TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS
(CONTINUED)

PAGE

TABLE OF CONTENTS
(CONTINUED)

PAGE

TABLE OF CONTENTS
(CONTINUED)

PAGE

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACRONYM	DEFINITION
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing Materials
ATV	All terrain vehicles
AWWA	American Water Works Association
Barr	Barr Engineering Company
BLPs	Board of Light and Power
BMP	Best Management Practices
CCD	County Conservation District
CCFRPM	Centrifugal Cast Fiberglass Reinforced Plastic Mortar
CCI	Cleveland-Cliffs Iron
CCD	County Conservation district
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CIPSLP	Cast In Place Slip-lining
Commission (or FERC)	Federal Energy Regulatory Commission
CY	cubic yards
dBA	Decibels
D2SI	Division of Dam Safety and Inspections
DBH	diameter-at-breast-height
DCH	Department of Community Health
DEH	Department of Environmental Health
DEQ	Department of Environmental Quality
DIP	Ductile Iron Pipe
DNR	Department of Natural Resources
D.O.	Dissolved Oxygen
DOT	Department of Transportation
EA	Environmental Assessment
El.	Elevation in feet
ER	Environmental Report

LIST OF ACRONYMS
(CONTINUED)

ACRONYM	DEFINITION
ESCP	Erosion and Sedimentation Control Plan
°F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FERC (or Commission)	Federal Energy Regulatory Commission
FPA	Federal Power Act
FQI	Floristic Quality Index
GIS	Geographic Information System
HDPE	High Density Polyethylene
HPMP	Historic Preservation Management Plan
HRC	Hydro Relicensing Commission
HSP	Health and Safety Plan
IBI	Index of Biological Integrity
KBIC	Keweenaw Bay Indian Community
kg	kilogram (one thousand grams)
KME	King & MacGregor Environmental, Inc.
KWh	Kilowatt Hours
KV	Kilovolts
KW	Kilowatts (one thousand watts)
L	Liter
LS&I	Lake Superior and Ishpeming Rail Road
LWS	Longitudinal Weld Steel
MAIN	Mid America Interconnected Network
Mean C	Mean Coefficient of Conservatism
mg	milligrams
mi	miles
NFI	Natural Features Inventory
MRO	Midwest Reliability Organization
MUTCD	Manual on Uniform Traffic Control Devices
MW	megawatt (one million watts)
MWh	megawatt-hours
NAIC	North American Industrial Classification
NEPA	National Environmental Policy Act
NAVD-88	North American Vertical Datum of 1988
NERC	North American Electric Reliability Council

LIST OF ACRONYMS
(CONTINUED)

ACRONYM	DEFINITION
NGVD-29	National Geodetic Vertical Datum of 1929
NOC	Notice of Coverage
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NREPA	Natural Resources and Environmental Protection Act
PCCP	Pre-stressed Concrete Cylinder Pipe
Michigan OSHA	Michigan Occupational Health and Safety Administration
POTW	Publicly Owned Treatment Works
PSC	Public Service Commission
PVC	Poly Vinyl Chloride
RCCP	Reinforced Concrete Cylinder Pipe
RCPP	Reinforced Concrete Pressure Pipe
RCRA	Resource Conservation and Recovery Act
RIZZO	Paul C. Rizzo Associates, Inc.
RTE	rare, threatened, or endangered
SESC	Soil, Erosion, and Sedimentation Control
SHPO	State Historic Preservation Officer
sq.	square
SWS	Spiral Weld Steel
TCC	Temporary Traffic Control Plan
TBM	Rock tunnel using Tunnel Boring Machine
UPPCO	Upper Peninsula Power Company
USACE	United States Army Corps of Engineers
USBIA	United States Bureau of Indiana Affaires
USC	United States Code
USDA	United States Department of Agriculture
USDOI	United States Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Service
WQC	Water Quality Certification
WSP	Wood-stave pipe

ENVIRONMENTAL REPORT

MCCLURE PENSTOCK REPLACEMENT
UPPER PENINSULA POWER COMPANY
FERC PROJECT NO. 10855-MI

EXECUTIVE SUMMARY

The McClure Hydroelectric Generating Station (McClure Powerhouse) is part of the Dead River Hydroelectric Project, an integrated hydroelectric generation network, owned and operated by the Upper Peninsula Power Company (UPPCO), and permitted by the Federal Energy Regulatory Commission (FERC) under License No. P-10855-MI. The Dead River Hydroelectric Project consists of three storage basins, which include the Silver Lake Reservoir, Hoist Storage Basin/Reservoir (also known as the Dead River Storage Basin), and the McClure Storage Basin/Reservoir. Hoist and McClure Storage Basins have associated hydroelectric power generating stations. The Silver Lake Reservoir has no power generation but provides water storage capacity for optimizing downstream power generation and maintaining minimum stream flows and water levels in Hoist and McClure Storage Basins in compliance with license requirements.

The Dead River travels 32 miles dropping 900 vertical feet from the headwaters region above Silver Lake Reservoir to the mouth of the Dead River where it enters Lake Superior in the vicinity of Marquette, Michigan. The Dead River/Hoist Storage Basin is located above river mile 14.4 where the Hoist Dam impounds water covering an area of more than 3,200 acres from a 137.2-square-mile drainage area. Approximately 1,000 feet downstream from the Dam is the Hoist Powerhouse, with a generating capacity rated at 3.2 megawatts (MW). The discharge from Hoist flows into a section of the Dead River leading to the smaller McClure Storage Basin, encompassing an area just under 100 acres. The McClure Dam impounds water in the McClure Storage Basin. Water flows from the McClure Storage Basin into a steep section of the Dead River channel known as the McClure Bypass Reach and also the Dead River Gorge.

Under operating conditions, a controlled amount of water from the McClure Storage Basin is also diverted by the Dam into the inlet of the McClure Penstock. The 13,302-foot McClure Penstock traverses more than two miles of terrain from the McClure Dam to two turbines in the McClure Hydroelectric Generating Station. The terrain over this section is steep, comprising almost half of the total vertical elevation drop of the river from the headwaters area to the river mouth. The McClure Penstock delivers 424 vertical feet of head to the twin turbine 8 megawatt McClure Generating Station that discharges into the Forestville Reservoir.

In addition to UPPCO's power generating assets on the Dead River, there is an additional generating station at Forestville and a replacement dam and powerhouse (following washout of the Dam in 2003) planned for Tourist Park, owned by the Marquette Board of Light and Power and operated under a separate FERC license.

SUMMARY OF MCCLURE PENSTOCK REPLACEMENT PROJECT

The McClure Penstock has been in service since 1919. Riveted and wood-stave concrete composite sections are partly buried and partly visible above ground. These structures consist of treated wood-stave pipe reinforced with steel wire ropes and encased in concrete. In November 2007, a portion of the steel Penstock failed. In order to restore the McClure Hydroelectric Generating Station to service, replacement of the entire Penstock is necessary. Documenting the potential environmental impacts and mitigation measures of the planned Project area is the subject of this Report.

The McClure Penstock Replacement Project involves the replacement of the 2.5 mile Penstock leading to the McClure Powerhouse on the Dead River, Marquette Michigan. The Proposed Option involves replacing the existing riveted steel section of the Penstock with new spiral welded steel pipe and installing a new buried Centrifugally Cast Fiberglass Reinforced Mortar (CCFRPM) or spiral welded steel pipe alongside the existing wood-stave concrete composite section of Penstock alignment. Controls at both ends of the Penstock (inlet at McClure Dam and at the McClure Powerhouse) would also be replaced. It is intended that a good portion of the new Penstock be established in the same location as the current Penstock, even using the same supports where possible. Additional aspects of the Project include construction haul roads, staging areas, etc.

ROLE OF FEDERAL ENERGY REGULATORY COMMISSION

The Commission, under authority of the Federal Power Act (FPA), licenses and oversees the operation of non-federal hydropower projects in the United States. As part of its oversight capacity, the Commission implements a Dam Safety Program through its Division of Dam Safety and Inspections (D2SI), to ensure that Commission-licensed projects comply with Federal Dam Safety Standards and are designed, constructed, and operated safely. Under Title 18 Code of Federal Regulations (CFR) Part 12, the D2SI and/or the Regional Engineer has the authority to, among other things, require a licensee to take action to replace or modify project works for the purpose of achieving or protecting the safety, stability, and integrity of project works. The current Project is proposed to be completed under the 18 CFR Part 12 regulations.

As part of its evaluation of this Project, the Commission, under the National Environmental Policy Act (NEPA), is required to prepare an Environmental Assessment (EA). This EA is a declaration by the agency summarizing Environmental Impacts of the Project and Measures necessary to insure environmental protection. The Environmental Report (ER) prepared by the applicant is used to assist the Commission in development of the EA.

This ER supports the McClure Replacement Project, which involves replacement of the Penstock delivering water to the McClure Power Station. The McClure Power Station is part of the FERC licensed Dead River Hydroelectric Project. The objectives of this ER are to: (1) describe the underlying purpose and need for implementing the proposed option of restoring the Penstock at McClure; (2) describe the proposed option and any other alternatives considered, including the No Action Alternative; (3) describe the current environmental conditions at the Site and its environs; (4) analyze the potential indirect, direct, and cumulative effects on the environment from implementation of the proposed option; and (5) compare the effects of the proposed option with the effects of the No Action Alternative.

The ER demonstrates that both the construction and operational aspects of the proposed option will have minimal or no long term effect on the environment providing appropriate construction Best Management Practices (BMPs) are implemented during construction. Some short term impacts may occur due to ground disturbance in the immediate construction area and noise, which may temporarily displace some wildlife. There will be some construction of new access roads, which will remain in service and be permanently maintained as open unimproved roads. Other than these new roads, the area where surface disturbance occurred is expected to recover back to a natural state in a short period of time. Areas that are disturbed would be revegetated with native species or the areas would be allowed to revegetate naturally. Impacts to wetland

areas would be largely avoided. Some marginal quality wetland areas that have been created as a result of prior Penstock leakage would no longer receive a continuing influx of water, and therefore, would eventually change character.

With few exceptions, all impacts are expected to be limited to areas UPPCO is authorized to use for the purposes of construction, operation, and maintenance of the hydroelectric facility. The exceptions include access roadways that would be used by truck traffic to transport construction materials and heavy equipment to perform earth work and some temporary withdrawal of water for construction as needed. Much of the required work will be performed on areas that have already been disturbed during construction or operation of the original McClure Penstock. It should be noted that during construction UPPCO will implement the following specific measures and plans to prevent environmental degregadation:

- Erosions & Sedimentation Control Plan (***Appendix A***).
- Project Revegetation Plan (***Appendix B***).

Factors which were evaluated in reaching this conclusion include the following, as described further in ***Section 5.0*** of this Environmental Report:

- **Water Resources:** During construction, procedures will be in place to minimize transport of silt, sediment, or hazardous materials to the waters of the state. No hazardous materials will be used during the construction process, with the exception of normal fluids used in construction equipment (i.e., hydraulic fluid, motor oil, diesel fuel, or gasoline). The replacement of the Penstock will permit managed flow from the McClure Storage Basin to continue, and the resource would also continue to be available for providing hydroelectric power and reserve capacity to the region. The Penstock, when operating, also provides a flood control benefit, by containing and moderating a portion of the Dead River flow and limiting, to an extent, extremely high water flows through the steepest areas of the Dead River Gorge that could potentially become destructive.
- **Use of Water during Construction:** Water will be required for construction purposes. Typical needs may include dust control, equipment wash down, initial irrigation of restored areas, concrete mixing, conditioning of backfill for compaction, and other needs typical of construction and earth work activities. It is anticipated that construction water would be withdrawn from the McClure or Forestville Reservoirs, or the Dead River. The total quantity of water anticipated to be required can adequately be supplied by normal flow and recharge of the watershed. The impacts to aquatic resources as a result of this withdrawal will,

therefore, be negligible. To avoid entrainment of young fish, any pump intakes utilized for minimum flow or for any other dewatering needs will include screens with openings no larger than 3/32 inches. In addition, in areas where pump intakes will come in contact with fish and other large aquatic organisms, a screened box with openings no larger than 3/32 inches and a volume greater than 90 cubic feet will surround the intake to insure pumping velocities are less than 0.33 feet per second.

- **Aquatic Resources:** The potential impacts of the Penstock replacement on fish or other aquatic resources are expected to be negligible. The replacement will result in no changes to the permitted licensed conditions or operation of the Penstock and Powerhouse. The McClure Powerhouse is currently offline in terms of power generation. Very little of the actual work will be conducted in waterways. Land Disturbance Permits will be applied for as required, including the Michigan Department of Environmental Quality (DEQ) Part 303 and Part 301 Permits for waterways and wetlands encroachment and the Marquette County Part 91 Erosion Control Permit.
- **Wetlands:** Minor wetland areas (anticipated to be less than 1/3 acre total) may be disturbed as a result of the construction. These are mainly lesser quality wetlands that have formed near the Penstock and have become established as the result of prior Penstock leaks. Generally high quality wetlands that are in the vicinity of the construction area are sufficiently far removed that either they will not be disturbed or they can be protected by implementing BMPs during construction.
- **Terrestrial Resources:** The Proposed Option involves replacement of more than two miles of Penstock. Construction may require clearing and/or grubbing in the vicinity of the Penstock, in lay down areas, and in areas where traffic/equipment access is required but is not currently available. There will be limited clearing of existing brush and small trees for temporary staging areas for equipment and supplies along the Penstock alignment. The total amount of disturbance is estimated to be approximately 34.6 acres. Except for some additional new access roads that will be permanent, this impact is temporary. The land that may need to be cleared is a small fraction of the surrounding environment. Any disturbed areas will be restored. In addition to reseeding, as part of final erosion control measures disturbed areas will be allowed to reforest naturally.
- **Threatened and Endangered Species/Habitats:** Results of an inquiry into the Michigan Natural Features Inventory (NFI) database and a field reconnaissance performed by qualified wildlife biologists indicated that no unique natural areas or populations of rare, threatened, or endangered species (RTE) are in the immediate area of the construction and there would be no RTE impacts related to the construction or operation of the new Penstock replacement.
- **Aesthetic Resources – Air Quality:** The Site is remote. Potential air emissions include dust and contaminant exhaust emissions from heavy

equipment exhaust during construction. These emissions are not expected to impact local air quality and are not expected to be observed beyond the immediate areas of construction activity. Dust control measures such as water spray will be used as necessary to reduce dust in active construction areas and on unimproved access roads should dust generation become excessive. Cleared or grubbed trees can be chipped, burned, or reused as wildlife habitat. There will be a temporary increase in truck traffic along public roads for delivery of raw materials, which will have a local emissions impact. Regionally, restoring the hydroelectric generating capacity of the McClure Powerhouse results in avoidance of using fossil fuels to provide/generate that capacity, thereby reducing potential air emissions and improving regional air quality. After the Proposed Option is completed, there will be no air quality impacts at the Project Site from normal operation and the generation will offset fossil emissions.

- **Aesthetic Resources – Noise Impacts:** The construction site area along the Penstock routing is in a relatively remote area. The area was previously disturbed in some locations for the installation of the Penstock. Vegetation management practices continue to be implemented to maintain access and the existing right-of-way. The larger area is surrounded by state and private land that is wooded. There are a handful of primary and secondary (vacation) residences within the near vicinity of the Project area.. Wildlife in the immediate area will shun the noise and activity, thus temporarily reducing the local wildlife density. However, this is a temporary effect. There is potential for the noise of construction to be heard by the public that may use the surrounding areas, but not at levels that would be expected to create a significant annoyance. Construction work may take place during both daylight and evening/night hours. After construction is completed, there will be no noise impacts from normal operations of the Penstock or Powerhouse.

- **Aesthetic Resources – Visual Impacts:** During construction, the immediate area will be closed to the public as a safety precaution. This may include limited access to the Dead River. No visual impact to aesthetic features is expected. Truck traffic for the delivery of construction material will increase. Trucks would be cleaned as appropriate to remove mud and soil and access roadways wetted to minimize nuisance dust. Stone construction entrances would be used to transition from construction roads onto public or paved roadways. After construction and restoration of disturbed areas, the new Penstock replacement will have no significant change in visual impact from the current situation.

- **Aesthetic Resources – Odor Impacts:** It is not anticipated that there will be any odor impacts from the Project outside of the Project Area. Some gasoline or diesel exhaust from equipment engine operation may be noticeable within the immediate construction area.

- **Cultural Resources:** An archeological survey of the area did not identify any archeological sites or artifacts in the area. Should there be a new finding during construction, the UPPCO Historic Properties Management Plan would address the finding and provide for appropriate actions and notifications. UPPCO is working with the Michigan State Historic Preservation Office (SHPO) regarding the preservation/protection of certain project facilities and surrounding features identified as having historic significance.
- **Recreational Resources:** UPPCO owns only a small portion of the land along the McClure Dam and Powerhouse. UPPCO retains easements along the McClure Penstock right-of-way for the purposes of maintaining, operating, repairing, replacement, and security of the Penstock and associated project facilities. Recreational use of the area is at the discretion of the land owners, except for the recreational opportunities required to be maintained by UPPCO per the FERC operating license. Along the Penstock route a number of recreational uses are present, which include hunting, hiking, bird watching, day camping, swimming, picnicking, fishing, sightseeing, bird watching, mountain biking, ATV use, and wildlife observation. During construction, access to the immediate area in the vicinity of construction would be closed or limited for public safety concerns. Following construction, all areas previously available to the public are anticipated to be available for public use and recreational opportunity, as was the case prior to the Penstock replacement. Although some access may be limited or restricted during the construction, no long-term permanent impacts reducing the quality of recreational resources or recreational opportunity within the region are anticipated.
- **Socioeconomic Resources:** During construction, there will be a positive impact on the local and regional economy due to the expenditure of funds for temporary living expenses for some of the contractors and procurement of construction materials. There may be temporary local hiring as well. After construction, when normal operations are instituted, effects on the local economy and well-being of the community are expected to be essentially similar to that during prior operations. The result of this project will be that reliability will be restored to the McClure Powerhouse operations and reserve capacity and revenue generated by power production from McClure will be fully available to be invested back into the greater region. This project is considered green power and is eligible for Michigan renewable credits.

REASONABLY FORESEEABLE ACCIDENTS CONSIDERED AND POTENTIAL EFFECTS

The most significant foreseeable negative consequence of the proposed Penstock replacement during construction is the potential for sedimentation and erosion during the various Penstock replacement operations. These impacts would be controlled through the implementation of

BMPs and engineered sedimentation and erosion controls. There is no reasonable expectation of a construction induced accidental failure that would release a significant quantity of impounded water or soil, since the flow in the Penstock would be controlled at the McClure Dam while demolition and replacement are underway. Currently, there is no regular flow through the Penstock.

As with any heavy construction program, construction type accidents involving personal injury due to the use of heavy equipment, rigging, excavation, etc., are possible. UPPCO and its contractors are committed to the best practices for safe work, and a work plan will be developed with careful consideration of maintaining a safe work environment at all times.

Presently, the Penstock is not operating. Without replacement the generating capacity at McClure is lost, reducing electrical supply reliability to the region and resulting in economic loss from unrealized sale of electrical power.

SEVERE ACCIDENTS CONSIDERED AND POTENTIAL EFFECTS

Accidents typical of construction activities and the operation of heavy equipment are possible. However, construction is very unlikely to cause a severe or catastrophic accident. The Penstock would be fully tested before full unattended operation is resumed. Construction activities related to working at or near the inlet below McClure Reservoir would not present a risk that might compromise operability or lead to a failure of the Main Dam.

TERRORISM AND SECURITY

The Penstock is designed to withstand a constant water pressure and other stresses experienced by normal operations. The goal of a terrorist act is to create fear through random unpredictable acts that inflict mortal injury, destruction, confusion, and disruption affecting substantial numbers of individuals or inflicting significant financial loss resulting in economic instability, panic, and disruption. A terrorist act against this structure involving explosives or other means is an unlikely reasonably foreseeable event. Although there is an access road into the area, accessibility is limited and the area is rural. Such an attack would affect few individuals. Should the Penstock be the object of such an attack, the flow through the line could be controlled at McClure Dam before catastrophic downstream damage resulting in loss of life or property damage. Thus, it is unlikely that this structure would be a terrorist target.

Flow monitoring instrumentation will be provided in the new penstock system at the upstream and downstream ends of the system to detect differences in flows that would indicate a

significant pipe failure. Flow meters will be installed at the upstream end near the intake valve, and the downstream end near the powerhouse. Flow data will be monitored and evaluated, comparing upstream flow measurement to downstream flow measurement. When a significant difference in flow is detected between the two measurements, an alarm will trigger for a response. The response could be an emergency call out for inspection and evaluation of further response actions, or the response could be penstock intake valve closure.

IMPACTS FROM THE NO ACTION ALTERNATIVE

The No Action Alternative is the current situation. Flow through the Penstock has been stopped due to safety concerns. Without reconstruction, the McClure Powerhouse cannot operate and this would result in a significant and continuing loss of low cost renewable local electrical generating reserve capacity and revenue to the region.

DECOMMISSIONING

There is no indication that the Dead River Hydroelectric Project Developments would be decommissioned in the near or long term future. As long as the replacement under the proposed option is made at McClure, the installation will continue to comply with all provisions of the current license. Under the No Action Alternative, either an amendment or termination to the existing license would be required to remove the McClure generating capacity and Station from the existing license. If the license were terminated completely, this would also mean shutting down power generation capacity at Hoist. If the McClure Power Station is not restarted, the license amendment at a minimum would require continued maintenance or dismantlement of the McClure Dam to avoid having the structure fall into disrepair and becoming a safety hazard. Dismantlement would require additional environmental restoration activities for the portion of the river that was previously inundated to return the river to its natural state. No matter what remedy is implemented for the McClure Penstock, the right-of-way along the current Penstock alignment will be retained and maintained as the existing 33 KV electric power distribution line in the right-of-way is part of a regional electric supply loop. If the McClure Development is removed from the license, but Hoist continues to generate power, the No Action Alternative may also require some changes in the current operation of the Hoist Development so that reservoir elevations and minimum flows are properly maintained throughout the remaining permitted system.

1.0 BACKGROUND AND HISTORY OF THE ORIGINAL MCCLURE DAM, PENSTOCK, AND POWERHOUSE CONSTRUCTION

On October 4, 2002, the Federal Energy Regulatory Commission (Commission) granted the UPPCO an original major license for the operation of the 11.2 megawatt (MW) Dead River Hydroelectric Project (FERC No. P-10855-MI) located on the Dead River in Marquette County, Michigan. The Project includes three developments. Farthest upstream is the Silver Lake Storage Basin development (Silver Lake Reservoir). Approximately 5 miles below Silver Lake Reservoir is the Hoist development (Hoist Reservoir, also known as the Dead River Storage Basin), consisting of Hoist Dam, a 3,202-acre Reservoir, and a Powerhouse located 1,000 feet downstream of the Dam. Approximately one half mile below the Hoist Powerhouse is the McClure Reservoir development (McClure Reservoir), which consists of the McClure Dam, a 95.9-acre Reservoir, and a Powerhouse located at the end of the Penstock approximately 2.5 miles downstream of the Dam. A Site Location Map is provided on ***Figure 1-1***.

In addition to UPPCO's Dead River Hydroelectric Project, the Dead River also supports downstream hydropower developments at Forestville Basin and Tourist Park Basin under FERC License No. 2589, before entering into Lake Superior. Forestville and Tourist Park developments are owned and operated by the Marquette Board of Light and Power (Marquette BLP) and are not a part of the current Project. However, the tailrace of the McClure Powerhouse discharges into the Forestville Basin, thus certain impacts on or observed in the Forestville Basin are relevant to this analysis.

The McClure Storage Basin/Reservoir is located above river mile 11.3 where the dam impounds water about 4 miles back up the Dead River, from a 137.2-square-mile drainage area above the Reservoir. A 13,302-foot-long 7-foot-diameter Penstock leading from the McClure Dam to the McClure Powerhouse provides approximately 424 vertical feet of head to the McClure Power Generating Station. A detailed description of all the features of the McClure Hydroelectric Project from the McClure Dam to the McClure Powerhouse is provided in ***Section 3.1***.

The Penstock consists of a 7-foot-diameter pipe constructed of sections of riveted steel pipe and wood-stave concrete composite pipe. Sections are partly buried and partly visible above ground or fully supported upon various engineered structures. The current Project involves replacement of all 13,302 feet of Penstock. Portions of the existing Penstock have been in use since 1919. A failure in one area of the Penstock that occurred in November 2007 prompted UPPCO to engage

a structural engineering consultant to evaluate the structural integrity of the Penstock (STS/AECOM, 2008). The consultant evaluated various options for replacement of the Penstock and concluded that replacement of the entire Penstock would provide the greatest reliability and safety. The Proposed Option involves replacing the existing riveted steel section of the Penstock with new spiral welded steel pipe and installing a new buried 84-inch-diameter CCFRPM or spiral welded steel pipe alongside the existing wood-stave concrete composite section of the Penstock alignment. Controls at both ends of the Penstock (inlet at McClure Dam and at the McClure Powerhouse) would also be replaced. This will be accomplished by removing and replacing the above ground riveted steel sections of the Penstock with new spiral welded steel pipe and by-passing the remaining wood-stave wire rope concrete composite sections with a new 84-inch-diameter CCFRPM pipe or spiral welded steel pipe installed and buried parallel to the existing pipe alignment. The existing surge tank and ancillary features will also be replaced or restored.

The NEPA requires Federal Agencies to prepare EAs for any major project impacting environment that is regulated/permitted under their authority. As a part of the FERC licensed Dead River Hydroelectric Project, the McClure Penstock Replacement project is subject to this requirement. An ER prepared by the applicant is used to assist the Commission in development of the EA. UPPCO engaged Paul C. Rizzo Associates (RIZZO) to prepare an ER in support of the proposed construction and replacement of the McClure Penstock. This ER describes and discusses potential environmental impacts as a result of completing the replacement under the proposed option.

