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FEDERAL ENERGY REGULATORY COMMISSION

November 11, 1996

Ms. Lois D. Cashell, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Subject: Article No. 404 (Dissolved Oxygen and Temperature Monitoring Plan)  
Order Issuing License - Minor Project - Issued October 18, 1995  
Crystal Falls Hydroelectric Project; FERC Project No. 11402  
City of Crystal Falls, Michigan 012

Dear Ms. Cashell:

On behalf of the city of Crystal Falls, Michigan, we are hereby filing an original and eight copies of the above-mentioned *Dissolved Oxygen and Temperature Monitoring Plan*. The plan is being submitted in accordance with Article No. 404 of the above-mentioned project license.

Copies have been sent to those entities that were consulted on matters relating to this filing. Proof of service is also included.

Thank you for your consideration in this matter. If you have any questions, please contact Dr. Phillip Rieger at (608) 273-6380.

Sincerely,

MEAD & HUNT, Inc.



Arie DeWaal  
Senior Project Scientist

Attachments

cc: See attached list

FERC DOCUMENTED

NOV 19 1996

MEAD & HUNT, Inc.  
Telephone (608) 273-6380

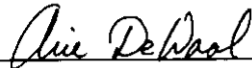
6501 Watts Road, Suite 101

Madison, Wisconsin 53719-2700  
Facsimile (608) 273-6391

## Certificate of Service

I hereby certify that I, on behalf of the City of Crystal Falls, Michigan, have this day served the foregoing documents upon each person designated on the attached distribution list.

Dated this 11<sup>th</sup> day of November, 1996.

A handwritten signature in cursive script, reading "Arie DeWaal", is positioned above a horizontal line.

Arie DeWaal  
MEAD & HUNT, Inc.

## **Distribution List**

### **Crystal Falls Hydroelectric Project (FERC Project No. 11402)**

#### ***Article No. 404***

Ms. Lois D. Cashell, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Mr. John H. Clements, Director  
Division of Project Review  
Office of Hydropower Licensing  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Mr. Tom Dean  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Mr. Walter Hagglund, City Manager  
City of Crystal Falls  
401 Superior Street  
Crystal Falls, MI 49920

Dr. Phillip Rieger  
Mead & Hunt, Inc.  
6501 Watts Road, Suite 101  
Madison, WI 53719-2700

Mr. Ashok K. Rajpal, P.E.  
Mead & Hunt, Inc.  
6501 Watts Road, Suite 101  
Madison, WI 53719-2700

Mr. Jim Fossum  
U.S. Department of the Interior  
U.S. Fish & Wildlife Service  
1015 Challenger Court  
Green Bay, WI 54311

Mr. Gary Whelan  
FERC Program Manager  
Michigan Department of Natural Resources  
Stevens T. Mason Building  
530 West Allegan  
Lansing, MI 48933

Article 404. Within 6 months of license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project.

The purpose of this monitoring plan is to ensure that streamflows below the project, as measured immediately downstream of the project tailrace, maintain the Michigan standards for DO concentration and temperature.

The monitoring plan shall include provisions for (1) monitoring of DO concentrations and temperature levels in the impoundment and downstream, with sensor locations and sampling frequently determined in consultation with the Michigan Department of Natural Resources (MDNR) and the U.S. Fish and Wildlife Service (FWS); and (2) the preparation of operating procedures developed in consultation with MDNR and FWS to address water quality conditions which deviate from the above limits.

The Licensee shall prepare the plan after consultation with MDNR and FWS. The water quality monitoring plan shall include a schedule for:

- (a) implementation of the program within 24 months from the date of issuance of this license;
- (b) consultation with MDNR and FWS concerning the results of the monitoring; and
- (c) filing the requests, agency comments, and Licensee's response to agency comments with the Commission.

The Licensee shall include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The Licensee shall allow a minimum of 30 days for the agencies to comment and make recommendations before filing the plan with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the plan. Upon Commission approval, the Licensee shall implement the DO concentration and temperature monitoring plan, including any changes required by the Commission.

