Falls

The proposed plan states that you will aerate the powerhouse intake to improve DO levels being passed from the reservoir into the turbines. How do you actually plan on doing this aeration? Is the intent of this aeration the destratification of the reservoir or are you just trying to oxygenate the forebay area? We would like to see the plans on how this aeration is actually going to be accomplished. Your proposed plan also needs to include a timeline as to when this aeration system will be online. We do not want to see DO compliance violations again this year, therefore we want to see any mitigation system in-place and working by the middle of June.

The proposed plan mentions a second tailwater monitor below the Caldron Falls Project at the Parkway Road Bridge. Why do you feel that this gage is needed and how will this data be used? We have no problem with additional monitoring, however we are interested in why you feel an additional gage is needed in this area.

The proposed plan states that upon identification of low DO levels, water will be released from the Caldron Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Releases from the Caldron Falls Dam may not prevent DO standards violations in the pool immediately below the Caldron Falls Powerhouse. As we have mentioned in the past, this pool provides important habitat for fish in this reach of the Peshtigo River. Your proposed plan should include provisions to insure that DO violations do not occur in this area of the river.

High Falls

We feel that the High Falls Road Bridge is an acceptable location for the tailwater monitor at this project. The monitoring equipment should be located in an area that will have a continual flow of water over the unit throughout the season.

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

The proposed plan also mentions the possibility of installing an aeration turbine at this project. Please include in the final plan the timeline for this replacement.

The proposed plan states that upon identification of low DO levels water will be released from the High Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Johnson Falls

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

The proposed plan states that upon identification of low DO levels water will be released from the Johnson Falls Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a

level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Potato Rapids

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

The proposed plan states that upon identification of low DO levels water will be released from the Potato Rapids Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Peshtigo

Your proposed plan states that you will investigate and implement turbine venting at this project. The proposed plan does not include any timeline as to when this will be done. The plan should include dates as to when you propose to have turbine venting implemented at this project and provide more details as to how this will be done, which turbines will be vented, etc. Please provide these details in your final plan.

The proposed plan states that upon identification of low DO levels water will be released from the Peshtigo Dam until an alternative solution can be implemented. Will the monitoring equipment that you plan on using allow you to retrieve real-time DO levels? Last year there was a delay of a week to ten days between the time the DO violations actually occurred and when the data was downloaded from the monitoring equipment. There is DO monitoring equipment available that will give you real-time data. This type of monitoring equipment must be used to allow you to determine when DO levels are at such a level that mitigation measures need to be implemented. Your final plan should contain provisions for using real-time DO monitoring equipment to identify low DO levels as they occur.

Please send us a copy of the final study plan you submit to the Federal Energy Regulatory Commission. If you have any questions on these comments feel free to contact me.

Sincerely,

Thomas F. Thuemler
Regional FERC Coordinator

cc: Greg Sevener
Jim Fossum – U. S. Fish and Wildlife Service

Wisconsin Public Service Corporation
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700 North Adams Street
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February 14, 2000

FERC Project Nos. 2525,
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Tom Thuemler
Department of Natural Resources
101 N. Ogden Road
P.O. Box 127
Peshtigo, WI 54157

Dear Mr. Thuemler:

Peshtigo River Hydroelectric Projects Dissolved Oxygen Deficiencies

This is to request Wisconsin Department of Natural Resources comments regarding a plan to correct Peshtigo River hydroelectric projects dissolved oxygen deficiencies. The following plan is in response to a November 15, 1999 Federal Energy Regulatory Commission (FERC) letter concerning dissolved oxygen (DO) deficiencies identified during the summer of 1999 at the Wisconsin Public Service Corporation (WPSC) Caldron Falls (FERC #2525), High Falls (FERC #2595), Johnson Falls (FERC #2522), Potato Rapids (FERC #2560), and Peshtigo (FERC #2581) Hydroelectric Projects.

WPSC has completed an in-depth analysis of the identified DO deficiencies and potential project modifications to ensure compliance with standards in the future. Following is our proposed plan to ensure compliance with DO standards:

Dissolved Oxygen Compliance Plan

The existing water quality monitoring plan for the Peshtigo River hydroelectric projects will continue to be implemented with the following enhancements:

All Projects:

- Improve monitoring equipment/implement refined calibration practices.
- Complete DO monitoring for two more years.