2.0 PURPOSE OF ACTION AND NEED FOR RELIABLE POWER GENERATION

The Commission, under authority of the FPA licenses and oversees the operation of non-federal hydropower projects in the United States. As part of its oversight capacity, the Commission implements a Dam Safety Program, through its D2SI, to ensure that licensed projects comply with Federal Dam Safety Standards and are designed, constructed, and operated safely. Under 18 CFR Part 12, the D2SI and/or the Regional Engineer has the authority to, among other things, require a licensee to take action to replacement or modify project works for the purpose of achieving or protecting the safety, stability, and integrity of project works. The current Project is proposed to be completed under the 18 CFR Part 12 regulations.

2.1 PURPOSE OF ACTION

The Proposed Action involves implementing the Penstock replacement option. Briefly, this option requires the replacement of the penstock with a new penstock from the McClure Dam inlet to the McClure Generating Station.

Maintaining the integrity of the Penstock at McClure is an operating condition necessary to maintain the FERC Operating License for the Dead River Hydroelectric Project. In order for UPPCO to continue operations at McClure, the Penstock must be replaced to satisfy applicable Dam Safety Requirements.

As part of its evaluation of this Project, the Commission, under NEPA, is required to prepare an EA. This EA is a declaration by the agency summarizing environmental impacts of the project and measures necessary to insure environmental protection. The ER prepared by the applicant is used to assist the Commission in development of the EA.

As part of its evaluation of this Project, FERC has requested the preparation of an ER that can be used as the basis for the Commission to prepare the EA the Project.

The objectives of this ER are to: (1) describe the underlying purpose and need for the proposed option; (2) describe the proposed option and other alternatives, including the No Action Alternative; (3) describe the current environmental conditions at the Site and its environs; (4) analyze the potential indirect, direct, and cumulative effects on the environment from

implementation of the proposed option; and (5) compare the effects of the proposed option with the effects of the No Action Alternative. Because the proposed option is the reconstruction of a component of the formerly operable Dead River Hydroelectric Project, the ER only considers alternative design options to complete the replacement and the No Action Alternative.

The ER process identifies environmental information that can be used in developing mitigation measures, if necessary, to minimize or avoid adverse effects on the quality of the human environment and natural ecosystems resulting from implementing the proposed option.

2.2 NEED FOR CONTINUED POWER GENERATION

UPPCO is the owner and operator of the McClure Hydroelectric Development on the Dead River in Michigan. UPPCO has six district offices and provides service for 100 communities in 10 counties and more than 51,000 customers, covering an area of approximately 4,450 square miles in the Upper Peninsula region of Michigan. UPPCO serves cities, villages, and townships located in the counties of Alger, Baraga, Delta, Houghton, Iron, Keweenaw, Marquette, Menominee, Ontonagon, and Schoolcraft. Additionally, within Iron County, UPPCO serves in and around the City of Iron River. UPPCO power is supplied to adjacent mining and rural locations at retail rates. Wholesale power is furnished to five municipalities, two rural electrification associations, and the Wisconsin Electric Power Company. The UPPCO regional service area is depicted on ***Figure 2-1***.

UPPCO is part of the larger Integrys Energy Group, (formerly WPS Resources), a holding company for several other energy service companies including:

- Michigan Gas Utilities;
- Minnesota Energy Resources;
- North Shore Gas;
- Peoples Gas;
- Integrys Energy Services; and
- Wisconsin Public Service Corporation.

UPPCO is a member of the Midwest Reliability Organization (MRO), one of the North American Electric Reliability Councils. As a member of MRO, UPPCO's capacity estimate including generation plus electrical purchases from other suppliers are reported annually in early

spring to the Michigan Public Utilities Commission for the purpose of evaluating the regional preparedness for the summer seasonal peak electrical demand load. UPPCO's planning reserve margins reported for 2008 were at 40.4 percent, 22.9 percent, and 28.7 percent for the months of June, July, and August, respectively. UPPCO estimated a summer peak demand at 149.3 megawatts, occurring in July. This demand estimate represents the peak UPPCO estimated total service area system load. The estimate includes transmission and distribution losses (e.g., increasing the demand estimate), but not serving interruptible load customers. Interruptible load customers are typically industrial and commercial customers that have agreed to accept a lower unit cost rate for power, but have a willing understanding with UPPCO that their power supply may preferentially be interrupted in the event of excessive peak network demand. The power generation capacity at McClure represents 6.7 percent of UPPCO's estimated peak demand. In-state generated power in 2008 represents 37 percent of UPPCO's projected peak summer load demand. This peak demand estimate is for the summer of 2008 and accounts for (e.g., does not include any contribution from) the expectation that the McClure Station will be offline until the Penstock replacement is completed. In order to make up the difference between in-state generating capacity and anticipated peak demand loading, UPPCO purchases power for distribution from partner Integrys generating companies, and/or from the national electric utility grid system (UPPCO, 2008b).

As described in ***Section 1.0***, the Dead River Hydroelectric Project is comprised of three storage basins (Silver Lake, Hoist, and McClure) and two Powerhouses (Hoist and McClure) on the Dead River. The Project is one of UPPCO's significant power generation assets and is operated as an integral part of UPPCO's regional power system. In February 1988, UPPCO purchased the Project from Cliffs Electric Service, a subsidiary of Cleveland-Cliffs Iron (CCI), the original developer of most of the facilities. On April 22, 1994, UPPCO filed an application with FERC for an initial license for operating the unlicensed 11.2-megawatt (MW) Dead River Hydroelectric Project. The Dead River Basin has been a source of regional power generation since the early 1900, but up until the time of this application, these resources had not been previously licensed under the Federal Power Act. FERC License No. 10855 was granted to UPPCO for the responsibility to operate hydroelectric project facilities on the Dead River in Marquette County, Michigan located between river miles (RM) 11.3 and 34.0. These resources do not occupy any federal lands (FERC, 2002). UPPCO owns only a small part of the lands included within the Project boundary, with the majority being owned by Longyear Realty. UPPCO holds extensive leases and flowage rights from Longyear for the purpose of maintaining project operation, including the right to inundate lands (UPPCO, 1994).

As noted above, the Project includes two Powerhouses. The estimated average annual generation at the Hoist Powerhouse for the period from 1983 to 1992 was 15,643 megawatt-hours (MWh). The estimated average annual generation at the McClure Powerhouse for the same period was 48,452 MWh. The Dead River Project is located in the region served by the Mid America Interconnected Network (MAIN) of the North American Electric Reliability Council (NERC). NERC annually forecasts electrical supply and demand in the nation and the region for a 10-year period. According to NERC, the demand for electric energy in the MAIN will grow at an average rate of 1.5 percent annually (from 243 billion kilowatt-hours [KWh] to 278 billion KWh during the period 2000 to 2009) (NERC, 2000).

FERC addresses the environmental impacts of replacing the resources of the Dead River Project with other non-renewable sources of power. The license states that the Dead River Projects, which includes the Marquette Project, together produce approximately 81 million KWh annually (0.03 percent of system generation). This capacity displaces or defers the demand on existing and planned non-renewable fossil-fueled electrical generation facilities that produce nitrogen oxides and sulfur oxides, which contribute to air pollution. Therefore, these hydroelectric generation facilities contribute to diversification of the generation mix in the MAIN region. By producing hydroelectricity, these projects displace the need for other power plants to operate, thereby avoiding some fossil-fuel power plant emissions and producing an environmental benefit. If the electric generating capacity of these projects were replaced with other fuels, greenhouse gas emissions could potentially increase by about 22,600 metric tons of carbon per year. In the MAIN reliability region where these projects are located, the capacity mix includes a proportionately small amount of hydropower, relative to systems located in other parts of the country. FERC considers that the electrical power produced by these facilities contributes to a diversified generation mix, and helps meet a need for power in the Project's area (FERC, 2002).

2.3 EXPECTED RESULTS AND POTENTIAL BENEFITS OF REPLACEMENT OF THE MCCLURE PENSTOCK

This Section discusses the local and regional benefits of implementing the recommended alternative to replace the McClure Penstock.

2.3.1 Restoration Generation Capacity and Regional Electrical Reliability

Replacement of the McClure Penstock will return the lost generating capacity to the regional grid system. Greater diversity in generating capacity increases regional power reliability (refer to ***Section 2.2***).

2.3.2 Compliance with License Requirements

The operating license for the Dead River Hydroelectric Project includes the operations at McClure. Restoration of the operational capacity at McClure will avoid having to reopen and change the license. The development could continue with only the power generation assets at Hoist. The ongoing and long term status of the McClure Dam and Reservoir would need to be addressed. No matter what remedy is implemented for the McClure Penstock, the right-of-way along the current Penstock alignment will be retained and maintained, as the existing 33 KV electric power distribution line in the right-of-way is part of a regional electric supply loop.

Implementation of the proposed construction and replacement measures will not require modifying the current license. However, not implementing the proposed construction and replacement measures (e.g., abandoning the intent of generating power at the McClure Powerhouse), will eventually require modifying the license to remove the capacity and operations at McClure. Implementing the proposed construction and replacement measures will not require any temporary waivers from the current license conditions. The McClure Powerhouse remains offline until the Penstock replacement measures are completed. No significant change in the originally proposed operation of the Project as contained in the License will result upon completion of the proposed option.

2.3.3 Contribution to Regional Economy

Restoration of the generating capacity at McClure will be beneficial to the regional economy. Revenue generated by the sale of electric power generated by McClure is invested by UPPCO back into the region through employment, payroll, and a return for shareholders.

2.3.3.1 Renewable Energy Credit Value

The Clean, Renewable, and Efficient Energy Act of 2008 was signed into Michigan law in October of 2008. The law requires electric providers serving retail load to achieve a renewable energy credit standard, beginning in 2012 and stepping up to 10 percent of retail electric sales in 2015. Hydroelectric generation is included as one of the eligible technologies that can be utilized to meet the requirement. The McClure Station provides UPPCO and its ratepayers a lower cost source of renewable generation when compared to the cost of building a new renewable generation facility. The McClure Station is a key component of UPPCO's renewable generation portfolio.

2.3.4 Recreational Resources

As a requirement of the license, certain recreational amenities are maintained by UPPCO throughout the project area. UPPCO owns only a small portion of the land along the McClure Dam and Powerhouse. UPPCO retains easements along the McClure Penstock right-of-way for the purposes of maintaining, operating, repairing, replacement, and security of the Penstock and associated project facilities. Recreational use of the area is at the discretion of the land owners, except for the recreational opportunities required to be maintained by UPPCO per the FERC operating license.

If capacity at McClure is not restored and the license for the project modified or abandoned, access to the properties not owned by UPPCO and any decisions regarding future development would defer back to the property owner. UPPCO would maintain the power line right-of-way along the Penstock alignment for the 33 KV loop line that is part of the local distribution network. Recreational amenities required to be maintained under the license would not likely continue to be available to the public by UPPCO if the related hydroelectric generating facilities were withdrawn from the license.

2.3.5 Flood Control

The restoration of the capacity of the McClure Penstock would provide capacity to bypass flow around the steepest part of the Dead River during extremely large precipitation events, which may help in controlling scouring and erosion during periods of high flow.

2.4 IMPACT ON THE PROJECT BOUNDARY

The majority of any construction will occur immediately in the vicinity of the McClure Development features as identified in the Dead River Hydroelectric Project License (UPPCO, 1994; FERC, 2002) and within the license Project Boundary. UPPCO either owns or has legal access to these lands. The Penstock route is noted on the Site Plan as shown on ***Figure 2-2.*** It lies well within the 400-foot corridor environmental survey area along the Penstock route which was implemented for this ER, as shown on ***Figures 2-3, 2-4, 2-5, and 2-6.*** There may also be some minimal access road construction and improvements to facilitate vehicle and equipment movement along the right-of-way and routine maintenance of local access roads as necessary due to increased use by construction traffic.

3.0 PROPOSED ACTION

This Section includes a discussion of the proposed option and the No Action Alternative, along with other options that were evaluated. The process of screening those options and alternatives is also discussed. The "Proposed Option" is the recommended alternative and mainly involves installing either CCFRPM or spiral welded steel pipe parallel to the existing wood-stave concrete composite pipe and replacing the riveted steel sections of the Penstock with new spiral welded steel pipe. The existing wood-stave concrete composite Penstock will be abandoned in place. Controls at both ends of the Penstock (inlet at McClure Dam and at the McClure Powerhouse) would also be replaced. The existing surge tank will be refurbished to accommodate the new proposed Penstock pipe and existing supports at existing wetland crossings will be reused.

Additional aspects of the Project include construction haul roads, staging areas, etc. In order to properly size and specify the new piping system components, UPPCO, through its consultant, Barr Engineering Company (Barr), performed a hydraulic analysis including a water hammer analysis to determine design conditions to insure reliability and safety as required by FERC. Based on the hydraulic analysis, Barr evaluated various options for pipeline repair and/or replacement including pipeline construction materials; methods of construction; pipe size availability/performance; and flow control. From this evaluation, a conceptual design for replacement of the McClure Penstock was proposed. The following information is summarized from Barr's Engineering and Conceptual Design Report and from subsequent evaluations and discussions with UPPCO (Barr, 2008).

3.1 DESCRIPTION OF ORIGINAL MCCLURE DAM, PENSTOCK, AND POWERHOUSE CONSTRUCTION AND FEATURES

This ER focuses on the environmental impacts specifically associated with the McClure Penstock Restoration Project, which is part of the McClure Hydroelectric Development on the Dead River. The McClure Development consists of (1) an existing 1,874-foot-long earth embankment and concrete gravity McClure Dam varying in height from 22 to 51.4 feet; (2) an existing McClure reservoir having a surface area of 95.9 acres with a storage capacity of 1,870 acre-feet and a normal water surface elevation of 1,196.4 feet National Geodetic Vertical Datum of 1929 (NGVD29); (3) a 99-foot-long, 10-foot-wide, and 28-foot-high existing intake structure; (4) an existing 13,302-foot-long, 7-foot-diameter steel, wood, and concrete Penstock; (5) an existing 40-foot-high, 30-foot-diameter concrete surge tank; (6) an existing Powerhouse

containing two Francis-type generating units with a total installed capacity of 8 MW; (7) an existing tailrace; (8) an existing 33-kV substation; and (9) appurtenant facilities (FERC 2002).

The McClure Dam impounds the Dead River about 11.3 river miles upstream from Lake Superior. The McClure Dam creates the McClure reservoir/storage basin, which is approximately 1.5 miles long, and having a surface area of 95.9 acres and a storage capacity of approximately 1,870 acre-feet. The maximum depth of the basin is approximately 53 feet near the dam, and the average depth is 20 feet. Flow into McClure Storage Basin is regulated by power generating operations at the Hoist Powerhouse and releases from Silver Lake. Flow from the Hoist Reservoir spills into the McClure Reservoir from Hoist Dam. Flow travels from the discharge at Hoist along a short section of the Dead River into the McClure Reservoir. The McClure Dam retains the McClure reservoir behind the Dam and provides the inlet to the McClure Penstock, which feeds the down gradient Powerhouse. The Penstock intake structure directs water to the 2.5 mile, 7-foot-diameter wood-stave concrete composite and riveted steel Penstock (which splits near the Powerhouse to feed each generator). A concrete inline surge tank (which is considered an aesthetic historical design feature) aids in hydraulic control and cushions flow through the pipeline to prevent water hammer. The McClure Powerhouse, containing two generating units producing 8 MW, discharges the turbine tailrace into the Forestville Reservoir of the separate Marquette Development Project. A 33-kV substation and other appurtenant facilities control and route power to local transmission lines (FERC, 2002). Approximately 6.1 river miles of the original Dead River channel below McClure Dam is bypassed by the Penstock of the McClure Development Project. This bypassed reach downstream of the McClure Dam receives a 20cfs minimum flow.

3.1.1 Penstock Alignment / Existing Feature Description

A survey of the existing penstock was completed in 2007 by Ayres Associates that documented the existing Penstock alignment, including relative locations along the penstock and right-of-way. Stationing for the 2007 survey was established with increasing numbers from upstream to downstream, as compared to the original project stationing that used increasing numbers from downstream to upstream. Design for the McClure penstock replacement will use a downstream-to-upstream project stationing convention, with 3+00 of original stationing fixed, and numbers increasing from this point in upstream direction, and decreasing from this point in downstream direction. This stationing convention will avoid stationing changes throughout the entire project if possible alignment modifications occur with additional bifurcation modeling and design.

Table 3-1 presents stationing and elevations at key locations along the Penstock and right-of-way. (Barr, 2008).

3.1.2 Assessment of Existing Penstock Features

Figure 3-1 presents a plan and profile of the existing Penstock, including major Project features. The existing Penstock features have been inspected and evaluated as part of the most recent FERC Part 12 D consultant safety inspection (STS/AECOM, 2008) and for the Preliminary Concept Design Report (Barr, 2008), resulting in the following recommendations by Barr:

- The concrete intake structure is in good condition and should be maintained as-is.
- The unlined concrete conduit section that extends through the concrete intake/non-overflow section of the dam appears to be in good condition. This section will be investigated further to verify the condition of the concrete, but is anticipated to be maintained as is.
- The intake valve located within the concrete intake / non-overflow section is old and inefficient. The valve is smaller in diameter than the Penstock, and in the open position the valve plate remains in the flow path. This valve should be replaced with a newer larger diameter valve that can be operated remotely and that will allow more efficient flow (less head loss).
- The riveted steel pipe between the intake valve and approximately Station 131+46 is in poor condition and should be replaced.
- The open air vent at Station 131+51 is in poor condition and should be replaced.
- The wood-stave concrete composite Penstock from Station 131+46 to 35+90 is aged and deteriorated, and has significant leakage in multiple locations. The wood-stave concrete composite Penstock should be replaced. The surge tank at Station 92+60 appears to be in good condition, but there has been no detailed inspection and evaluation of the existing surge tank. The surge tank appears to be in a location that balances hydraulic surge protection, constructability, and cost. The existing surge tank will be refurbished. The existing surge tank should be investigated further to evaluate the condition and make a recommendation on repair.
- The steel pipe between Station 35+90 and the bifurcation at Station 0+17 is deteriorated, and many sections are over-stressed according to modern steel design standards. Therefore, the entire steel pipe should be replaced.

TABLE 3-1
EXISTING PENSTOCK FEATURES
(BARR, 2008)

ORIGINAL STATIONING CONVENTION	2007 AS-BUILT SURVEY STATIONING	FEATURE DESCRIPTION	INVERT ELEVATION
133+20	0+00	Intake to 7-foot-diameter steel pipe	1183.3
131+51	1+69	Open air vent	
131+46	1+74	End of riveted steel Penstock / start of wood-stave concrete composite Penstock	
92+60	40+60	Center of 30-foot-diameter concrete surge tank	1171.5
88+17	45+03	L.S.&I. railroad crossing	1102.5
74+90	58+30	Manhole and drain	1040
59+70	73+50	Manhole	1040
51+33	81+87	Manhole	1040
51+11	82+09	Valve air vent	1040
43+08	90+12	Manhole	1030.5
37+76	95+44	Manhole	
35+90	97+48.5	End of wood-stave concrete composite Penstock / start of riveted steel Penstock	983
30+65	102+55	New manhole	
29+97	103+23	Expansion Bellows No. 1	
28+82	104+38	Drain	910
25+69	107+51	Mini manhole	946
25+30	107+90	Valve air vent	946
22+76	110+44	Manhole	924
22+18	111+02	Expansion Bellows No. 2	924
20+74	112+46	Mini manhole	
17+30	114+89	Bend right	889
15+42	117+78	Mini manhole	
15+19	118+01	Manhole	869
11+68	121+52	Expansion Bellows No. 3	
10+57	122+63	Mini manhole	822
10+36 to 9+26	122+84 to 123+94	Penstock bridge	822
9+85	123+35	Drain	822
9+57	123+63	Manhole	822
9+30	123+90	Downstream end of Penstock bridge	822
7+30	125+90	Valve air vent	854
5+60	127+60	New manhole	
3+84	129+36	Expansion Bellows No. 4 (buried)	
1+40	131+80	Mini manhole	843.8
0+17	133+03	Bifurcation	792

- The bifurcation pipe from Station 0+17 to the Powerhouse is also deteriorated, with some overstress of the steel pipe in this section. In addition, the existing bifurcation arrangement results in un-even distribution of flows to the turbine generator units. Considering the rest of the Penstock is recommended for replacement, the bifurcation pipes should also be replaced. Otherwise, deteriorated and overstressed bifurcation pipes would be the only aging component on an otherwise new Penstock system. The replacement bifurcation arrangement will include modifications in alignment and geometry to improve hydraulic characteristics with the intent of improving operations and generation efficiency. The modifications will fit within the general corridor of the existing alignment.
- The butterfly valves in the Powerhouse are old and inefficient. In the open position, the valve plate remains in the flow path, and in the closed position, it does not seal well. These valves should be replaced with newer valves that can be operated remotely and that will allow more efficient flow (less head loss).

3.1.3 Basic Design Assumptions

The following Section presents a summary of the basic design assumptions developed by Barr Engineering. These assumptions are based on input from UPPCO and conclusions of the hydraulic design analysis.

Table 3-2 provides a summary of basic design assumptions for the McClure Penstock replacement design as developed by Barr.

3.2 ALTERNATIVE DESIGNS CONSIDERED

Barr was retained as engineer of record by UPPCO to perform an engineering economic analysis of the rebuild options for the McClure Penstock, develop a recommended conceptual design and develop a detailed design of the approved option. Following the initial inspection and hydraulic analysis, Barr evaluated thirteen different materials for suitability for replacement of the existing 84-inch-diameter Penstock. Barr also evaluated construction, abandonment, and disposal options

TABLE 3-2
BASIC DESIGN ASSUMPTIONS
(BARR, 2008)

Penstock length	Approximate 13,320 foot length.	
Penstock Alignment (Note: Stations may not follow transition locations exactly, dropping into existing alignment where appropriate in order to minimize wetlands impacts)	0+00 – 45+00	Same as current alignment
	45+00 – 91+50	Parallel existing – offset 11 ft
	91+50 – 93+50	Same as current alignment
	93+50 – 128+50	Parallel existing - offset 11 ft
	128+50 – intake	New alignment
Vertical datum	Project elevations are in the North American Vertical Datum of 1988 (NAVD-88), and Project control (benchmarks) will be developed in this datum.	
Horizontal datum	Horizontal datum (coordinates) and control (benchmarks) for the Project design will be developed in Michigan State Plane Coordinates North.	
Project stationing	Project stationing for design will be developed beginning at the upstream face of the Powerhouse (0+00 = upstream face) and proceeding upstream with increasing Station numbers / distances.	
Existing pipe composition / lengths	3,743 feet of 84" diameter riveted steel pipe 34 feet of 48" diameter riveted steel pipe 9,556 feet wood-stave concrete composite pipe wrapped in wire rope, encased in concrete, and buried.	
Proposed pipe Composition / lengths	3572 feet of 84" diameter spiral weld steel pipe 50 feet of bifurcated spiral weld steel pipe 9635 feet of 84" diameter CCFRPM pipe or spiral welded steel	
Project head	424 feet normal static head.	
Design flow capacity	UPPCO would like to have capacity of 390 cubic feet per second (cfs) to match Hoist capacity. The existing system is designed for 320 cfs.	
Penstock access	Access hatches should be incorporated into at least five locations, with at least one access located between the intake and surge tank, and access points space at reasonable intervals and key locations for the remainder of the alignment.	

for a new Penstock installation. Evaluation criteria considered a range of factors including reliability, performance, maintenance, and technical effectiveness for materials, and cost, schedule, environmental impacts, and operational characteristics. Based on the initial evaluation of options, five replacement alternatives were developed and screened in detail and a final alternative recommended. This evaluation process is discussed in the sections below.

3.2.1 Pipe Material Screening

The existing Penstock materials, upon inspection and analysis, have been determined to be significantly degraded and will be replaced in their entirety. Each of the preliminary pipe materials was initially screened for performance, cost, and schedule criteria.

Each of the following materials or technologies was considered for preliminary screening:

- Spiral Weld Steel (SWS);
- Longitudinal Weld Steel (LWS);
- Ductile Iron Pipe (DIP);
- Reinforced Concrete Pressure Pipe (RCPP);
- Reinforced Concrete Cylinder Pipe (RCCP);
- Pre-stressed Concrete Cylinder Pipe (PCCP);
- Cast In Place Slip-lining (CIPSLP);
- Centrifugal Cast Fiberglass Reinforced Plastic Mortar Pipe (CCFRPM);
- Poly Vinyl Chloride (PVC);
- High Density Polyethylene (HDPE);
- Wood-stave Pipe (WSP); and
- Rock tunnel using Tunnel Boring Machine (TBM) construction.

The following materials were dismissed from further consideration for reasons noted:

- LWS due to higher cost and limited availability;
- DIP due to size limitation of 60 inches;
- PCCP due to historic reliability and difficulty to repair;
- CIPSL due to productivity and long-term maintenance;
- PVC due to limited diameter availability;

- HDPE solid wall due to limited diameter availability;
- HDPE structural wall due to limited maximum working pressure;
- WSP due to limited working life; and
- TBM due to substantially higher cost.

The following configurations were then considered for installation of these pipe materials:

- Above ground alignment, with pipe material supported on cradles.
- Direct bury, consisting of excavating a trench, placing bedding aggregate, laying pipe on the bedding, and backfilling around the pipe.
- Partial bury, consisting of setting bedding aggregate on the ground, shaping the bedding to match the pipe diameter and supporting at least 120 degrees of the pipe, and placing the pipe onto the bedding.
- Installing new pipe using slip lining technology to set the pipe inside the existing wood-stave concrete composite Penstock
- Burying entire pipe except around Station 9+75 and 11+50 at stream crossing.