# **A Plan for Monitoring Dissolved Oxygen and Temperature Levels in the Paint River in the vicinity of the Crystal Falls Hydroelectric Facility**

## **Introduction**

On October 18, 1995, the Federal Energy Regulatory Commission issued a license for the City of Crystal Falls to continue to operate and maintain the 1,000-kilowatt Crystal Falls Hydroelectric Project, No. 11402, located on the Paint River in Iron County, Michigan. This license is subject to various articles. Among those articles, Article 404 specifies that "Within 6 months of the license issuance, the Licensee shall file with the Commission, for approval, a plan to monitor dissolved oxygen (DO) and temperature levels in the Paint River downstream of the project. This report is intended to provide the plans for implementation of the DO and temperature monitoring program in accordance with Article 404.

Article 404 of the Commissions' license, requires that the water quality data (DO and temperature) would be compared to Michigan State water quality standards. According to these standards (R323.1041), the Crystal Falls hydroelectric project should not influence DO or temperature beyond specified limits as follows: a DO of at least 5 mg/l should be maintained; and a heat load shall not be received that would warm the waters at the edge of the mixing zone by more than 5°C above natural water temperatures, or greater than monthly maximums.

A draft plan for monitoring DO and temperature was prepared and forwarded to the appropriate resource agencies for review in February, 1996. The Michigan Departments of Natural Resources and Environmental Quality prepared a joint reply and the Fish and Wildlife Service concurred with their comments – these entities are hereinafter referred to as the "Agencies." A copy of the draft plan, and the Agencies' comments are attached. The draft plan intended to monitor dissolved oxygen and temperature in the Crystal Falls impoundment and at a downstream location only during the times when the activities related to the proposed Barrier Net Effectiveness Study would be in operation. This allowed the city to combine efforts and maintain study costs for water quality monitoring to within the FERC's proposed \$15,000 cost estimate (FERC Environmental Assessment, page 65). This original plan has been substantially revised as follows to reflect the Agencies' comments and due to the fact that the original Barrier Net Effectiveness Study plan has also been substantially revised.

## **Study Plan**

We propose to continuously monitor both temperature and DO in a mid-depth placement approximately 500 feet below the dam in the Paint River during the months of June through September. Additionally, temperature will be continuously monitored at a mid-depth placement in the Paint River approximately 500 feet upstream of the Crystal Falls impoundment area. A one-meter-increment profile of temperature and DO will be obtained from the deepest part of the impoundment once a week during the months of June through September, and twice during the month of February.

The water quality monitoring plan is proposed to take place in conjunction with the Barrier Net Effectiveness Plan. That is, the site visits used to perform weekly fisheries studies for the effectiveness of the barrier net would be also used to download and recalibrate the continuous monitoring probes, and to conduct weekly profiles of the impoundment. Thus, it is proposed to conduct the water quality monitoring plan during the same two years that are proposed for the Barrier Net Effectiveness Study.

## **Monitoring Equipment**

We propose to use Hydrolab DataSonde III probes for temperature and DO monitoring. The probes would be calibrated according to the manufacturers recommended procedure every two weeks throughout the continuous monitoring period. The continuous monitoring probes would be recalibrated bi-weekly throughout the deployment period and the profiling probe would be calibrated prior to each sample.

## **Schedule**

Continuous monitoring would record temperature and DO hourly during the deployment period. The profile of the impoundment would produce instantaneous data. It is proposed to conduct water quality monitoring for a period of two years. If at no time within this two year period the water quality standards have been exceeded the Crystal Falls Hydroelectric Project should be considered as not having the potential to violate state water quality standards and water quality monitoring would be discontinued. If, however, at any time during the monitoring period, water quality standards are substantially exceeded, the applicant shall inform the Agencies of the deviation from the established limits and, in consultation with the Agencies, the applicant may modify the water sampling procedures to more closely verify the extent and source of the water quality problem and success of any mitigation procedure.