- Implement activities annually to mitigate low DO levels based upon calendar dates to be established by the monitoring that will take place over the next two years. (Note: Mitigation activities will be implemented during 2000 and 2001 when a downward trend of DO levels is observed during monitoring activities.)

Caldron Falls

- Aerate powerhouse intake to improve DO levels being passed from the reservoir into the turbines.
- Install a second tailwater area monitor at the Parkway Road Bridge.
- Upon identification of low DO levels (if they occur after the initiation of aeration) release water from Caldron Falls dam until an alternative solution can be implemented.

High Falls

- Relocate the tailwater monitor to the High Falls Road Bridge.
- Implement a monitoring program to assess the potential low DO problems and causes in the reservoir.
- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- As part of a turbine replacement project, evaluate, design, and develop costs for an aeration turbine. Based upon the monitoring results and engineering studies determine effectiveness and feasibility of the new aeration turbine installation.
- Upon identification of low DO levels (if they occur after the initiation of turbine venting) pass water from the High Falls dam until an alternative solution can be implemented.

Johnson Falls

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) pass from the Johnson Falls dam until an alternative solution can be implemented.

Potato Rapids

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) monitor DO levels at the confluence of the powerhouse and spillway channels, if low Do levels exist at that location, pass water from the Potato Rapids dam until an alternate solution can be implemented.

Peshtigo

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) pass water from the Peshtigo dam until an alternative solution can be implemented.

Please provide your comments within 30 days. Thank you. If you have any questions, feel free to contact me at (920) 433-5713.

Sincerely,

Gregory W. Egtvedt
Assistant Director
Environmental Services

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Green Bay ES Field Office
1015 Challenger Court
Green Bay, Wisconsin 54311-8331
Telephone 920/465-7440
FAX 920/465-7410

March 7, 2000

Mr. Greg Egtvedt
Assistant Director
Environmental Services
Wisconsin Public Service Corporation
700 North Adams Street
P.O. Box 19002
Green Bay, Wisconsin 54307-9002

re: Peshtigo River Hydro Projects
(FERC Nos. 2525, 2595, 2560 and 2581)
Peshtigo River, Wisconsin

Dear Mr. Egtvedt:

Your letter of February 14, 2000, requested the U.S. Fish and Wildlife Service (Service) to review the draft plan for correcting dissolved oxygen deficiencies at the referenced hydroelectric projects.

Due to time, staff, and funding constraints associated with our large hydroelectric relicensing workload, the Service will not be able to review your plan.

We apologize for any inconvenience that this may cause you. If you wish to discuss this further, please call Jim Fossum of my staff at 920-465-7421.

Sincerely,

Janet M. Smith
Field Supervisor

cc: Tom Thuemler, Wisconsin DNR, Peshtigo, WI

Wisconsin Public Service Corporation
(a subsidiary of WPS Resources Corporation)
700 North Adams Street
P.O. Box 19002
Green Bay, WI 54307-9002

February 14, 2000

FERC Project Nos. 2525,
2595, 2522, 2560, & 2581

Jim Fossum
U.S. Fish & Wildlife Service
1015 Challenger Court
Green Bay, WI 54311

Dear Jim:

Peshtigo River Hydroelectric Projects Dissolved Oxygen Deficiencies

This is to request U.S. Fish & Wildlife Service comments regarding a plan to correct Peshtigo River hydroelectric projects dissolved oxygen deficiencies. The following plan is in response to a November 15, 1999 Federal Energy Regulatory Commission (FERC) letter concerning dissolved oxygen (DO) deficiencies identified during the summer of 1999 at the Wisconsin Public Service Corporation (WPSC) Caldron Falls (FERC #2525), High Falls (FERC #2595), Johnson Falls (FERC #2522), Potato Rapids (FERC #2560), and Peshtigo (FERC #2581) Hydroelectric Projects.

WPSC has completed an in-depth analysis of the identified DO deficiencies and potential project modifications to ensure compliance with standards in the future. Following is our proposed plan to ensure compliance with DO standards:

Dissolved Oxygen Compliance Plan

The existing water quality monitoring plan for the Peshtigo River hydroelectric projects will continue to be implemented with the following enhancements:

All Projects:

- Improve monitoring equipment/implement refined calibration practices.
- Complete DO monitoring for two more years.