Based on these evaluations, three materials were recommended for further evaluation, including:

- Concrete Pipe consisting of a combination of American Society for Testing Materials (ASTM) C361 Reinforced Concrete Pressure Pipe (RCPP) and American Water Works Association (AWWA) A C300 Reinforced Concrete Cylinder Pipe (RCCP). These materials are viable pipe materials for working pressures expected within the existing wood-stave concrete composite pipe segments (generally under 100 psi).
- Centrifugal Cast Fiber Reinforced Plastic Mortar (CCFRPM) pipe for working pressures expected within the existing wood-stave concrete composite pipe segments (generally under 100 psi), and for working pressures necessary for replacement of the upstream existing riveted steel pipe segments.
- Spiral Weld Steel (SWS) pipe is the only viable pipe material for the working pressures necessary for replacement of the downstream existing riveted steel pipe segment and is also a viable pipe material for replacement of the existing wood-stave concrete composite pipe segments.

Various pipe sizes and size combinations were evaluated to consider the potential hydraulic head loss, resulting power generation loss, and the difference in capital costs. This evaluation was not a detailed analysis, but provides a reasonable characterization of the relative costs and

hydroelectric power generation. Based on a hydraulic and size analysis, pipe options were narrowed to spiral welded steel or CCFRPM pipe materials.

3.2.2 Handling of Existing Materials

New pipe will be installed to replace the entire existing Penstock. Therefore, it will be necessary to safely and effectively abandon the existing Penstock materials. In areas where existing Penstock pipe removal is required, materials would be exposed with backhoe excavation equipment, broken down into manageable pieces by cutting or crushing, loaded onto dump trucks, and hauled off-site for appropriate permitted disposal.

- Most of the existing wood-stave concrete composite Penstock segments will be abandoned in place. The existing wood-stave concrete composite Penstock is structurally stable and secure from outside access. In select areas, the existing wood-stave concrete composite Penstock will be filled with concrete materials to support heavy load conditions over the pipe.
- Portions of the wood-stave concrete composite Penstock will need to be removed to accommodate new Penstock construction. In these sections, all of the Penstock material (concrete, steel, and wood-stave concrete composites) would be removed and disposed of in a licensed landfill.
- Removed steel pipe segments could be salvaged for recycling or land filled, at Contractor's option. Riveted steel Penstock removal and disposal would likely result in approximately 912 tons of steel material.

The following is a detailed description of the existing and proposed **pipe covering**:

Existing Penstock

The existing penstock is made up of two materials, steel and wood stave pipe. From Station 0+00 – 4+00 the existing steel pipe soil cover is approximately 8 – 10 feet prior to entrance into the powerhouse. From Station 4+00 to 28+00 the steel pipe cover varies from approximately 3.0 feet of cover to exposure of the entire penstock. The penstock is exposed in numerous locations including steep grade areas, stream crossings and areas with shallow bedrock soil cover. At stream crossings located at Station 9+50 and 11+75, the penstock is completely exposed and above grade. The penstock transitions from steel to wood stave pipe at Station 35+90.

From Station 35+90 to 131+46 the existing wood stave pipe has a soil cover between 1.5 feet and 3.0 feet based on field investigations done by Barr Engineering. Near the intake the wood stave pipe has variable soil cover due to the existing dam embankment.

Proposed Penstock

The proposed penstock will consist of two materials, Centrifugally Cast Fiberglass Reinforced Polymer Mortar (CCFRPM) and Spiral Weld Steel (SWS) Pipe or entirely SWS. The proposed penstock will be covered with approximately 2.5 feet of cover throughout the entire alignment of the penstock except at the two stream crossings located at Station 9+50 and 11+75. At these locations, the SWS pipe will be placed on the existing support structures. The proposed penstock will have the greatest amount of soil cover at the dam embankment, railroad crossing, road crossing and at the powerhouse.

Wood Stave Pipe Removal

Replacement of the existing penstock pipe will require removal of several sections of the existing wood stave pipe. Following is a brief discussion on how this pipe will be removed and disposed.

Bulkhead

The existing wood stave pipe will have bulkheads installed both upstream and downstream of the removal area. Bulkheads will be poured reinforced concrete. Installing bulkheads will require excavation and cutting of the existing pipe.

Excavation

Currently the entire wood stave section of the penstock is covered by approximately 1.5 – 3’ of soil. Backhoes will need to carefully remove this cover soil above and along side the pipe. Soil will need to be stockpiled temporarily.

Demolition of Pipe

Once the pipe is exposed backhoes will dismantle the existing wood stave pipe. Materials will need to be separated which include asphalt, wood, concrete and metal banding. Backhoes with chippers and grabbers will need to separate materials for appropriate disposal. The existing wood stave penstock pipe is approximately 8 inches thick.

Loading of Materials

Separated materials will be loaded into dump trucks for removal from the site. Typical dump truck capacity will be approximately 15 cubic yards. Estimated removal is approximately 1650 feet of wood stave pipe, which totals about 1000 cubic yards to be removed from the site.

Hauling Demolished Pipe

Demolished pipe material will be transported to an appropriate disposal site. Materials in the wood stave pipe will need to be disposed of in an approved landfill.

Four alternatives were considered for abandoning the existing wood-stave concrete composite Penstock. For each alternative the level of effort, cost, schedule, environmental impact, and uncertainty in construction and performance are considered, as summarized below.

- Remove existing Penstock, dispose of demolition materials in off-site landfill, and place new Penstock along same alignment. This alternative is most disruptive, requiring extensive excavation and ground disruption, thereby accumulating the greatest amount of adverse impacts to the environment for all the alternatives that are technically viable. It also requires trucking material off-site with increased air emissions, and placement of demolition materials within a landfill. This alternative would take between 8 and 20 weeks to implement, depending on the number and size of crews and equipment used for removal. The cost for full removal and off-site disposal is estimated to be around $2.4 million.
- Abandon existing Penstock in place, stabilizing critical areas where the Penstock will experience significant surface-applied loads. This option is least disruptive, and represents the lowest cost, thereby accumulating the least amount of adverse environmental impacts for all the alternatives. Pipe would be stabilized at the railroad crossing and near Station 50 where the maintenance and access road crosses over the Penstock. The existing Penstock is structurally competent to hold up under the shallow overburden and light traffic personnel, ATV traffic, and light material storage. The estimated cost for this alternative is in the range of $50,000 to $100,000. The anticipated construction schedule to implement this alternative is likely 2 to 4 weeks. The abandoned pipe alignment will be marked and blockaded to prevent heavy equipment traffic and heavy material loading over the existing Penstock.
- Abandon existing Penstock in place, filling the pipe with flowable material to eliminate voids. This option is less disruptive than removing the existing Penstock, but more disruptive than abandoning in place with select fill only, and provides little or no safety advantage and a moderate amount of adverse impact to the environment. This option would require

select Penstock demolition at regular intervals for access points, and additional construction effort to transport and place nearly 14,000 cubic yards of cementitious grout and concrete materials. Costs for implementing this alternative are estimated to be around $2.3 million. The anticipated schedule for implementing this alternative is likely 6 to 8 weeks.

- Install new pipe within existing pipe space (slip-line technology). This option combines new pipe installation and abandonment of the existing pipe. New pipe would be installed inside existing pipe by excavating periodic loading pockets, setting new pipe inside the existing pipe at these pockets, pulling new pipe into place and joining pipe, and grouting the space between the new and existing pipes. This alternative is not technically viable for this project, as it cannot be operated in a safe manner because of the difficulty of monitoring and maintaining the joints within an existing pipe. Environmental disruption is less than full removal but more than abandoning in place with select stabilization measures This alternative reduces capacity for Michigan renewable energy credits (e.g. green power). Power production would be significantly reduced, as this alternative requires a smaller diameter pipe than would be used for a pipe set in an open trench. Other considerations include uncertainty in potential construction conditions, difficulties in grouting the space between pipe to prevent pipe floating, potential difficulties in joining and testing pipe joints, and limited ability to inspect and isolate newly installed pipe.

Based on the anticipated level of effort (and associated cost), construction schedule, operational, environmental, and liability considerations, the following recommendations were made for abandoning the existing Penstock:

- For wood-stave concrete composite Penstock segments:
  - Completely remove and dispose in permitted landfill segments where proposed alignment matches the existing alignment.
  - Abandon in place as is where proposed pipe alignment is offset from the existing alignment.
  - Strengthen existing pipe with cementitious fill where high loading conditions are anticipated over existing Penstock remaining in place.
- For steel Penstock segments, remove the steel pipe and salvage or dispose of steel materials.

3.2.3 Alternative Penstock Replacement Configurations

Based on a thorough engineering evaluation of the various options, three viable alternatives for replacement of the Penstock were developed and considered for detailed evaluation. These are described below. A comparison of these alternatives is provided in ***Table 3-3*****.**

Alternative A – Spiral Weld Steel 84-inch-diameter direct bury

This alternative consists of new 84-inch-diameter spiral weld steel pipe installed in a direct bury manner alongside the existing Penstock for the length of the existing wood-stave concrete composite Penstock alignment. Pipes would be connected with double-weld joints. . The majority of the existing wood-stave concrete composite Penstock would be abandoned in place from Station 45+00 to the McClure Dam. A trench would be excavated as close as possible to the existing Penstock, bedding material placed on the bottom of the trench, and pipe installed and buried with cover material over the crown of the pipe. It is anticipated that new steel pipe would be stockpiled on the fill atop the existing wood-stave concrete composite Penstock, and an access road would be established by expanding or relocating the current access road within the same Penstock corridor. The existing 33 KV power line would need to be relocated along portions of the wood-stave concrete composite Penstock alignment to accommodate construction work. From the bifurcation at Station 00+17 to Station 45+00, the existing penstock would be removed, and a new 84-inch diameter spiral weld steel pipe would be installed in a direct bury manner, in a trench along the same general alignment as the demolished riveted steel pipe. The bifurcation section up to the Powerhouse will also be replaced. New access roads would be necessary where there are not currently access roads alongside the riveted steel Penstock segments (Station 5+60 to 27+30 and 39+50 to 50+50).

Alternative B – Pressure Concrete Pipe 84-inch-diameter direct bury + Spiral Weld Steel 84-inch-diameter direct bury

This alternative consists of new 84-inch-diameter pressure concrete pipe installed in a direct bury manner alongside the existing Penstock for the length of the existing wood-stave concrete composite Penstock alignment. The existing wood-stave concrete composite Penstock would be abandoned in place and a trench would be excavated as close as possible to the existing Penstock, bedding material placed on the bottom of the trench, and pipe installed and buried with cover material over the crown of the pipe. It is anticipated that concrete pipe would be stockpiled on the fill atop the existing wood-stave concrete composite Penstock, and an access

TABLE 3-3
ALTERNATIVE PENSTOCK REPLACEMENT CONFIGURATION

		ALTERNATIVE A: 84" STEEL PENSTOCK DIRECT BURY	ALTERNATIVE B: 84" PRESSURE CONCRETE PENSTOCK DIRECT BURY + 84" STEEL PENSTOCK DIRECT BURY	ALTERNATIVE C: 84" CCFRPM PENSTOCK DIRECT BURY + 84" STEEL PENSTOCK DIRECT BURY
Existing Wood Stave Penstock Segments - Stations 133 to 36	New Construction Access Roads	Expand existing access road along entire reach	Expand existing access road along entire reach	Expand existing access road along entire reach
	Powerline Relocation	Relocation of approximately 8,000 feet of existing power line	Relocation of approximately 8,000 feet of existing power line	Relocation of approximately 8,000 feet of existing power line
	Estimated Project Staging Area (acres)	26.7 acres	26.7 acres	26.7 acres
	Estimated Volume of Demolition Debris	1,000 cubic yards	1,000 cubic yards	1,000 cubic yards
	Cost for Abandonment of Existing Wood Stave Penstock	$280,000	$280,000	$280,000
	Cost for New Pipe Materials	$5.5m to $7.8m	$7.8m to $9.4m	$4.3m to $5.1m
	Cost for New Penstock Installation	$1m	$0.8m	$0.8m
Existing Riveted Steel Penstock Segments - Stations 36 to 0+17	New Construction Access Roads	Station 27+30 to 5+60 only (same for all alternatives)	Station 27+30 to 5+60 only (same for all alternatives)	Station 27+30 to 5+60 only (same for all alternatives)
	Powerline Relocation	None / Nominal (same for all alternatives)	None / Nominal (same for all alternatives)	None / Nominal (same for all alternatives)
	Estimated Project Staging Area (acres)	7.9 acres	7.9 acres	7.9 acres
	Estimated Weight of Demolished Steel Pipe Material	912 tons	912 tons	912 tons
	Cost for Abandonment of Existing Riveted Steel Penstock	TBD - same for all alts	TBD - same for all alts	TBD - same for all alts
	Cost for New Pipe Materials	$1.9m to $2.8M	$1.9m to $2.8M	$1.9m to $2.8M
	Cost for New Penstock Installation	TBD - same for all alts	TBD - same for all alts	TBD - same for all alts
	Estimated Total Pipe Material Costs	$7.4m to $10.6m	$9.7m to $12.2m	$6.2m to $7.9m
	Simplified Comparative Estimate of Demolition and Pipe Installation Costs	$2.8m	$2.6m	$2.6m
	Estimated Annual Energy Production (megawatt-days)	1,767	1,721	1,767

road would be established by expanding or relocating the current access road within the same Penstock corridor. Existing power lines would need to be relocated along portions of the wood-stave concrete composite Penstock alignment to accommodate construction work. The existing riveted steel Penstock would be removed, and new 84-inch-diameter spiral weld steel pipe would be installed in a direct bury manner in a trench along the same alignment as the demolished riveted steel pipe. Pipes would be connected with double-weld joints, and buried with cover material over the crown of the pipe. New access roads would be necessary where there are not currently access roads alongside the Penstock (Station 5+60 to 27+30 and 39+50 to 50+50).

Alternative C – Centrifugal Cast Fiberglass Reinforced Polymer Mortar Pipe 84-inch-diameter direct bury + Spiral Weld Steel 84-inch-diameter direct bury

This alternative consists of new 84-inch-diameter CCFRPM pipe installed in a direct bury manner alongside the existing Penstock for the length of the existing wood-stave concrete composite Penstock alignment from Station 45+00 to the McClure Dam. Pipes would be joined with double gasketed connections. The existing wood-stave concrete composite Penstock would be abandoned in place, a trench would be excavated as close as possible to the existing Penstock, bedding material would be placed on the bottom of the trench, and new pipe material would be installed and buried with cover material over the crown of the pipe. It is anticipated that CCFRPM pipe would be stockpiled on the fill atop the existing wood-stave concrete composite Penstock, and an access road would be established by expanding or relocating the current access road within the same Penstock corridor. The existing 33 KV power line would need to be relocated along portions of the wood-stave concrete composite Penstock alignment to accommodate construction work. From the bifurcation at Station 00+17 to Station 45+00, the existing penstock would be removed, and a new 84-inch diameter spiral weld steel pipe would be installed in a direct bury manner, in a trench along the same general alignment as the demolished riveted steel pipe. The bifurcation section up to the Powerhouse will also be replaced. New access roads would be necessary where there are not currently access roads alongside the riveted steel Penstock segments (Station 5+60 to 27+30 and 39+50 to 50+50).

3.2.4 Recommended Design Configuration

The resulting recommendation is for replacement of all of the steel and wood-stave concrete composite portions of the Penstock, as well as the intake valve and the Powerhouse control valves. The surge tank and the mass concrete intake section of the pipeline should be investigated further.

The recommended design configuration for the McClure Penstock Replacement Project is Alternative A (spiral weld steel pipe, 84-inch-diameter, direct bury), or Alternative C (CCFRPM pipe, 84-inch-diameter, direct bury + spiral weld steel 84-inch-diameter direct bury), based on viability, technical performance, environmental impacts of construction, reliability, ease of installation, procurement and construction schedule, long term durability, and cost. The environmental impacts associated with installation of spiral welded steel pipe or CCFRPM pipe are equivalent.

Additional detail regarding considerations for development of the recommended design is described in the following Section.

3.3 PROPOSED OPTION DETAILED DESCRIPTION AND GENERAL DESCRIPTION OF CONSTRUCTION

The proposed option involves using the most cost effective and technically viable penstock materials to replace the existing Penstock. Spiral weld steel (Steel) is technically viable along the entire length of the Penstock, and could be installed using direct bury methods or CCFRPM pipe is technically viable for anticipated working pressures along the existing wood-stave concrete composite Penstock segments, and could be installed using direct bury methods. Based on environmental impacts, cost, viability, and schedule, UPPCO's design consultant recommended a design configuration consisting of:

- Construct new 84-inch-diameter spiral welded steel or CCFRPM pipe installed in a direct bury manner alongside the existing Penstock for the length of the existing wood-stave concrete composite Penstock alignment from Station 45+00 to the McClure Dam.
- Refurbish the existing concrete conduit through the intake/non-overflow section of the dam and the existing reinforced concrete surge tank.
- Remove the existing 84-inch-diameter riveted steel Penstock and those previously mentioned wood-stave concrete composite segments and replace with 84-inch-diameter spiral weld steel pipe using direct bury construction in the same alignment and profile as the existing riveted steel pipe.
- Remove and replace the existing bifurcation and bifurcation pipes with new steel pipe; configuration and geometry of bifurcation and diameter of bifurcation pipes will be developed as part of detailed design.

3.3.1 Site Access

It will be necessary to access the Project Site from both upstream (dam/intake) and downstream (Powerhouse) of the Site for construction equipment, materials (pipe, concrete), and removal of demolition debris.

Primary access routes to the McClure Penstock Project Site are anticipated to originate from US Highway 41, west of Marquette. The Marquette County Road Commission will be contacted to determine road and bridge conditions along site access routes. At the upstream end of the Penstock, access from Highway 41 will be along County Road 510 to County Road JW / Neejee Road to McClure Road. County Road 510 is paved and has a narrow bridge crossing the Dead River. This bridge has a 40-ton weight limit and width is restricted to 20 feet. This bridge is scheduled to be replaced in 2010, but will remain open during construction. County JW / Neejee Road is paved for all but about a tenth of a mile. The remainder of Neejee Road, as well as all of McClure Road, is a graded gravel surface. From McClure Road, site access will be along un-improved gravel site access roads.

Additional site access is also anticipated from the upstream end via Neejee Road to the LS&I railroad access roads. The LS&I access roads are un-improved gravel roads that extend from Neejee Road to the Penstock access road. It will be necessary to coordinate the use of these access routes with the railroad. Easements and license agreements are being acquired from the appropriate owners and the LS&I Railroad.

At the downstream end of the Penstock, access from Highway 41 will be along Wright Street to Forestville Road. Forestville Road leads directly to the McClure Powerhouse. Wright Street and Forestville Road are paved. There is a narrow bridge on Forestville Road crossing the Dead River, but the County reports that the bridge is in good condition, and has no unusual weight restrictions. Forestville Road is very curvy, but should accommodate semi-truck loads for the anticipated 50-foot pipe materials. Access to the Site from the Powerhouse will be along a steep limited use gravel road. It may be necessary to re-grade the steep access ramp adjacent to the Powerhouse. However, UPPCO reports that this ramp has been used previously for concrete truck access.

3.3.2 Site Preparation

Initial site preparation will involve site setup for staging a construction support trailer and portable sanitary facilities. Open areas in the vicinity of the Powerhouse will be used for laydown and staging of materials and equipment. The type of equipment on-site at any given time will vary depending on work being performed. The following is a list of materials and equipment that is expected to be used and staged onsite:

Pipeline Materials:

- 84" Pipe – Steel;
- 84" Pipe – CCFRPM;
- Piping Hardware – joint bands; bolts; nuts; etc.;
- Valve assembly;
- Bifurcation assembly;
- Pipe Bends;
- Pipe Jointing;
- Metal manhole castings; and
- Concrete manhole sections – bases, barrels, cone sections.

Incidental Construction Materials:

- Concrete culvert pipe sections;
- Corrugated metal pipe sections;
- Steel reinforcing bars;
- Plastic drain tile; and
- Granular pipe bedding.

Erosion Control Materials:

- Silt fence;
- Straw/Wood Fiber Blanket;
- Silt sock;
- Bio roll;
- Construction entrance rock; and
- Geotextile fabric.

Road Materials:

- Gravel.

General Equipment On-site During Construction:

- Scrapers;
- Off-highway trucks;
- Bulldozer/track-type tractors;
- Motor grader;
- Dump trucks
- Hydraulic excavator/backhoe;
- Vibratory compactor;
- Skid steer loaders;
- Wheel loader;
- Contractor pickup trucks;
- Contractor maintenance vehicles;
- Concrete truck;
- Material delivery trucks;
- Tractor trailer / semi trucks;
- Tracked crane;
- Boom truck; and
- Rubber tire loader.

During construction, the following hazardous materials potentially will be staged and used in support of construction activities:

Petroleum Products and Fuel:

- Diesel fuel;
- Hydraulic fluid;
- Motor oil – new;
- Motor oil – used; and
- Gasoline.

Other Products and Materials:

- Miscellaneous construction equipment fluids - grease; brake fluids; coolants;
- Joint compounds for pipe;
- Sealers;
- Solvents;
- Septic waste; and
- Propane containers.

During site setup, provisions will be established for the proper management and disposal of wastes generated from construction. Waste materials that will be managed include:

Residual Construction Materials

Residual construction materials will include gravel for haul roads and culverts. Haul roads used during construction will be used as roads for maintenance of the newly installed Penstock.

Excavated Spoil

Excavated spoil could include over excavation of poor materials such as clay, peat, topsoil or rock. Large rock may be crushed and/or used onsite for stable fill as needed, or disposed offsite.

Management of excavated spoil will include stockpiling. Stockpiles will be surrounded by a silt fence or similar to prevent erosion and sediment runoff. Stockpiles will be revegetated as required by the Project Erosion and Sedimentation Control Plan (ESCP) and Project Revegetation Plan found in ***Appendix A*** and ***Appendix B***.

Disposal of these materials will include spreading the material on impacted slopes and used in necessary fill areas. These areas will be stabilized according to the Project ESCP

Demolition Debris

Management of this material will include temporary stockpiling and removal from the Site. Removed steel pipe segments could be salvaged for recycling at Contractor's option. Riveted steel Penstock removal and disposal would likely result in approximately 1000 tons of steel material. Demolition debris will include the removal of:

- Existing Intake Valve – 133+20;

- Open Air vent at Station 131+51;
- (2) 48” steel pipe from Station 0+00 - 0+17
- 84” steel pipe from Station 0+17 – 35+90, 131+46 – 132+25;
- Remove existing 84” wood stave pipe from Station 35+90 to approximately Station 45+50; 91+00 – 95+00; 128+50 – 131+46;
- Bifurcation;
- 2 Butterfly valves in powerhouse;
- Concrete removal at surge tank and existing wood stave/steel pipe transition;
- Removal of existing Penstock manhole structures;
- Grubbed materials; and
- Management of clearing and grubbing material including:
  - Piling potential logs for use as wood product,
  - Wood chipping all brush, branches, etc.

Disposal will involve removal of stockpiled logs by a wood product contractor. Wood chips will be saved on-site for use as erosion control. Excess wood chips will be removed from the Site by a wood product contractor. Some permitted burning may occur for materials that cannot be readily managed.

Trash and Debris

Management will include dumpsters located at both the downstream and upstream staging areas and within close proximity to where current construction operations are occurring. Disposal will be contracted through a local waste management organization. All material will be delivered to local landfill facility.

Sanitary Services/Waste

Management will include portable toilet rental facilities located at both the downstream and upstream staging areas. Since the overall Project is significant in length, a portable toilet will also be located within close proximity to where current construction operations are occurring. Disposal will be contracted through a local waste management organization. All waste will be delivered to local wastewater facility.

Fleet Fuel Management

Vehicles will be regularly inspected for leakage of fluids and promptly repaired. Spilled or leaked material and contaminated soils will be containerized for proper off-site disposal. Appropriately sized and equipped spill kits will be maintained on-site.

Blasting and Explosives

Specific locations necessary for blasting have not been identified at this time. Additional geotechnical information has been gathered and the final pipe design will define the necessity for blasting measures. The management, storage, and use of explosives will comply with all applicable standards. A secure magazine will be used to store any explosives on-site if the quantities required dictate. A Blasting and Explosives Management Plan will be developed once the extent of necessary blasting has been better determined. Any blasting required will be limited to no more than three shots per day during daylight hours.

Worker Safety

In accordance with generally accepted construction practices and job-site conditions, safety procedures and programs will be established at the beginning of the job to ensure worker safety, including safety and health of all persons and property, on those portions of the property affected by the construction, including protection of contractor employees, UPPCO employees, subcontractors, agents, and the general public. This requirement will apply continuously and not be limited to normal working hours. The construction contractor will be primarily responsible for the protection of property and the safety of all persons in the vicinity of or impacted by the construction work.

Daily tailgate safety meetings will be conducted and a log of attendees will be maintained by the Site Safety Officer. That meeting will also be attended by resident supervisors and Subcontractors involved in the Work during the upcoming period.

Proper personnel protective equipment will be supplied to any persons working on-site in construction areas where it is required or the specific activity dictates specific personal protective equipment to be used.

3.3.3 Access Roads

Local access roads into the Site are shown on ***Figure 2-2***. Some new access roadway will be constructed to facilitate reaching areas along the Penstock and will be maintained after the

completion of construction as noted on ***Figure 3-3***. Most of the access roads into the Site are currently wide enough, but some areas will need improvement. Some localized surface work may be needed throughout the Site on different sections of road to stabilize them and prepare them for construction traffic. A traffic management plan addressing public traffic management, control, and access measures/plans/descriptions will be implemented as follows:

Permits

The Project will acquire all permits and public notices regarding work in the right-of-way, road closings or detours as required by federal, state, or local agencies.

Traffic Management

This Project will take all necessary precautions to effectively address vehicle and pedestrian traffic, accessibility, and worker safety during construction.

Access Measures

This Project anticipates maintaining access on all local roads.

