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10 March 2004

Mr. Constantine Tjoumas
Director, Division of Dam Safety and Inspections
Federal Energy Regulatory Commission
888 First Street, NE, Room 6N-01
Washington, D.C. 20426

Re: Response to Comments on Report No. 2
of FERC INDEPENDENT CONSULTANTS REVIEW PANEL,
SILVER LAKE DAM

Dear Mr. Tjoumas:

At your request we have written this letter report to respond to questions and comments on our Report No. 2 dated December 2003 entitled Technical Reasons for the Release of Silver Lake Reservoir on May 14-15, 2003. The comments we have responded to were contained in the following three letters.

1) Letter of Robert J. Smith and Carl A. Sinderbrand of Wickwire Gavin, P.C., Attorneys at Law, dated February 2, 2004, which contains comments by MWH Americas, Inc. (see ATTACHMENT I).

2) Letter of David W. Harpole of Wisconsin Public Service Corporation, dated February 2, 2004, which contains comments by Upper Peninsula Power Company (UPPCo). (See ATTACHMENT II).

3) Letter of David E. Hickey of City of Marquette, Board of Light and Power, dated February 12, 2004. (See ATTACHMENT III).

Our response to the comments contained in the three letters above are given in the remainder of this letter. These responses have been categorized under the following headings:

1. FUSE PLUG DESIGN
2. WATER LEVELS RESERVOIR OPERATION
3. MAY 10-11 RAINFALL
4. FUSE PLUG FOUNDATION ERODIBILITY
5. COHERENCE OF REPORT NO. 2 CONCLUSIONS
6. TOURIST PARK DAM WASH OUT
7. CHANGES OR ERRATA TO REPORT NO. 2

The detailed letter response is given below. The comments or questions from the three letters referenced above are given in italics and the Panel responses are given in conventional type.

1 - FUSE PLUG DESIGN

The MWH comments start with a false bold statement:

The Panel Report confirms the adequacy of the Fuse Plug Design.

This sentence is based on a misquoted statement from Panel Report No. 2. MWH quotes that:

At page 49, the Panel notes that the MWH design of the fuse plug embankment was consistent with conventional practice, and that ...

Actually, Panel Report No. 2, on Pg. 49 reads: The zoning of the fuse plug embankment was consistent with conventional practice.

The MWH comment is false because it ignores the other aspects of the fuse plug design criticized by the Panel as follows:

Low Setting of the Fuse Plug

For equivalent operating rules, the annual probability of fuse plug breaching was higher than the annual probability of overtopping Dike 4 prior to the modification.

Underestimation of flow velocities in the fuse plug channel

The estimated maximum velocity of 9.1 fps (2.8 m/s) used in design was shown to be about 14.5 fps (4.4 m/s).

Underestimation of erodibility of foundation soils and overly optimistic evaluation of the resistance of grass cover

The consequent construction of the fuse plug on the highly erodible cohesionless sand foundation which was insufficiently protected was unprecedented.

The release of the reservoir on May 14-15, 2003 demonstrated the inadequacy of the fuse plug design. The fuse plug embankment behaved as designed since it was designed to breach when the reservoir level exceeded 1485.5. The fuse plug design however was inadequate as the erosion did not stop at the base of the fuse plug at El. 1481.0 but progressed down to about El. 1456.0 through the foundation resulting in the loss of nearly the entire reservoir.

2 - WATER LEVELS RESERVOIR OPERATION

GENERAL

The UPPCO and MWH comments on Panel Report No. 2 of 15 December 2003 refer to minimum and target elevations and minimum flows specified in FERC s license document of October 4, 2002 as if they were related to the concept of normal maximum operating level , NMOL, defined in MWH design documents. Many of the statements are incomplete and/or out of context and do not help in the understanding of the responsibilities for the operation of the reservoir under flood conditions.

The more representative of those statements are presented in italics and each statement is briefly commented on below by the Panel. A final clarifying commentary follows.

UPPCO STATEMENTS

Page 1 - Paragraph 3

Both Article 402 and The Michigan DEQ requirements incorporated in Appendix A to the license are specific in stating that UPPCO s obligation at Silver Lake is to maintain the Silver Lake Basin at all times above the minimum water surface elevations required in the order. No maximum elevation requirements exist for Silver Lake in the license.

The argument above ignores the requirements for the target elevations in the same article (See ATTACHMENT IV).

Page 1 - Paragraph 4

..., with the further exception that up to 200 cfs may be discharged if necessary to prevent loss of service or if necessary to maintain target elevations downstream.

The word downstream does not exist in the terms of article 403. The prescription refers to target elevations at Silver Lake Reservoir.

Page 1 - Bottom Line

Releases from the project may be temporarily modified if required by operating emergencies, but discharge of more than 200 cfs to achieve a perceived maximum level of 1481.5 feet (above the minimum elevation specified in the license) would not be permitted as part of any normal operating procedure under terms of the license.

Article 403 includes the provision: Releases of the project may be temporarily modified if required by operating emergencies ... Floods and high reservoir levels may constitute emergencies.

Page 2 - Paragraph 2

Further, the statement in Paragraph 2.3.2, page 17 ... indicating that the MDEQ regulations required reservoir levels at Silver Lake to be operated within a relative small range between a level of 1477.0 in December and 1481.5 in July is in error.

... the license requirements and the Michigan water quality certification do not require the reservoir levels to be operated within a relative small range but rather require that the Silver Lake Storage basin be maintained above the specified minimum elevations.

The error is not in the small range between levels 1477.0 and 1481.5, but in the specified period of the year. The Panel Report No. 2, in the last sentence of the first paragraph of page 17, should read ... to be operated within a small range between a level of 1477.0 in February, March, and April and 1481.5 in July instead of ... to be operated within a small range between a level of 1477.0 in December and 1481.5 in July.

UPPCO s statement ignores again the specifications for target elevations. The licensee should strive to operate the reservoir to achieve the start of month target elevations. That requirement put constraints on the maximum reservoir elevations.

Page 2 - Paragraph 3

... It appears that the design engineers now claim that they intended Silver Lake to be operated with a maximum reservoir level at Silver Lake of 1481.5 feet rather than the normal water surface level of 1486.25 provided in the license.

Page 2 - Paragraph 4

While 1481.5 feet might arguably be construed as an acceptable assumed starting point for calculation of a Probable maximum flood (PMF) routing study, it was never communicated by the design engineer that it was a maximum elevation critical to the fuse plug design or operation of Silver Lake.

The changes in reservoir operation required after the October 2002 modifications, due to the new NMOL, were not made clear in the design documents and certainly were not understood by UPPCO. The fuse plug pilot channels at El. 1485.5 for example precluded the reservoir operation at a normal maximum operating level of 1486.25.

MWH STATEMENTS

Page 2 - Paragraph 3

... For example, the FERC license prescribed maximum and minimum water levels and minimum flow and monitoring requirements.

The FERC license makes no reference to maximum water levels.

Page 3 - Paragraph 3

Moreover two other simple operational steps should have been taken, but were not. First, the stop logs could have been removed entirely to elevation 1480.25. This was expected in flood situations, such as that confronting UPCCO on May 12-14, 2003. Indeed UPCCO prepared and published detailed instructions for removing stop logs at the Silver Lake Reservoir.

The stop logs in the fourth bay of the spillway were not designed to be operated during floods. The instructions for installation and removal of stoplogs prepared by UPCCO, known to the Panel, refer to the bottom outlet facility. That maneuver, at the bottom outlet, as is the normal case for stop logs, was to be carried out under balanced water pressure.

Page 3 - Paragraph 4

... This maneuver, which is consistent with the concept of the NMOL elevation [a requirement of both the FERC license and the MDEQ 401" certification] would have prevented...

The statement between brackets has been added by MWH to the Panel s original statement. The concept of NMOL is never mentioned in the FERC license and MDEQ 401" certification.

Page 4 - Paragraph 2

... Further, we understand that UPCCO/WPS engaged in extensive negotiations with the Michigan Department of Environmental Quality (MDEQ) regarding the monthly target (maximum) reservoir elevations ....

The word (maximum) is added without justification.

Page 4 - Paragraph 3

UPPCO also was well aware of the change in NMOL down to 1481.5 which was the basis of design and incorporated into its FERC license.

The FERC license makes no reference to the NMOL at El. 1481.5. The license is not concerned with risks of overtopping. Water level limitations refer to environmental concerns only.

FINAL CLARIFYING COMMENTARY

General

The minimum reservoir elevation and start of month target elevation , defined in the FERC s license of October 4, 2002, have an objective and a nature that bear no relationship to the normal maximum operating level , NMOL defined in the Harza and MWH design documents of May 2001 - March 2002.

Minimum and Target Elevations

The minimum and target elevations are defined in Article 402 of the license document for the protection and enhancement of water quality, recreation, aesthetics, and fishery resources in the Dead River .

According to the terms of Article 402, the licensee shall act at all times to maintain the storage basin water surface elevations as measured immediately upstream of each project dam, as follows:

1. Maintain the Silver Lake Storage Basin (SLSB) water surface levels at all times above the minimum seasonal target elevations and strive to operate the existing project facilities to achieve the start of month target elevations listed below.

	Start of Month	Minimum

Month	Target Elevation	Elevation
April	1477.5	1477
May	1479	1478.5
June	1481	1480.5
July	1481.5	1480
August	1480	1479
September	1479.5	1479
October	1479.5	1479
November	1479	1478.5
December	1479	1478.5
January	1479	1477.5
February	1477.5	1477
March	1477.5	1477

The rate of lowering the SLSB shall not exceed 0.5 ft per day.

Minimum flow requirements, treated in Article 403, are also defined for the protection and enhancement of water quality, recreation and aquatic resources in the Dead River .

The requirements for minimum and target elevations and for minimum flows do not refer to levels or flows required to assure the safety of the dam against overtopping during floods. Article 402 recognizes this independence stating: Storage basin water surface elevations may be temporarily modified if required by operating emergencies beyond the control of the licensee, including but not limited to floods, ice conditions, drought ... . Similarly, Article 403 states Releases from the project may be temporarily modified if required by operating emergencies beyond the control of the licensee ...

The license document does not contain any reference to water levels to be respected in flood handling operations.

Normal Maximum Operation Level B NMOL

According to common practice and as described in Davis Handbook of Applied Hydraulics, 4th Ed., Vincent J. Ziparro and Hans Hasen, 1993, The normal maximum operating level is the maximum level at which the reservoir is operated to serve any of its planned purposes . Generally, it corresponds to the crest of the spillway for ungated spillways or the top of the gates for surface gated spillways. By definition, every time the reservoir level tends to raise above the NMOL due to a flood, the gates are opened to maintain the level at the NMOL. If the flood inflow surpasses the gated spillway capacity at NMOL elevation, the water level rises in the reservoir and a natural routing of the flood takes place. In ungated spillways, the spilling of excess water and the routing process occur automatically.

Prior to the October 2002 modifications, for more than 55 years, the Silver Lake reservoir had the NMOL at El. 1486.25, the crest of the ungated spillway. No requirements existed for the control of the NMOL. Spilling of excess water in high water periods occurred automatically. The March 2002 MWH design, taking into account the PMF flood, was based on a new normal maximum operating reservoir level at El. 1481.5.

MWH defined the new NMOL elevation as equal to the maximum value of the start of month target elevation required in July. This coincidence does not make the two levels of the same nature. The need to respect the target elevation as expressed in the terms of the license is not imperative... strive to operate the existing project facilities to achieve the start of the month target elevations. The target is defined for the start of the month only. No character of urgency or concern with safety is conveyed by the terms of the license. The respect given to the NMOL, on the other hand, is vital to the safety of the project against overtopping. The reservoir operation has to be permanently conditioned by the need to restore the NMOL every time it is surpassed, to make available the empty reservoir volume needed for flood routing.

The new NMOL is lower than the crest level of the surface spilling facilities of the new project: stop logs in the 4th bay lowered to El. 1482.5, the main spillway with crest at El.

1486.25, and the fuse plug pilot channels at El. 1485.5. This design decision has changed the nature of Silver Lake spillway. The project spillway has become a gated spillway.