## **Reporting and Compliance**

It is intended to download temperature and DO data from the continuous monitoring

probes weekly throughout the deployment period. At each download, it will be determined if there has been a violation of the water quality standards during the preceding week, and if this violation is still occurring; if so, the Agencies would be immediately notified by telephone and procedures to mitigate the violation would be attempted. If there is a violation of the 5 mg/L dissolved oxygen level at the downstream location, it is proposed that the most likely procedure would be to implement spillage from the impoundment surface waters to aerate the water below the dam. If this plan is invoked, the downstream dissolved oxygen levels would be downloaded daily to monitor the success of this effort. The amount of spillage would be modified according to the success of this effort in increasing the DO as determined by the daily monitoring. The Agencies would be kept apprised of this effort. We have no plan, nor has the Agencies offered a solution, to mitigate any violation of the Delta Temperature Standard. It is proposed to report any violation of the Delta Temperature Standard to the Agencies immediately upon its discovery and at that time determine what, if any, solution might exist to the problem.

In addition to the above reporting procedures, we would prepare an annual report to the FERC and the Agencies. This report would include a computer diskette with all raw data from the continuous and weekly monitoring efforts. In addition to the raw data, a summary of the data by daily average, minimum, and maximum DO, and temperature at the continuous monitoring sites and weekly profiles from the impoundment would be provided. This report would also include an upstream/downstream comparison of the Temperature Delta Standard.

### **Agency Comments**

The agency recommendations have been accommodated into our revised plan as follows:

- a) Monitoring locations and equipment. We have added a site upstream for temperature measurements. We intend to calibrate our probes according to the manufacturers recommended procedure. We do not understand their request for a 70% data quality goal – all continuous monitoring probes would be recalibrated bi-weekly regardless of their accuracy to a calibration standard. We have agreed to monitor at one-meter intervals within the deepest part of the impoundment once a week from June through September.
- b) Monitoring Schedule. We propose to monitor temperature and DO only during the months of June through September. It is unlikely that DO would be less than 5 mg/L during May or October and continuous monitoring during winter months is not feasible due to extreme weather conditions which would make access and equipment malfunctioning a problem. We will agree to provide a temperature and DO profile of the impoundment twice during the month of February to determine if there exists a potential for ice cover to deplete DO within the impoundment during the period of this event's greatest likelihood.

c) Data Reporting. We propose to provide an annual report to the FERC and the Agencies. This report would include a computer diskette of all raw data and a graphical and tabular presentation of daily minimum, maximum, and average temperature and DO values as measured during the previous year. This report will also note any violations of the Delta Temperature Standard or DO violations and rationale for any lapses in the data. We do not propose to measure any other water quality parameters as suggested such as stream flow, chlorophyll level, or instream chemistry. We do not understand what is meant by the recommendation for "instantaneous" comparisons of temperature values.

d) Detection and Notification. Data would be downloaded weekly from the continuous monitoring probes (at the time of the weekly temperature/oxygen profile of the impoundment). The comment of the Agencies seems to suggest that an hourly downloading and reporting is preferred but we do not understand how this is possible. Other than the annual report described above, no other reports would be made to the agency unless there is a recorded violation of the water quality standards. If such a violation in either the Delta Temperature Standard or the 5 mg/L DO limit is found, then the Agencies would be immediately notified by telephone and a remediation or mitigation procedure would be invoked. We would, as suggested, notify both the Chief of Surface Water Quality Division of the Michigan Department of Environmental Quality, and the FERC Program Manager for the Michigan Department of Natural Resources within one working day of any detected water quality standard violations.

e) Mitigative measures. If water quality standards are violated we intend to notify and work with the Agencies to mitigate those violations. The exact nature of the mitigation measure would depend upon the significance of the violation and the environmental conditions contributing to or otherwise affecting the ability of the applicant to remediate or mitigate the violation.