- Implement activities annually to mitigate low DO levels based upon calendar dates to be established by the monitoring that will take place over the next two years. (Note: Mitigation activities will be implemented during 2000 and 2001 when a downward trend of DO levels is observed during monitoring activities.)

Caldron Falls

- Aerate powerhouse intake to improve DO levels being passed from the reservoir into the turbines.
- Install a second tailwater area monitor at the Parkway Road Bridge.
- Upon identification of low DO levels (if they occur after the initiation of aeration) release water from Caldron Falls dam until an alternative solution can be implemented.

High Falls

- Relocate the tailwater monitor to the High Falls Road Bridge.
- Implement a monitoring program to assess the potential low DO problems and causes in the reservoir.
- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- As part of a turbine replacement project, evaluate, design, and develop costs for an aeration turbine. Based upon the monitoring results and engineering studies determine effectiveness and feasibility of the new aeration turbine installation.
- Upon identification of low DO levels (if they occur after the initiation of turbine venting) pass water from the High Falls dam until an alternative solution can be implemented.

Johnson Falls

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) pass from the Johnson Falls dam until an alternative solution can be implemented.

Potato Rapids

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) monitor DO levels at the confluence of the powerhouse and spillway channels, if low Do levels exist at that location, pass water from the Potato Rapids dam until an alternate solution can be implemented.

Peshtigo

- Investigate and implement turbine venting to satisfy identified DO deficiencies.
- Upon identification of low DO levels (if they occur after initiation of turbine venting) pass water from the Peshtigo dam until an alternative solution can be implemented.

Please provide your comments within 30 days. Thank you. If you have any questions, feel free to contact me at (920) 433-5713.

Sincerely,

Gregory W. Egtvedt
Assistant Director
Environmental Services

Appendix 2

Hydrolab Corporation Consultation

Hydrolab Corporation
8700 Cameron Road, Suite 100
Austin, TX 78754 USA

phone: (800) 949-3766 or (512) 832-8832
fax: (512) 832-8839
email: sales@hydrolab.com
http://www.hydrolab.com

November 24, 1999

Shirley Scharff
Wisconsin Public Service Corp.
700 N Adam
Green Bay, WI 54307-9004
(920) 433-1396 ph

Dear Shirley Scharff,

Thank you expressing your displeasure with the results of the 2 MiniSonde 4a units you purchased. I appreciate your bringing these issues directly to me.

We found an anomaly with a specific manufacturer's components on the 2 MiniSonde 4a units that you sent in and replaced the components as I discussed with you on the phone. The components are PTCs (positive-temperature-coefficients). They are resistors that increase in ohms as the temperature rises. The temperature rises as additional current flows through the PTC's. They are installed to provide additional protection to the circuit. In short, they act as thermal fuses and will reset when the circuit is functioning properly.

The components that I described above had a 3 ohm drop and were expected to be at a 1 ohm drop. This caused a "brown-out" effect and caused the instruments to cut out and produce the "power loss " error messages. Normally, your MiniSonde 4a's would run down to approximately 4.2 volts but the defective components caused your MiniSonde 4a's to have an extremely short battery life. Your equipment has now been repaired and returned to you and should be functioning properly.

While I cannot apologize enough for the problems you suffered, I am glad we were able to resolve the problems you experienced. After being repaired and/or modified, your equipment was sent through our QA department and should have the reliability you once had entrusted in our equipment.

Although this may be of little solace to you for the data you lost, I do want to regain your trust in Hydrolab Corporation.

Respectfully yours,

Gary Miller
Customer Service Manager
Hydrolab Corporation

HYDROLAB

January 13, 2000

Hydrolab Corporation
8700 Cameron Road, Suite 100
Austin, TX 78754 USA

phone: (800) 949-3766 or (512) 832-8832
fax: (512) 832-8838
email: sales@hydrolab.com
http://www.hydrolab.com

Shirley Scharff
Wisconsin Public Service Corporation
Environmental Services
700 N. Adams
Green Bay, WI 54307

Dear Ms. Scharff:

This letter is written to address several of the questions about dissolved oxygen monitoring that were brought up during our discussion last week at your offices. If you would like additional information from a third party, you might check the Sable Systems web site at www.sablesys.com.