From the primary site access points, contractors and suppliers will need to access the Project areas on construction access roads. This will include construction equipment, Project materials (pipe, concrete), and workers vehicles, as well as removal of demolition debris. An un-improved gravel surface road is present along most of the existing Penstock route. However, most areas will require improvements to increase width and access for construction. It will be necessary to establish a new access road from Station 5+60 to 27+30 and 39+50 to 50+50. It may also be necessary to improve the steep grade of the access road from the Powerhouse Site.

3.3.4 Staging Areas

It is anticipated that expansion of existing on-site access roads and clearing areas will be necessary for adequate staging of construction materials and equipment. The concept typical design has assumed a 90-foot-wide corridor along the existing Penstock for an access road, pipe unloading and storage, and an installation staging area. At the junction of local access roads and the Penstock, more substantial contractor staging areas will be established to allow for office trailers, worker parking, construction equipment storage and maintenance areas, fabrication and assembly areas, and stockpiling of materials. Anticipated staging areas and access roads are indicated in ***Figures 3-4 through 3-8***.

3.3.5 Power Line Relocation

The recommended design requires some sections of the existing 33 KV power line to be relocated. Necessary relocation areas are due to required staging, access and proposed Penstock alignment. It is anticipated that approximately 8,000 linear feet of the 33 KV power line may need to be relocated within the existing right-of-way.

Typical clearances for an UPPCO 33 kV distribution line are in the range of twenty five feet (25') from the center line. This clearance distance corresponds with both the easements and the established tree line. Typical corridor vegetation management includes the removal of all tall growing species from the corridor with follow-up herbicide treatment scheduled two years after the initial maintenance.

3.3.6 Penstock Demolition / Abandonment

Penstock Removal

The recommended design includes leaving most of the existing wood-stave concrete composite Penstock in place, and removing the riveted steel Penstock. It will be necessary to remove the following features:

- Existing Intake Valve – 133+20;
- Open Air vent at Station 131+51;
- (2) 48" steel pipe from Station 0+00 - 0+17
- 84" steel pipe from Station 0+17 – 35+90; 131+46 – 132+25;
- Remove existing 84" wood-stave concrete composite pipe from Station 35+90 - 45+50; Station 91+00 – 95+00; 128+50 – 131+46;
- Bifurcation;
- Two Butterfly valves in powerhouse;
- Concrete removal at Surge Tank and existing wood-stave concrete composite/steel pipe transition; and
- Removal of existing Penstock manhole structures

Penstock Abandonment

The decision as to the extent of pipe sections that can more beneficially be abandoned in place will be related to the structural stability of the existing pipe. This determination is will be based on:

- Core samples;
- Geotechnical borings;
- Test pits;
- Interior laser survey; and
- Visual inspection.

Work related to abandoning the existing wood stave pipe will occur during the construction of the new Penstock pipe and will include:

- Removal of existing Penstock in critical areas;
- Removal of existing Penstock in areas where the new proposed alignment follows the current pipe location;
- Locking, covering, and sealing the existing Penstock to eliminate access; and
- Local filling of the existing Penstock with cementitious materials at access and/or train rail crossings.

Penstock Inspection

Inspections – Currently the existing Penstock alignment corridor is inspected from grade surface on a weekly basis. After construction of the new proposed Penstock, inspections will include weekly inspection of both proposed and abandoned in-place pipe alignment from grade surface. The existing wood stave pipe is currently covered with approximately 2 – 3 feet of soil. The proposed pipe (both CCFRPM and steel sections) will be covered with approximately 3 feet of fill. (except at stream crossing at Stations 9+75 and 11+50). Inspections will evaluate and document any deterioration, stability, safety, and repair needs.

Inspections that document required repair will be addressed immediately. Repairs may include:

- Filling of the existing Penstock in the local area of deterioration;
- Removal of the existing Penstock entirely; or
- Re-grading surface.

3.3.7 General Construction Activities

The following is an approximate outline of general construction actions and sequencing:

1. Site Preparation:
    a. Clearing and Grubbing;
    b. Modification to existing access roads;
    c. Establish new haul roads;
    d. Relocate existing power lines; and
    e. Establish staging, material storage, and parking areas.

2. Major Demolition:
    a. Remove existing 48” steel pipe from Station 0+00 - 0+17
    b. Remove existing 84” steel pipe from Station 0+17 – 35+90 and 131+46 – 132+25; and
    c. Remove existing 84” wood-stave concrete composite pipe from Station 35+90 to approximately Station 45+50, 91+00 – 95+00, 128+50 – 131+46.

3. Minor Demolition concurrent with Pipe Installation:
    a. Existing Intake Valve – 133+20,
    b. Open Air vent at Station 131+51,
    c. Bifurcation, and
    d. Two Butterfly valves in powerhouse.

4. Pipe Installation:
    a. Intake Valve;
    b. Spiral welded steel pipe or CCFRPM Pipe from Station 35+90 – 132+25;
    c. Improvements to surge tank if needed;
    d. Spiral welded steel pipe from Station 0+17 – 35+90;
    e. Bifurcation at Station 0+17;
    f. Parallel pipe installation from Station 0+00 – 0+17; and
    g. Valve installations at Powerhouse.

5. Site Restoration:
    a. Final slope stabilization; and
    b. Final access road stabilization.

Following is an approximate outline of general erosion control actions.

1. Acquire necessary permits including:
    - Marquette County Part 91 Soil Erosion and Sedimentation Control (SESC) Permit;
    - Notice of Coverage (NOC) to obtain Permit by Rule coverage under Michigan DEQ's National Pollutant Discharge Elimination System State Wide General Permit for construction. Prior to submitting the NOC, a Soil Erosion and Sedimentation Control (SESC) Permit must be obtained from Marquette County; and
    - Michigan DEQ Part 301/303 wetlands encroachment permit.

2. Install temporary erosion controls including:
    - Rock construction entrances to be installed at all access locations to the Site and as shown on the ESCP;
    - Silt fence to be installed around the perimeter of areas to be graded as shown on the grading plans and ESCP;
    - Floatable silt fence plans to be installed in stream areas as shown on plans as necessary;
    - Construct temporary sediment basins;
    - Install Rock fill sedimentation control barriers;
    - Construct ditch checks; and
    - Construct concrete washout areas.

3. Prepare designated parking and construction material storage areas:
    - Grade area;
    - Install rock fill or gravel to establish surface; and
    - Install filter sock.

4. Locate on-site proper containers such as dumpsters or roll-off boxes for construction waste.
5. Perform clearing and grubbing operations.
6. Install necessary tree protection fencing.
7. Phase proposed development of access roads and pipeline alignment staging areas to minimize overall grading and duration of exposed soil impacts.
8. Install necessary culverts, ditches and other means of stormwater conveyance.

9. Place stockpiled woodchips in possible erosion areas.
10. Perform pipe installation.
11. Seed and mulch, erosion control matting, etc., in disturbed areas according to the Project Revegetation Plan (***Appendix B***).
12. Install silt fence and revegetate all temporary stockpile areas per ESCP and Project Revegetation Plan (***Appendix A*** and ***Appendix B***).
13. Reseed disturbed areas per Project Revegetation Plan (***Appendix B***).
14. Perform street sweeping on an as needed basis.
15. Perform dust control measures on an as needed basis.
16. Final establishment of all disturbed areas and final plantings.
17. Remove temporary erosion controls.
18. Terminate permits as necessary.

3.4 PIPE DESIGN

The recommended McClure Penstock Replacement Design includes two different pipe materials, CCFRPM and spiral welded steel. CCFRPM pipe will conform to AWWA Standard C950 *Fiberglass Pressure Pipe* and AWWA Standard M45 *Fiberglass Pipe Design Manual.* The new pipe materials and appurtenances will be designed to withstand the required static pressure and surge pressure based on transient pipeline analysis. Normal working pressures will be limited to a maximum 100 psi for the CCFRPM pipe.

Spiral weld steel pipe will be designed, manufactured, and constructed in accordance with American Society of Civil Engineers (ASCE) Manuals and Reports on Engineering Practice No. 79 *Steel Penstocks*. Pipe joints will be field tested in accordance with American Water Works Association's *Steel Water Pipe: A Guide for Design and Installation (M11) Fourth Edition*.

3.4.1 Flow Controls

Flow controls will be designed to replace the intake valve and the two valves in the Powerhouse. These valves will be replaced with new, modern valve designs that will provide better flow efficiency (less head loss), better sealing capabilities, and remote operation capabilities. The final selection of valve configurations and sizes will be determined based on availability, delivery, lead time, and cost.

It will also be necessary to establish the minimum (fastest) closure time for turbine wicket gates to facilitate the water hammer analysis.

3.4.2 Flow Measurements

The Michigan DEQ has requested that flow measurements be established near the intake and the turbines to allow for an alarm system if flows are determined to differ by more than three percent. It will be difficult to establish this level of accuracy in flow measurement. During detailed design development, options will be considered for either flow or pressure (head) monitoring systems that could accomplish these objectives, and to assess the likely accuracy of such systems. UPPCO will complete a detailed design, which requires review and approval by FERC Dam Safety prior to construction.

Flow monitoring instrumentation will be provided in the new penstock system at the upstream and downstream ends of the system to detect differences in flows that would indicate a significant pipe failure. Flow meters will be installed at the upstream end near the intake valve, and the downstream end near the powerhouse. Flow data will be monitored and evaluated, comparing upstream flow measurement to downstream flow measurement. When a significant difference in flow is detected between the two measurements, an alarm will trigger for a response. The response could be an emergency call out for inspection and evaluation of further response actions, or the response could be penstock intake valve closure.

3.5 PROJECT SCHEDULE

UPPCO anticipates construction will start upon receipt of FERC and other necessary regulatory approvals, which are expected during the summer of 2009. UPPCO has set a goal of returning the McClure Hydropower Facility into production by the late fall of 2010.

3.5.1 Borrow Pits

Borrow pits will be necessary to complete earthwork for staging areas, trench excavation, cover fill for proposed pipe and development of access/haul roads along the Penstock alignment.

Borrow pit alternatives include hauling borrow material from currently known local source or designating borrow excavation areas on-site. On-site borrow would be the preferred alternative

to reduce impacts to local access roads off-site, the need for traffic control, risk to public safety and fuel consumption by the haul trucks.

Several borrow areas have been indicated on the plans ***Figures 3-4 through 3-8***. These borrow areas are approximate in location and will require geotechnical evaluation of the existing material. The location of these borrow areas are based on reducing haul distances during construction to areas that require additional fill, reduce crossing of railroad tracks and right of way during construction, and reduce construction traffic on local access roads. Other borrow areas may need to be developed based on fill quality. These would be developed within the right of way and would be developed with engineered sedimentation and erosion controls (***Appendix A***) and revegetated according to the Project Revegetation Plan (***Appendix B***).

Topsoil will be stripped and stockpiled prior to borrow excavation. Topsoil stockpiles will be protected with silt fence and revegetated according the ESCP and Project Revegetation Plan (***Appendix A*** and ***Appendix B***). Borrow areas will be surrounded by silt fence during material removal and excavated so as to limit runoff from exposed soils. At completion of work, stockpiled topsoil will be respread over the borrow pit area and revegetated.

3.5.2 Proposed Environmental Impact Control Measures

Temporary environmental impacts will result from the construction; however, these can be limited or mitigated through engineering controls and appropriate planning. The primary temporary construction impact is the potential for erosion and sedimentation, which will be handled through implementation of the ESCP (***Appendix A***). The ESCP for the Site describes E&S Controls and BMPs that will be implemented.

At the time of construction, a final ESCP will be developed by the Construction Contractor. UPPCO will be responsible for applying for any permits relating to erosion and sedimentation control, construction water discharge, and conducting the required inspections. The Contractor will be responsible for providing the state-required Construction-Site Certified Operator. The final plan will incorporate BMPs and erosion control practices under Michigan's NPDES Program for "Stormwater Discharges Associated with Construction Activities." Engineering controls as well as administrative methods and procedures will be employed to contain, control, and prevent excessive sedimentation and erosion at the Site during construction and after completion of the Scope of Work for the proposed option.

Sediment transport will be controlled at all construction, borrow, and lay down area sites. The primary control measure for sedimentation control will be sediment traps, sized at either 20 feet by 40 feet or 30 feet by 60 feet. Diversion ditches lined with rock will guide sediment-carrying runoff to the traps where the resulting reduced flow will allow the suspended particles time to settle out. The traps will be monitored and cleaned out as required to maintain an effective retention time.

Silt fencing, silt socks, hay bales, and other appropriate barrier and capture control methods will also be employed. The primary means of sedimentation control at the laydown areas will be silt socks. These socks, placed around the down-sloping perimeter of the laydown areas, will filter sediment through mulch contained within the sock, greatly reducing the amount of sediment in the water that passes through. The socks will be monitored to maintain their effectiveness. This type of sedimentation control is preferred because the socks are biodegradable and, along with the mulch, can be left in place after use. UPPCO's contractor will employ and maintain appropriate BMPs and barrier/capture control methods at on-site or off-site borrow areas under the contractor's control.

Upon completion of all construction activities, disturbed areas that are not rock faced will be seeded. Additional topsoil may be imported and placed to aid in the establishment of stable surface vegetation. Methods to be implemented for site restoration are described in the Project Revegetation Plan provided in ***Appendix B***. Upland areas that were cleared of trees and brush to allow for construction will be stabilized, graded, and contoured as appropriate to match the surrounding environment, seeded, and allowed to reforest naturally.

3.5.3 Regulatory Permitting of Construction Activities that Disturb Wetlands

Protecting wetland areas from impacts during construction will be a high priority. As part of the design process, a field survey and delineation of wetland areas has been conducted and the results reviewed to assure that these areas will not be impacted by construction, except as specifically called out in the construction plans. Further discussion of the locations of wetlands and water resources in the Project area is provided in ***Sections 5.5 and 5.6.***

Several delineated wetland areas will be impacted by this Project for construction of access roads and pipe installation. Impacts occur in both regulated and nonregulated wetland areas and will be permanent in nature. These impacts are summarized in ***Table 3-4*** and shown on ***Figures 3-4***

through 3-8, and Appendix E, Sheets 1-13. Mitigation for wetland impacts is not proposed because the anticipated wetland impacts will be less than 1/3 acre.

TABLE 3-4
ESTIMATED REGULATED WETLAND IMPACT
(BARR, 2008)

WETLAND ID	REGULATED/NONREGULATED	IMPACT TYPE (TEMPORARY/PERMANENT)	IMPACT AREA (SQUARE FEET)
B	Regulated	Permanent	768
E	Regulated	Permanent	221
F	Regulated	Permanent	860
K	Regulated	Permanent	37
R	Regulated	Permanent	309
T	Regulated	Permanent	3,704
V	Regulated	Permanent	4,155
W	Regulated	Permanent	96
		Estimated Total Impact =	10,150

The following design techniques have been implemented to minimize impacts to wetland where feasible:

- Wetland crossings at narrow wetland areas – at several locations access roads are realigned to avoid greater wetland impacts by preferentially crossing at narrow points.
- Use of existing access roads wherever possible throughout the entire Project reduces wetland impacts and overall ground altering exposure.
- Reuse of existing concrete and steel pipe supports at current stream crossings at Station 9+75 and 11+50 significantly reduces wetland impact potential in these areas. No access road from Station 9+25 – 10+20 greatly reduces the overall wetland impact in this area. Contractor will develop means to work around this wetland area.
- Buffer areas – where possible the Project incorporates a 15-foot buffer around wetland areas to reduce the overall impact to the wetland complex.
- Direct Runoff – stormwater will be directed to temporary sediment basins, rock filter dikes and through vegetated buffer areas prior to discharge to wetland areas further reducing potential impacts.

- Phasing – Construction will be developed in several phases to minimize exposed soil.
- Slopes – The Project will incorporate 1.5:1 slopes based on slope stability and geotechnical information to reduce wetland impacts that would typically occur if slopes of lesser gradient were proposed.

Total avoidance of any wetland impacts is not possible for this Project. Several situations make this not feasible:

- Access to the Site – wetland impacts are required to access the Project from Station 12+00 – 88+10. The only access to this area is at an existing railroad crossing north of the Project. Wetland impacts along the railroad corridor are required to maneuver vehicles.
- Wetlands developed due to existing Penstock location and elevation - incidental wetlands have been created along the existing Penstock due to both elevation and capture of runoff or due to leaks within the original Penstock. These wetlands are located within close proximity and avoidance is not possible.

The 23 wetland areas identified during the environmental survey are described in detail in the Wetland Determination Report provided in ***Appendix E***. Wetlands and streams identified in the vicinity of the Penstock and right-of-way are also described in ***Sections 5.6 and 5.7.*** Following is an individual case by case description and justification for each wetland impact:

- Wetland B – shown on ***Figure 3-3***. This impact allows construction of the Penstock from Station 10+00 – 11+50. A culvert will be installed with the crossing.
- Wetland E – shown on ***Figure 3-4***. This impact allows demolition of the existing Penstock and construction of the new pipe. An extension of the existing culvert will be necessary.
- Wetland F – shown on ***Figure 3-4***. This impact is to allow construction of the necessary access road. Access required for maneuvering vehicles requires an approximate road width of 20 feet and slopes to construct this road.
- Wetland K – shown on ***Figure 3-4***. This impact is to allow construction of the necessary access road. Access required for maneuvering vehicles requires an approximate road width of 20 feet and slopes to construct this road.

- Wetland R – shown on ***Figure 3-5***. This impact is to allow construction of the necessary access road. Access required for maneuvering vehicles requires an approximate road width of 20 feet and slopes to construct this road.
- Wetland T – shown on ***Figure 3-5***. This impact is to allow construction of the necessary access road. Access required for maneuvering vehicles requires an approximate road width of 20 feet and slopes to construct this road.
- Wetland V – shown on ***Figure 3-3.*** This impact is to allow vehicle movements at the existing railroad crossing. This local access road will need improvement to allow access to the Project Site. The turning radius for tractor trail assemblies necessitates this impact.
- Wetland W – shown on ***Figure 3-3.*** This impact is to allow vehicle movements at the existing railroad crossing. This local access road will need improvement to allow access to the Project Site. The turning radius for tractor trailer assemblies necessitates this impact.

4.0 CONSULTATION AND COMPLIANCE

4.1 CONSULTATION

Since the McClure Penstock event in November 2007, UPPCO has been involved in consultation efforts to evaluate the most appropriate replacement options for the Penstock. The McClure Penstock Replacement Project is the subject of this ER.

4.1.1 Consultation to Comply with the Existing License

The process of official consultation on the replacement of the McClure Penstock to comply with the requirements of the existing operating license began on September 11, 2008, with submittal of the Michigan DEQ Land and Water Management Division Pre-Application Meeting Request Form (***Appendix F***). On September 16, 2008, a pre-application meeting was conducted on location at the site of the McClure Penstock with the Michigan DEQ. UPPCO was still in the final design stages of the proposed Penstock replacement so the existing corridor impacts were reviewed and discussed. During the meeting, several items were discussed as UPPCO and Michigan DEQ representatives walked the Penstock route, reviewing individual wetlands and stream crossings which had been identified in the field. Michigan DEQ identified regulated and nonregulated wetlands along the Penstock for inclusion in the ER. At the time of the meeting, various options for replacement of the penstock were discussed. The complete corridor was evaluated. Subsequent to the meeting, UPPCO's plans remain the same for replacing the steel section of the existing Penstock. After further evaluation UPPCO's plans now call for leaving the majority of the existing wood-stave concrete composite section of the Penstock in place and building a spiral welded steel or CCFRPM Penstock along this section. This design will minimize impacts to the Project wetlands and stream crossings as much as practicable, which addresses Michigan DEQ's concerns. The Michigan DEQ was again contacted concerning the new design on December 18, 2008. Michigan DNR was contacted by telephone in the fall of 2008 and the project was discussed. With the final design nearing completion the Michigan DNR was again contacted via voice mail on December 18, 2008, and made aware of the new Project developments. After the UPPCO final proposed design decision was made, the U.S. Fish and Wildlife Service (USFWS) and the Keweenaw Bay Indian Community (KBIC) were contacted by telephone and made aware of the Project on December 18, 2008.

UPPCO has notified the Michigan SHPO concerning various issues as certain Project facilities are eligible for the National Historic Register (refer to ***Appendix F.***). UPPCO originally

proposed the project to Michigan SHPO on September 19, 2008. The original proposal included slip-lining the Penstock. The Michigan SHPO concurred with the slip-lining proposal on November 19, 2008. UPPCO is in the process of consulting with the Michigan SHPO on the current proposal that does not include slip lining, as it has been determined upon additional study that this is no longer a technically viable option.

SHPO did respond to UPPCO in a letter on January 27, 2009, indicating concern regarding the change in plans and the potential impact this would have on certain features they considered significant. UPPCO has provided a complete response to SHPO which is noted under Comment 5 in the Summary of FER Comments Table provided in ***Appendix F***. UPPCO has and will continue to work with the Michigan SHPO as per the Programmatic Agreement. UPPCO will develop a proposal outlining the alterations and file the proposal with SHPO for appropriate and timely review.

UPPCO held face-to-face meetings with the Marquette County Conservation District (Marquette CCD) in the spring and summer of 2008 to discuss the Penstock Project. It is believed that the entire Penstock Replacement Project can be included in a single permit. Various methods of erosion control were discussed. UPPCO again contacted the Marquette CCD with the new project developments on December 18, 2008. UPPCO intends to work closely with the County to assure environmental protection and obtain a County Sedimentation and Erosion Control Permit.

On October 1, 2008, letters were sent to Project vicinity property owners making them aware of the Project and supplying them with UPPCO and FERC Project contact information (Refer to standard letter provided in ***Appendix G***). The following potentially affected property owners were notified:

- Long Year Realty Corporation;
- McClure Basin Association;
- Ms. Bonita Moisio;
- Mr. & Mrs. Jonah S. & Laura D. Bonovetz;
- Mr. & Mrs. Dean & Melanie Salmonson; and
- The Leslie Connon Trust.

On October 27, 2008, UPPCO sent letters to the following agencies/organizations soliciting those who would like to review the Draft ER (refer to standard letter provided in ***Appendix F***):

- U. S. Department of Agriculture (USDA) Natural Resource Conservation Service;
- Board of Commissioners County Court House;
- U.S. Environmental Protection Agency (USEPA) Region V;
- U.S. National Park Service (USNPS);
- Michigan Public Service Commission (PSC);
- Dead River Campers; Inc.;
- Michigan Hydro Relicensing Coalition (HRC);
- Marquette Board of Light and Power (BLP);

On October 27, 2008 UPPCO also sent letters to the following members of the public soliciting comments on the project (refer to standard letter provided in ***Appendix G***).

- Longyear Realty Corporation;
- Mr. Kirby Juntilla;
- Ms. Bonita Moisio;
- Mr. and Mrs. Jonah S. Bonovetz;
- Mr. and Mrs. Dean Salmonson;
- The Leslie Connon Trust - Trustees; Ms. Leslie J. Connon and Ms. Carolyn A. Crowley; and
- Mr. Kurt Fosburg.

Additional property owner notification was made by letter from UPPCO on January 23, 2009, to:

- Christopher & Lisa Hetherman; and
- Dale Berquist.

In addition, the McClure Basin Association was notified by phone on January 21, 2009 of the availability of the Draft ER. They indicated to UPPCO that they would like to receive a copy of the document but were unlikely to provide comments.

On October 27, 2008, UPPCO sent letters to the following Native American tribes soliciting those who would like to review the Draft ER (refer to standard letter provided in ***Appendix F***).

- Bad River Chippewa Tribe;
- Grand Portage Chippewa Tribe;
- Bay Mills Indian Community of Michigan;
- Lac du Flambeau Chippewa Tribe;
- Fond du Lac Chippewa Tribe;
- Menominee Indian Tribe;
- Lac Courte Ooreilles Chippewa Tribe of Wisconsin;
- U.S. Bureau of Indian Affairs (USBIA);
- Mille Lacs Chippewa Tribe;
- Mole Lake / Sokaogon Chippewa Tribal Office;
- Red Cliff Tribal Office; and
- St. Croix Chippewa Office.

As a result of responses to the above solicitations, the USDA state conservationist was provided the requested design plans and the Marquette BPL, Michigan HRC, McClure Basin Association, and a property owner, Ms. Bonita Moisio were provided copies of the Draft ER.

4.1.2 Consultation for Review of Draft Environmental Report

Copies of the Draft Environmental Report were provided for review and comment to the following agencies, Tribes, and organizations:

- Michigan Department of Natural Resources (DNR);
- Michigan Department of Environmental Quality (DEQ);
- U.S. Fish and Wildlife Service (USFWS);
- Marquette BLP;
- Keweenaw Bay Indian Community (KBIC);
- Michigan HRC;
- FERC;

- The McClure Basin Association

4.1.3 Comments Received from the Public

Following public notification of the Project, UPPCO received public input and comment for the Project. Correspondence was received from:

- Ms. Bonita Moisio requested a copy of the Draft ER

4.1.4 Comments from the Resource Agencies and KBIC

Copies of this correspondence and/or meeting summaries and UPCCO responses are provided in ***Appendix F.***

4.2 COMPLIANCE

4.2.1 Michigan DEQ and USACE Permits

The Project affects navigable waters and would result in the placement of fill material within waters of the State of Michigan and the United States. No Section 10 waterway would be impacted by the proposed Project. Michigan DEQ is authorized by the U.S. Army Corps of Engineers (USACE) to conduct permitting activities on their behalf for matters under the USACE wetland jurisdiction. UPPCO has consulted with the Michigan DEQ Land and Water Management Division for all matters pertaining to the Project under their permitting authority. UPPCO has also held a pre-Application Meeting with the Michigan DEQ on the Project (refer to ***Appendix F)***. UPPCO will comply with all requirements for obtaining permits and implementing permit requirements.

4.2.2 Endangered Species Act

KME recently performed a field reconnaissance to identify natural resources of unique quality and/or designated status that may be subject to effects from the Project (refer to ***Appendix C***). Their results indicated that no unique natural areas or populations of rare, threatened or endangered species were observed to occur in the area that will be affected by the Project. USFWS has been provided the opportunity to comment on this Report.