The bottom outlet valve is the only gate of the new spillway. The stop-logs at the fourth bay cannot be considered as maneuverable elements. These stop-logs are designed and constructed to be operated in the dry.

For this gated spillway, the reservoir level should be maintained at El. 1481.5, not only for the routing of the PMF flood, but at all times, for the routing of any more frequent flood. Not respecting this rule could result in the unexpected activation of the fuse plug as occurred in May 2003.

Such a significant conceptual change in operating procedures in relation to a more than 50 yr old practice was not mentioned by MWH in the design documents, was recognizably not understood by UPPCO, and was ignored in all documents exchanged among MWH, UPPCO, and FERC during the development and approval of the design, during construction, and until the time of the accident.

3 - MAY 10-11 RAINFALL

UPPCO Comments

UPPCO makes comments about the statement or paragraph 3.4 of Panel Report No. 2, on page 26: The total precipitation estimated for the Silver Lake basin of 4.5 in (114 mm) in five days about 4.1 (104 mm) in two days is a significant event with annual frequency evaluated as less than 1:100. The main UPPCO comments are transcribed and answered below.

Page 2 - Paragraph 6

... had an annual frequency evaluated as less than 1:100". While a true statement it should be classified that this rain event was substantially less than a 100 year precipitation event.

The clear intention of the Panel was to express that the annual frequency was evaluated as **more** than 1:100.

With this correction, there is no question about the veracity of the Panel s remark. The Panel purposely chose not to express the frequency estimate more closely. The measured rainfall data was all outside of the Silver Lake Basin. No rainfall frequency analysis for any of the 7 rain gage stations in the area around the Silver Lake Basin, indicated in the table of pg. 25 of Panel Report No. 2, was available to the Panel. A rough estimate of frequency was based on regional maps for the 100 yr 24 h point precipitation.

ASCE Handbook 4.3 in (109 mm)
Huff and Angel 5.32 in (135 mm)

In Panel report No. 2 (pgs. 25, 26), these values were compared to the maximum value recorded in rain gage 21 at 3.14 in (80 mm) to indicate that the rainfall could have been well below the 1:100 value. However, the measurements at 24 h intervals may underestimate the maximum intensity in 24 h as remarked in paragraph 2, pg. 26, for the Herman data. The 4.88 in (124 mm) in two days could refer to a single 24 h period.

Page 3 - Paragraph 2-3

As detailed in the WGI summary... WGI further used the Huff and Angel Atlas (1992). UPPCO is advised that the later publication is generally regarded as being more current and a better developed data source than the 1961 Hershfield data, particularly for this area.

While the Panel estimate of 4.1 inches of rainfall over a 48-hour period should not be assessed by reference to a 24-hour table to determine annual frequency, if compared with the more recent Huff and Angel Atlas data 4.17 inches, even in a 24-h period, would have a recurrence interval of 25 years. UPPCO submits while perhaps appropriate as a rough estimate to confirm that this rainfall event was less than a 100-year event, the point of clarification is that as confirmed by STS and WGI, this precipitation event was substantially less than a 1:100 annual frequency event.

The Panel had not available the Huff and Angel Atlas. Table 1-4 in WGI Summary page 1-11, indicates point precipitation frequencies taken from Huff and Angel, page 126. The 4.1 in (104 mm) in two days is distributed in the basin area. The possible point value of 4.88 in (124 mm) in Herman would have had an annual frequency between 1:50 and 1:100 in that table.

The actual rainfall distribution in the Silver Lake Basin had to be evaluated with the help of radar supported estimates, recognizably of low accuracy. The total 4.5 in (114 mm) in five days estimated by the Panel proved consistent with the minimum run off needed to raise the reservoir level from El. 1483.4 to El. 1485.6 : 2.4 in (60.6 mm). STS Consultants have estimated a total rainfall depth of 4.0 in (101.6 mm) that can be considered a confirmation of the rough Panel estimate, taking in account the accuracy expected from those studies. The complementary WGI - STS studies confirm that the May 11 - 12 rainfall event had a frequency clearly above the 1:100 annual frequency. How far above cannot be quantified objectively with great accuracy.

Page 3 - Paragraph 3

... Moreover, this event produced a 7.5-year flood (24-hour) or a 9-year flood (72-hour).

The statement refers to the results of the STS study of synthetic floods based on assumed point precipitation frequencies from the Atlas by Huff and Angel, and created using a calibrated HEC-HMS model. Table 1-5 of WGI Root Cause Report of October 6, 2003, transcribed below, shows the results of the study.

Table 1-5

Synthetic Flood Runoff and Peak Inflow

Recurrence Interval (years)	Total Rainfall (inches) (24 sq. miles)	Total watershed Runoff (inches) (24-hour rainfall)	Peak Inflow (cfs) (24-hour rainfall)
2	2.32	0.78	494
5	2.91	1.23	809
10	3.38	1.60	1062
25	4.05	2.15	1420
50	4.59	2.58	1706
100	5.16	3.04	2001
May 11-12 storm	2.94 (24-hr) 3.85 (72-hr)	1.58	910

The 7.5-year flood was estimated using the synthetic peak value of 900 cfs (26.6 m^3/s). The 9-year flood was based on the synthetic runoff volume of 1.55 in (39.4 mm), Fig. 1-6. Actual peak values are not known for the May 11-14, 2003 flood. The run-off volume however is known to have been equal to or larger than 2.4 in (60.6 mm). From Table 1-5 its recurrence interval could be estimated as about 50 yr.

Final Remarks

Evaluation of the frequency of the May 10-11, 2003 rainfall and consequent run-off will always be lacking in accuracy because of the nature of the raw data. More sophisticated models do not add information.

The actual frequency of the event is secondary in the evaluation of the technical causes for the fuse plug breaching.

Although frequency studies normally complement fuse plug designs for appraisal of the economic significance of its breaching, that was not the case for the Silver Lake Fuse Plug. Frequency studies during the design period would possibly have pointed out the design and operation features more critical for the overtopping of the fuse plug.

4 - FUSE PLUG FOUNDATION ERODIBILITY

GENERAL

The MWH comments contained a paragraph which questions the Panel s assessment of the erodibility of the foundation materials of the fuse plug. That paragraph and the Panel Response is given below.

MWH COMMENTS

On p. 4 - Paragraph 3 of the Wickwire Gavin, P.C. letter containing the MWH comments, the following comments were given:

According to the transmittal letter, the Panel reviewed the Draft FERC Staff Report of July 24, 2003, and took its contents into account in its findings. That report notes (at p. 52) that the glacial till in the area of Silver Lake is classified as sand (SP-SM) both visually and in the laboratory. Evaluating this material in situ, however, the glacial till stands vertically as shown in numerous photographs. The Draft FERC Staff Report further suggests that this material likely contains weak carbonate cementation.

Accordingly, in evaluating this material with respect to the fuse plug release, it seems most appropriate to consider its in situ properties, not its properties after it has been disturbed. The erosion resistance of the in situ till is substantially greater than that of sand. Thus, the Panel Report overstates the erodibility of the material.

The Panel inspected the site on June 5, 2003 and our impression of the characteristics of the insitu foundation materials were obtained by direct observation during this site inspection. The upper soils were glacial tills which were brown in color and were observed to be cohesionless materials with no plastic clay fines. It was also observed during the site visit that there were circular erosion features (pipes) just above and at the base of the steep slopes in brown till where the slopes intersected the channel or at the base of the brown till where it was in contact with an underlying gray unweathered till. These were typical of locations where the gradient of the groundwater surface toward the channel were sufficient to cause piping and erosion of the brown till materials. These features were shown on pages 55, 56, and 57 in Figures 2, 3, 4, and 5 of the FERC Draft Report. It was also noted in the FERC Draft Report that there were vertical erosional gullies shown in Figure 3. The steep slopes of about 15 ft in height could have been primarily due to apparent cohesion due to capillarity above the groundwater table. Weak cementation could also be a possible explanation for this behavior, but not necessarily the most likely.

As indicated in the paragraph above which contains the MWH comments on erodibility, the draft FERC report gives a description of the surficial geology along the fuse plug channel on p. 52. That paragraph is given in quotes below.

This material is visually classified as poorly graded sand with silt (SP-SM), with occasional gravel, cobbles and boulders. It is generally 90% fine to coarse sand and 10% non-plastic fines. Upon exposure to air, it quickly dries out and may contain a minor amount of (carbonate?) weak cementation. It displays properties similar to loess in that it stands vertically but is cohesionless. It has a low dry strength (crushes easily with light finger pressure), rapid dilatancy, low toughness, and is nonplastic. This material contains approximately 10% angular, hard gravel on average about 2 inches in diameter and a trace amount of sub-rounded cobbles and boulders.

The upper 12- to 18-inches of this deposit is oxidized to a medium to dark brown color, with some organic root material from surface vegetation. The lower 6 feet is unweathered, light tan in color, and is massive to faintly stratified. This material displays an unusual circular

erosional characteristic (Figures 2 through 6) at the base of this unit that appears to concentrate immediately above the change in lithology. This erosion may be the result of washing away of silt and/or carbonate cementation.

Although the MWH comments indicate that the FERC report suggests this material likely contains weak carbonate cementation , the actual paragraphs above from the geology section of the FERC report indicate that these materials may contain a minor amount (carbonate?) weak cementation. This wording is clearly less strong than indicated in the MWH comments. In the paragraphs from the FERC report immediately above, the unusual circular erosion characteristics were noted at the base of this unit that appears to concentrate immediately above the change in lithology (i.e. just above the gray till). It was indicated that this erosion may be the result of washing away of silt and/or carbonate cementation.

On pg. 60 of the FERC report the following paragraphs were written to describe the soils in the foundation of the fuse plug.

b) Foundation. There were no borings or sampling of the foundation during the design phase, and the following assessment resulted from a site visit after the fuse plug activation.

The foundation observed in the side walls of the breach includes a stratum of tan loose to medium dense sand from the ground surface to an approximate depth of 8-10 feet. This stratum contains some outwash material, but is primarily weathered till. The repeated freezing and thawing, with the resultant volume increase of in-situ water, is primarily responsible for creating the loose structure from the original dense till. Beneath the surface layer is a zone of tan very dense weathered till approximately 10 feet thick, followed by dark gray very dense unweathered till to great depth. Both of these stratum appeared cemented. The grain size distribution of all till layers appeared to be a slightly silty coarse to fine sand with some gravel, with the most noticeable difference in stratums being the tan coloration of the upper two weathered zones, and the lower density of the uppermost zone. The till was in

general void of clayey or plastic fines. When samples of either the dense tan weathered or gray unweathered till were placed in water, they quickly melted into a cohesionless mass.

Please note from the above paragraph that, although the brown and gray tills appeared to be cemented, samples of the insitu materials disintegrated into a cohesionless mass when placed in water. For practical purposes it makes no difference whether this is due to water dissolving a weak carbonate cement or whether the free water releases the negative pore pressure from samples of partially saturated sand tills taken from above the water table. The bottom line result is that they behave as cohesionless soils when saturated because of the high percentage of sand and the complete absence of plastic clay fines.

The Panel has considered the insitu characteristics of the fuse plug foundation soils from our field inspection and from the descriptions and boring information given in the FERC Investigation Report of July 24, 2003, and the WGI Report of October 6, 2003. In addition, MWH was given questions by the Independent Consultants Review Panel on September 11, 2003 which were answered on September 19, 2003. Question No. 5 was asked to be answered by Ms. Manoshree Sundaram, the MWH representative at the site during construction. The question was as follows.

How would you describe the foundation soil on which the fuse plug was built? Her response was: Based on my visual observations, the foundation soil on which the fuse plug was built was in situ soil compacted, moist, reddish-brown silty sand. Please refer to the accompanying notes from my site visit and site photographs.

Based on the information cited above and our judgment it was our evaluation that the erodibility was that of a sand material. Although it may be true that an alluvial sand or a glacial outwash sand may be more erodible than a dense till composed of sand, it was and still is our judgment that the cohesionless sandy till foundations of the fuse plug were too erodible to resist the conditions imposed by triggering of the fuse plug during the PMF event. In fact the water has already acted as a very objective referee during the May 14-15 event of

2003 and has eroded the sandy till foundation deep enough to release Silver Lake Reservoir for a hydrologic event much less severe than the PMF.