f) Initial monitoring period. We disagree with the requirement for long term monitoring. An initial period of two years should be adequate to assess whether there exists the potential for significant effects of the hydropower facility on the Paint River water quality. Furthermore, the FERC Environmental Assessment concluded that the water quality monitoring plan should cost about \$15,000. It is our estimate that the plan we have proposed will somewhat exceed that estimate. To extend the monitoring plan beyond two years would substantially and unreasonably exceed that estimate. Extended monitoring is regarded as necessary only if the initial two-year monitoring indicates that there is potential for significant water quality degradation from the hydropower operations that warrant further monitoring to develop and/or monitor long-term mitigation measures.

**NATURAL RESOURCES  
COMMISSION**

JERRY C. BARTNIK  
KEITH J. CHARTERS  
LARRY DEVUYST  
L. THORNTON EDWARDS, JR.  
PAUL EISELE  
DAVID HOLLI  
WILLIAM U. PARFET

STATE OF MICHIGAN



JOHN ENGLER, Governor

**DEPARTMENT OF NATURAL RESOURCES**

STEVENS T MASON BUILDING, PO BOX 30026, LANSING MI 48906-7526

K. L. COOL, Director

Refer to:  
4202.2.76

**REPLY TO:**

FISHERIES DIVISION  
PO BOX 30446  
LANSING MI 48906-7946

April 1, 1996

Mr. Arie DeWaal  
Senior Project Scientist  
Mead & Hunt Inc.  
6501 Watts Road, Suite 101  
Madison, WI 53719-2700

Re: City of Crystal Falls Hydroelectric Project (FERC No. 11402)  
Articles 404, 408, 409, 410 and 414 Plan Comments

Dear Mr. DeWaal:

The Department of Natural Resources (Department) has reviewed the plans for Articles 409, 410 and 414, dated February 16, 1996, and received on February 22, 1996. The Departments of Natural Resources and Environmental Quality have reviewed the plan for Article 404, dated February 20, 1996, and received on February 23, 1996. We have the following comments on these plans:

- 1) Article 409 - The Department has reviewed your proposed Bald Eagle Management Plan as outlined in your February 16, 1996 letter. The Department strongly concurs with your incorporation of the U.S. Fish and Wildlife Service and Wisconsin DNR Bald Eagle Management Guidelines into your Comprehensive Land Management Plan for the Brule Project. We have the following additional recommendations:
  - a) Identification in the plan of who is responsible to update nest site locations on project land maps.
  - b) Annual planning meetings should be held with resource agency personnel (MDNR and USFWS) to discuss land management issues that impact on bald eagle management. The meeting should occur soon after the annual bald eagle nest surveys are completed for the project area and should cover exactly how the licensee will implement the guidelines in that given year.
  - c) The Department recommends that the licensee reimburse the MDNR for flight time over the project area for the purpose of identifying bald eagle nest locations. This funding will guarantee that the flights will continue to be made over the life of the license and that this critical land planning information will be collected.
  - d) The plan does not contain any specifics on how the location of bald eagle perch, feeding and roost areas will continue to be identified and/or confirmed in their continued use. This information is critical to the proper protection of these sites. The Department recommends that either the licensee conduct periodic surveys for perch, roost, feeding (if necessary) and nest (if necessary) locations, scope of which to be developed in consultation with the

resource agencies, or that the licensee apply secondary zone protection standards (660-1320 foot zone) to the entire project shoreline except for existing recreation sites. The implementation of the secondary zone standards will have to be accomplished through your public information efforts as we recognize that you do not own much of the shoreline.

If the latter course is selected then consultation on the operation of the recreation sites should be conducted during the annual planning meeting to ensure consistency with bald eagle management objectives.