4.2.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires consideration of effects of the Proposed Action on historic properties in the affected area. The area affected by the Proposed Action has been surveyed for archaeological and cultural resources. A copy of the survey report has been provided to the SHPO. No cultural resources were identified in the area (AVD, 2008).

UPPCO has been consulting with SHPO concerning various issues as certain Project facilities are eligible for the National Historic Register (refer to submittal forms and letters provided by UPPCO to SHIPO in ***Appendix F***). UPPCO will move forward with the Project under the requirements listed in the approved Historic Properties Management Plan for the Dead River Hydroelectric Project.

SHPO did provide comments on the earlier proposed engineering options that were being considered for replacement of the Penstock which included slip-lining portions of the existing wood-stave concrete composite sections. Since that option was later determined to be no longer technically viable, SHPO was again notified by UPPCO on December 24, 2008, of the final recommended approach which involves replacement of the existing Penstock using spiral welded steel or a combination of spiral welded steel and CCFRPM within the existing right-of-way, demolition of the existing riveted steel sections, and abandoning in-place the wood-stave concrete composite sections. A copy of this correspondence to SHPO is provided in ***Appendix F***.

SHPO did respond to UPPCO in a letter on January 27, 2009, indicating concern regarding the change in plans and the potential impact this would have on certain features they considered significant. UPPCO has provided a complete response to SHPO which is noted under Comment 5 in the Summary of FER Comments Table provided in ***Appendix F***. UPPCO has and will continue to work with the Michigan SHPO as per the Programmatic Agreement. UPPCO will develop a proposal outlining the alterations and file the proposal with SHPO for appropriate and timely review.

4.2.4 Federal Energy Regulatory Commission

UPPCO is moving forward with this Project in consultation with both the FERC Division of Dam Safety and Inspections and the Division of Hydropower Administration and Compliance.

On January 13, 2009, the Division of Hydropower Administration and Compliance was provided a copy of the Draft ER.

4.2.5 Project-Specific Permits

Permits that are expected to be required for the Replacement are identified as follows:

1. Permits issued by the Michigan DEQ to comply with the State of Michigan, Part 301, Inland Lakes and Streams, and Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA);
2. Permit issued by Marquette County under Part 91, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act 451, PA 1994, as amended; and
3. A Notice of Coverage (NOC) issued by the Michigan DEQ under Rule 323.2190, Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act 451, PA 1994, as amended.

Additionally, subcontractors may be required to obtain their own permits/authorizations for construction related activities.

4.2.6 Section 401 Water Quality Certification

The Federal Clean Water Act gives authority to each state to issue a 401 Water Quality Certification permit (WQC) for any project that needs a Federal 404 permit. Additionally an applicant is required to obtain a WQC for any activity that may result in a discharge into navigable waters. The WQC is verification by the State that the project will not violate water quality standards.

In Michigan, the Michigan DEQ is also responsible for administering the Section 404 permitting process of the Clean Water Act, and has regulatory authority over the onsite wetlands, due to their size (> 5 acres) and proximity (direct nexus) to a water body. As such, a permit must be obtained from the Michigan DEQ prior to conducting most filling, dredging, and/or draining

activities, or maintaining use a regulated wetland. Section 404 requires that anyone interested in depositing or discharging dredge or fill material into waters of the United States, including wetlands, receive authorization for such activities.

As part of this combined WQC permitting process, Michigan DEQ may require specific conditions to insure that water quality is protected. If permitting is required by Michigan DEQ, the licensee is required to provide the Commission with a copy of the Michigan DEQ Permit for the proposed work, or a letter from the Michigan DEQ stating that permitting is not required.

5.0 ENVIRONMENTAL ANALYSIS

5.1 General Description and Environmental Setting of The Dead River Drainage Basin

This Section contains a description of the Dead River Drainage Basin.

5.1.1 Dead River Hydroelectric Development

The Dead River drainage flows through the north-central portion of Michigan's Upper Peninsula. It is the largest tributary to Lake Superior in Marquette County. The Dead River flows in a southeasterly direction from its headwaters in the bog forests of western Marquette County. Leaving the bogs as a small stream, it transects remote forests and steep terrain before entering Silver Lake, the first of the five impoundments created by the two licensed Hydropower Projects as described in ***Sections 1.0 and 2.0***. Approximately 20 of the 35 miles of the main river are occupied by the five impoundments. The Dead River Project comprises three separate developments or facilities, Silver Lake (approximately 1,464 acres), Hoist [also known as the Dead River Storage Basin] (3,202 surface acres), and McClure (95.9 acres). Downstream of the Dead River Project is the Marquette Hydroelectric Project, which includes the Forestville and Tourist Park impoundments. A summary of data for the five FERC-regulated Dead River impoundments is provided in ***Table 5-1***.

TABLE 5-1
SUMMARY DATA FOR HYDROELECTRIC DEVELOPMENTS ON THE DEAD RIVER, MARQUETTE COUNTY, MICHIGAN

Project/Development Name	FERC No.	Installed Capacity (KW)	Drainage Area (sq. mi)	Surface Area (acres)	Approx. River Mile at Dam
Silver Lake	10855	0	23.4	1,464	32
Hoist (Dead River)	10855	3,200	134.3	3,202	14.4
McClure	10855	8,000	137.2	96	11.3
Forestville	2589	3,200	153.0	110	3.5
Tourist Park	2589	700	158.0	100	1.0

Source: FERC, July 24, 2003

Over the course of its 35-mile traverse, the river drops in elevation from just under El. 1,500 feet at Silver Lake Reservoir to approximately El. 600 feet at Lake Superior. Most of this drop is in

the last 15 miles where the river drops approximately 750 feet from the nominal pool elevation at the Hoist Powerhouse Reservoir to Lake Superior, over an average grade of 0.95 percent. The greatest head available for power generation occurs between the McClure Reservoir and the McClure Powerhouse. This represents a vertical head change of approximately 424 feet. The four power plants on the Dead River are located between Hoist and Lake Superior and take advantage of this elevation profile. Silver Lake is the only impoundment without a power plant.

The drainage area of the entire Dead River Basin to the Tourist Park Reservoir, one river mile above Lake Superior, comprises an area of 158 square miles. The drainage area lies entirely within Marquette County. Numerous tributaries contribute to flow in the river including Wildcat Canyon; Mulligan, Connor, Boise, Barnard, Clark, Reaney, and Brickyard Creeks; and the Little Dead River. The average annual river flow is estimated to be 36 cfs at Silver Lake and 240 cfs at Tourist Park. The Tourist Park Reservoir was drained in 2003. As of December 18, 2007, the Marquette Board of Light and Power and the City of Marquette favored moving forward with rebuilding the Dam at Tourist Park (Diem, 2007).

5.1.2 Regional Climate

The climate in this region is characterized by long, cold winters with heavy snowfall and cool, short summers. The climate is strongly influenced by the far north latitude-central interior U.S. location and proximity to Lake Superior. Average annual precipitation is between 30 and 40 inches, with snowfall ranging from 50 to over 200 inches in the drainage area. Snow cover begins in mid-November and lasts through late-April, for an average duration of 140 days. Spring melt contributes to the highest river flows during the months of April and May. October and November experience high flow due to fall rains. The growing season is 100 days long. Average minimum and maximum temperatures for July are 55°F and 80°F, respectively; while those for January are 5°F and 25°F.

5.1.3 Regional Vegetation

Approximately 88 percent of the land area in Marquette County is forested, including mixed hardwoods and conifers. Vegetation in the Project area of the Upper Peninsula is generally described as mixed northern hardwood and coniferous forest. Dominant species include sugar maple, yellow birch, and eastern hemlock, with balsam fir, white and black spruce, and black and green ash dominating poorly drained areas. Lands adjacent to the Dead River Project are dominated by deciduous and mixed deciduous-coniferous forests. The Dead River Basin, with

its undeveloped headwaters, water resources (including waterfalls), and developed Project-related recreational facilities, offer a variety of passive and active recreational opportunities.

5.2 McClure Hydroelectric Development

A failure in one area of the Penstock that occurred in November 2007 prompted UPPCO to engage a structural engineering consultant to evaluate the structural integrity of the Penstock (STS/AECOM, 2008). The consultant evaluated various options for replacement of the Penstock and concluded that replacement of the entire Penstock would provide the greatest reliability and be most cost effective.

5.3 Review of Anticipated Construction Impacts

This Section discusses the anticipated environmental related impacts during construction mobilization, site set up, implementation of the proposed option, and demobilization from the Site.

5.3.1 Construction Parking Areas

At the start of mobilization, parking areas, lay down areas, borrow areas and areas for equipment and personnel trailers, etc., will be developed. Some areas may need to be cleared and grubbed. Some grading and leveling might also be required. The Site Plan provided on ***Figures 3-4 through 3-8*** identify the areas of construction activity.

There are currently several alternative places in which to construct parking areas. Because of the distance between the different structures being built, it is desirable to provide separate parking areas for various separate construction zones.

Parking areas may need to be graded and/or covered with rock fill or gravel for stability. Until covered with rock fill or gravel, perimeter barriers or drainage paths to sedimentation control ditches will be provided to all areas, or they will be individually contained using silt fence or other appropriate sedimentation and erosion control methods. Should these areas become exceptionally dry and visible dust becomes an issue, water spray and other appropriate dust control methods will be employed.

5.3.2 Clearing and Grubbing

Clearing and grubbing will be initiated on an as needed basis as the Project progresses along the alignment route according to the Project Plan. Additional access roadway will be constructed as needed along the alignment to facilitate the movement of equipment and materials for construction. The Site Plan noting areas of construction are shown on ***Figure 2-2***. Transition areas from construction areas to public roadways would be constructed as needed according to the Project ESCP to prevent excessive sedimentation off-site.

It will be necessary to provide sufficient working area in the different site locations identified for construction. Approximately 15 acres have been identified as areas that may need to be cleared for construction machinery to maneuver and for the installation and burial of the new pipeline sections. All of this area is within the defined construction limits and will be subject to erosion control measures.

Clearing and grubbing may be needed for the relocated sections of the 33 kV power line that will be located within the 400 foot project boundary/right of way.

In addition to providing work area for construction, it will be necessary to provide sufficient area for stockpiling excavated spoil and fill material. Approximately 10.3 acres have been identified as potential lay down areas for these types of materials. All lay down areas will be specified in the Erosion and Sedimentation Control Plan, and will be stabilized or protected with filter roll, silt sock, silt fence, or similar effective measures to prevent transportation of sediment from these areas.

5.3.3 Invasive Species

UPPCO representatives conducted a vegetation survey of the McClure Penstock Right-of-Way during the 2008 growing season and no purple loosestrife (*Lythrum salicaria)* was found.

The construction area lies within the surveyed McClure Penstock Right-of-Way and it is unlikely that any of the construction activities will result in the introduction of purple loosestrife. In order to minimize the potential for introducing invasive species into the area, construction equipment will be cleaned prior to entering the job site.

5.3.4 Maintenance and Repair of Roads

Routine maintenance of the roads will be provided for haul roads on UPPCO property and as necessary on the county access roads damaged by construction traffic. Soil fill and gravel material will be used as necessary to fill in washed out or degraded areas resulting from construction traffic. Haul roads may need to be widened or improved to allow passage of larger construction vehicles. Maintenance of roads not on UPPCO property will be coordinated with the Michigan Department of Transportation (DOT), the Marquette County Road Commission, or the property owner.

5.3.5 Air Emissions

Air emissions during construction are expected to be negligible. Air emissions will result from construction equipment in the form of dust and equipment exhaust. If a concrete batch plant is brought on-site during construction, the plant will be permitted in compliance with Michigan regulations.

It is possible that dust will result from the movement of construction vehicles and equipment over roadways and in construction areas. Active excavation and handling of materials will likely result in some generation of dust emissions. Visible dust emissions will be controlled using water spray on haul roads and in excavation areas as necessary. Heavy construction equipment will emit diesel fuel exhaust. These emissions are expected to be *de minimis* and are not expected to impact residences in the area. Equipment will be kept in good repair to limit emissions and excess engine noise within the equipment manufacturer's design standards.

5.3.6 Water Requirements for Construction

Largely depending on how much water may be needed for dust control, an estimated three to five acre-feet of water may be required for construction. This would be withdrawn from the McClure or Forestville Reservoir to be used for dust control, mixing concrete/grout, equipment wash down, aiding compaction of soil fill, and other construction related uses. Water use during construction will be controlled so as to minimize the potential for runoff or sedimentation. Equipment wash water would be managed within areas contained by sedimentation controls to capture soil or removed sediment.

5.4 CUMULATIVELY AFFECTED RESOURCES

The contribution of site activities to regional air emissions, water pollution, and waste generation has been considered. There may be some transient additional impacts to the ambient air quality from truck traffic transporting materials to the Project. BMPs will be applied, including performing regular maintenance on the trucks and covering the loads.

UPPCO will note on its construction specifications a buffer zone between construction and riparian areas and wetlands, where construction impacts are to be avoided if possible.

There will be no cumulative, lasting impacts to ecological resources of the area, as the proposed option will not substantially change the original features. The improvements will provide a higher degree of water flow reliability and safety through the restored Penstock, which will be beneficial to power generation in the region.

Water use for construction purposes has been considered and will not significantly affect the local ecology or diminish reserves for hydropower generation. The quantity of water that may be used for dust control, soil conditioning, concrete mixing, etc. is not expected to be significant.

5.5 ENVIRONMENTAL RESOURCES, POTENTIAL IMPACTS, AND MITIGATION ALTERNATIVES

This Section provides a discussion of the affected environment as well as potential environmental impacts and recommendations associated with the proposed action. The activities outside the Project Boundary include truck traffic to transport construction materials and heavy equipment to perform earth work, and some temporary withdrawal of water for construction. The impact from all other construction activities are expected to be limited to UPPCO controlled property and primarily on areas that have already been disturbed during the original construction of the McClure Penstock or ongoing maintenance of the rights of way.

5.5.1 Geological and Soil Resources

This Section considers the potential for the Project to impact geological and soil resources. This includes evaluating short term and long term impacts from construction and operations.

5.5.1.1 Affected Environment

The Dead River Hydroelectric Project lies in the Great Lakes Basin, a geological feature of glacial origin covering much of the Upper Peninsula. Surfical geology varies with the stream gradient. From McClure Dam to the Lake Superior and Ishpeming (LS&I) Railroad trestle, the river courses through a granodiorite canyon with bedrock outcrops and small waterfalls. From the railroad trestle to about one-half mile below the Midway Creek confluence, a distance of about 3.4 miles, the surrounding geology consists of low hills of schist with the river coursing through an alluvial/glacial outwash plain of from 100 to several hundred feet in width. Below this point, the channel enters a narrow canyon of amphibolite and gneiss, which forms numerous crags, scarps, and short waterfalls (UPPCO, 1994).

Surfical geology in the Project area includes large areas of Precambrian, meta-igneous bedrocks, (schist and gneiss) and metamorphic bedrock (slate and chert). Other areas, particularly valley bottoms and wetlands, are dominated by Tertiary glacial/alluvial deposits (sand, gravels, and boulders). The topography and soils of the Project area have been derived from material deposited through continental glaciations. Topography is dominated by large glacial outwash plains and low, rolling hills or ridges with numerous, scattered, wet depressions. The area's soil characteristics are closely associated with these different landforms and bedrock types. Soils are relatively young, very complex, and intermingled, and the drainage patterns are immature.

5.5.1.2 Environmental Impacts and Recommendations

The environmental impact of replacing the Penstock involves mainly the impact of clearing and grubbing in areas along side of the existing route/right-of-way, any additional clearing required to construct lay down areas, and the construction of temporary roadway access for heavy equipment and other vehicle traffic. Such disturbance could lead to sedimentation and erosion concerns. Also, some wetland areas may be impacted directly as a result of invasive activity along the Penstock route, or indirectly as some wetland areas have been created artificially due to Penstock leaks. These artificial wetland areas will decline upon the completion of the Penstock replacement. Mitigating these potential effects will require development and implementation of BMPs and engineered sedimentation and engineered erosion controls that would be implemented as part of the Project planning. Construction methods such as engineered demolition, welding, use of engineered and compacted fill, concrete forming, slip lining, in place grouting, excavation, compaction, and other conventional approaches will be used to restore the integrity of the Penstock. Replacement is scheduled to be completed within one construction season.

Under the proposed option, there will be some minor alteration of topography from excavation and other disturbance. To the extent possible, disturbed areas will be restored to their prior condition. Borrow areas in uplands will be covered with a layer of top soil and revegetated according to the Project Revegetation Plan in ***Appendix B***. All other disturbed areas will be aesthetically contoured and the surfaces seeded as noted in ***Appendix B***.

No unique geological features in the vicinity of the project are will be disturbed as a result of the construction. There will be no significant changes relative to geology and soils at McClure Reservoir under the proposed option.

5.5.1.3 Effects of No Action Alternative

Under the No Action Alternative and current condition, there would be no substantial impacts on regional or local geology. However, the hydraulic load normally passing through the McClure Penstock may increase erosion in the steeper portion of the Dead River Channel as stream channel velocities would be higher.

5.5.2 Water and Fisheries Resources

This Section addresses the environmental impacts on water resources and aquatic habitat as a result of implementing the proposed option.

5.5.2.1 Affected Environment

The water resources potentially affected by the restoration of the McClure Penstock include the waters in McClure Reservoir, the McClure By-Pass Reach below McClure Dam, the impoundments at Forestville and Tourist Park (when it is restored), and the discharge from each of these reservoir impoundments. The annual hydrograph of the Dead River is typical of most rivers and streams in Michigan's Upper Peninsula, with a high discharge in the spring caused by precipitation and snowmelt runoff, diminishing flows throughout the summer, a period of increased discharge in the fall caused by fall rains, and low flows throughout the winter.

The impact on water resources of construction within the drainage area is influenced by topography. Steeper terrain produces higher water runoff velocities and disturbance is more critical because a greater degree of erosion is more likely to occur. The terrain also determines

the extent of possible flooding. ***Figure 5-1*** provides a 7.5 minute series United States Geological Survey (USGS) topographic survey map of the general Project area. ***Figure 5-2*** provides a flood plain map showing the drainage of Dead River watershed down to Lake Superior in the vicinity of the City of Marquette. Federal Emergency Management Agency (FEMA) flood mapping only extends about 1,100 feet up the Dead River from Lake Superior, to cover the City of Marquette. The flood limits beyond the City Limits of Marquette have been calculated based on topography and terrain by a consultant hired by the City of Marquette (Marquette County, 2008). The flood plain map shows that the topography and terrain on either side of the river provide enough relief to contain flood levels up to 10 feet, relatively close to the river, without inundating large land areas adjacent to the river. At lower elevation near the City of Marquette, more extensive areas beyond the river could be impacted by flooding, where the relief of the land is flatter. In addition to providing lake areas for recreation and wildlife habitat and storage for hydroelectric power generation, the storage basins on the Dead River provide reserve capacity that tempers the impacts of heavy rainfall limiting the potential for downstream flooding.

Water Quantity

Stream flows in the nine streams characterized along the McClure Penstock route were not quantified. However, the quality of the streams was evaluated by UPPCO's consultant and is discussed in ***Section 5.5.3.1***.

The proposed option will have no significant effect on McClure Reservoir; the McClure bypassed reach on the Dead River, or the Forestville Reservoir.

Dissolved Oxygen

Dissolved oxygen (D.O.) and temperature were monitored by UPPCO at two locations on the Dead River near McClure downstream of the McClure Dam in the bypassed reach of the Dead River (NW ¼, SW ¼, Sec. 13, T48N, R26W) and in the tailrace of the McClure Powerhouse prior to its confluence with the Dead River (NE ¼, SW ¼, Sec. 7, T48N, R25W). Temperature monitoring was conducted during the months of May through October 2007. Dissolved oxygen monitoring was conducted during the months of June through September. There were no deviations from the dissolved oxygen or temperature water quality standards below the McClure Powerhouse or below the McClure Dam in the bypassed reach of the Dead River during the 2007 monitoring season

Hardness and pH

The water quality of the Dead River and its tributaries is related to the mineral and organic composition of the soils and geological materials in the watershed. The watershed soils are derived from moraine materials covered by glacial outwash. They are sandy and have relatively high organic matter content in the surface horizons. An organic mat on the soil surface consists of partially decayed plant materials that have accumulated under deciduous and evergreen forest canopies. Because of these soil and geologic factors, Dead River water exhibits low hardness (11.7 to 36.6 mg/l as $CaCO_3$), a slightly acidic to near-neutral nature (pH 6.3 to 7.7), and a slight organic stain.

Toxic Substances

Michigan DNR confirmed that no known toxic substances have been found in Dead River waters. While certain heavy metal concentrations in Dead River waters are elevated, Michigan DNR considers them to be consistent with background levels for the region (UPPCO, 1994). Sediment metal concentrations are consistent with background levels for lakes of Michigan's Upper Peninsula. Other water quality parameters, including total dissolved solids, pH, microorganisms, nutrients, taste- and odor-producing substances, and physical properties, meet Michigan water quality standards and are at levels appropriate for designated uses (UPPCO, 1994).

Mercury

Mercury is not detected at levels in water above that which are considered background. Mercury levels in fish are at levels that warrant continued restriction under the state-wide mercury fish advisory for all inland lakes. The Michigan Department of Environmental Health (DEH) publishes fish consumption guidelines by species for fish harvested from the inland lakes. The presence of mercury in fish is not due to a current water quality concern, but due to historic deposition in sediment from industrial activity (DEH, 2007). Mercury uptake by fish is discussed in more detail below under Fisheries Resources.

Compliance with Water Quality Standards and for Designated Uses

Water in the Dead River watershed, which includes Silver Lake Basin, Hoist Storage Basin, and McClure Storage Basin, has good chemical and biological quality. The U.S. Environmental Protection Agency (USEPA) National Assessment Database, compiling data under the State Water Quality Reporting provisions of Title 40 Code of Federal Regulations (CFR) § 305(b), indicates that water quality met State Water Quality Standards for 2002, 2004, 2006, and 2008

(USEPA, 2002, 2004; Michigan DEQ, 2006, 2008). Water quality was acceptable for all designated uses as noted in ***Table 5-2***.

TABLE 5-2
WATER QUALITY ATTAINMENT THROUGHOUT THE DEAD RIVER HYDROELECTRIC PROJECT DEVELOPMENTS

DESIGNATED USE CATEGORY	STATE DESIGNATED USE	ATTAINMENT STATUS	THREATENED
Recreation	Total Body Contact Recreation	Fully Supporting	No
Aquatic Life Harvesting	Cold Water Fishery	Fully Supporting	No
Aquatic Life Harvesting	Fish Consumption Advisory*	Fully Supporting	No

*There is a State fish advisory limiting weekly fish consumption based on species due to mercury for all water bodies in the State (DEH, 2007)

The Dead River is not used as a public drinking water source. There are no significant consumptive uses of Project waters or discharge of wastewater into the Project watershed. No NPDES permits exist for discharge into Project waters, nor does any Publicly Owned Treatment Works (POTW) discharge into Project waters. Review of the National Priorities List and the Marquette County Resource Management and Development Department's database did not identify any known Resource Conservation and Recovery Act (RCRA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sites in the Dead River watershed. UPPCO utilizes and stores Project waters only for hydroelectric power generation.

Flow

There is a USGS stream gauge that measures real time flow located at the discharge of the McClure Storage Basin. ***Table 5-3*** provides a historic summary of mean daily-seasonal flows from the McClure Reservoir. UPPCO continuously manages and monitors discharge from the McClure Dam to the Dead River and flow through the McClure Penstock in accordance with the FERC license granted for the Dead River Hydroelectric Project.

TABLE 5-3
USGS GAUGE USGS 04043800
MCCLURE STORAGE BASIN
MARQUETTE, MICHIGAN
DISCHARGE, CUBIC FEET PER SECOND (CFS)
HYDROLOGIC UNIT CODE 04020105
LATITUDE 46°34'19", LONGITUDE 87°28'35" NAD27
GAGE DATUM 785 FEET ABOVE SEA LEVEL NGVD29
MEAN OF DAILY MEAN VALUES FOR EACH DAY FOR YEARS OF RECORD, IN CFS
(CALCULATION PERIOD 1989-10-01 -> 2007-09-30)

DAY OF MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	151	163	180	271	285	239	174	114	104	105	128	165
2	152	160	179	271	286	227	170	113	113	105	130	159
3	150	158	185	261	286	220	157	126	124	93	136	166
4	151	157	190	263	285	220	148	121	128	88	139	171
5	149	151	191	272	282	215	148	132	116	99	142	166
6	143	146	192	273	278	205	142	132	104	83	139	168
7	137	140	193	273	267	196	141	132	90	97	131	163
8	142	143	199	276	255	191	141	118	95	115	122	159
9	139	147	197	271	253	182	146	118	96	116	123	164
10	134	145	202	273	252	185	146	114	101	114	125	166
11	133	144	202	286	253	185	142	99	104	119	132	161
12	133	156	201	295	242	185	137	108	98	120	119	157
13	136	157	201	298	243	190	132	105	96	107	118	154
14	141	161	205	302	238	194	120	104	100	112	126	158
15	151	164	206	305	233	199	129	105	90	120	128	157
16	146	160	203	301	242	202	130	108	96	127	137	157
17	145	162	202	300	252	205	136	104	94	115	147	158
18	146	161	201	301	251	204	133	103	84	106	146	163
19	154	162	198	305	245	205	139	110	93	123	146	166
20	154	162	199	299	252	203	145	108	104	131	146	165
21	153	161	202	298	256	199	142	110	105	135	141	165
22	148	163	214	302	253	184	145	101	99	142	142	163
23	142	169	214	304	253	190	147	96	98	141	150	160
24	142	168	217	301	259	196	149	97	108	145	151	151
25	154	170	218	296	253	198	144	95	107	141	152	151
26	157	179	227	298	239	188	138	103	101	134	149	151
27	157	178	236	297	233	179	119	110	114	137	146	151
28	156	180	250	290	243	179	113	111	115	148	152	154
29	156	217	259	292	244	174	128	109	97	148	158	154
30	162		258	287	247	176	128	108	96	149	164	150
31	163		264		245		122	107		137		152

Fisheries Resources

In the past the Michigan DNR has managed and stocked the Dead River Hydroelectric Project Reservoirs as coldwater fisheries and will continue to pursue experimental programs related to coldwater fisheries management, the current strategy in all of the reservoirs focuses on sustainable warm-water fisheries management.