FINAL CLARIFYING COMMENTARY

In Section 5.3 of the March 20, 2002 Design Report, MWH had apparently classified the fuse plug channel materials as easily erodible bed materials and was utilizing the Natural Resources Conservation Services Guidelines to conclude that the permissible velocity for a grassed channel with easily erodible bed materials is 6 ft/sec. These same Conservation Service Guidelines warned that some soils such as dispersed clays and non plastic fine silty sands may be so erosive that successful grassed waterways cannot be constructed. In addition the Guidelines had five restrictions with regard to the quality of grass cover. One of these restrictions was:

A velocity of 0.9 m/s (3.0 ft/s) should be the maximum if, because of shade, soils, or climate, only a sparse cover can be established or maintained. It is noted that this is most likely the conditions which prevailed in May 14-15, 2003. In the Independent Review Panel Report No. 2, pg. 45, it was stated that For no channel treatment, the permissible velocity could probably not exceed 2.5 fps (0.76 m/s). This is very close to the 3 fps (0.9 m/s) maximum permissible velocity recommended by the Conservation Service Guidelines for sparse cover on easily erodible soils.

It has been shown in Report No. 2, pg. 42, that for the PMF case the maximum channel velocities expected should have been about 14.5 fps (4.4 m/s) and that the maximum channel velocities in the initial channel slope should have reached about 10 fps (3.2 m/s) for the May 14, 2003 event. These velocities, for both events, are significantly higher than could be resisted by the cohesionless sand-tills present at the location of the fuse plug channel.

5 - COHERENCE OF REPORT NO. 2 CONCLUSIONS

In the conclusion of its comments MWH states:

Our principal concern with the draft Panel Report is its conclusion that the design of the fuse plug was the root cause of the breach event on May 14, 2003.

The statement above is an inaccurate reference to the Panel s conclusions. Panel Report No. 2 does not mention in its conclusions that the design of the fuse plug was the root cause of the breach event on May 14, 2003.

Panel Report No. 2 points out the three requirements for the accident:

1) Lake levels sufficient to activate the fuse plug.
2) Breaching of the fuse plug.
3) Erosion of the fuse plug foundations.

It comments on the three requirements and clearly defines the reasons for the breaching of the fuse plug and erosion of the fuse plug foundation that resulted in the release of the reservoir.

A summary of the conclusions is given in the last paragraph of pg. 52 of the Panel Report No. 2:

The erodibility of the plug foundation and emergency spillway channel is the root cause of the Silver Lake Reservoir releases. Although the low elevation setting of the fuse plug crest, the low releases from the bottom outlet, and the high setting of the stop logs are factors which affect the frequency of fuse plug breaching the reservoir would not have been released, except for the upper 5 ft (1.5 m), for any breaching of the fuse plug if the fuse plug were founded on a non-erodible foundation in a non-erodible channel.

MWH also states:

... the conclusory statements at the end of the Panel Report are not consistent with the more detailed analysis within the body of the Panel Report.

The conclusory statements at the end of Panel Report No. 2 under item 5. CONCLUSIONS (pgs 48-53) are totally consistent with the more detailed analysis within the body of the report and are further confirmed by the answers and clarifying remarks of this letter report.

6 - TOURIST PARK DAM WASH OUT

GENERAL

The reasons for the loss of the Tourist Park Dam due to the Silver Lake Reservoir Release are beyond the terms of reference of the Panel s work. However, the City of Marquette has commented on certain wording in Report No. 2 of the Panel as discussed below.

CITY OF MARQUETTE COMMENTS

The second paragraph of the City of Marquette letter says:

The Independent Consultant s Report, Section 3.6.5, states that debris from the Tourist Park dam carried downstream and damaged the Presque Isle Power Plant.

The wording in our report is:

The debris carried downstream from the Tourist Park Dam failure entered the cooling water intake of Wisconsin Electric Power Company s Presque Isle coal-fired thermal power station, causing considerable damage, and shutting it down.

The issue appears to be the phrase from the Tourist Park Dam failure, which might be interpreted as indicating that all of the debris that caused damage to the power plant came from, and had been part of, the Tourist Park Dam. The sources of the debris are not known, and of course it was not our intention to say that the damaging debris came exclusively from the Tourist Park dam. To preclude this possible interpretation of this sentence, the Panel responds that the information contained within this sentence will be expressed as follows, replacing the word from with the word beyond . The report will be changed to read:

The debris carried downstream beyond the Tourist Park Dam failure entered the cooling water intake of Wisconsin Electric Power Company s Presque Isle coal-fired thermal power station, causing considerable damage, and shutting it down.

7 - CHANGES OR ERRATA TO REPORT NO. 2

GENERAL

As a result of additional review by the authors and comments by MWH, UPPCo, and the city of Marquette, there are detailed changes or errata to Report No. 2 given in the following section of this letter report.

DETAILED CHANGES TO REPORT NO. 2

At the bottom of the first paragraph on pg. 17 the last sentence should be changed to read: The October 4, 2002 license include the MDEQ regulation requiring the reservoir levels to be operated within a relatively small range between a level of 1477.0 in February, March, and April and 1481.5 in July.

The first sentence of the third paragraph on pg. 26 should be changed to read: The total precipitation estimated for the Silver Lake Basin of 4.5 in. (114 mm) in five days, about 4.1 in. (104 mm) in two days, is a significant event with annual frequency evaluated as more than 1:100.

The second sentence of the fourth paragraph on pg. 33 should be changed to read: The debris carried downstream beyond the Tourist Park Dam failure entered the cooling water intake of Wisconsin Electric Power Company's Presque Isle coal-fired thermal power station, causing considerable damage, and shutting it down.

The fourth sentence of the first paragraph on pg. 43 should be changed to read: It is noted that 61-94% passes the #4 sieve and that from 41-71% passes the #40 size.

The second sentence of the second paragraph on pg. 43 should be changed to read: The sample was identified as Sample 10 in the UPPCO Final Construction Report.

Respectfully submitted,

Alfred J. Hendron Jr.

Alfred J. Hendron Jr.

Nelson Pinto

J. Michael Duncan

ATTACHMENT I

MWH Comments on Panel Report No. 2

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Sender's E-Mail Address: rsmith@wi.wickwire.com

February 2, 2004

VIA E-MAIL AND OVERNIGHT MAIL
Mr. Constantine G. Tjoumas, P.E.
Director, Division of Dam Safety & Inspections
Federal Energy Regulatory Commission
Office of Energy Projects
888 First Street, N.E., Routing Code: PJ-13
Washington, DC 20426

Subject: Silver Lake Dam (P-10855)
FERC Independent Consultants Review Panel Report
Comments of MWH Americas, Inc.

Dear Mr. Tjoumas:

Introduction

MWH Americas, Inc. ("MWH"), which designed the facilities constructed at Silver Lake in 2002, has reviewed the Independent Consultants Review Panel Report filed with FERC on December 18, 2003 ("Panel Report"). We appreciate that the Panel had to consider a substantial amount of information in a limited time period, and we commend its efforts. However, we believe that some of the Panel's conclusions, particularly as to "root cause," do not follow from the information available to the Panel. We therefore offer the following comments on critical issues, on behalf of MWH.

The Panel Report Confirms the Adequacy of the Fuse Plug Design

At page 49, the Panel notes that the MWH design of the fuse plug embankment was "consistent with conventional practice," and that the design enhancement of including a shell zone was not a deficiency or contributing factor in the erosion of the fuse plug. Moreover, at page 50, the Panel correctly concludes that the fuse plug embankment behaved as designed. This is a critical point. By their nature, fuse plugs are

designed to erode in conditions of extreme high water, and cannot differentiate high water that results from exceptional, short-term precipitation events from high water that results from operational errors and omissions over a three-week span, as in the May 2003 event.

The adequacy of the design is further substantiated by the extensive and continuing involvement and specific approvals by FERC's Division of Dam Safety and Inspections over the course of the project. The FERC engineering staff has tremendous experience, expertise, and objectivity. Its well-documented approvals, endorsements, and professional engineering recommendations from concept to completion confirm the soundness of the Silver Lake design.

The Panel Report Accurately Notes That, But For Critical Operational Errors and Omissions, the Fuse Plug Would Not Have Released

Both the FERC license and the MWH design are premised on the owner's active operation of the reservoir. The necessary operational tasks were simple and obvious, but the system was never intended to be entirely passive. For example, the FERC license prescribed maximum and minimum water levels and minimum flow and monitoring requirements: complying with the license would therefore entail ongoing monitoring and operational adjustments. Similarly, the new facilities were designed for the fuse plug to erode if the reservoir level exceeded the invert elevation of the pilot channel.

In addition to the clear legal obligations of its FERC license, as the owner and operator of the Silver Lake Reservoir, UPPCO had a duty to downstream riparians and the general public to operate the reservoir to avoid overfilling. To guard against overfilling, the stoplogs should have been removed – as a baseline condition – to 1482.5 feet. This point was emphasized by MWH in its 2001 and 2002 Design Reports and by FERC in a letter to UPPCO dated May 16, 2002 – a full year before the breach. Further, UPPCO was fully aware that stoplog removal to 1482.5 feet was an integral part of the construction project. *See* exhibits 1 and 2 enclosed with this letter — Construction Drawing C-1 (Exh. 1), submitted to UPPCO on May 29, 2001 (Exh. 2).

In its design review, the Panel noted:

> **... the new project requires the operator to fully open the bottom outlet to assure the safety of the dam in the case of an extreme event, every time the reservoir exceeds elevation 1481.5 [p. 17]**

The Panel correctly concluded that even if no other operational step had been taken:

> **If the bottom outlet discharge had been maintained at about 20 cfs (.57 $m^3/_s$) and the stop logs were at elevation 1482.5, it is probable that the breaching of the fuse plug could have been avoided.**

Panel Report, p. 49 (emphasis added).

Moreover, two other simple operational steps should have been taken, but were not. First, the stoplogs could have been removed entirely, to elevation 1480.25. This was expected in flood situations, such as that confronting UPPCO on May 12-14, 2003. Indeed, UPPCO prepared and published detailed instructions for removing stop logs at the Silver Lake Reservoir. Second, the four-foot diameter, low level outlet could easily have been opened, but was not. As the Panel emphasized:

> **If the bottom outlet valve were opened on April 23, when it was first noticed that the NMOL elevation had been surpassed, to discharge 280 cfs (8 $m^3/_s$), the reservoir level could have been brought to elevation 1481.5 in about 3 days. This maneuver, which is consistent with the concept of the NMOL elevation [a requirement of both the FERC License and the MDEQ "401" Certification], would have prevented the May 14 breaching accident. The storage volume in the reservoir between elevations 1481.5 and 1485.5 is about 5700 acre-ft (7.0 hm^3), which would be sufficient to store any conceivable runoff from the May 10-11, 2003, rainfall. [p. 34]**
>
> * * * * * * * * * *
>
> **By opening the low level outlet valve in late April, the reservoir could have been controlled at about elevation 1481.5 and the breaching of the fuse plug avoided. [p. 49]**

(Emphasis added.)

Given actual conditions, it appears that UPPCO could have prevented the triggering of the fuse plug by opening the low level outlet as late as the morning of May

14, 2003, two days after the rains had stopped and after the high water conditions. Yet, it is undisputed that UPPCO did absolutely nothing.

UPPCO Was Fully Aware of the New Operating Regime

The Panel Report states that UPPCO told the Panel that it was not aware of the new operating regime, *i.e.*, the NMOL of 1481.5. That statement is inconsistent with other available information. UPPCO has an experienced hydro operations staff. In addition, UPPCO's parent and sister companies, WPS Resources Corp. and Wisconsin Public Service Corp., respectively, employ licensed engineers with extensive hydro operating knowledge and experience.[1] Further, we understand that UPPCO/WPS engaged in extensive negotiations with the Michigan Department of Environmental Quality (MDEQ) regarding the monthly target (maximum) reservoir elevations that ultimately became a part of the FERC license.