- e) The Department recommends, upon the establishment of bald eagle nest(s) on project area, that if eagle productivity drops below a three year running average of 1.0 young per occupied nest or two years of zero production then additional analysis of the causative problems and potential fixes will need to be conducted. The annual productivity review should be conducted during the annual planning meeting. The additional analyses should be developed in consultation with the resource agencies for each instance where the above target is not met. The analysis could range from a simple consultation session where nest failure could be easily identified to conducting additional surveys to determine the cause of the nest failure. This measure will ensure that the bald eagle restoration goal of 1.0 young per occupied nest is achieved and allow for flexible management when this goal is not attained.
- f) The Department strongly supports your educational efforts to persuade riparian owners to adopt the appropriate measures to protect bald eagles in the project area.

2) Article 410 - The Department has reviewed your proposed Wildlife Management Plan as outlined in your February 16, 1996 letter. We concur with your proposed measures with the following comments:

- a) The Department requests that the installation of the osprey platform and the mallard nesting structures be held in abeyance until notice from the Department. Currently, there are a number of bald eagles using this impoundment and the installation of the osprey platform could cause competitive interactions that may be problematic for both species. In addition, there are a number of problem geese on the impoundment that may compete for the mallard nesting platforms and increase the problems with nuisance geese on this impoundment. Thus, we request that both measures be deferred until further notice from the Department.
- b) We recommend that the project make available bluebird, kestrel and owl boxes for distribution to riparian landowners. There is some habitat available for these species on adjacent riparian lands and these lands can be enhanced by the efforts of the project.
- c) Annual planning meetings should be held with resource agency personnel (MDNR and USFWS) to discuss land management issues that impact on wildlife management.

3) Article 414 - The Department has reviewed your proposed Land Management Plan as outlined in your February 16, 1996 letter. We concur with your proposed measures with the following comments:

- a) The Department recommends that during the periodic shoreline inventories that you also examine the condition of the shoreline buffer zone (approx. 200 feet from the shoreline) and make a good faith effort through education to maintain this area as a no-cut zone, where possible. We also expect that you will manage your limited riparian lands as a no-cut zone except where there are recreation facilities.
  - b) The plan does not state what the interval of shoreline inspection will be. We recommend that inspections be made during the first two years then, upon a review of the results by the resource agencies, a determination of the inspection interval will be made. We also recommend that a video of the shoreline be made during each survey to provide a record for each inspection. Additionally, aerial photos from National Resources Conservation Service should be used to assess the condition of the riparian zone, if available.
  - c) Annual planning meetings should be held with resource agency personnel (MDNR and USFWS) to discuss land management issues that impact on shoreline and buffer zone management. Any educational efforts and the results of these efforts should be provided at the annual meeting. This meeting can incorporate measures for all of the above license articles.
- 4) Article 404 - The Departments (Departments of Natural Resources and Environmental Quality) have reviewed your proposed Plan for Monitoring Dissolved Oxygen and Temperature Levels as outlined in your February 20, 1996 letter. We have the following comments:

- a) Monitoring Locations and Equipment - The Departments recommend addition of a site upstream of the Project on Paint River as a temperature monitoring site to determine compliance with the Delta Temperature Standard. This site, combined with the tailwater site will allow for the determination of your compliance with the Delta Temperature Standard. Both sites should be selected in consultation with the Departments and we request a field examination of both sites before deployment.

All monitoring equipment for dissolved oxygen and temperature should be validated with an independent measurement system such as a National Bureau of Standards thermometer for temperature and a Winkler analysis for DO at the end of each unattended monitoring period.

The Departments recommend a data quality goal be established for DO values. At minimum, 70% of the DO data should be verified as accurate to within 1 mg/l of the true DO value as determined by a check of meter accuracy at the end of each unattended monitoring period. Service visits, on a weekly basis, should be scheduled to achieve the proper data quality.

The Departments recommend that reservoir dissolved oxygen and temperature readings should be taken at one meter intervals, in the deepest part of the reservoir, once per week from the May 1 through October 31 period each year instead of using the datasonde deployed in three depth locations.