Fisheries resources in the Dead River were evaluated for the original licensing application and at other times. Reservoirs of the fishery contain a variety of game fish including splake, brook trout, brown trout, yellow perch, white sucker, bluegill, northern pike, and walleye (UPPCO, 1994; Normandeau, 2006; Michigan DEQ, 2008).

Dead River Fishery from the McClure to the Forestville Storage Basin

McClure Storage Basin is cold, well-oxygenated, and mesotrophic. The water quality of McClure Storage Basin is good, with epilimnion temperatures and dissolved oxygen concentrations suitable for its current management as a coldwater fishery. Reservoir substrates are principally bedrock, with an expanse of sandy substrates at the delta formed where the Dead River enters the basin. A thick layer of silt covers the remnant channel and the bottom of the coves in this Reservoir (UPPCO, 1994). The combination of limited littoral area and bedrock substrates results in small amounts of aquatic vegetation.

The McClure Storage Basin fishery consists primarily of northern pike, yellow perch, smallmouth bass, walleye, and brown trout. UPPCO conducted a fish contaminant study in the summer of 1992 to assess the potential impact of fish contaminants at McClure Storage Basin (UPPCO, 1994).

Approximately 0.4 mile of river channel (including the tailrace channel) lies between the Hoist Powerhouse and McClure Storage Basin. This short river reach supports a trout fishery. The surrounding bedrock geology in this stream reach is slate. The channel courses through an alluvial/glacial outwash plain from 100 to several hundred feet wide. The stream has an average gradient of 12 feet per mile in this reach. Habitat conditions are dominated by shallow riffles and runs, with minor pool development. Substrate conditions throughout the stream reach consist primarily of the sand and gravels of the adjacent alluvium, but the riffles and faster runs contain cobble, rubble, and some small boulders. In some areas there is modest undercutting of the banks.

North-facing slopes along this section of the river are dominated by eastern hemlock (*Tsuga canadensis*) and yellow birch, with white cedar (*Thuja occidentalis*) of secondary importance and sugar maple and white pine as associated overstory species. South facing slopes are dominated by paper birch, white pine, and northern white cedar, with sugar maple and white spruce of secondary importance and yellow birch an associated species.

The fishery in the Hoist Powerhouse Stream Reach is an extension of the McClure Storage Basin fishery. All species found in McClure Storage Basin are capable of ascending the stream to the Powerhouse. Walleye and white sucker adults have been recorded in the tailrace channel during the spring; these fish likely ascended the river from McClure Storage Basin for the purpose of spawning. Brown trout and yellow perch have been observed in the draft tube pit and tailrace channel (UPPCO, 1994).

Approximately 6.1 miles of the Dead River channel between McClure Storage Basin and Forestville Basin may be affected by diversion for power generation at the McClure Powerhouse Much of this stream reach is affected by inflows from Midway Creek, which is located 2.1 miles below McClure Dam (river mile 9.2), and from Brickyard Creek, which enters the Dead River 4.2 miles below McClure Dam (river mile 7.1). The McClure Bypass Stream Reach extends from McClure Dam to its confluence with the McClure Powerhouse tailrace and consists of three segments. Segment 1 extends 2.1 miles from McClure Dam to the Midway Creek confluence and has an average slope of 244 feet per mile. Segment 2 extends 2.1 miles from Midway Creek to the confluence with Brickyard Creek and has a slope of 5.33 feet per mile. Segment 3 extends 1.9 miles from Brickyard Creek to the Powerhouse tailrace confluence (river mile 5.2). Except for the upper one-half mile of this segment, which is nearly flat, the stream slope averages 138 feet per mile. The overstory along the McClure Bypass Stream Reach is extremely diverse. Sugar maple and red oak (*Quercus rubra*) share dominance, with yellow birch and paper birch as secondary or associated species. Large-toothed aspen (*Populus grandidentata*) and/or quaking aspen (*Populus tremuloides*) attain dominant status in some areas, and northern white cedar and eastern hemlock are important on north-facing slopes. White pines occur on the ridge south of the river. Segment 1 and Segment 3 have very limited fish habitat potential due to the extremely high gradients and predominant bedrock substrates. Spawning habitat is non-existent. Adult and juvenile trout could inhabit the plunge pools. A short stretch of Segment 1 (2,900 linear feet) has a moderate gradient and diverse habitats, including two riffle/run/pool sequences and an upper section containing boulder-strewn run or pocket water type habitat (UPPCO, 1994).

Mercury in the Dead River Drainage Basin

Hydroelectric Project operations do not contribute to the elevated mercury levels found in the fish of Dead River Reservoirs. These levels are largely the result of natural and anthropogenic sources and of regional accumulation due to prior atmospheric deposition from historical industrial combustion at former mining and metal finishing operations in the Upper Peninsula. While certain heavy metal concentrations in Dead River waters are elevated, Michigan DNR considers them to be consistent with background levels for the region (UPPCO, 1994).

Michigan DEQ continues to monitor the waters of the state and evaluate fishing resources to determine if fishing advisories are necessary or can be relaxed. Fish tissue sampling has been performed in the Dead River Basin since the Reports contained in the 1994 License Application Document (UPPCO, 1994). The last sampling reported by the State was in 2005. Fish samples were collected in the lower reservoir located at Forestville (DEQ, November, 2007).

Elevated mercury levels in fish from McClure Storage Basin are similar to regional mercury concentrations. In 2005, fish in the Dead River collected at the Forestville Basin, in Marquette County were sampled for mercury as a water quality indicator. The fish sampled were northern pike and walleye. Six northern pike ranging in length from 19 to 24 inches were collected from the Dead River, Forestville Basin and analyzed for mercury only. Only one of the fish was of legal size, but the mercury concentrations in all six northern pike exceeded the Michigan Department of Community Health (DCH) "restrict consumption" trigger level of 0.50 ppm. The median mercury concentration for all six fish was 0.78 ppm. Similarly, eight walleye ranging in length from 16 to 20 inches were collected from the Dead River at the Forestville Basin and analyzed for mercury only. Mercury concentrations in seven walleye exceeded the Michigan DCH trigger level, and the median mercury concentration was 0.58 ppm for all eight walleye. A total of 13 walleye have been collected and analyzed since 1996. The overall median mercury concentration was 0.58 ppm. There is an existing statewide Michigan DCH mercury advisory in effect which covers these resources. Michigan DEQ has recommended that no change be made to the advisory. No sampling has been performed since 2006 (DEQ, 2006; Michigan DEQ, 2007; Michigan DEQ, 2008).

Aquatic Macro Invertebrates

On behalf of UPPCO, King and MacGregor Environmental, Inc. (KME) performed a macro-invertebrate and water quality assessment of the Dead River Drainage Basin from Silver Lake Reservoir to Lake Superior in June 2004. Data were collected from 10 sample stations (7 fixed sites, including 1 reference site in Connors Creek, and 3 random sites). Of 157 taxa of macro

invertebrates identified, 45 were found at one sampling station in Reach # 2, between the McClure and Forestville Basins on the Dead River. This reach had the highest taxa index value and the highest taxa richness of the four reaches (KME, 2004), indicative of a good quality habitat.

KME also surveyed macro invertebrates in the nine streams identified along the McClure Penstock route. Macro invertebrate populations were confirmed in Streams identified as Numbers 3, 4, and 6. A summary of the characterization results and taxa identified are presented in ***Tables 5-4, 5-5, and 5-6***.

Fresh Water Mussels

A Phase I and Phase II aquatic mussel assessment was conducted within the Dead River Drainage Basin in August and September 2004 (Normandeau Associates, Inc., 2005).

Aquatic resources potentially providing mussel habitat were identified using existing data, including aerial imagery and resource agency/UPPCO accounts. The reservoir assessment then divided cell units into habitat categories as:

- **High Quality**: Live or fresh dead shells of mussels observed. Substrate is stable/moderately stable where sand, silt, or gravel comprises most of the substrate.
- **Moderate Quality**: All of the above characteristics except without the evidence of mussels during a ten-minute search.
- **Low Quality**: No evidence of mussels present. Substrate was unstable (visibly shifting areas of sand, silt, gravel, or organic debris) and the substrate was almost entirely (>75 percent) composed of bedrock, large boulders/cobble, or soft silt. Also included areas where depth was too deep to safely search for mussels due to extremely low visibility (>6 feet).

TABLE 5-4
STREAM #3, BENTHIC MACROINVERTEBRATES (KME, 2008)
(BY SPECIES, TOTAL COUNT OBSERVED, AND PERCENT OF TOTAL)

Ephemeroptera

Ametropodidae		0.00%
Baetiscidae		0.00%
Baetidae	11	8.27%
Caenidae		0.00%
Ephemerellidae		0.00%
Ephemeridae	1	0.75%
Heptageniidae		0.00%
Isonychiidae		0.00%
Leptophlebiidae		0.00%
Metretopodidae		0.00%
Polymitarcyidae		0.00%
Potamanthidae		0.00%
Siphlonuridae		0.00%
Tricorythidae		0.00%

Odonata

Aeshnidae		0.00%
Cordulegastridae		0.00%
Corduliidae		0.00%
Gomphidae		0.00%
Libellulidae	1	0.75%
Macomiidae		0.00%
Calopterygidae		0.00%
Coenagrionidae		0.00%
Lestidae		0.00%

Plecoptera

Capniidae	3	2.26%
Chloroperlidae		0.00%
Leuctridae		0.00%
Nemouridae	1	0.75%
Peltoperlidae		0.00%
Perlidae		0.00%
Perlodidae		0.00%
Pteronarcyidae		0.00%
Taeniopterygidae		0.00%

Hemiptera

Belostomatidae		0.00%
Corixidae		0.00%
Gelastocoridae		0.00%
Gerridae		0.00%
Mesoveliidae		0.00%
Naucoridae		0.00%
Nepidae		0.00%
Notonectidae		0.00%
Pleidae		0.00%
Saldidae		0.00%
Veliidae		0.00%

Megaloptera

Corydalidae		0.00%
Sialidae		0.00%

Neuroptera

Sisyridae		0.00%

Trichoptera

Brachycentridae		0.00%
Glossosomatidae		0.00%
Helicopsychidae		0.00%
Hydropsychidae	10	7.52%
Hydroptilidae		0.00%
Lepidostomatidae	2	1.50%
Leptoceridae		0.00%
Limnephilidae	22	16.54%
Molannidae		0.00%
Odontoceridae		0.00%
Philopotamidae	1	0.75%
Phryganeidae		0.00%
Polycentropodidae	29	21.80%
Psychomyiidae		0.00%
Rhyacophilidae		0.00%
Sericostomatidae		0.00%
Uenoidae		0.00%

Lepidoptera

Noctuidae		0.00%
Pyralidae		0.00%

Coleoptera

Dryopidae		0.00%
Dytiscidae		0.00%
Elmidae		0.00%
Gyrinidae (A)		0.00%
Gyrinidae (L)		0.00%
Haliplidae (A)		0.00%
Haliplidae (L)		0.00%
Heteroceridae		0.00%
Hydraenidae		0.00%
Hydrophilidae	1	0.75%
Lampyridae (A)		0.00%
Lampyridae (L)		0.00%
Noteridae (A)		0.00%
Noteridae (L)		0.00%
Psephenidae(A)		0.00%
Psephenidae (L)		0.00%
Ptilodactylidae (A)		0.00%
Ptilodactylidae (L)		0.00%
Scirtidae (A)		0.00%
Scirtidae (L)		0.00%

Diptera

Athericidae	1	0.75%
Ceratopogonidae		0.00%
Chaoboridae		0.00%
Chironomidae	30	22.56%
Culicidae		0.00%
Dixidae		0.00%
Dolichopodidae		0.00%
Empididae		0.00%
Ephydridae		0.00%
Muscidae		0.00%
Ptychopteridae		0.00%
Psychodidae		0.00%
Sciomyzidae		0.00%
Simuliidae	2	1.50%
Stratiomyidae		0.00%
Syrphidae		0.00%
Tabanidae		0.00%
Thaumaleidae		0.00%
Tipulidae		0.00%

Gastropoda

Ancylidae		0.00%
Bithyniidae		0.00%
Hydrobiidae		0.00%
Lymnaeidae		0.00%
Physidae	1	0.75%
Planorbidae	1	0.75%
Pleuroceridae		0.00%
Pomatiopsidae		0.00%
Valvatidae		0.00%
Viviparidae		0.00%

Pelecypoda

Dreissenidae		0.00%
Pisidiidae		0.00%
Sphaeriidae	1	0.75%
Unionidae		0.00%

Misc.

Porifera		0.00%
Turbellaria		0.00%
Nematomorpha		0.00%
Bryozoa		0.00%
Hirudinea		0.00%
Oligochaeta	5	3.76%
Amphipoda	10	7.52%
Decapoda		0.00%
Isopoda		0.00%
Hydracarina		0.00%

Total Individuals: **133**

TABLE 5-5
STREAM #4 BENTHIC MACROINVERTEBRATES (KME, 2008)
(BY SPECIES, TOTAL COUNT OBSERVED, AND PERCENT OF TOTAL)

Ephemeroptera		
Ametropodidae		0.00%
Baetiscidae		0.00%
Baetidae	4	4.44%
Caenidae		0.00%
Ephemerellidae	1	1.11%
Ephemeridae		0.00%
Heptageniidae		0.00%
Isonychiidae		0.00%
Leptophlebiidae		0.00%
Metretopodidae		0.00%
Polymitarcyidae		0.00%
Potamanthidae		0.00%
Siphlonuridae		0.00%
Tricorythidae		0.00%

Odonata		
Aeshnidae	1	1.11%
Cordulegastridae	1	1.11%
Corduliidae		0.00%
Gomphidae		0.00%
Libellulidae	1	1.11%
Macomiidae		0.00%
Calopterygidae		0.00%
Coenagrionidae		0.00%
Lestidae		0.00%

Plecoptera		
Capniidae	2	2.22%
Chloroperlidae		0.00%
Leuctridae		0.00%
Nemouridae	3	3.33%
Peltoperlidae		0.00%
Perlidae		0.00%
Perlodidae		0.00%
Pteronarcyidae		0.00%
Taeniopterygidae		0.00%

Hemiptera		
Belostomatidae		0.00%
Corixidae		0.00%
Gelastocoridae		0.00%
Gerridae	3	3.33%
Mesoveliidae		0.00%
Naucoridae		0.00%
Nepidae		0.00%
Notonectidae		0.00%
Pleidae		0.00%
Saldidae		0.00%
Veliidae		0.00%

Megaloptera		
Corydalidae		0.00%
Sialidae	1	1.11%

Neuroptera		
Sisyridae		0.00%

Trichoptera		
Brachycentridae		0.00%
Glossosomatidae		0.00%
Helicopsychidae		0.00%
Hydropsychidae	1	1.11%
Hydroptilidae		0.00%
Lepidostomatidae	14	15.56%
Leptoceridae		0.00%
Limnephilidae	1	1.11%
Molannidae		0.00%
Odontoceridae		0.00%
Philopotamidae		0.00%
Phryganeidae		0.00%
Polycentropodidae	22	24.44%
Psychomyiidae		0.00%
Rhyacophilidae		0.00%
Sericostomatidae		0.00%
Uenoidae		0.00%

Lepidoptera		
Noctuidae		0.00%
Pyralidae		0.00%

Coleoptera		
Dryopidae		0.00%
Dytiscidae		0.00%
Elmidae		0.00%
Gyrinidae (A)		0.00%
Gyrinidae (L)		0.00%
Haliplidae (A)		0.00%
Haliplidae (L)		0.00%
Heteroceridae		0.00%
Hydraenidae		0.00%
Hydrophilidae		0.00%
Lampyridae (A)		0.00%
Lampyridae (L)		0.00%
Noteridae (A)		0.00%
Noteridae (L)		0.00%
Psephenidae(A)		0.00%
Psephenidae (L)		0.00%
Ptilodactylidae (A)		0.00%
Ptilodactylidae (L)		0.00%
Scirtidae (A)		0.00%
Scirtidae (L)		0.00%

Diptera		
Athericidae		0.00%
Ceratopogonidae		0.00%
Chaoboridae		0.00%
Chironomidae	21	23.33%
Culicidae		0.00%
Dixidae		0.00%
Dolichopodidae		0.00%
Empididae		0.00%
Ephydridae		0.00%
Muscidae		0.00%
Ptychopteridae		0.00%
Psychodidae		0.00%
Sciomyzidae		0.00%
Simuliidae	3	3.33%
Stratiomyidae		0.00%
Syrphidae		0.00%
Tabanidae	3	3.33%
Thaumaleidae		0.00%
Tipulidae		0.00%

Gastropoda		
Ancylidae		0.00%
Bithyniidae		0.00%
Hydrobiidae		0.00%
Lymnaeidae		0.00%
Physidae	1	1.11%
Planorbidae		0.00%
Pleuroceridae		0.00%
Pomatiopsidae		0.00%
Valvatidae		0.00%
Viviparidae		0.00%

Pelecypoda		
Dreissenidae		0.00%
Pisidiidae		0.00%
Sphaeriidae	2	2.22%
Unionidae		0.00%

Misc.		
Porifera		0.00%
Turbellaria		0.00%
Nematomorpha		0.00%
Bryozoa		0.00%
Hirudinea		0.00%
Oligochaeta	4	4.44%
Amphipoda	1	1.11%
Decapoda		0.00%
Isopoda		0.00%
Hydracarina		0.00%

Total Individuals: **90**

TABLE 5-6
STREAM #6 BENTHIC MACROINVERTEBRATES (KME, 2008)
(BY SPECIES, TOTAL COUNT OBSERVED, AND PERCENT OF TOTAL)

Ephemeroptera		
Ametropodidae		0.00%
Baetiscidae		0.00%
Baetidae		0.00%
Caenidae		0.00%
Ephemerellidae	4	2.56%
Ephemeridae		0.00%
Heptageniidae		0.00%
Isonychiidae		0.00%
Leptophlebiidae		0.00%
Metretopodidae		0.00%
Polymitarcyidae		0.00%
Potamanthidae		0.00%
Siphlonuridae		0.00%
Tricorythidae		0.00%

Odonata		
Aeshnidae		0.00%
Cordulegastridae		0.00%
Corduliidae		0.00%
Gomphidae		0.00%
Libellulidae		0.00%
Macomiidae		0.00%
Calopterygidae		0.00%
Coenagrionidae		0.00%
Lestidae		0.00%

Plecoptera		
Capniidae	3	1.92%
Chloroperlidae		0.00%
Leuctridae		0.00%
Nemouridae	1	0.64%
Peltoperlidae		0.00%
Perlidae		0.00%
Perlodidae		0.00%
Pteronarcyidae		0.00%
Taeniopterygidae		0.00%

Hemiptera		
Belostomatidae		0.00%
Corixidae		0.00%
Gelastocoridae		0.00%
Gerridae	1	0.64%
Mesoveliidae		0.00%
Naucoridae		0.00%
Nepidae		0.00%
Notonectidae		0.00%
Pleidae		0.00%
Saldidae		0.00%
Veliidae		0.00%

Megaloptera		
Corydalidae		0.00%
Sialidae		0.00%

Neuroptera		
Sisyridae		0.00%

Trichoptera		
Brachycentridae		0.00%
Glossosomatidae		0.00%
Helicopsychidae		0.00%
Hydropsychidae		0.00%
Hydroptilidae		0.00%
Lepidostomatidae	2	1.28%
Leptoceridae		0.00%
Limnephilidae	29	18.59%
Molannidae		0.00%
Odontoceridae		0.00%
Philopotamidae		0.00%
Phryganeidae		0.00%
Polycentropodidae		0.00%
Psychomyiidae		0.00%
Rhyacophilidae		0.00%
Sericostomatidae		0.00%
Uenoidae		0.00%

Lepidoptera		
Noctuidae		0.00%
Pyralidae		0.00%

Coleoptera		
Dryopidae		0.00%
Dytiscidae	5	3.21%
Elmidae		0.00%
Gyrinidae (A)		0.00%
Gyrinidae (L)		0.00%
Haliplidae (A)		0.00%
Haliplidae (L)		0.00%
Heteroceridae		0.00%
Hydraenidae		0.00%
Hydrophilidae		0.00%
Lampyridae (A)		0.00%
Lampyridae (L)		0.00%
Noteridae (A)		0.00%
Noteridae (L)		0.00%
Psephenidae(A)		0.00%
Psephenidae (L)		0.00%
Ptilodactylidae (A)		0.00%
Ptilodactylidae (L)		0.00%
Scirtidae (A)		0.00%
Scirtidae (L)		0.00%

Diptera		
Athericidae	5	3.21%
Ceratopogonidae		0.00%
Chaoboridae		0.00%
Chironomidae	89	57.05%
Culicidae		0.00%
Dixidae	1	0.64%
Dolichopodidae		0.00%
Empididae		0.00%
Ephydridae		0.00%
Muscidae	1	0.64%
Ptychopteridae		0.00%
Psychodidae		0.00%
Sciomyzidae		0.00%
Simuliidae	13	8.33%
Stratiomyidae		0.00%
Syrphidae		0.00%
Tabanidae		0.00%
Thaumaleidae		0.00%
Tipulidae		0.00%

Gastropoda		
Ancylidae		0.00%
Bithyniidae		0.00%
Hydrobiidae		0.00%
Lymnaeidae		0.00%
Physidae		0.00%
Planorbidae		0.00%
Pleuroceridae		0.00%
Pomatiopsidae		0.00%
Valvatidae		0.00%
Viviparidae		0.00%

Pelecypoda		
Dreissenidae		0.00%
Pisidiidae		0.00%
Sphaeriidae		0.00%
Unionidae		0.00%

Misc.		
Porifera		0.00%
Turbellaria		0.00%
Nematomorpha		0.00%
Bryozoa		0.00%
Hirudinea		0.00%
Oligochaeta	2	1.28%
Amphipoda		0.00%
Decapoda		0.00%
Isopoda		0.00%
Hydracarina		0.00%

Total Individuals: **156**

Field studies and surveys were then conducted within each of the Reservoirs. Most of the McClure Basin contained moderate quality mussel habitat and suitable substrate to support a more diverse mussel community. Also, water fluctuations are minimal in this Reservoir. However, only three *A. fersussacianus* were found in the McClure Basin during the Rapid Assessment. The lack of mussels was unexpected. Interviews with local residents indicated that some 20 years ago, mussels were more abundant than they are now. There did not appear to be any explanation as to why the decline has occurred.

The river reach from the McClure Reservoir to the Forestville Basin also contained low probability mussel habitat, most likely due to the bedrock substrate and fast river flow. A single specimen of *A. fersussacianus* was found in a pool habitat with silt substrate approximately two miles downstream of the McClure Dam. The lack of mussels in this area would be expected due to poor mussel habitat quality as a result of the bedrock river bottom.

5.5.2.2 Environmental Impacts and Recommendations

Implementation of the proposed option is not expected to impact water resources, water quality, water quantity, fisheries resources, or fish habitat. Implementation of the proposed option will not impact downstream flooding below Forestville. However, the Penstock does provide an alternative conduit to limit extremely high flows, erosion, and flooding through the steeper part of the Dead River along the McClure bypassed reach. Although there will be disturbance in the various construction areas, BMPs will be implemented to prevent sedimentation and erosion that could impact streams and runoff within the watershed. Impacts to wetlands will be minimized or avoided. Wetland areas that have been created previously by leakage of the Penstock will diminish and return to a more natural state. Disturbed areas will be revegetated according to the Project Revegetation Plan provided in ***Appendix B***.

5.5.2.3 Effects of No Action Alternative

Without restoration of the Penstock, the flood/river velocity control benefit provided by the Penstock by-pass would not be available. The McClure Penstock by-passes the steepest part of the Dead River where heavy precipitation and high water levels could be the most destructive. Although there is an environmental benefit of periodic full bank flows in the river, extremely high flows beyond the full bank level could lead to the potential for scouring, erosion, and habitat loss. The Penstock provides a bypass to carry potentially damaging flows from the

McClure Reservoir down to the lower elevation parts of the Dead River where the profile is less severe.

5.5.3 Terrestrial Resources

As a condition of the License, the following specific provisions are required relative to environmental management of UPPCO's Dead River Hydroelectric Project:

- Develop a Wildlife Management Plan (entire Dead River Hydroelectric Project area including McClure Development);
- Develop and implement a Shoreline and Bank Erosion Control Plan (Silver Lake, Hoist, and McClure Storage Basins);
- Conduct annual cleanups of the existing informal McClure Bypassed Reach Trail (McClure Development);
- Develop and implement a Natural Organic Debris Maintenance Plan (lands managed by UPPCO);
- Develop and implement a Bald Eagle Protection Plan (entire Dead River Hydroelectric Project area including McClure Development);
- Develop and implement a Nuisance Plant Control Plan (entire Dead River Hydroelectric Project area including McClure Development); and
- Develop and implement a Comprehensive Land Management Plan (entire Dead River Hydroelectric Project area including McClure Development).

An extensive regional wildlife survey was conducted in 1992 and reported in the original licensing application (UPPCO, 1994). The wildlife diversity in the local region has remained largely the same since 1992, as there have been no significant changes such as large scale development, invasion of non-native species, selective disease, or wide scale natural disasters that would have substantially changed the ecological balance. Specific data cited for the areas in the vicinity of the McClure Penstock are reported in ***Section 5.5.3.1*** below and in the photographs provided in ***Appendix C***, reported from the field survey performed by UPPCO's consultant in the summer of 2008 (KME, 2008). Data for wildlife in the broader area in the vicinity of the McClure Powerhouse and Penstock are provided from various sources as reported in the original licensing application (UPPCO, 1994).