UPPCO also was well aware of the change in NMOL down to 1481.5, which was the basis of design and incorporated into its FERC license. No fewer than three Registered Professional Engineers employed by UPPCO or Wisconsin Public Service Corp. had "hands-on" involvement with the review and approval of various studies, reports, and construction documents, which from at least March 2001 forward consistently noted a NMOL of 1481.5 and based flood routing studies on a starting elevation of 1481.5.

The In-Situ Soils are Dense, Hard, and Cemented

According to the transmittal letter, the Panel reviewed the Draft FERC Staff Report of July 24, 2003, and took its contents into account in its findings. That report notes (at p. 52) that the glacial till in the area of Silver Lake is classified as sand (SP-SM) both visually and in the laboratory. Evaluating this material in situ, however, the glacial till stands vertically as shown in numerous photographs. The Draft FERC Staff Report further suggests that this material likely contains weak carbonate cementation. Accordingly, in evaluating this material with respect to the fuse plug release, it seems most appropriate to consider its in situ properties, not its properties after it has been disturbed. The erosion resistance of the in situ till is substantially greater than that of sand. Thus, the Panel Report overstates the erodibility of the material.

[1] Collectively, Wisconsin Public Service Corp. and UPPCO operate 19 FERC-licensed hydro projects, including some with more than one dam.

Minor Inaccuracies

Given the scope of the project – investigation, analysis, planning, licensing, design, construction, and operation spanned at least nine years – it can be understood that there are a few inaccurate details in the Panel Report. For example, the Panel Report states at section 4.4.1 (p. 43) that MWH prepared a final construction report. In fact, MWH had a limited role during construction and did not prepare any such report. However, FERC and UPPCO did prepare such reports. While this letter focuses on more fundamental concerns about the Panel Report, MWH notes that the Panel Report contains additional inaccuracies.

Conclusion

Our principal concern with the draft Panel Report is its conclusion that the design of the fuse plug was the "root cause" of the breach event on May 14, 2003. The substantive analysis of the Panel Report more accurately recognizes that there were multiple, significant operational failures, that UPPCO had knowledge of operational requirements and repeated opportunities to implement them, up to and including the day of the breach, and that implementation of some or all of those requirements would have prevented the breach. That is, the conclusory statements at the end of the Panel Report are not consistent with the more detailed analysis within the body of the Panel Report.

MWH appreciates the opportunity to comment on the Panel Report. Further, it would be pleased to answer questions or provide further information relating to its comments.

Sincerely,

WICKWIRE GAVIN, P.C.

Robert J. Smith
Carl A. Sinderbrand

Enclosures

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HARZA ENGINEERING COMPANY

May 29, 2001

Mr. Benjamin Trotter
Project Coordinator
Wisconsin Public Service Corporation - UPPCO
600 Adams Street
Green Bay, WI 54301

Subject: Silver Lake Basin
Drawings for Fuse Plug Spillway Design

Dear Mr. Trotter:

Enclosed for your review are copies of the latest drawings for the Silver Lake Basin Fuseplug Spillway Project. These include the following:

18305G-01	Area Map, Site Location Map, and Site Plan
18305G-02	Fuse Plug and Spillway Channel, Plan and Profile
18305G-03	Profile and Cross-Sections, Fuse Plug

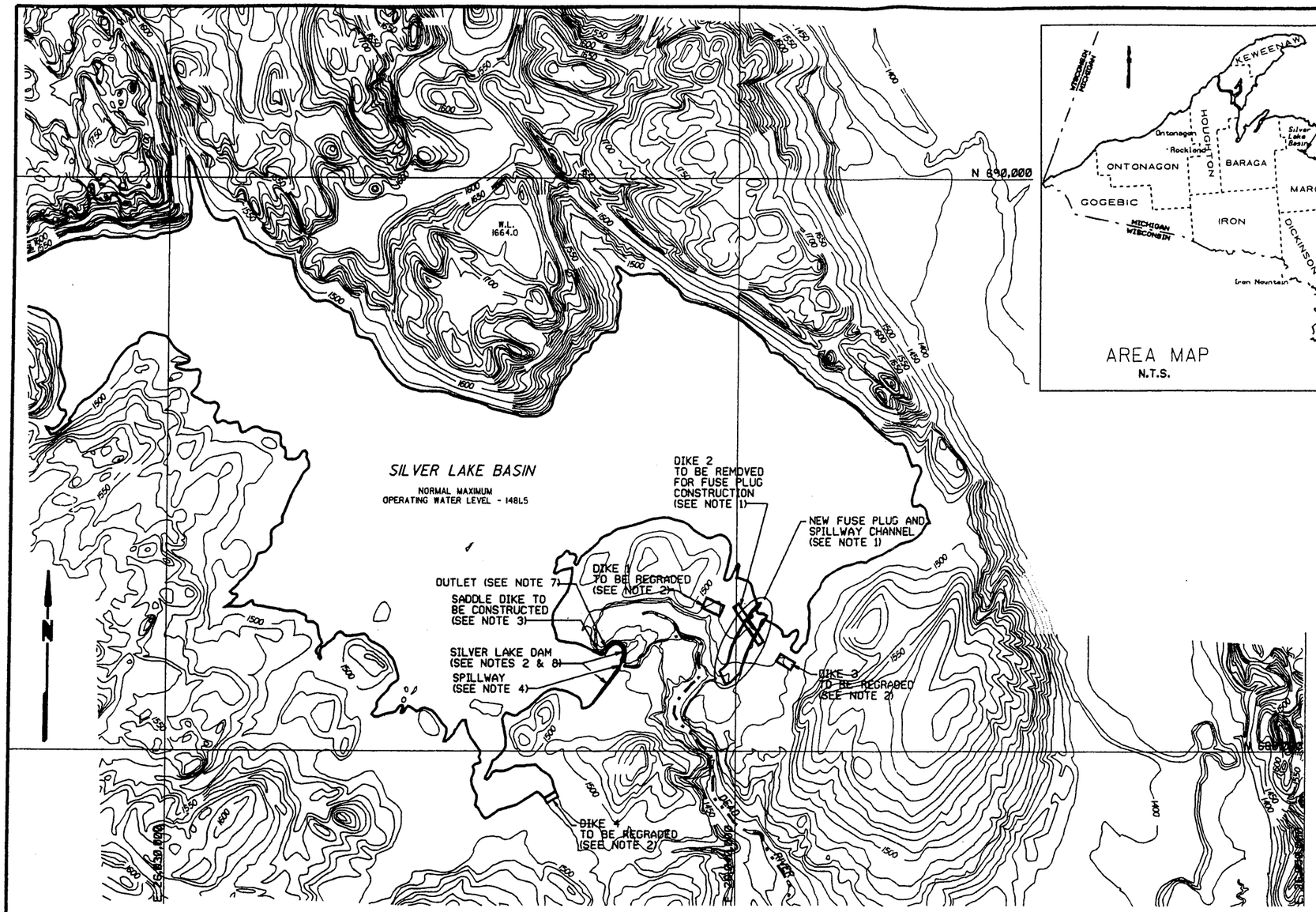
Please do not hesitate to call me at (720) 932-7741 if you have any questions.

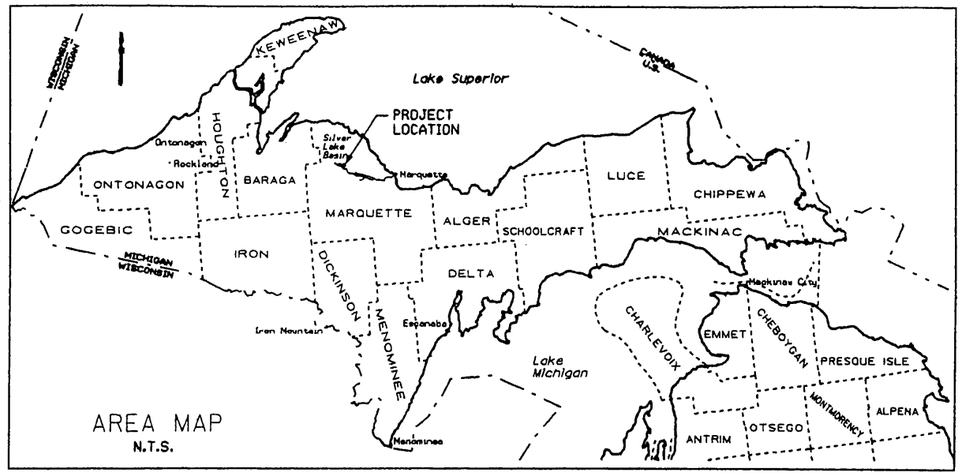
Very truly yours,

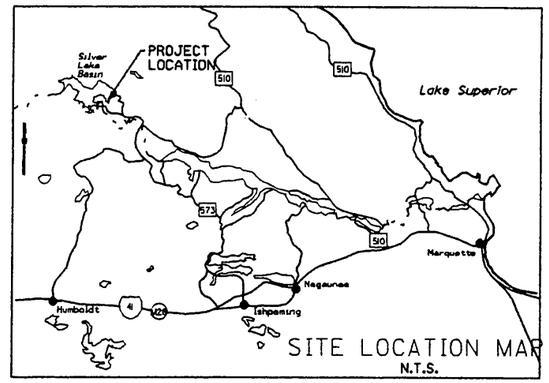
for

Norman A. Bishop, Jr., P.E., M.B.A.
Partner

NAB/jeh
Enc: as noted







INDEX OF DRAWINGS

NUMBER	TITLE
20895-C1	AREA MAP, SITE LOCATION MAP AND SITE PLAN
20895-C2	MAIN DAM PLAN
20895-C3	MAIN DAM AND SPILLWAY SECTIONS AND DETAILS
20895-C4	CONCRETE OUTLET STRUCTURE SECTIONS AND DETAILS
20895-C5	SADDLE DIKE PLAN AND CROSS SECTION
20895-C6	FUSE PLUG AND SPILLWAY CHANNEL PLAN AND PROFILE
20895-C7	FUSE PLUG PROFILE AND CROSS SECTIONS

		REVIEWED	
DSGN.	MS		
CHKD.	CW	CIVIL	
DRN.	LAM	MECH.	
CHKD.		ELECT.	
SUBM.			

NOTES:

1. DETAILS OF WORK TO BE PERFORMED BY CONTRACTOR FOR CONSTRUCTION OF NEW FUSE PLUG AND SPILLWAY CHANNEL AND REMOVAL OF DIKE 2 ARE SHOWN ON DRAWINGS 18305G-02 AND 18305G-03.
2. CONTRACTOR SHALL REGRADE CREST OF EXISTING DAM AND DIKES 1, 3 AND 4 TO EL. 1491.5 USING SUITABLE MATERIAL RECOVERED DURING REMOVAL OF DIKE 2 IN ACCORDANCE WITH THE SPECIFICATIONS.
3. CONTRACTOR SHALL CONSTRUCT SADDLE DIKE USING SUITABLE MATERIAL IN ACCORDANCE WITH THE SPECIFICATIONS. DETAILS OF WORK TO BE PERFORMED ARE SHOWN ON DRAWING 20895-C5.
4. ~~CONTRACTOR SHALL REMOVE WOODEN STOPLOGS FROM FIFTH SPILLWAY BAY FROM THE LEFT IN ACCORDANCE WITH THE SPECIFICATIONS. STOPLOGS ARE CURRENTLY IN PLACE AT EL. 1486.5 AND SHALL BE REMOVED TO EL. 1482.5.~~ CONTRACTOR SHALL ALSO INSTALL ANCHORS IN CENTER OF EACH SPILLWAY BAY IN ACCORDANCE WITH THE SPECIFICATIONS. DETAILS OF WORK TO BE PERFORMED ARE SHOWN ON DRAWING 20895-C3. and new detail dwg.
5. HORIZONTAL PROJECT DATUM IS MICHIGAN STATE PLANE COORDINATE SYSTEM, NAD 83/86, NORTH ZONE. VERTICAL PROJECT DATUM IS NGVD 1929.
6. THE COMPANY WILL PROVIDE STOCKPILE AND DISPOSAL AREAS.
7. CONTRACTOR SHALL REPAIR AREAS OF DAMAGED CONCRETE ON OUTLET STRUCTURE IN ACCORDANCE WITH THE SPECIFICATIONS. DETAILS OF WORK TO BE PERFORMED ARE SHOWN ON DRAWINGS 20895-C2 AND 20895-C4.
8. CONTRACTOR SHALL REGRADE OVERSTEEPENED DOWNSTREAM SLOPE OF MAIN DAM NEAR OUTLET STRUCTURE IN ACCORDANCE WITH THE SPECIFICATIONS. CONTRACTOR SHALL INSTALL TOE DRAIN ALONG DOWNSTREAM TOE OF MAIN DAM IN ACCORDANCE WITH SPECIFICATIONS. DETAILS OF WORK TO BE PERFORMED ARE SHOWN ON DRAWINGS 20895-C2 AND 20895-C3.