The Hydrolab Datasonde 3 and Minisonde 4a sondes that you own use a standard polarographic Clark Cell that has been in use for field situations for many years. The sensors use a gold cathode and silver anode. The potassium chloride electrolyte and electrodes are in a reservoir covered with a one mil Teflon membrane. The sensor has a flow requirement of one foot per second past the membrane. In waters where this flow requirement can not be assured, Hydrolab recommends the use of a stirrer/circulator.

Accuracy:

The stated measurement accuracy for the dissolved oxygen sensor is +/- 0.2 mg/l. This accuracy should be maintained for a period of thirty days provided that the sensor has been properly maintained and calibrated, the sensor is given an appropriate warmup time prior to taking a measurement, there has been no damage to the membrane during deployment, no air bubbles have formed under the membrane, the proper flow past the membrane is maintained, and no membrane fouling has occurred.

Membrane Issues:

One issue that came up during our discussion regarded the length of time that should be taken between changing the Teflon membrane and calibrating the instrument. It is Hydrolab's recommendation that a dissolved oxygen sensor be calibrated no sooner than twenty fours hours after a membrane change. The reason for this recommendation is that the membrane will "relax" during that period. As the membrane stretches slightly during that time, the response of the sensor will change and any calibration done prior to that time will not meet the stated accuracy of the sensor. The bias created by a calibration done prior to that twenty four hour period will be negative.

It is recognized that there will be situations where a researcher will need to calibrate a dissolved oxygen sensor and take measurements before this twenty four hour period has passed. Under these circumstances, the membrane should be changed and then the calibration should occur as long as practical after the membrane change. Generally, about 90% of the membrane relaxation takes place in the first four hours after the membrane is changed. If the calibration takes place only a few hours after a membrane change, it is recommended that the calibration be checked and altered as needed several times during the next twenty four hour period. The researcher will then alter the data collected based on the changes made in the calibration.

The negative bias associated with calibrating prior to allowing the membrane to relax is difficult to assess because several factors are involved. First, each membrane will react in a unique manner. Next, the relaxation process is not a linear process during the twenty four hour period. As stated above, about 90% of the relaxation takes place in the first four hours. Thus, the amount of time between the membrane change and the calibration can effect the bias, especially in the first few hours after the membrane change. Finally, this negative bias can be affected by the manner in which the membrane is handled during the membrane change. Some individuals stretch the membrane more than others when they change a membrane and this can affect the amount of relaxation and the time it takes to complete the relaxation process.

Older Dissolved Oxygen Electrodes:

During the operation of the dissolved oxygen sensor, the silver at the anode is consumed. The rate of consumption is related to the time of sensor operation and the concentration of the oxygen in the water. Typically, as the amount of silver is diminished to a critical level, the sensor will no longer calibrate. Prior to that time, the sensor may not be as stable and have a longer response time. Consequently, calibration accuracy for older electrodes may suffer under unattended monitoring situations. The bias may be high or low.

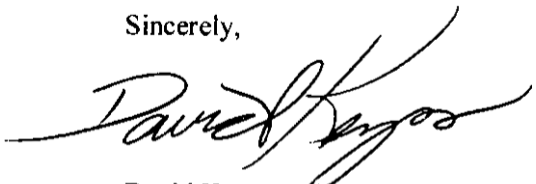
Data corrections:

When significant drift has occurred in a dissolved oxygen sensor, it is typically due to some sort of fouling. Other causes include insufficient time between a membrane change and calibration or an electronics or sensor malfunction. When the fouling is biological in nature or when it is from silt in a fairly stable system, the drift tends to occur during the entire period of deployment. Under these situations, the data can be corrected as if the drift were linear through time. If there is some indication as to when the drift occurred, a non-linear adjustment to the data can be made. For example, if the sensor was calibrated prior to the membrane becoming fully relaxed, one would expect a negative drift during the first day of deployment. Another situation could be a storm that caused high silt levels in the stream that became deposited on the sensor membrane. Under this scenario, most of the drift could be applied at that time.

In order to ascertain the drift during deployment, a post field calibration check should be completed. Prior to any cleaning or membrane change, the sonde should be set up for a calibration. Once the dissolved oxygen reading stabilizes, the concentration should be recorded. Then, the researcher should go through the process of doing a calibration and then record the new dissolved oxygen value. The difference between the two values should be the best estimate of the drift that has occurred. Once this is done, then the researcher can proceed to conduct any cleaning and maintenance needed prior to the next calibration and deployment.