5.5.3.1 Affected Environment

The upland and wetland habitats of the Greater Dead River Hydroelectric Project and surrounding areas are used by approximately 250 wildlife species (UPPCO, 1994). Mixed northern hardwood forests occupy most of the greater Project area uplands. These are relatively mature, second-growth forests that resulted from logging early in the 20th century.

It is expected that mammals and birds will avoid the areas of construction due to noise and human activity. Because the area is heavily wooded, mammals and birds will be able to find sufficient habitat, food, and water nearby during the single construction season. Following construction, there will be no negative impacts on mammals and birds. There will be some negative impacts to vegetation resources resulting from ground disturbance, compaction, and heavy equipment use in the vicinity of the Penstock. Following construction, disturbed areas will be revegetated according to the Project Revegetation Plan provided in ***Appendix B***. Following the completion of construction, no long-term lasting negative impacts to upland vegetation are anticipated. Disturbed areas are expected to recover quickly or within several years. Past vegetation management practices impacting terrestrial resources and responsibility for maintaining right-of-way areas related to the McClure Penstock will continue after construction is complete.

Because of the construction there will be a limited impact on some of the wetland areas, which could affect terrestrial resources. The impact should involve disturbance of less than 1/3 acre. Wetlands that have evolved and are sustained due to leakage from the Penstock will diminish and eventually return to the natural upland condition of the area. If it is determined that any offsets are required, mitigation options will be discussed with Michigan DEQ. High quality wetlands identified during the stream survey will be protected during construction to avoid disturbance and impact.

5.5.3.2 Effects of No Action Alternative

The Penstock can no longer be safely and reliably operated, thus flow from leaks that are sustaining some wet areas will also be discontinued under the No Action alternative. No Action would avoid any potential for active disturbance of wetlands that would occur during construction. However, that difference is negligible as care will be taken during construction to implement BMPs to avoid wetland impacts and minimize disturbance to and impact on streams and associated wetland areas.

5.6 HABITAT/LAND-USE UNITS

UPPCO's consultant, KME, conducted environmental field studies in the Summer 2008 within a 400-foot wide corridor centered on the existing McClure Penstock (***Figures 2-3 through 2-6***). In September 2008, the eastern end was expanded to encompass the existing powerhouse area and the garden park west of the small stream channel (***Figure 2-3***). An additional 100-ft wide corridor was added to the study area near where the Penstock crosses the railroad tracks, extending northward from the original corridor for a length of 1,400 feet along an existing access road (***Figure 2-5***). The western end of the study area was expanded to include all of the area up to the toe of the dam slope (***Figure 2-6***). The study area is located within the Upper Peninsula of Michigan, Marquette County, T28N, R26W, Section 7, and T28N, R26W, Sections 12, 13, and 14. The study scope included: 1) gathering and reviewing available information regarding habitat/land-use (including wetlands, forestlands, and wildlife use) and streams within the study area; 2) determining potential impacts of Penstock construction activities on habitat/land-use and streams within the study area; 3) constructing a Geographic Information System (GIS) map of the study area depicting habitat/land-use types and stream locations; and 4) querying the Michigan DNR/Michigan Natural Features Inventory (NFI) database to determine if any known occurrences of threatened, endangered, or otherwise significant plant or animal species, rare natural plant communities, or other rare natural features exist within the study area (as noted by letter in ***Appendix D***).

The evaluation methods and discussion of the study results are provided below.

5.6.1 Habitat/Land-Use Units

The results of the study identified the following distinct habitat/land-use units along the McClure Penstock Route along with nine small streams:

- Garden Park Area;
- Lower Right-of-Way Open Area;
- Mature Conifer / Broad-leaved Deciduous;
- Riparian Wetlands;
- Non-riparian Wetlands;
- Middle/Upper Right-of-Way Open Area;
- Maturing Broad-leaved Deciduous;

- Young Broad-leaved Deciduous;
- Selective Timber Harvest Area; and
- Riparian Wetlands.

These features along with the nine stream areas identified are described in detail within ***Sections 5.6 and 5.7***.

Methods

KME initially reviewed the study area (hereafter called the Project area) using 1998 and 2005 aerial photographs, which were obtained from the Michigan DNR online Geographic Data Library (MDIT 2008). High-resolution year-2005 aerial photographs were obtained from Marquette County Resource Management Department and reviewed. Meander surveys were conducted by KME biologists throughout the Project area during mid-summer 2008. The additional 100-foot-wide corridor near the rail line was observed for the existing access road. Meander surveys were not conducted within the northern portion of this area. Plant and animal species were identified and documented throughout the entire Project area. An inventory of forestlands and other habitat types within the Project area was completed. Habitat/land-use categories were developed based on prevalent vegetation communities and land-use characteristics. Mean Coefficient of Conservatism (Mean C) scores and Floristic Quality Index (FQI) scores were calculated based on plant species documented (Herman et. al., 2001).

Results

Ten distinct habitat/land-use units were identified throughout the Project area (***Figures 2-3, 2-4, 2-5, and 2-6***). KME's data are shown in ***Tables 5-7, 5-8, and 5-9***. ***Table 5-7*** is a list of plant species documented within each habitat/land-use unit. ***Table 5-8*** shows vegetation community metrics within each habitat/land-use unit, including total species documented, native species, Mean C scores, and FQI scores. ***Table 5-9*** lists animal species documented within each habitat/land-use unit.

Ten distinct habitat/land-use units and nine streams were identified within the area of investigation. The most significant ecologic features occur within the eastern portion of the Penstock corridor. These include an early 20th century garden park area, riparian wetlands associated with coldwater streams, and a 21-acre mature conifer/broad-leaved deciduous forest habitat that is valued as an aesthetic and recreational resource. The highest quality streams are

TABLE 5-7
PLANT SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND-USE UNIT (KME, 2008)

Common Name	Scientific Name	Native	T/E	C	Habitat/Land-use Units									
					Old-Growth Hemlock Stand	Selective Timber Harvest	Young Broad-leaved Deciduous	Maturing Broad-leaved Deciduous	Riparian Wetlands	Other Wetlands	Middle/Upper Right of Way	Lower Right of Way	Mature Conifer / Broad-leaved	Garden / Park Area
Allegheny blackberry	*Rubus allegheniensis*	Yes	No	1		+						+		+
American bittersweet	*Celastrus scandens*	Yes	No	3										+
American elm	*Ulmus americana*	Yes	No	1										+
American water-horehound	*Lycopus americanus*	Yes	No	2					+	+				
balsam fir	*Abies balsamea*	Yes	No	3	+	+	+	+	+				+	
balsam poplar	*Populus balsamifera*	Yes	No	2			+	+	+	+	+	+		
beaked hazelnut	*Corylus cornuta*	Yes	No	5		+	+	+					+	
big-tooth aspen	*Populus grandidentata*	Yes	No	4	+	+	+	+			+	+	+	
black ash	*Fraxinus nigra*	Yes	No	6					+					
black cherry	*Prunus serotina*	Yes	No	2										+
black-eyed susan	*Rudbeckia hirta*	Yes	No	1										+
black spruce	*Picea mariana*	Yes	No	6					+					
blue beadlily	*Clintonia borealis*	Yes	No	5	+	+		+					+	
blue-joint	*Calamagrostis canadensis*	Yes	No	3					+	+				+
bracken fern	*Pteridium aquilinum*	Yes	No	0	+	+	+	+		+	+	+	+	+
broad-leaved cattail	*Typha latifolia*	Yes	No	1						+				
bur-dock	*Arctium minus*	No	No	0										+
Canada goldenrod	*Solidago canadensis*	Yes	No	1										+
Canada mayflower	*Maianthemum canadense*	Yes	No	4	+			+	+		+		+	+
cinnamon fern	*Osmunda cinnamomea*	Yes	No	5					+					
crab-apple	*Malus spp.*	Yes	No	4										+
common buckthorn	*Rhamnus cathartica*	No	No	0										+
common columbine	*Aquilegia vulgaris*	No	No	0										+
common st. john's-wort	*Hypericum perforatum*	No	No	0							+	+		+
crested sedge	*Carex cristatella*	No	No	3					+	+				
digitate clubmoss	*Lycopodium digitatum*	Yes	No	3	+			+						
dwarf raspberry	*Rubus pubescens*	Yes	No	4					+					
European swamp thistle	*Cirsium palustre*	No	No	0					+	+				
fireweed	*Epilobium angustifolium*	Yes	No	3										+

TABLE 5-7
PLANT SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND-USE UNIT (KME, 2008)
(CONTINUED)

Common Name	Scientific Name	Native	T/E	C	Habitat/Land-use Units									
					Old-Growth Hemlock Stand	Selective Timber Harvest	Young Broad-Leaved Deciduous	Maturing Broad-Leaved Deciduous	Riparian Wetlands	Other Wetlands	Middle/Upper Right of Way	Lower Right of Way	Mature Conifer / Broad-Leaved	Garden / Park Area
fowl manna grass	*Glyceria striata*	Yes	No	4					+					
fox sedge	*Carex vulpinoidea*	Yes	No	1					+	+				
goldthread	*Coptis trifolia*	Yes	No	5					+					
great mullein	*Verbascum thapsus*	No	No	0		+					+	+		+
eastern hemlock	*Tsuga canadensis*	Yes	No	5	+				+				+	
hop sedge	*Carex lupulina*	Yes	No	4					+					
intermediate fern	*Dryopteris intermedia*	Yes	No	5		+		+	+				+	
jack pine	*Pinus banksiana*	Yes	No	5				+						
lady fern	*Athyrium filix-femina*	Yes	No	4					+				+	
large-leaved aster	*Aster macrophyllus*	Yes	No	4	+	+		+			+	+	+	+
low sweet blueberry	*Vaccinium angustifolium*	Yes	No	4	+	+	+	+					+	
maned sedge	*Carex crinita*	Yes	No	4					+	+				
oak fern	*Gymnocarpium dryopteris*	Yes	No	5				+	+		+			
orange day-lily	*Hemerocallis fulva*	No	No	0										+
orange touch-me-not	*Impatiens capensis*	Yes	No	2					+	+				
orchard grass	*Dactylis glomerata*	No	No	0		+				+	+	+		
ostrich fern	*Matteucia struthiopteris*	Yes	No	3					+					+
ox-eye daisy	*Chrysanthemum leucanth.*	No	No	0							+			
panicled phlox	*Phlox paniculata*	No	No	0										+
paper birch	*Betula papyrifera*	Yes	No	2	+	+	+	+				+	+	+
perennial ryegrass	*Lolium perenne*	No	No	0		+				+	+	+		
pussy willow	*Salix discolor*	Yes	No	1					+	+				
red maple	*Acer rubrum*	Yes	No	1	+	+	+	+	+	+		+	+	
red oak	*Quercus rubra*	Yes	No	5	+	+	+	+				+	+	+
red pine	*Pinus resinosa*	Yes	No	6	+	+		+					+	
red-osier dogwood	*Cornus stolonifera*	Yes	No	2					+	+				
redtop	*Agrostis gigantea*	Yes	No	0		+			+	+	+	+		+
reed canary grass	*Phalaris arundinacea*	Yes	No	0										+
rostrate sedge	*Carex utriculata*	Yes	No	5					+					
round-leaf wintergreen	*Pyrola rotundifolia*	Yes	No	7					+					
royal fern	*Osmunda regalis*	Yes	No	5					+					

TABLE 5-7
PLANT SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND-USE UNIT (KME, 2008)
(CONTINUED)

Common Name	Scientific Name	Native	T/E	C	Habitat/Land-use Units									
					Old-Growth Hemlock Stand	Selective Timber Harvest	Young Broad-Leaved Deciduous	Maturing Broad-Leaved Deciduous	Riparian Wetlands	Other Wetlands	Middle/Upper Right of Way	Lower Right of Way	Mature Conifer / Broad-Leaved	Garden / Park Area
running clubmoss	*Lycopodium clavatum*	Yes	No	4	+			+			+			
scabrous sedge	*Carex scabrata*	Yes	No	4					+					
sensitive fern	*Onoclea sensibilis*	Yes	No	2					+	+				
smooth brome	*Bromus inermis*	No	No	0								+		+
smooth serviceberry	*Amelanchier laevis*	Yes	No	4		+	+	+					+	
speckled alder	*Alnus incana ssp. rugosa*	Yes	No	5					+					
spinulose woodfern	*Dryopteris carthusiana*	Yes	No	5					+					
spotted joe-pye-weed	*Eupatorium maculatum*	Yes	No	4					+					
staghorn sumac	*Rhus typhina*	Yes	No	2								+		
starflower	*Trientalis borealis*	Yes	No	5	+	+		+	+					
stipitate sedge	*Carex stipata*	Yes	No	1					+	+				
strict sedge	*Carex stricta*	Yes	No	4					+					
striped maple	*Acer pensylvanicum*	Yes	No	5	+	+	+	+				+	+	
sugar maple	*Acer saccharum*	Yes	No	5	+	+	+	+					+	+
swamp aster	*Aster puniceus*	Yes	No	5					+					
tall buttercup	*Ranunculus acris*	No	No	0					+	+	+			
thimbleberry	*Rubus parviflorus*	Yes	No	6					+			+	+	+
timothy	*Phleum pratense*	No	No	0		+				+	+	+		+
tumid sedge	*Carex intumescens*	Yes	No	3					+	+				
varicolored iris	*Iris versicolor*	Yes	No	5					+					
velvetleaf blueberry	*Vaccinium myrtilloides*	Yes	No	4	+	+		+	+				+	
Virginia creeper	*Parthenocissus quinquefolia*	Yes	No	5										+
white cedar	*Thuja occidentalis*	Yes	No	4					+					+
white pine	*Pinus strobus*	Yes	No	3	+	+		+					+	
white spruce	*Picea glauca*	Yes	No	3									+	
wild bergamot	*Monarda fistulosa*	Yes	No	2										+
wild geranium	*Geranium maculatum*	Yes	No	4				+			+			
wild red raspberry	*Rubus strigosus*	Yes	No	2		+			+	+	+	+		+
wild sarsaparilla	*Aralia nudicaulis*	Yes	No	5	+	+		+					+	
winterberry holly	*Ilex verticillata*	Yes	No	5					+					
wintergreen	*Gaultheria procumbens*	Yes	No	5	+	+		+			+	+	+	

TABLE 5-7
PLANT SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND-USE UNIT (KME, 2008)
(CONTINUED)

Common Name	Scientific Name	Native	T/E	C	Habitat/Land-use Units									
					Old-Growth Hemlock Stand	Selective Timber Harvest	Young Broad-Leaved Deciduous	Maturing Broad-Leaved Deciduous	Riparian Wetlands	Other Wetlands	Middle/Upper Right of Way	Lower Right of Way	Mature Conifer / Broad-Leaved	Garden / Park Area
yarrow	*Achillea millefolium*	No	No	1							+	+		
yellow birch	*Betula alleghaniensis*	Yes	No	7				+	+				+	

TABLE 5-8
VEGETATION COMMUNITY METRICS (KME, 2008)

HABITAT/LAND-USE UNIT	TOTAL SPECIES	NATIVE SPECIES		MEAN COEFFICIENT OF CONSERVATISM (MEAN C)	FLORISTIC QUALITY INDEX SCORE
Old-Growth Hemlock Stand	21	21	100%	3.90	17.89
Selective Timber Harvest	27	23	85%	3.07	15.97
Young Broad-leaved Deciduous	12	12	100%	3.33	11.55
Maturing Broad-leaved Deciduous	28	28	100%	4.07	21.54
Riparian Wetlands	47	44	94%	3.66	25.09
Other Wetlands	22	16	73%	1.36	6.40
Middle/Upper Right-of-Way	20	12	60%	1.90	8.50
Lower Right-of-Way	21	14	67%	1.90	8.73
Mature Conifer / Broad-leaved Deciduous	25	25	100%	4.16	20.80
Garden / Park Area	N/A	N/A	N/A	N/A	N/A

TABLE 5-9
ANIMAL SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND USE UNIT (MME, 2008)

V = visual observation, A = audio identification, I = indirect evidence (tracks, etc.)

Common Name	Scientific Name	Old-Growth Hemlock Stand	Selective Timber Harvest	Young Broad-leaved Deciduous	Maturing Broad-leaved Deciduous	Riparian Wetlands	Other Wetlands	Middle/Upper Right of Way	Lower Right of Way	Mature Conifer / Broad-leaved	Garden / Park Area
Mammals											
American black bear	*Ursus americanus*					V					
eastern chipmunk	*Tamias striatus*	V	A		A		A	V	V	A	
raccoon	*Procyon lotor*	V				I		V		I	
white-tailed deer	*Odocoileus virginianus*	I	I		I	I		V		I	
Birds											
American crow	*Corvus brachyrhynchos*				A			V		A	
American robin	*Turdus migratorius*		A				V	V			
barred owl	*Strix varia*		A								
black-capped chickadee	*Poecile atricapilla*	A			A	A				A	A
black-throated blue warbler	*Dendroica caerulescens*				A	A				A	
black-throated green warbler	*Dendroica virens*				A	A				A	
blue jay	*Cyanocitta cristata*				A					A	A
blue-headed Vireo	*Vireo solitarius*				A					A	
eastern wood-pewee	*Contopus virens*	A	A		A	A				A	
American gold finch	*Carduelis tristis*										A
hermit thrush	*Catharus guttatus*	A	A		A	V				A	
northern parula	*Parula americana*					A				A	
ovenbird	*Seiurus aurocapilla*		A		A					A	
pileated woodpecker	*Dryocopus pileatus*		V		A						
raven	*Corvus corax*									A	
red-eyed vireo	*Vireo olivaceus*		A	A	A					A	
red-tailed hawk	*Odocoileus virginianus*	V									
ruby-crowned kinglet	*Regulus calendula*					A					
veery	*Catharus fuscescens*					A				A	
white-breasted nuthatch	*Sitta carolinensis*		V		A					A	
white-throated sparrow	*Zonotrichia albicollis*									A	
wren	*Troglodytes sp.*										V

TABLE 5-9
ANIMAL SPECIES DOCUMENTED WITHIN EACH HABITAT/LAND USE UNIT (MME, 2008)
(CONTINUED)

V = visual observation, A = audio identification, I = indirect evidence (tracks, etc.)

COMMON NAME	SCIENTIFIC NAME	OLD-GROWTH HEMLOCK STAND	SELECTIVE TIMBER HARVEST	YOUNG BROAD-LEAVED DECIDUOUS	MATURING BROAD-LEAVED DECIDUOUS	RIPARIAN WETLANDS	OTHER WETLANDS	MIDDLE/UPPER RIGHT OF WAY	LOWER RIGHT OF WAY	MATURE CONIFER / BROAD-LEAVED	GARDEN / PARK AREA
yellow-bellied sapsucker	*Sphyrapicus varius*				A						A
Other Animals											
brook trout	*Salvelinus fontinalis*					V					
gypsy moth	*Lymantria dispar*		V		V						
northern green frog	*Rana clamitans*					V					
tiger swallowtail butterfly	*Papilio glaucus*							V		V	
white admiral butterfly	*Limenitis arthemis*				V	V		V		V	

all located within the eastern portion of the study area. Brook trout were observed in the Dead River (Stream #2 and Stream #3).

Several of the riparian wetlands and streams located mainly at the east end of the study area are vulnerable to potential degradation during construction because of their relatively small size and proximity to the Penstock. BMPs should be employed during any construction activities which may be proposed. Other than a small area of mature hemlock trees and a seasonal intermittent watercourse, the western and central portion of the Penstock corridor contain no ecologically significant habitat/land-use features.

No federal/state-listed species, potential habitat for listed species, rare natural plant communities, or other rare natural features were observed or are known to occur within the study area.

Garden Park Area (1.76 acres) (*Photos 1 and 2 - Appendix C*)

Landscape architect Warren H. Manning, a protégé of Frederick Law Olmstead, created the garden park near the powerhouse in 1918. Manning (1860–1938) was an influential American landscape designer and promoter of the informal and naturalistic "wild garden" approach to garden design. He emphasized pre-existing flora to create a "spatial structure and character" and described his wild gardening as "that form of floriculture which is concerned with planting in a nature-like manner colonies of hardy plants that require a minimum of care" (Karson 1997). Manning's gardens within the park still exhibit a wild and naturalistic character. Native vegetation such as ostrich fern (*Matteuccia struthiopteris*), thimbleberry (*Rubus parviflorus*), Canada goldenrod (*Solidago canadensis*), and interrupted fern (*Osmunda claytoniana*) prevail over non-natives, such as common buckthorn (*Rhamnus cathartica*) and reed-canary grass (*Phalaris arundinacea*). A giant red oak tree (*Quercus rubra*), though much smaller in 1918, was likely one of the pre-existing natural elements utilized by Manning. Some aspects of the garden park appear to have changed over the 90 years since completion. The garden park now contains mowed lawns, a parking area, and numerous paved and gravel lanes. Manning's stone terraces located on the hillside are now completely overgrown and are no longer visible. During the field investigation, KME staff noted a relatively constant recreational use of the garden park area, as people utilized the parking area and walked through the garden park en route to the Dead River falls.

Lower Right-of-Way Open Area (5.02 acres) (*Photo 3 - Appendix C*)

This habitat/land-use unit is a shrub/sapling-dominated linear strip that extends over 3,000 linear feet, ranging in width from 30 to over 100 feet. The unit's open characteristic must be

maintained because of the existing 34.5kV power line that generally parallels the Penstock within the UPPCO easement. Although a shrub/sapling stratum is present along much of this unit, periodic herbicide spraying, cutting, and other maintenance activities have suppressed woody vegetation growth. The majority of shrubs and saplings appear to be dead or dying, though many woody stems remain. Areas of bare ground are evident. Perennial ryegrass (*Lolium perenne*), redtop (*Agrostis gigantea*), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), large-leaved aster (*Aster macrophyllus*), yarrow (*Achillea millefolium*), mullein (*Verbascum thapsus*), and bracken fern (*Pteridium aquilinum*) can be found in a patchy herbaceous layer. Vegetation community metrics indicate relative low quality. Few animals were documented within this habitat/land-use unit. The Dead River is nearby and the eastern end of this unit is utilized by people accessing the gorge and falls. This corridor is likely utilized by hunters to access interior areas.

Mature Conifer/Broad-leaved Deciduous (21.89 acres) (*Photos 4, 5, and 6 - Appendix C*)
The majority of the overstory is dominated by mature white pine (*Pinus strobus*) and red pine (*Pinus resinosa*) trees, ranging from 18-24 inches diameter-at-breast-height (DBH). Conifers, including occasional large (>14 inches DBH) white spruce (*Picea glauca*), make up 30 to 60 percent of the overstory. Large red oak (16-24 inches DBH), and medium-sized (12-16 inches DBH) sugar maple (*Acer saccharum*) and red maple (*Acer rubrum*) comprise much of the remainder of the overstory. The terrain is variable and is relatively steep in some areas. The understory consists primarily of sugar maple, red maple, big-tooth aspen (*Populus grandidentata*), paper birch (*Betula papyrifera*), and balsam fir (*Abies balsamea*). A diverse array of native plant species make up the shrub/sapling and ground cover component of this habitat type. Vegetation community metrics indicate relative high quality. Many animal species were documented within this habitat/land-use unit. Lack of stumps and average size of trees within the overstory component indicate that this unit is a relatively old, second-growth timber stand. The unit likely hasn't been timbered extensively for at least 85 years. The Dead River gorge and falls are adjacent to the edge of this habitat/land-use unit and recreational activities such as hiking, sightseeing, fishing, and day-camping appear to be the main anthropogenic uses. Recreational use of this area is at the discretion of the landowners except for the recreational opportunity required to be maintained by UPPCO per the FERC operating license.

Riparian Wetlands (2.52 acres) (*Photos 7 and 8 - Appendix C*)
This habitat type is associated with eight small streams and part of a river within the Project area. The overstory, where it exists, is dominated by red maple, yellow birch (*Betula alleghaniensis*), white cedar (*Thuja occidentalis*), balsam fir, and eastern hemlock (Tsuga canadensis). The

understory is comprised of smaller individuals of the same species. Speckled alder (*Alnus incana*), red-osier dogwood (*Cornus stolonifera*), winterberry holly (*Ilex verticillata*), pussy willow (*Salix discolor*), and small red maple and yellow birch saplings can be found in the shrub/sapling stratum. A diverse array of sedges, ferns, and other herbaceous species are found at the ground level. Vegetation community metrics indicate high quality. A relatively numerous assortment of animals was documented within this habitat/land-use unit, including a visual observation of an American black bear (*Ursus americanus*). Recreational use of this habitat may include hunting and bird watching.

Non-riparian Wetlands (1.29 acres) (*Photo 9 - Appendix C*)

These wetlands are primarily associated with the open right-of-way areas and are not directly associated with streams. Except for the larger wetland located within the 100-foot-wide access corridor (***Figure 2-5***), most have no forested component. Woody species such as pussy willow, red-osier dogwood, and small red maple seedlings and saplings can be found within a few of these wetlands. The herbaceous component is mostly comprised of common grasses, sedges, and weedy herbaceous species such as redtop grass, fox sedge (*Carex vulpinoidea*), and broad-leaved cattail (*Typha latifolia*). Vegetation community metrics indicate relative low quality. An exception is the wetland located within the northeast portion of the 100-foot wide access corridor (***Figure 2-5***), which contains a higher quality native vegetation community featuring dominant species such as yellow birch, interrupted fern, and speckled alder. Few animals were documented within the non-riparian wetlands.

Middle/Upper Right-of-Way Open Area (15.60 acres) (*Photo 10 - Appendix C*)

This habitat/land-use unit is a herbaceous-dominated linear strip that extends over 10,000 linear feet, ranging from 30 to 70 feet wide for most of its length. Periodic mowing and other low-intensity maintenance activities associated with the Penstock and power line right-of-way have suppressed tree and shrub growth, while enabling herbaceous vegetation to flourish. Several common grass species such as perennial ryegrass, redtop, timothy, and orchard grass are co-dominant with forbs such as large-leaved aster, ox-eye daisy (*Chrysanthemum leucanthemum*), tall buttercup (*Ranunculus acris*), and yarrow. Vegetation community metrics indicate relative low quality. However, a wide assortment of animals were documented within this habitat/land-use unit. This unit is utilized recreationally by people riding mountain bikes and all-terrain vehicles (ATV). Other uses may include the use of this corridor to access interior hunting areas.