REFERENCE DRAWINGS:

WORK THIS DRAWING WITH 20895-C2, C3, C4, C5, C6, C7 AND 1992 COLEMAN ENGINEERING DRAWINGS 1, 2, 3, 4, 5, 6 AND 7 OF 11.

SCALE 0 1000 2000 FEET

REV. NO.	DWG. TRANSMITTAL LETTER NO.	DATE	NATURE OF REVISION	BY	CHKD.	APPD.	OWNER

UPPER PENINSULA POWER COMPANY
"A SUBSIDIARY OF WPS RESOURCES"

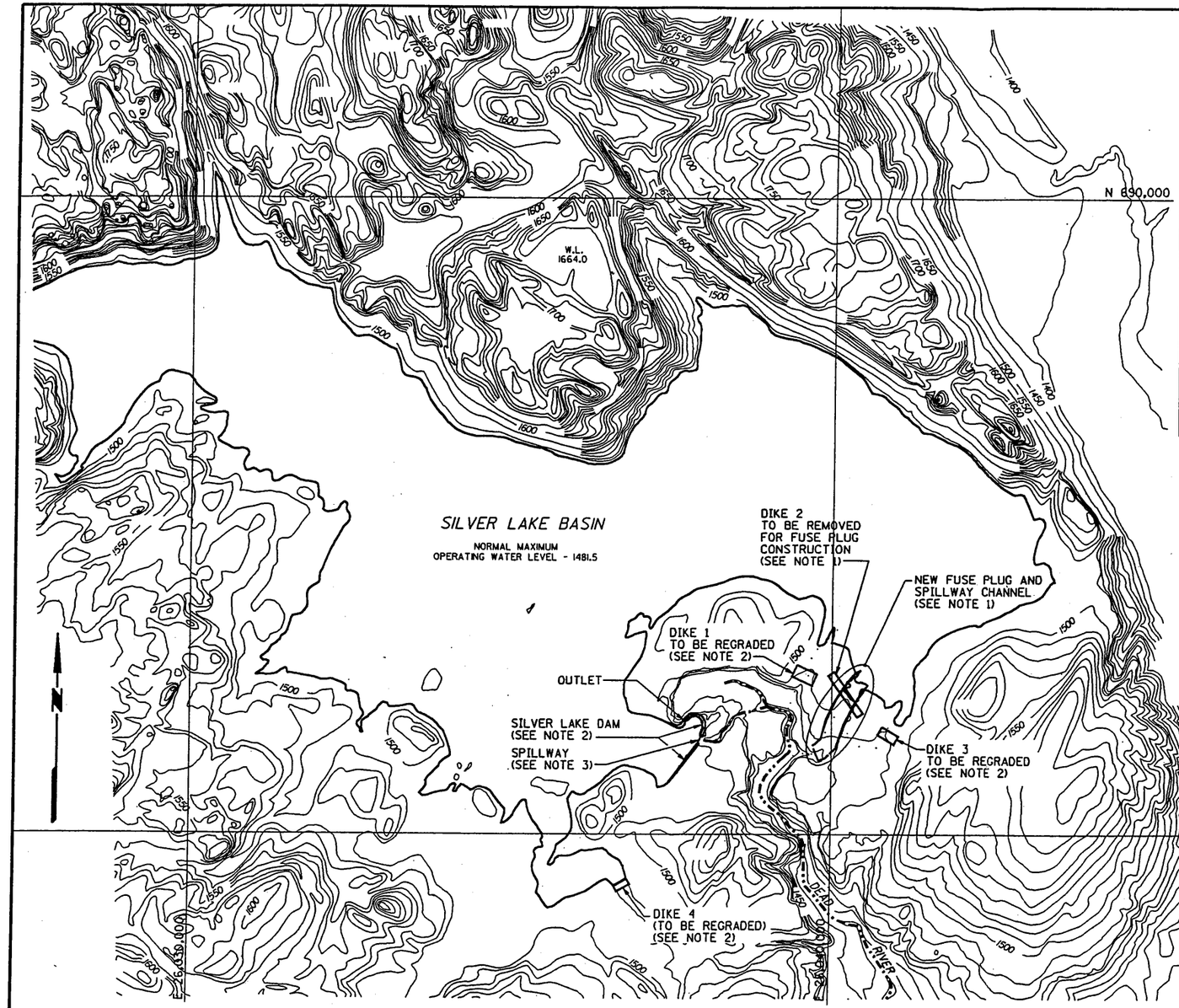
SILVER LAKE BASIN PROJECT
FUSE PLUG SPILLWAY & DAM MODIFICATIONS

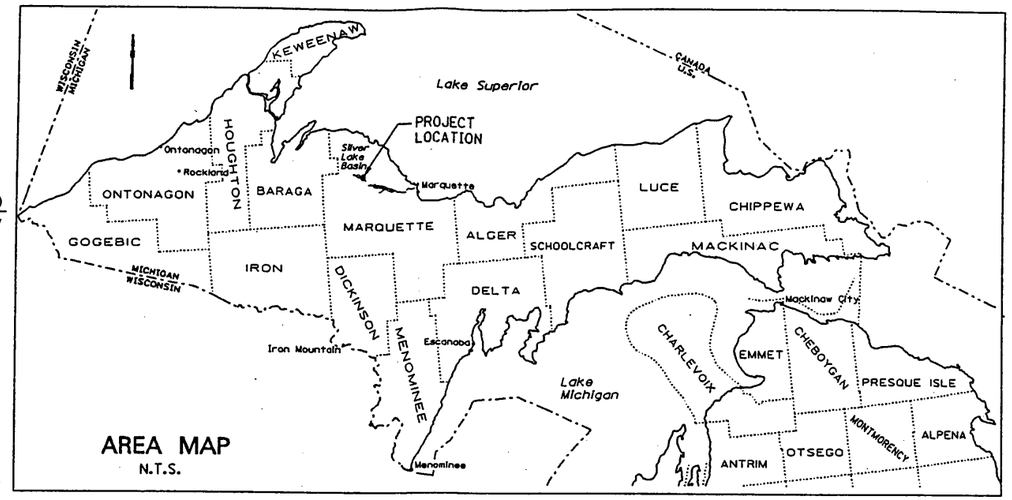
AREA MAP, SITE LOCATION MAP AND SITE PLAN

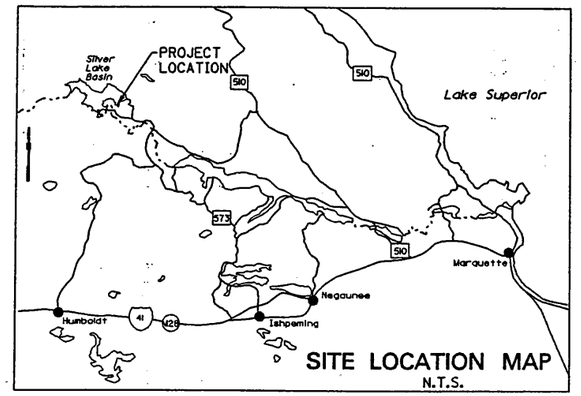
MWH
MONTGOMERY WATSON HARZA
CHICAGO, ILLINOIS

DATE

DWG. NO. 20895-C1







REFERENCE DRAWINGS:

WORK THIS DRAWING WITH 1830G-02 AND 18305G-03

NOTES:

1. DETAILS OF REMOVAL OF DIKE 2 AND WORK TO BE PERFORMED BY CONTRACTOR FOR CONSTRUCTION OF NEW FUSE PLUG AND SPILLWAY CHANNEL ARE SHOWN ON DRAWINGS 18305G-02 AND 18305G-03.
2. CONTRACTOR SHALL REGRADE EXISTING DAM AND DIKE FILLS TO EL. 1491.5 USING SUITABLE MATERIAL RECOVERED DURING REMOVAL OF DIKE 2 IN ACCORDANCE WITH THE SPECIFICATIONS.
3. CONTRACTOR SHALL REMOVE WOODEN STOPLOGS FROM FOURTH SPILLWAY BAY FROM THE LEFT TO ELEVATION 1482.5. STOPLOGS ARE CURRENTLY IN PLACE TO ELEVATION 1486.5 IN ACCORDANCE WITH THE SPECIFICATIONS.
4. HORIZONTAL PROJECT DATUM IS MICHIGAN STATE PLANE COORDINATE SYSTEM, NAD 83/86, NORTH ZONE. VERTICAL PROJECT DATUM IS NGVD 1929.

SCALE 0 1000 2000 FEET

DSGN.		REVIEWED	
CHK'D.		CIVIL.	
DWN.		MECH.	
CHK'D.		ELECT.	
SUBM.			

REV. NO.	DWG. TRANSMITTAL LETTER NO.	DATE	NATURE OF REVISION	BY	CHK'D.	APP'D.	OWNER

UPPER PENINSULA POWER COMPANY
"(A SUBSIDIARY OF WPS RESOURCES)"

SILVER LAKE BASIN PROJECT
FUSE PLUG SPILLWAY

AREA MAP, SITE LOCATION MAP AND SITE PLAN

HARZA ENGINEERING COMPANY
APPROVED _____

CHICAGO, ILLINOIS | DATE | DWG. NO. 18305G-01

ATTACHMENT II

UPPCo Comments on Panel Report No. 2

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

February 2, 2004

BY FACSIMILE and US MAIL

Mr. Constantine G. Tjoumas PJ-13
Director, Division of Dam Safety and Inspection
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Independent Consultants Review Panel Report on Release of Silver Lake (May 14-15, 2003) [FERC Project No. 10855]

Dear Mr. Tjoumas:

On behalf of the Project Licensee, Upper Peninsula Power Company (UPPCo) we appreciate the opportunity for review and comment on the Independent Consultants Review Panel Report No.2.

UPPCo believes that some of the statements made in Panel Report No. 2 may be misconstrued or misinterpreted and will benefit from clarification. This is not intended to address every point of possible disagreement, but to address key issues that could be the basis for misunderstanding.

FERC's "Order Issuing Original License" dated October 4, 2002, [101 FERC ¶ 62,013], Order Part (b)(2) specifies that the Silver Lake Development has a reservoir of 1,464 acres and a normal water surface level of 1,486.25 feet NGVD.[1] Such order gives the Silver Lake Reservoir a storage capacity of 33,500 acre feet as noted in Panel Report No. 2 at § 2.1, page 5. The Panel further correctly states that the FERC licensing order of the same date incorporates Article 402 and the Water Qualifications Certification issued by the Michigan Department of Environmental Quality (MDEQ) under section 401 of the Federal Clean Water Act. Both Article 402 and the Michigan DEQ requirements incorporated in Appendix A to the license are specific in stating that UPPCo's obligation at Silver Lake is to maintain the Silver Lake Storage Basin at all times above the minimum water surface elevations required in the order. No "maximum" elevation requirements exist for Silver Lake in the license. Moreover, no "normal maximum operating level" (NMOL), as used by the Panel, is contained in the license.

Article 403(1) does prescribe "minimum flows" from Silver Lake Dam, along with stated "maximum" allowable discharge values (150 cfs from Silver Lake when such discharge is under the Licensee's control, with the further exception that up to 200 cfs may be discharged if necessary to prevent loss of service, or if necessary to maintain target elevations downstream). Releases from the project may be temporarily modified if required by operating emergencies

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[1] FERC also noted the normal elevation for Silver Lake to be 1,486.25 feet NGVD in footnote 4 of FERC Order on Rehearing and Modifying License issued February 4, 2003 [102 FERC ¶ 61,114].

beyond the control of the Licensee, or for short periods upon mutual agreement between the Licensee, the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ), and the U.S. Fish and Wildlife Service (FWS), but discharge of more than 200 cfs to achieve a perceived "maximum" level of 1,481.5 feet (above the "minimum" elevation specified in the license) would not be permitted as part of any "normal" operating procedure under terms of the license.