I appreciate the opportunity to work with you on this issue. Please contact me or our Technical Support Program in Austin with any questions you have about Hydrolab equipment.

Sincerely,

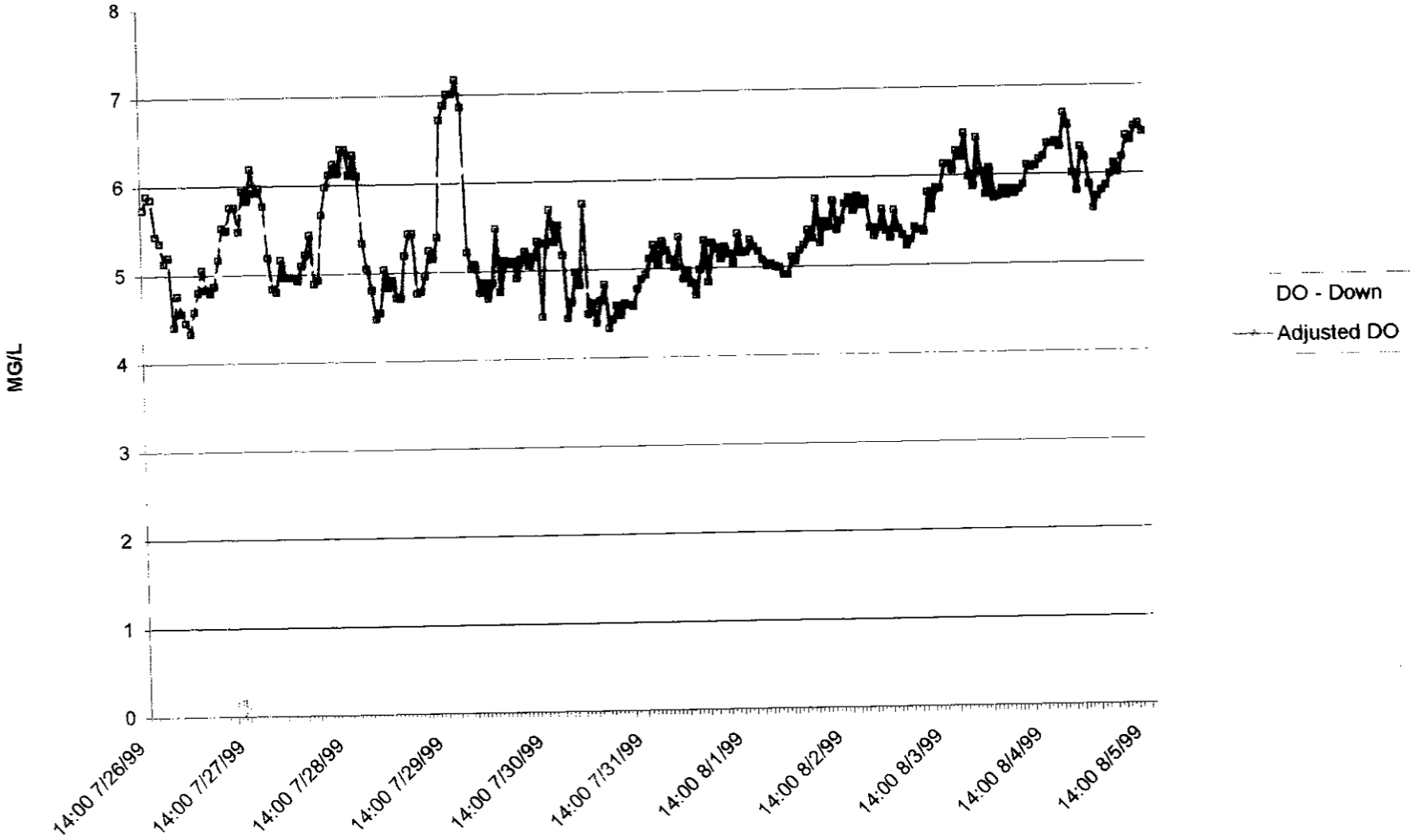


David Kamps, Ph.D.
Limnologist, Midwest Manager

Appendix 3

Caldron Falls Peaking Operation in the Summer of 1999

CALDRON - DISSOLVED OXYGEN - JULY 26 thru August 5, 1999



CALDRON GENERATION & CFS - JULY 26 thru AUG 5, 1999