- b) Monitoring Schedule - The Departments recommend that temperature should be monitored continuously over the specified period as violations could occur in any season. Dissolved oxygen should be monitored hourly from May to October and during February. These periods will encompass the entire likely warm weather season and the ice covered period when dissolved oxygen values could be in violation of standards.
- c) Data Reporting - Each hourly value recorded should be compared to the DO standard. Delta Temperature values should be compared instantaneously to determine compliance with the Delta Temperature standard.

The Departments request that a computer and hard copy of all of the raw data be provided to us at the time of submittal of the annual water quality report. Additionally, we request quarterly transmittals of the raw data on computer disk along with all of the information concerning the calibration of your equipment in that quarter.

The following data should be provided in all reports on water quality:

- i. A determination of the daily minimum, daily maximum and daily average DO and temperature for each monitoring station and each day monitored. Data shall not be censored. An accounting shall be made for the entire monitoring period. Data gaps shall be fully explained.
  - ii. An upstream/downstream comparison of the DO and temperature including the frequency and magnitude of any values that exceed or violate the standard at each station.
  - iii. An evaluation of the relationship between any observed temperature or DO violations and other environmental factors that were monitored such as time of day, stream flow, sunlight, temperature, chlorophyll level, instream chemistry and operating characteristics of the dam.
  - iv. All quality assurance data shall be submitted for each reporting period.
- d) Detection and Notification - The Departments cannot determine from your data when data will be downloaded. We are concerned with your proposal to record DO on an hourly basis and then only having it available when the instruments are periodically downloaded. This means that data that could have indicated that there was a problem would not be downloaded until long after the event occurred. The Departments strongly recommend that these data be recorded and analyzed by the licensee in real time so that data is available to correct current operating conditions.

The proposed notification and consultation list is also inadequate. The Chief of Surface Water Quality Division of the Department of Environmental Quality, and the FERC Program Manager of the Department of Natural should all be notified within one working day of any detection of standard violations.

- e) Mitigative Measures - The Departments recommend the use of spillage as a first step in resolving any short term dissolved oxygen problems in downstream river reaches. If this solution does not resolve dissolved oxygen problems in the immediate tailwater, then a solution must be proposed to deal with any dissolved oxygen problem in the immediate tailwater area. Potential solutions which should be evaluated include the installation of aeration equipment in front of the turbine intakes or in the tailwater to increase DO to above the standard. Upon the determination that DO is below the standard then the aeration equipment should be operated until such a time that DO is above the standard.

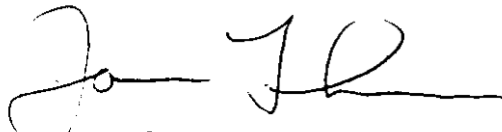
It is also unclear how you will deal with any temperature violation. Please provide us with your proposed solution to temperature violations.

Any additional installed devices should be evaluated for effectiveness and all uses should be reported in the annual report.

- f) Initial Monitoring Period - The Departments strongly object to your proposal to terminate monitoring after two years. We recommend that after three years monitoring, the project may send a written request to the Program Manager for the FERC Coordination Unit for the MDNR and MDEQ to change the frequency of temperature and dissolved oxygen monitoring. After receiving written notification from the Program Manager for the FERC Coordination Unit for the MDNR and MDEQ, alternative monitoring frequencies for temperature and DO may be implemented as determined by the above individuals. As conditions warrant, the monitoring frequencies, methods and locations may be changed at the discretion of the Departments.

Because of workload constraints, the Department will provide our comments on the Article 408 plan on April 9, 1996. We appreciate the opportunity to review these plans and look forward to our continued interactions on this project. If you have any comments on this matter, please contact me.

Sincerely,



James G. Truchan  
MDNR FERC Program Manager  
FISHERIES DIVISION  
(517) 373-1280

cc: Mr. Walter Haaglund, City of Crystal Falls  
Mr. James Fossum, USFWS  
Mr. J. Mark Robinson, FERC