Further, the statement in § 2.3.2, page 17 (the last sentence of the fourth paragraph of this section) indicating that the MDEQ regulations required reservoir levels at Silver Lake to be operated "within a relatively small range between a level of 1,477.0 in December and 1,481.5 in July" is an error. The actual "minimum" elevation for December as specified in the license is 1,478.5 feet NGVD, with a target elevation of 1,479 NGVD. However, more importantly, the license requirements and the Michigan water quality certification do not require "the reservoir levels to be operated within a relatively small range," but rather require that the Silver Lake Storage Basin be maintained above the specified minimum elevations. Such is also more consistent with the desired objectives of optimizing fish habitat and in maintaining desired flow and water levels downstream of Silver Lake.

Based upon review of the Panel's report, and more specifically the submission of Montgomery Watson Harza (Harza), it appears that the design engineers now claim that they intended Silver Lake to be operated with a "maximum" reservoir level at Silver Lake of 1,481.5 feet rather than the normal water surface level of 1,486.25 provided in the license. From the perspective of the Licensee, UPPCo does not understand how it could achieve a "maximum" water level at 1,481.5 feet given the remote location of this facility, the limited control features in place, and the operating parameters specified in the license. Such would also have been inconsistent with historical operations and the use of Silver Lake as a storage facility.

The express terms of the Project License, project historical data, the use of Silver Lake as a storage facility, and correspondence all suggest that 1,481.5 feet was never intended or appreciated as the "maximum" water elevation for Silver Lake. Such could not be readily achieved within the operating parameters of the license and with the facilities and procedures in place. While 1,481.5 feet might arguably be construed as an acceptable assumed starting point for calculation of a Probable Maximum Flood (PMF) routing study, it was never communicated by the design engineer that such was a maximum elevation critical to the fuse plug design or operation of Silver Lake. Had such been the understanding, appropriate amendment of the license to include the requirements of Articles 402 and 403 in consultation with state agencies would have been required.

Clarification also needs to be made in characterization of the weather event as a preliminary to the release of Silver Lake. More specifically, as assessed in the Washington Group International (WGI) report and in the Panel analysis, this was, by all accounts, a multi-day event, and at least a 48-hour precipitation event.

The Panel Report relates in the last paragraph of § 3.4 that the rain event preceding the fuse plug operation of Silver Lake had an "annual frequency evaluated as less than 1:100." While a true statement, it should be clarified that this rain event was substantially less than a 100-year

precipitation event. The Panel Report utilized a 24-hour precipitation table published as Figure 2.13 in the ASCE Hydrology Handbook (1996), which in turn republished some 1961 data published by Hershfield (Hershfield Technical Paper No. 40). The Panel Report admittedly referenced such as a "rough indication" of the frequency of precipitation by reference to the isopluvial map derived from the Hershfield data; however, it is not accurate to characterize a 48-hour event through use of dated 24-hour data.

As detailed in the WGI summary, use of actual data from rain gauges from surrounding areas and Doppler radar images obtained for this storm event, indicated that this was between a 4- to 5-year 24-hour storm and a 6- to 7-year, 72-hour storm. WGI further used the Huff and Angel Atlas (1992). UPPCo is advised that the latter publication is generally regarded as being more current, and a better developed data source than the 1961 Hershfield data, particularly for this area.

While the Panel estimate of 4.1 inches of rainfall over a 48-hour period should not be assessed by reference to a 24-hour table to determine annual frequency, if compared with the more recent Huff and Angel Atlas data 4.17 inches, even in a 24-hour period, would have a recurrence interval of 25 years. UPPCo submits while perhaps appropriate as a "rough estimate" to confirm that this rainfall event was less than a 100-year event, the point of clarification is that as confirmed by STS and WGI, this precipitation event was substantially less than a 1:100 annual frequency. Moreover, this event produced a 7.5-year flood (24-hour) or a 9-year flood (72-hour). United States Bureau of Reclamation (USBR) guidelines indicate that fuse plugs should not be designed to breach for floods with recurrence intervals of less than 100 years.

By way of further comment on the Panel findings, of necessity UPPCo relied upon one of the most reputable dam engineering design firms in the world. These consulting engineers were selected because they had intimate familiarity with Silver Lake and the Dead River Project, dating back to their previous work while then with Stone & Webster in the early 1990's. At no time was UPPCo advised that a previous Harza publication had indicated that fuse plugs were inappropriate for soil conditions similar to what existed at Silver Lake. UPPCo had no understanding or appreciation of the exit velocities found by the Panel to exist at the fuse plug pilot channel and downstream, and had no appreciation or assessment from the design engineer that such exceed accepted design criteria. UPPCo also had no understanding that the Silver Lake fuse plug, constructed at significant cost, would effectively become the primary spillway.

As assessed by WGI and the Panel, had this fuse plug operated appropriately to its design level, the result would have been the loss of an expensive fuse plug (and required replacement) but the release would have been well within the existing capacity of the Hoist Reservoir and safely contained. The root cause for what did occur was the result of exit velocities acting upon the existing soils to produce erosion well beyond the intended design level with the resultant loss of the Silver Lake Reservoir.

UPPCo would also comment that one positive demonstration from this experience was the operation of the Emergency Action Plan (EAP) put into effect with these events. Fortunately, there was no loss of life, and implementation of these procedures undoubtedly prevented loss of life or personal injury, and minimized property damages.

One element not addressed in the Panel Report is the root cause for failure of the Tourist Park facility, and the status and implementation of its Emergency Action Plan. Given that the majority of inundation and damage in the Marquette area occurred with the failure of Tourist Park Dam, the Tourist Park failure should also be the subject of an evaluation.

From UPPCO's perspective, the fuse plug, as designed, now appears to have been inappropriate for Silver Lake. Having now had the benefit of the design engineers' explanations UPPCo suggests that where substantial changes in operation are necessitated by a design which now appears to contemplate significant departures from past operation practices, any such change in operation must be directly and adequately communicated by the design engineer to the Licensee and FERC, and that a changed operation plan should be prepared and in place before the fuse plug is constructed. Further, better geotechnical analysis should be required, and, consistent with accepted engineering design standards, fuse plugs should not be recommended or utilized for soil conditions of the type present at Silver Lake, and particularly without required geotechnical assessment.

UPPCo thanks you for the opportunity for review and comment of the Panel Report. Should you or the Panel have any specific questions regarding the information provided here, please contact me at (920) 433-1264.

Sincerely,

David W Harpole

David W. Harpole
Vice President – Energy Supply (for WPSC)

ATTACHMENT III

City of Marquette Comments on Panel Report No. 2

BOARD OF LIGHT AND POWER

CITY OF MARQUETTE
2200 WRIGHT STREET
MARQUETTE, MI 49855-1398

DAVID E. HICKEY
EXECUTIVE DIRECTOR

PHONE 906-228-0320
FAX 906-228-0329
PLANT FAX 906-228-0359

February 12, 2004

Mr. Constantine G. Tjoumas PJ-13
Director, Division of Dam Safety and Inspections
Federal Energy Regulatory Commission
888 First St., N.E.
Washington, D.C. 20426

Dear Mr. Tjoumas:

Thank you for the opportunity to offer the Marquette Board of Light and Power's comments to both the draft Independent Consultant's Report and the FERC Staff Report on the Silver Lake fuse plug breach, May 14, 2003. These reports describe the May Dead River flood event and its consequences. The damage done at the Marquette Board of Light and Power's Tourist Park Dam is also a consequence of the flood. The dam performed as predicted during this flood event.

The Independent Consultant's Report, Section 3.6.5, states that debris from the Tourist Park dam carried downstream and damaged the Presque Isle Power Plant. The debris that washed into the power plant and Lake Superior came from both upstream and downstream of the Tourist Park Dam as well as the natural abutment adjacent to the dam and the portion of the dam's earthen embankment that was washed away.

The FERC Staff Report, Section IX, Page 84, states that waters from the Tourist Park Dam resulted in flooding and shutting down the Presque Isle Power Plant. The waters that shut down the power plant came from Silver Lake. During a flood of 5,000 CFS, the failure of the Tourist Park dam results in a projected water elevation of less than 606.8 NGVD at the Presque Isle Power Plant while the plant elevation has been reported at approximately 612 NGVD.

Again, thank you for the opportunity to offer comments to the FERC Independent Consultant's Report and the FERC staff report.

Very truly yours,

David E. Hickey,
Executive Director

ATTACHMENT IV

Selected Pages from FERC License

101 FERC 62, 013
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Upper Peninsula Power Company Project No. 10855-002

ORDER ISSUING ORIGINAL LICENSE
Major Project

(October 4, 2002)

INTRODUCTION

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1. On May 2, 1994, Upper Peninsula Power Company (UPPCO), a subsidiary of Wisconsin Public Service Corporation (WPSC) filed an application for an initial license under Part I of the Federal Power Act (FPA),[1] for the operating unlicensed 15.5-megawatt (MW) Dead River Hydroelectric Project No. 10855. The project is located on the Dead River[2] in Marquette County, Michigan. UPPCO proposes no construction or new capacity at the project. The project generates approximately 64,100 megawatthours (MWh) of electricity annually. This order issues an original license for the project.

BACKGROUND

[1] 16 U.S.C. §§ 791a - 825r.

[2] The Commission determined that the Dead River is a waterway over which Congress has Commerce Clause jurisdiction, and the operation of the project affects interstate commerce. Therefore, the Dead River Project is required to be licensed. 39 FERC ¶ 62,015, 62,016 (1987), reh'g denied 56 FERC ¶ 61,191 (1991).

protect and enhance fish and wildlife resources, water quality, recreational, aesthetic, and cultural resources. The electricity generated from this renewable water power resource will be beneficial because it will continue to offset the use of fossil-fueled, steam-electric generating plants, thereby conserving nonrenewable resources and reducing atmospheric pollution. I conclude that the Dead River Project, with the conditions and other special license articles set forth below, will be best adapted to the comprehensive development of the Dead River for beneficial public uses.

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The Director orders:

(A) This license is issued to the Upper Peninsula Power Company (licensee) for a period of 40 years, effective the first day of the month in which this order is issued, to construct, operate, and maintain the Dead River Hydroelectric Project. This license is subject to the terms and conditions of the Federal Power Act (FPA), which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

(1) All lands, to the extent of the licensee's interests in those lands, enclosed by the project boundary as described and shown by Exhibit G filed on May 2, 1994:

Exhibit G	FERC No. 10855	Showing
Sheet 1	1	Project Location
Sheet 2	2	Silver Lake Dam Storage Reservoir & Facilities
Sheet 3	3	Hoist Dam Storage Reservoir & Facilities
Sheet 4	4	McClure Dam Storage Reservoir & Facilities - West End
Sheet 5	5	McClure Dam Storage Reservoir & Facilities - East End

(2) Project works consisting of three separate developments: the Silver Lake Development, the Dead River (Hoist) Development, and the McClure Development.

The Silver Lake development, which is the furthest upstream, consists of the following existing facilities: (1) the 1,500-foot-long, 30-foot-high earth embankment Silver Lake dam; (2) a 100-foot-long, 7.7-foot-high concrete ogee crest spillway consisting of 10 bays; (3) an 11.9-foot-wid, 34-foot-high concrete gravity low-level outlet structure; (4) four earthen saddle dikes consisting of: (a) the 200-foot-long, 5-foot-high dike 1; (b) the 370-foot-long, 7-foot-high dike

2; (c) the 170-foot-long, 6-foot-high dike 3; and (d) the 290-foot-long, 5-foot-high dike 4; (5) the 1,464-acre Silver Lake with a normal water surface level at 1,486.25 feet National Geodetic Vertical Datum (NGVD).

The Dead River (Hoist) development consists of the following existing facilities: (1) the Hoist dam consisting of (a) a 1,264-foot-long left (east) concrete abutment with sections varying in height from 6 to 48 feet; (b) a 630-foot-long, 20-foot-high right (west) abutment; ©) a 1,340-foot-long, 45-foot-high earthen embankment; and (d) a 440-foot-long 63-foot-high concrete spillway; (2) a 3,202-acre reservoir with a normal water surface elevation of 1,347.5 feet NGVD; (3) a 34-foot-long, 23-foot-wide, and 68-foot-high intake tower structure; (4) a 342-foot-long, 9-foot-wide, 10-foot-high rock tunnel leading to; (5) a 193-foot-long, 7-foot-diameter steel penstock; (6) a powerhouse containing 3 generating units with a total installed capacity of 5.5 MW; (7) a 200-foot-long tailrace; (8) a 33-kilovolt (kV) substation; and (9) appurtenant facilities.

The McClure development consists of the following existing facilities: (1) the McClure dam consisting of: (a) an 114-foot-long, 46.5-foot-long right (west) concrete abutment; (b) a 66.5-foot-long, 37-foot-high concrete section; ©) a 360-foot-long, 22-foot-high left (east) earth embankment; and (d) a 200-foot-long, 51.4-foot-high concrete spillway; (2) a 95.9-acre reservoir with a normal water surface elevation of 1,196.4 feet NGVD; (3) a 99-foot-long, 10-foot-wide, and 28-foot-high intake structure; (4) a 13,302-foot-long, 7-foot-diameter steel, wood, and concrete penstock; (5) a 40-foot-high, 30-foot-diameter concrete surge tank; (6) a powerhouse containing two generating units with a total installed capacity of 10 MW; (7) a tailrace; (8) a 33-kV substation; and (9) appurtenant facilities.

The project works generally described above are more specifically described in Exhibit A of the application and shown by Exhibit F filed on May 2, 1994:

Exhibit F	FERC No. 10855	Showing
Sheet 1	6	Silver Lake Dam Plan & Profile
Sheet 2	7	Silver Lake Dam Sections
Sheet 3	8	Silver Lake Dike Locations & Sections
Sheet 4	9	Hoist Powerhouse Plan & Sections
Sheet 5	10	Hoist Dam Plan & Elevation
Sheet 6	11	Hoist Dam Sections
Sheet 7	12	McClure Powerhouse Plan & Section
Sheet 8	13	McClure Dam Plan & Elevation

Exhibit F	FERC No. 10855	Showing
Sheet 9	14	McClure Dam Sections
Sheet 10	15	McClure & Hoist Substations One Line Diagram

(3) All of the structures, fixtures, equipment, or facilities used to operate or maintain the project and located within the project boundary, all portable property that may be employed in connection with the project and located within or outside the project boundary, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) The exhibits A, F, and G as designated above are approved and made part of this license.

(D) This license is subject to the water quality certification conditions submitted by the Michigan Department of the Environmental Quality pursuant to Section 401(a) of the Clean Water Act, as those conditions are set forth in Appendix A to this order.

(E) This license is subject to the articles set forth in Form L-10 (October 1975), entitled "Terms and Conditions of License for Constructed Major Project Affecting the Interests of Interstate or Foreign Commerce," and the following additional articles:

Article 201. The licensee shall pay the United States annual charges, effective the first day of the month in which the license is issued, for the purposes of reimbursing the United States for the cost of administration of Part I of the Federal Power Act, as determined in accordance with provisions of the Commission's Regulations in effect from time to time. The authorized installed capacity for that purpose is 15,500 kilowatts.

Article 202. The licensee shall file, within 45 days of the license issuance, three sets of aperture cards of the approved exhibit drawings. The sets must be reproduced on silver or gelatin microfilm and mounted on type D (3 1/4" X 7 3/8") aperture cards.

Prior to microfilming, the FERC Drawing Number (10855-001 through 10855-015) shall be shown in the margin below the title block of the approved drawing. After mounting, the FERC Drawing Number must be typed on the upper right corner of each aperture card. Additionally the Project Number, FERC exhibits (e.g., F-1, G-1, etc.), Drawing title, and date of this license must be typed on the upper left corner of each aperture card.

The original and one duplicate set of aperture cards shall be filed with the Secretary of the Commission, ATTN: OEP/DHAC. The remaining duplicate set of aperture cards shall be filed with the Commission's Chicago Regional Office.

Article 203. Pursuant to Section 10(d) of the Act, after the first 20 years of operation of the project under license, a specified reasonable rate of return upon the net investment in the project shall be used for determining surplus earnings of the project for the establishment and maintenance of amortization reserves.

The licensee shall set aside in a project amortization reserve account at the end of each fiscal year one half of the project surplus earnings, if any, accumulated after the first 20 years of operations under the license, in excess of the specified rate of return per annum on the net investment.

To the extent that there is a deficiency of project earnings below the specified rate of return per annum for any fiscal year after the first 20 years of operation under the license, the licensee shall deduct the amount of that deficiency from the amount of any surplus earnings subsequently accumulated, until absorbed. The licensee shall set aside one-half of the remaining surplus earnings, if any, cumulatively computed, in the project amortization reserve account. The licensee shall maintain the amounts established in the project amortization reserved account until further order of the Commission.

The specified reasonable rate of return used in computing amortization reserves shall be calculated annually based on current capital ratios developed from an average of 13 monthly balances of amounts properly includable in the licensee's long-term debt and proprietary capital accounts as listed in the Commission's Uniform System of Accounts. The cost rates for such ratios shall be the weighted average cost of long-term debt and preferred stock for the year, and the cost of common equity shall be the interest rate on 10-year government bonds (reported as the Treasury Department's 10-year constant maturity series) computed on the monthly average for the year in question plus four percentage points (400 basis points).

Article 401. *Shoreline Erosion Control.* Within three years of license issuance, the licensee shall file, for Commission approval, a shoreline and bank erosion control plan. The plan shall include, at a minimum, the following:

(67) a determination of the area influenced by project operations;

(68) an erosion site inventory;

(69) an assessment of reasonable erosion control alternatives available for each site;

(70) implementation dates for the erosion control option(s) selected for each site; and

(71) the proposed methods that will be used to identify and control future project-related erosion and sedimentation.

The plan shall be developed in consultation with the Michigan Department of Natural Resources (MDNR) and Michigan Department of Environmental Quality (MDEQ). The licensee shall include with the plan, documentation of agency consultations, including: copies of agency comments and recommendations on the draft plan and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the resource agencies to comment and to make recommendations, before filing the final plan with the Commission. If the licensee does not adopt an agency's recommendation, the filing shall state the licensee's reasons, based on project-specific information.

The Commission reserves the right to require changes to the proposed erosion control measures specified in the plan. No ground-disturbing or land-clearing activities for erosion control measures shall begin until the licensee is notified the plan is approved. Upon Commission approval, the licensee shall implement the erosion control measures specified in the plan, including any changes required by the Commission.

Article 402. *Storage Basin Levels.* The licensee shall operate the Dead River Project to maintain minimum storage basin water surface elevations at each of the project developments, for the protection and enhancement of water quality, recreation, aesthetics, and fishery resources in the Dead River. The licensee shall act at all times to maintain the storage basin water surface elevations, as measured immediately upstream of each project dam, as follows:

(1) Maintain the Silver Lake Storage Basin (SLSB) water surface levels at all times above the minimum seasonal target elevations and strive to operate the existing project facilities to achieve the start of month target elevations listed below.

Month	Start of Month Target Elevation (feet in National Geodetic Vertical Datum [NGVD])	Minimum Elevation (feet NGVD)
April	1477.5	1477
May	1479	1478.5
June	1481	1480.5
July	1481.5	1480
August	1480	1479
September	1479.5	1479
October	1479.5	1479
November	1479	1478.5
December	1479	1478.5

Month	Start of Month Target Elevation (feet in National Geodetic Vertical Datum [NGVD])	Minimum Elevation (feet NGVD)
January	1479	1477.5
February	1477.5	1477
March	1477.5	1477

The rate of lowering the SLSB shall not exceed 0.5 foot per day.

(2) Maintain the Dead River Storage Basin (DRSB) at all times above the minimum elevations shown below and strive to operate the existing project facilities to achieve the start of month target elevations listed below, to minimize erosion due to high water levels and enhance recreational opportunities and aesthetics. If natural conditions cause the DRSB to exceed an elevation of 1,341 feet NGVD, the licensee shall take all reasonable steps to lower the impoundment to the target elevation.

Month	Start of Month Target Elevation (feet NGVD)	Minimum Elevation (feet NGVD)
April	1337.5	1337
May	1340	1339
June	1341	1339
July	1341	1339.5
August	1341	1339.5
September	1341	1339.5
October	1341	1339.5
November	1341	1339.5
December	1339	1338.5
January	1339	1337.5
February	1337.5	1337
March	1337.5	1337

The rate of lowering the DRSB shall not exceed 0.5 foot per day.

(3) Maintain the McClure Storage Basin (MSB) between elevation 1,194.8 and 1,196.4 feet NGVD, and limit fluctuation in storage basin water level to less than 1.0 foot on any day.

Storage basin water surface elevations may be temporarily modified, if required by operating emergencies beyond the control of the licensee, including but not limited to floods, ice conditions, drought, and electrical emergencies, or for short periods, upon mutual agreement among the licensee, the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ), and the U.S. Fish and Wildlife Service (FWS). At the MSB, water surface elevations may be temporarily modified during periods of high flow or if higher storage basin elevations are needed to pass organic debris over the spillway as required by article 408, or to provide flushing flows as required in article 403. During the adverse conditions described above, the licensee shall, within 1 business day after identifying the noncompliance condition relating to water surface elevations, consult with the Marquette District Supervisor of the MDEQ, the MDNR, and the FWS regarding the emergency actions taken or planned.

Consultations during the adverse conditions shall continue, following a mutually agreed upon schedule with the MDEQ, MDNR, and FWS. Upon cessation of the adverse conditions, the licensee shall resume the normal project operating water levels. The licensee shall notify the Commission as soon as possible, but no later than 10 days after each such emergency incident, and shall provide the reason for the modified reservoir elevations and actions taken to return the project to normal operating levels.

Article 403. *Minimum Flows.* The licensee shall maintain minimum flows at each of the three Dead River Project developments for the protection and enhancement of water quality, recreation, and aquatic resources in the Dead River as described below.

(1) Maintain minimum flows from the Silver Lake dam as follows: January through March - 15 cubic feet per second (cfs); April - 25 cfs or inflow, whichever is less; May - 20 cfs; June - 15 cfs; July through September - 10 cfs; and October through December - 15 cfs. The licensee shall not discharge a flow from the Silver Lake dam in excess of 150 cfs when such discharges are under its control, except that a flow up to 200 cfs may be discharged if necessary to prevent loss of service to customers, or if necessary to maintain target elevations during extreme wet weather conditions.

(2) Maintain a continuous minimum flow downstream of the Hoist powerhouse of 100 cfs.

(3) Maintain a continuous minimum flow downstream of the McClure powerhouse of 80 cfs, when sufficient flow is available.

(4) Provide a minimum instream flow of 20 cfs, using a deep water draw, to the bypassed natural river channel, as measured immediately downstream of McClure dam, as soon as practical following license issuance, but in no case shall the implementation date extend beyond two construction seasons following license issuance. See article 405 regarding the operations monitoring plan that describes the water release structure, monitoring to ensure water releases meet coldwater standards, and the re-evaluation clause, should MDEQ decide to re-examine the success of the 20-cfs release beginning after 12 years of operation.

Releases from the project may be temporarily modified if required by operating emergencies beyond the control of the licensee, or for short periods upon mutual agreement between the licensee, the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ) and the U.S. Fish and Wildlife Service (FWS). If the flow is so modified, the licensee shall within one business day after identifying the noncompliance minimum or maximum flow condition, consult with the Marquette District Supervisor of the MDEQ, the MDNR, and the FWS, regarding the emergency actions taken or planned. Consultation during the adverse conditions shall continue following a mutually agreed upon schedule with the MDEQ, MDNR, and FWS. Upon cessation of the adverse conditions, the licensee shall resume the normal minimum flow releases. The licensee shall notify the Commission as soon as possible, but no later than 10 days after each such incident, and shall provide the reason for the modified flow and actions taken to return the project to normal operating minimum flows.

Article 404. *Gages.* Within one year of license issuance, the licensee shall install calibrated staff gages at the Silver Lake, Hoist, and McClure developments in the locations that are clearly visible to the public. The gage locations shall be determined by the licensee in consultation with the Michigan Department of Environmental Quality, the Michigan Department of Natural Resources, and the U.S. Geological Survey.

Article 405. *Operations Monitoring Plan.* The licensee shall file for Commission approval, within one year of license issuance, a plan to monitor storage basin water surface elevations and drawdown rates at each development as required by article 402, and the minimum flows at each development as required by article 403. This plan must be prepared after consultation with the Michigan Department of Natural Resources (MDNR), the Michigan Department of Environmental Quality (MDEQ), the U.S. Fish and Wildlife Service (FWS), and the U.S. Geological Survey (USGS).

The operations monitoring plan shall include provisions to monitor: (1) storage basin water surface elevations, and (2) all minimum flows. The plan shall detail the mechanisms and structures that would be used, including any periodic maintenance and calibration necessary for

any installed devices or gages, to ensure that the devices work properly, and shall specify how often storage basin and minimum flow releases will be recorded and reported to the MDNR and MDEQ.

The plan shall include, at a minimum:

(1) final locations of the calibrated staff gages near each project dam that are clearly visible to the public, as required by article 404;

(2) procedures to record the water surface elevations at least weekly for the Silver Lake Storage Basin,(monthly when snow or ice prevents access to the gage), daily for the Dead River Storage Basin, and hourly for the McClure Storage Basin;

(3) provisions to file annual reports of all summary data and all gate opening changes, which shall also be provided to the MDNR, and a procedure to submit all data to the MDNR and MDEQ, upon request;

(4) procedures for emergency and planned drawdowns, including the timing, duration, and rate of drawdown and measures to minimize the effects on water quality, recreation, aesthetics, and fish and wildlife resources;

(5) procedures for releasing flows during planned and emergency shut-downs including limits on planned outages in the spring;

(6) a plan for the installation of the structure at the McClure dam that would release minimum flows into the bypassed reach using a deepwater draw; the plan should include three components: (1) a design and implementation schedule; (2) procedures to collect scientific data to allow the MDEQ to re-evaluate the need for the 20-cfs minimum flow into the McClure bypassed reach beginning 12 years after license issuance, if it desires to do so; and (3) measures that will be taken to ensure that the minimum flow release meets the state water quality standards for a coldwater stream;

(7) a plan to provide periodic flushing flows to the bypassed reach downstream of the McClure dam, specifying the amount and duration of flows, which shall be designed to prevent injurious sedimentation of the channel, and to provide for the natural movement of woody debris as required by article 409;

(8) a provision for a 3-year test period to determine the licensee's ability to comply with the storage basin water levels required by article 402 and minimum flows required by article 403, to begin after flow monitoring is implemented; and

(9) a schedule for implementing the monitoring plan within one full construction season after plan approval by the Commission.

The licensee shall include with the operations monitoring plan documentation of agency consultations, including copies of agency comments and recommendations on the draft plan, 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 to 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. The operations monitoring plan shall not be implemented until the licensee is notified that the plan is approved. Upon Commission approval, the licensee shall implement the plan according to the approved schedule, including any changes required by the Commission.

Article 406. *Temperature.* The licensee shall not warm the Dead River downstream from Silver Lake dam, Hoist powerhouse, and the bypassed reach downstream of McClure dam, through the operation of the project, to temperatures (in degrees Fahrenheit) higher than the following monthly average temperatures, for the protection of water quality and fishery resources:

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
38	38	43	54	65	68	68	68	63	56	48	40

The licensee shall not warm the Dead River downstream of the McClure powerhouse tailrace channel, through operation of the project, to temperatures (in degrees Fahrenheit) higher than the following monthly average temperatures:

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
38	38	41	56	70	80	83	81	74	64	49	39

This requirement shall not apply when, after consideration of appropriate lag times, the natural temperatures of the Dead River measured at the water quality monitoring station upstream of the storage basins, exceed the above monthly average temperature limits.

The licensee shall notify the Marquette District Supervisor of the Michigan Department of Environmental Quality, within one business day of identifying a temperature noncompliance condition, as defined by the water quality monitoring plan required by article 408, and take all reasonable steps necessary to ensure that compliance with these limitations is achieved. The licensee shall notify the Commission as soon as possible, but not later than 10 days after each

APPENDIX A

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
CERTIFICATION UNDER SECTION 401 OF THE
FEDERAL CLEAN WATER ACT

On February 24, 1999, the Michigan Department of Environmental Quality granted water quality certification under Section 401 of the Federal Clean Water Act to the Upper Peninsula Power Company (UPPCO) for the Dead River Hydroelectric Project with the following conditions:

Silver Lake Development

1.0 Silver Lake Development - Operational Requirements:
1.1 The UPPCO shall maintain the Silver Lake Storage Basin at all times above the minimum elevations shown below. The UPPCO shall also strive to operate the existing facilities in such a manner as to achieve the start of month target elevations fisted below.

The rate of lowering shall not exceed 0.5 foot per day.

Month	Start of Month Target Elevation (ft NGVD)	Minimum Elevation (ft NGVD)
April	1477.5	1477
May	1479	1478.5
June	1481	1480.5
July	1481.5	1480
August	1480	1479
September	1479.5	1479
October	1479.5	1479
November	1479	1478.5
December	1479	1478.5
January	1479	1477.5
February	1477.5	1477
March	1477.5	1477

1.2 The UPPCO shall, within one construction season of the FERC license issuance, install a calibrated staff gauge in the Silver Lake Storage Basin at a location clearly visible to the public as determined in consultation with the MDEQ-SWQD and the MDNR. The storage basin level shall be recorded at least weekly when access is not prevented by snow or ice cover on the access road. If snow or ice prevents access to the gauge, then the storage basin level shall be recorded monthly. An annual report of all recorded storage basin levels and all gate opening changes shall be submitted to the MDNR. All data shall be provided promptly to the MDNR upon request

1.3 The UPPCO shall maintain the following minimum flows from the Silver Lake Dam to the Dead River: January-March - 15 cfs; April - 25 cfs or inflow whichever is less; May - 20 cfs; June - 15 cfs; July-September - 10 cfs; and October-December - 15 cfs.
The UPPCO shall not discharge a flow from the Silver Lake Storage Basin in excess of 150 cfs when such discharges are under their control except that flow up to 200 cfs may be discharged if necessary to prevent loss of service to customers or if necessary to maintain target elevations during extreme wet weather conditions.

1.4 Within one year of FERC license issuance, the UPPCO shall provide a plan for approval by the MDEQ-SWQD, to monitor flow of the Dead River downstream of the Silver Lake Dam. This plan shall contain a timetable for implementation of the monitoring within one full

construction season after plan approval, annual submission of summary results to the MDNR, and a provision for submission of all data upon request.

1.5 During adverse conditions (including, but not limited to, electrical emergencies, droughts, and floods) when the above requirements cannot be met, the UPPCO shall, within one business day after identifying the noncompliance condition, consult with the District Supervisor of the MDEQ-SWQD and the MDNR regarding emergency actions taken or planned. Consultation during the adverse conditions shall continue following a mutually agreed upon schedule. Upon cessation of the adverse conditions, the UPPCO shall resume the normal Silver Lake Development operations.

2.0 Silver Lake Development - Water Quality Limitations:

2.1 The UPPCO shall not warm the Dead River downstream from the Silver Lake Dam, by operation of the development, to temperatures in degrees Fahrenheit higher than the following monthly average temperatures:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
38	38	43	54	65	68	68	68	63	56	48	40

This limitation shall not apply when, after consideration of appropriate lag times, the natural temperatures of the Dead River measured at the water quality monitoring station upstream of the Silver Lake Storage Basin exceed the above monthly average temperature values.

2.2 The UPPCO shall not cause the dissolved oxygen (DO) concentration, measured in the Dead River downstream of the Silver Lake Dam, to be less than 7.0 mg/l at any time.

2.3 In the event that any of the water quality limitations listed in Sections 2.1 and 2.2 of this Certification are not met, the UPPCO shall notify the Marquette District Supervisor of the MDEQ-SWQD, within one business day of identifying the noncompliance condition and take all reasonable steps necessary to ensure that compliance with these limitations is achieved.

2.4 Compliance with the DO and temperature limitations in Sections 2.1 and 2.2 of this Certification shall be determined from samples collected in the river channel downstream of the confluence of the main discharge channel and the spillway channel.

3.0 Silver Lake Development - Water Quality Monitoring and Reporting:

3.1 United States Environmental Protection Agency (EPA) approved methods shall be used for all measurements of water quality.

3.2 The UPPCO shall monitor the temperature of the Dead River at a representative location upstream of the Silver Lake Storage Basin and at the downstream location as described in Section 2.4 of this Certification, hourly from May 1 through October 31.

Annual reports shall be submitted to the Marquette District Supervisor of the MDEQ-SWQD, shall be based on the monitoring data, and shall include, but not necessarily be limited to, the following provisions:

A. A determination of the daily minimum, daily maximum, and daily average 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 explained.

B. All upstream/downstream comparison of the monthly average temperature.

C. All quality assurance data shall be submitted for each reporting period.

After one year of monitoring, the UPPCO may send a written request to the MDEQ-SWQD, to change the frequency of the temperature monitoring. Alternative monitoring frequencies for temperature may be implemented by the UPPCO upon written approval of the MDEQ-SWQD.

3.3 Within one year of the issuance of the FERC license, the UPPCO shall prepare and submit for approval to the MDEQ-SWQD, a water/sediment/fish monitoring plan capable of satisfying the requirements listed in Appendix A.

After one year of water/sediment/fish monitoring data have been collected, the UPPCO may send a written request to the MDEQ-SWQD, to change the monitoring frequency, chemical analyses, or target fish species listed in Appendix A. Alternative monitoring frequencies, chemical analyses, or target fish species may be implemented by the UPPCO upon approval of the MDEQ-SWQD.

4.0 Silver Lake Development - Bank Erosion Control:

4.1 The UPPCO shall, within three years of the issuance of the FERC license, develop and with approval from the MDEQ-SWQD and the MDNR, implement a plan to remediate stream bank erosion sites caused by the operation of the Silver Lake Development. This plan shall include an erosion site inventory, an assessment of reasonable erosion control alternatives available for each site, and implementation dates for the erosion control option(s) selected for each site. The plan shall include a mechanism for the UPPCO to identity and control future stream bank erosion problems caused by the Silver Lake Development.

5.0 Silver Lake Development - Natural Organic Debris Maintenance:

5.1 The UPPCO shall within one year of FERC license issuance, submit a plan for MDEQ-SWQD approval, to pass appropriate natural organic debris collected on the trash racks

and log booms over the dam. The plan shall be consistent with dam safety considerations. Natural organic debris includes logs, stumps, sticks, aquatic plants, and leaves. The UPPCO shall implement the plan immediately upon plan approval.

6,0 Silver Lake Development - Natural Resource Damages and Penalties:

6.1 The state reserves the right to seek civil or criminal penalties and liabilities under applicable law for natural resource damages which may occur.

7.0 Silver Lake Development - Permits and Approvals:

7.1 Nothing herein shall relieve the UPPCO from the requirement to obtain any other necessary permits, licenses, or approvals from other federal or state departments or agencies.

Hoist Development

8.0 Hoist Development - Operational Requirements:

8.1 The UPPCO shall maintain the Dead River Storage Basin at all times above the minimum elevations shown below. The UPPCO shall also strive to operate the existing facilities in such a manner as to achieve the start of month target elevations listed below, to minimize erosion due to high water levels, within the Dead River Storage Basin. If natural conditions cause the Dead River Storage Basin to exceed an elevation of 1340.5 (NGVD), the UPPCO shall take all reasonable steps to lower the impoundment to the target elevation. The rate of lowering shall not exceed 0.5 foot per day.

Month	Start of Month Target Elevation (ft NGVD)	Minimum Elevation (ft NGVD)
April	1337.5	1337
May	1340	1339
June	1340.5	1339
July	1340.5	1339
August	1340.5	1339
September	1340.5	1339
October	1340.5	1339
November	1340.5	1339
December	1339	1338.5