Maturing Broad-leaved Deciduous (33.39 acres) (*Photo 11 - Appendix C*)

The majority of the overstory is dominated by medium to large-sized (12-16 inches DBH) sugar maple, red maple, and mature (16-24 inches DBH) big-tooth aspen. A few, scattered large (>16 inches DBH) red oak and large (>18 inches DBH) white pine were also noted. Paper birch, big-tooth aspen, balsam fir, red maple, sugar maple, and red oak comprise the understory. In many areas where the canopy is naturally more open, smaller woody species and shrubs such as smooth serviceberry (*Amelanchier laevis*), beaked hazelnut (*Corylus cornuta*), striped maple (*Acer pensylvanicum*), and low sweet blueberry (*Vaccinium angustifolium*) are abundant. Herbaceous species such as wild sarsaparilla (*Aralia nudicaulis*), wintergreen (*Gaultheria procumbens*), starflower (*Trientalis borealis*) are prevalent at the ground level. Vegetation community metrics indicate relative high quality. Many animal species were documented within this habitat/land-use unit. There is no evidence of significant logging activity occurring within approximately the past 50 years. Because wildlife is relatively abundant, and the edges of this unit are adjacent to much of the middle/upper right-of-way unit, recreational use of this habitat likely includes hunting and wildlife observation.

Young Broad-leaved Deciduous (10.25 acres) (*Photo 12 - Appendix C*)

This habitat/land-use unit is a dense stand of mostly pole-sized (3-8 inches DBH) big-toothed aspen, paper birch, red maple, and sugar maple trees. The monotypic structure and relative uniformity of age class (less than 25 years) indicates that this area had likely been clear-cut within the past three decades. The groundcover is dominated by bracken fern. Vegetation community metrics indicate relative low quality. Few animals were documented within this habitat/land-use unit. Recreational use within this unit is likely minimal, and may be limited primarily to occasional hunting.

Selective Timber Harvest Area (37.59 acres) (*Photos 13 and 14 - Appendix C)*

The majority of the overstory is comprised of small to medium-sized (10-16 inches DBH) red and sugar maples, and a few scattered large (>16-inch DBH) red oak. The overstory was selectively logged within the past two decades and logging slash and debris remnants are still evident. Large canopy openings are common. Logging activity likely focused primarily on oak and northern hardwoods, sparing softer-grained species such as aspen. Because the species was not harvested during past timbering operations, mature (18-22 inches DBH) big-tooth aspen are abundant and dominate the overstory in many areas. The understory varies from sparse to dense, and is primarily composed of young maples, oaks, paper birch, and big-tooth aspen. A gypsy moth (*Lymantria dispar*) infestation was documented within this unit, affecting primarily oak and aspen. The groundcover is dominated by bracken fern in many areas. Vegetation

community metrics indicate relative moderate quality. An array of animals was documented within this habitat/land-use unit. Because wildlife is moderately abundant, and the edges of this unit are adjacent to much of the middle/upper right-of-way unit, recreational use of this habitat likely includes hunting and wildlife observation.

Mature Hemlock Stand (0.78 acres) (*Photo 15 - Appendix C*)

The nucleus of this small habitat/land-use unit is comprised of at least four mature eastern hemlock trees. Measurements of these slow-growing conifers ranged from 25 to 33 inches DBH, with ages likely near the century mark. The overstory of the unit is comprised of approximately 30 percent conifers such as eastern hemlock, white pine, and red pine. The remainder of the overstory is comprised of medium (14-16 inches DBH) red maple, small to medium-sized (10-14 inches DBH) sugar maple, and mature (18-22 inches DBH) big-tooth aspen. Large canopy gaps occur throughout the overstory. The understory is generally sparse and consists primarily of both maple species and red oak. Stump evidence indicates that many hardwoods were selectively harvested from the overstory within the past two decades. The groundcover is dominated by bracken fern in some areas. Vegetation community metrics indicate relative high quality. Several small mammals, deer, and several bird species were documented within this habitat/land-use unit. Recreational use likely includes hunting and wildlife observation. No federal or state-listed endangered, threatened, or otherwise rare species were documented within this habitat/land-use unit. Though not listed within the Michigan DNR/ Michigan NFI database, this small hemlock stand is a relatively unique natural feature.

5.6.2 Discussion

Garden Park Area

Much of the Warren H. Manning's garden park near the powerhouse now appears to be lawn, pavement, and gravel. Portions of these are to be utilized as a lay-down staging zone for construction equipment and supplies, while care is taken to avoid the several large patches of shrub and wildflower vegetation. Access to recreational opportunities may be temporarily affected, if the pedestrian pathways to the Dead River falls area are blocked or impeded by construction activities. Recreational access on non-UPPCO owned property is at the discretion of each landowner.

Lower Right-of-Way Open Area

Because of its narrow width and proximity to the Penstock, this relatively low quality habitat will likely be completely altered during Penstock construction. Due to public safety concerns, access

to the Dead River falls may be blocked during construction activities. Access to the Dead River falls area may be blocked or impeded due to public safety concerns during construction activities. Recreational access on non-UPPCO owned property is at the discretion of each landowner.

Mature Conifer/Broad-leaved Deciduous

The presence of large, mature trees, undulating topography, and the lack of recent, major anthropogenic disturbances have produced an ecologically complex habitat structure that supports a relatively diverse flora and fauna. This habitat/land-use unit is also an important vegetative buffer that provides protection for three high-quality tributaries, the east side of another small tributary, and a small portion of a river. The unique, aesthetic features of this habitat/land-use unit also make it a popular recreational resource. Recreational access on non-UPPCO owned property is at the discretion of each landowner. Care must be taken during Penstock construction to remove large trees only if absolutely necessary, so as not to alter the character of this unit.

Riparian Wetlands

These wetlands have relatively high ecological value, protecting headwater streams and providing specialized habitat for native species of plants and animals. They are relatively fragile systems, susceptible to degradation from uncontrolled land disturbance. BMPs such as wetland avoidance, minimization of area of impact, and erosion control measures should be carefully implemented during Penstock construction. Several riparian wetlands are located immediately adjacent to the Penstock. In these situations, if BMPs are planned and utilized so that the plant community (especially the forested component) and substrate are not significantly disturbed during Penstock construction, then long-lasting impacts to these systems may be negligible. Mitigation or restoration would be problematic, because of the difficulty of excluding non-native and invasive species after any large-scale substrate disturbance. Most construction activities are regulated by the Michigan DEQ.

Non-Riparian Wetlands

The majority of these small wetlands occur within the open right-of-way areas in close proximity to the Penstock and will likely be within the zone of construction activity. Many of these wetlands likely exist due to years of extensive leaking from the Penstock. Impacts to many of these small wetlands may be unavoidable. Some of these wetlands may be regulated by Michigan DEQ because they may be within 500 feet of any stream.

Middle/Upper Right-of-Way Open Area

This habitat/land-use unit has relatively low vegetation quality scores because of the preponderance of non-native species. However, this unit provides some grassland/prairie characteristics that are utilized by many species of wildlife. Because of its proximity to the Penstock, much of this habitat will likely be destroyed or otherwise negatively altered during construction.

Maturing Broad-Leaved Deciduous

If no trees are removed beyond the outer fringe of this habitat/land-use unit, no serious impacts are likely to occur during Penstock construction activities. Because of expected noise disturbance, extensive wildlife use may temporarily decline during Penstock construction. Wildlife would be expected to resume normal population and diversity levels after construction is complete. There are many similar habitat areas in close proximity for wildlife use.

Young Broad-Leaved Deciduous

This habitat/land-use unit is located over 80 feet from the Penstock. No serious impacts to this habitat/land-use unit are expected from Penstock construction activities.

Selective Timber Harvest Area

If no trees are removed beyond the outer fringe of this habitat/land-use unit, no serious impacts to this habitat/land-use unit are expected from Penstock construction activities.

Mature Hemlock Stand

These large, slow-growing, old conifers have reached the peak of their life span, yet may tower over the surrounding forest for many more decades if left undisturbed. This is a relatively unique community; therefore, it should be avoided to the extent possible. Most of the giant hemlocks occur at least 60 feet from the Penstock and will likely not be threatened by Penstock construction activities.

5.7 STREAM CHARACTERIZATION

5.7.1 Methods

KME conducted on-site stream evaluations on July 3, July 24, and September 24, 2008. The study areas included:

- A 400-foot-wide corridor centered on the existing McClure Penstock;
- The garden park area near the existing powerhouse; and
- A 100-foot-wide corridor encompassing an access road leading to the Penstock, east of the existing rail line/right-of-way.

The study scope included: 1) gathering and reviewing available information regarding habitat/land-use and streams within the study area; 2) determining potential impacts of Penstock construction activities on habitat/land-use and streams within the study area; 3) constructing a Geographic Information System (GIS) map of the study area depicting habitat/land-use types and stream locations; and 4) querying the Michigan DNR/Michigan NFI database to determine if any known occurrences of threatened, endangered, or otherwise significant plant or animal species, rare natural plant communities, or other rare natural features exist within the study area.

All streams were given a numeric designation for this study (e.g., Stream #1), based on relative distance from the Project area's east end boundary. Physical characteristics were determined for all streams within the Project area. Investigations were conducted in late July so that low-flow status could be determined accurately. Average widths and average depths were calculated for each stream within the Project area. For perennial streams, an average velocity classification was determined by visual estimation. The Michigan DEQ Stream Crossing Watershed Survey Procedure (DEQ, 2000) was used to compute the Index of Biological Integrity (IBI) scores based on benthic macro invertebrate community data (***Tables 5-4, 5-5, and 5-6***) collected at each of the three perennial streams that cross the Penstock. Habitat integrity was determined for each stream, based on IBI scores and direct observation of habitat features and condition (***Table 5-10***). Stream locations are shown in ***Figures 2-3, 2-4, 2-5, and 2-6.*** In addition to the 10 land use/habitat units and 9 streams that were identified during the habitat survey, 23 wetland areas were also noted. The location and size of these wetland areas relative to the Penstock right of way and study area are shown on ***Sheets 1 through 13*** provided in ***Appendix E.*** Photographs of habitat, stream, and wetland areas surveyed along the Penstock route are provided in ***Appendix C (Photographs 1 through 32)***.

5.7.2 Results

Stream #1 (*Photo 16 - Appendix C)*

The flow of this stream is completely dependent upon the outflow from the Penstock powerhouse. There was no outflow from the powerhouse during the time of this field study.

TABLE 5-10
STREAM CHARACTERIZATIN (KME, 2008)

Stream Name	Pipeline Crossing	Average Velocity	Average Width (ft)	Average Depth (ft)	Dominant Substrate	Flow Status	Fish	Associated Wetland	Biological Integrity Score	Habitat Integrity	Potential Habitat Value
# 1	No	medium	8	1.00	gravel, cobble, boulder	perennial	yes	N/A	N/A*	fair	good
# 2	No	medium-high	35	2.50	bedrock, boulder, cobble	perennial	brook trout	Wetland V	N/A*	excellent	high
# 3	Yes	low-medium	3	0.40	bedrock, cobble, gravel	perennial	brook trout	Wetland A	>48 (excellent)	excellent	high
# 4	Yes	low	1.5	0.25	gravel, sand, organic	perennial	no	Wetland B	>48 (excellent)	excellent	high
# 5	No	low	1	0.05	sand, organic	perennial	no	Wetland D	N/A*	excellent	moderate
# 6	Yes	low	1	0.08	sand, cobble, organic	perennial	no	Wetlands F,E	32 (fair)	somewhat degraded	moderate
# 7	Yes	N/A*	1	0.05	sand, organic	intermittent	no	Wetland G	N/A*	good	moderate
# 8	No	low	1	0.05	sand, organic	perennial	no	Wetland J	N/A*	excellent	moderate
# 9	Yes	N/A*	1	N/A	bedrock, boulder, cobble	intermittent	no	N/A	N/A*	good	moderate

*Not applicable because the stream was seasonally dry (no flow) during timeframe of investigation.

Though a well-defined stream channel exists, only a series of lentic pools were evident. Small fish of the family Cyprinidae were observed within the pools. The substrate consists primarily of gravel, cobbles, and boulders.

Stream #2 (*Photo 17 - Appendix C*)

Downstream of the Dead River falls, part of the river is within the east end of the Project area. Recreational uses observed within or near this section of the Dead River included fishing, swimming, day camping/picnicking, and hiking. Brook trout (*Salvelinus fontinalis*) were observed within this section of the Dead River near the mouth of a small tributary (Stream #2). No significant habitat degradation was apparent.

Stream #3 (*Photos 18, 19, 20, and 21 - Appendix C)*

This is a small, perennial stream that crosses the Penstock near the east end of the Project area. After merging with several other small streams outside the northern boundary of the Project area, the stream flows south toward the Penstock. After entering the Project area, the stream flows through the dense shrubs and sedges of a high-quality riparian wetland. Emerging from this wetland, the stream flows southeast for approximately 100 feet through a narrow channel consisting of low banks, overhanging herbaceous vegetation, and a gravel/cobble bottom substrate. Several yearling and young-of-year brook trout were observed within this location. Near the Penstock span, the stream's substrate and banks are comprised mainly of cobble and coarse woody debris. After passing under the Penstock, Stream #3 flows approximately 200 feet southeast toward the Dead River (Stream #1). Near the junction with the Dead River, the stream slows down and deepens considerably before entering the river. Substrate is silt, sand, and cobble. Numerous (>50) young-of-year brook trout were observed within this lower reach. Several older brook trout were netted and released during macroinvertebrate IBI sampling efforts (***Photo 16***). The stream has a diverse benthic macroinvertebrate community, including highly-sensitive Plecopteran (stonefly) nymphs, and consequently scored high in all IBI metrics (***Table 5-10***). No significant habitat degradation was apparent.

Stream #4 (*Photos 22, 23, and 24 - Appendix C)*

This stream is a very small, perennial stream that originates in forested wetland seeps south of the Project area's southern boundary and slowly flows north through a riparian wetland toward the Penstock. South of the Penstock, the substrate is a mixture of organic silt, sand, and gravel. Banks are very low and covered with ferns and sedge species. The stream crosses the Penstock near the east end of the Project area, approximately 200 feet west of the Stream #2 crossing. The small stream eventually flows northward out of the Project area, where it merges with the upper

reaches of Stream #2. No fish were detected within this stream (during macroinvertebrate sampling) because of its small size and shallow depth. However, the stream has a diverse benthic macroinvertebrate community, including highly-sensitive stonefly genera, and consequently scored high in all IBI metrics (***Table 5-10***). No habitat degradation was apparent.

Stream #5 (*Photo 25 - Appendix C*)

This stream is a very small, slow-moving perennial stream that originates in forested wetland seeps, approximately 100 feet south of the Penstock. It flows southeast through a large forested wetland complex, away from the Project area. The stream's substrate consists primarily of sand and organic debris. Within the Project area, the stream is too small to support fish. No habitat degradation was apparent.

Stream #6 (*Photos 26, 27, 28, and 29 - Appendix C*)

This stream is a very small, perennial watercourse that originates in wetlands southwest of the Project area, flows northeast through a riparian wetland, then eventually passes below the access road and Penstock near the road's terminus. Within the Project area, the stream is too small to support fish. The stream has been impacted by erosion and sedimentation caused by run-off and flooding. South of the Penstock, the stream disappears from the surface occasionally as it flows through limestone rip-rap near the roadside. Downstream (north) of the Penstock crossing, within the Project area the stream's banks and channel have suffered extensive scouring, erosion, and sand deposition. Herbaceous riparian vegetation has been significantly altered (removed or buried). Although permanently flowing, the stream occasionally disappears into the sand substrate as it courses through a forested wetland. Habitat degradation along this stream within 100 feet of both sides of the Penstock crossing ranges from minimal to extensive, based on the benthic macroinvertebrate IBI score and visual observation.

Stream #7 (*Photo 30 - Appendix C*)

This is a very small, intermittent stream that originates in wetland seeps northwest of the Project area and flows southeast, under both the Penstock and the access road, where it discharges into Stream #5. Banks are barely discernible and lined with wetland sedges, grasses, ferns, and trees for much of its course. Its substrate consists primarily of sand and organic silt. No significant habitat degradation was apparent.

Stream #8 (*Photo 31 - Appendix C*)

This stream is a very small, slow-moving perennial stream that originates in wetland seeps approximately 125 feet north of the Penstock. Banks are low and lined with wetland sedges,

ferns, and trees. Its substrate consists primarily of sand and organic silt. Within the Project area, the stream is too small to support fish. No significant habitat degradation is apparent.

Stream #9 (*Photo 32 - Appendix C)*

This is a very small intermittent stream that originates near the Penstock, over 1,300 feet east of the railroad tracks. The stream channel is barely evident among strewn boulders, as it descends over a steep, forested hillside toward the Dead River. The channel was completely dry when observed in early and late July. No significant habitat degradation was apparent.

5.7.3 Discussion

Stream #1

Because of its close proximity to a potential laydown/staging area for Penstock construction, this small stream's narrow riparian corridor may be vulnerable to physical damage. The stream may also be susceptible to some water quality impacts from surface run-off. Care must be taken to implement proper run-off control measures and avoid damaging the riparian banks and vegetation with heavy equipment and construction materials.

Stream #2

This portion of the Dead River is over 150 feet from the Penstock and is therefore not in threatened by direct impact from Penstock construction activities. The health of the fishery within that section of the river could potentially be impacted indirectly, if Stream #2 is degraded significantly.

Stream #3

The high IBI score, variable and complex substrate (including gravel), association with a high-quality riparian wetland, and observation of numerous young-of-year brook trout indicate that this is a high-quality nursery stream capable of producing at least several hundred brook trout every year. Many of these trout will migrate downstream to the Dead River. The lower section of this small tributary likely provides thermal refuge during the hottest summer days for trout inhabiting the nearby reach of the Dead River. Construction within or near a small stream can negatively impact the structure of its natural banks and bed, often resulting in an ecologically degraded, channelized watercourse. Once natural vegetation along a stream is gone, it is very difficult to reestablish and the stream is unlikely to maintain pre-existing hydrologic and biological conditions (DEQ, 1998). Therefore, the stream banks (including existing riparian vegetation) and bed should be maintained to the best possible extent. Because it parallels the

Penstock for approximately 100 feet and then flows underneath the Penstock, this small stream is highly susceptible to rapid deterioration if BMPs are not implemented properly during Penstock construction. Examples of BMPs include erosion control measures throughout the construction-site and the use of a temporary, clear-span structure to keep construction machinery out of the stream channel and preserve stream bank integrity (DNR, 2007). Utilization of the existing alignment and concrete structures will lessen potential impacts to the stream during Penstock construction.

Stream #4

This high-quality perennial stream, while too small to support fish, is an important tributary to the (Stream #2). Because it flows under the Penstock, this small stream is highly susceptible to rapid deterioration if appropriate BMPs are not implemented properly during Penstock construction.

Stream #5

Because of its distance from the Penstock, the riparian wetland associated with Stream #5 will likely not be impacted significantly by Penstock construction. Therefore, hydrology and habitat characteristics of this very small, slow-moving perennial stream will likely remain unaltered.

Stream #6

Because a large section of this stream flows along the south side of the access road and eventually flows under the Penstock, construction will likely cause further degradation, unless BMPs are properly utilized. If riparian wetlands in the vicinity are left intact, this small stream will likely recover from Penstock construction impacts within several years.

Stream #7

Because this stream flows under the Penstock just before it intersects with Stream #5, only a small section (approximately 50 linear feet) would likely be impacted by Penstock construction. Erosion of the stream channel is unlikely because it appears to flow only in early spring. However, if erosion occurs in this stream it will directly affect Stream #5.

Stream #8

During Penstock construction, avoidance of the forested portion of the wetland at its source will ensure that hydrology and habitat characteristics of this very small, slow-moving perennial stream will remain unaltered.

Stream #9

The wetland on the opposite side of the access road appears to be the source of hydrology for this small, intermittent stream. Avoidance of this wetland and careful erosion control measures during Penstock construction will limit impacts. Downstream of the Dead River falls, part of the river is within the east end of the Project area. Recreational uses observed within or near this section of the Dead River included fishing, swimming, day camping/picnicking, and hiking. Brook trout (*Salvelinus fontinalis*) were observed within this section of the Dead River near the mouth of a small tributary (Stream #2). No significant habitat degradation was apparent.

5.8 ENDANGERED, THREATENED, OR SPECIAL CONCERN SPECIES EVALUATION

5.8.1 Methods

The Michigan DNR, in conjunction with the Michigan NFI, maintains a database of all known occurrences of threatened, endangered, or otherwise significant plant or animal species, rare natural plant communities, or other rare natural features in Michigan. A query was made of the Michigan DNR/Michigan NFI database to identify the presence any known occurrences within the Project area. Meander surveys were conducted by KME biologists throughout the Project area during mid-summer 2008. Plant and animal species were identified and documented throughout the Project area. An inventory of habitat types within the Project area was completed.

5.8.2 Results

No federal or state-listed endangered, threatened, or special concern species, rare natural plant communities, or other rare natural features were documented within the Project area.

5.8.3 Discussion

Though relatively remote, nearly the entire Project area has experienced some form(s) of major anthropogenic disturbance throughout the past 150 years, such as logging road construction, timber removal, original Penstock construction, Penstock right-of-way maintenance activities, ongoing maintenance of the Penstock structure, railroad corridor maintenance, and a host of human recreational activities. Existence of rare species and rare natural communities are typically inversely related to extent of anthropogenic disturbance. Therefore, absence of these

features within the Project area would be expected Michigan DNR, Michigan NFI, Michigan DNR, Michigan NFI.

5.9 RARE, THREATENED, OR ENDANGERED SPECIES AND SPECIES OF SPECIAL CONCERN BEYOND THE 400 FOOT MCCLURE PENSTOCK CORRIDOR

5.9.1 Affected Environment

The Endangered Species Act of 1973, as amended, requires a federal agency to ensure that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of any endangered or threatened species or to result in destruction or adverse modification of critical habitat of such species.

A recent Michigan NFI review for the area of investigation concluded that no federally or state listed threatened and endangered species have been documented in the greater Project area. The potential for the Project impacts on rare, threatened, or endangered species and their habitat were discussed above in ***Section 5.5.3.1*** and it was concluded that no endangered species are present within the immediate Project area.

Table 5-11 provides a list of threatened and endangered species identified within Marquette County listed in the Michigan NFI data base. Threatened or endangered plant species known to occur in Marquette County, including species listed or proposed for federal listing, Michigan-listed threatened or endangered plant species, and "plant species of special concern" in Michigan are also included in ***Table 5-11.*** Species of special concern are not afforded legal protection under federal or state endangered species laws.

The vegetation around the Dead River Hydroelectric Project was surveyed during the summer of 1992 for the presence of threatened and endangered plant species and plant species of special concern. The 1992 wildlife survey reported special and unique environments identified by the County of Marquette in the vicinity. The area of the Dead River Hydroelectric Project included habitat sites for the state-listed big-leaf sandwort (*Arenaria macrophylla*), narrow-leaved gentian (*Gentians linearis*), rock whitlow grass (*Draba arabisans*), dwarf bilberry (*Vaccinium caespitosum*), and Clinton's bulrush (*Scirpus clintonii*). According to Michigan DNR at the time, only big-leaf sandwort has been recorded within the Dead River Hydroelectric Project boundary, at a location in the vicinity of the Hoist Powerhouse, which is outside of the area of impact of the proposed option for replacement at McClure (UPPCO, 1994).

TABLE 5-11
MARQUETTE COUNTY THREATENED AND ENDANGERED SPECIES LIST

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Accipiter gentilis	Northern Goshawk		SC
Adlumia fungosa	Climbing Fumitory		SC
Allium schoenoprasum	Wild Chives		T
Alvar	Alkaline Scrub/Grassland, Upper Midwest Type		
Amerorchis rotundifolia	Round-leaved Orchis		E
Arenaria macrophylla	Big-leaf Sandwort		T
Armoracia lacustris	Lake Cress		T
Asplenium trichomanes-ramosum	Green Spleenwort		T
Boloria frigga	Frigga Fritillary		SC
Calamagrostis lacustris	Northern Reedgrass		T
Calypso bulbosa	Calypso or Fairy-slipper		T
Canus lupus	Gray Wolf	LE	LE
Carex atratiformis	Sedge		T
Clematis occidentalis	Purple Clematis		SC
Clemmys insculpta	Wood Turtle		SC
Collinsia parviflora	Small Blue-eyed Mary		T
Coregonus artedi	Cisco or Lake Herring		T
Coregonus hubbsi	Ives Lake Cisco		SC
Crataegus douglasii	Douglas's Hawthorn		SC
Cryptogramma stelleri	Slender Cliff-brake		SC
Cypripedium arietinum	Ram's Head Lady's-slipper		SC
Cystopteris laurentiana	Laurentian Fragile Fern		SC
Danthonia intermedia	Wild Oat-grass		SC
Dendroica kirtlandii	Kirtland's Warbler	LE	E
Dermatocarpon moulinsii	Lichen		
Draba arabisans	Rock Whitlow-grass		SC
Drosera anglica	English Sundew		SC
Dry Northern Forest	Dry Woodland, Upper Midwest Type		
Dry-mesic Northern Forest			
Dryopteris filix-mas	Male Fern		SC
Dryopteris fragrans	Fragrant Cliff Woodfern		SC
Elymus glaucus	Blue Wild-rye		SC
Elymus mollis	American Dune Wild-rye		SC
Erebia discoidalis	Red-disked Alpine		SC
Falcipennis canadensis	Spruce Grouse		SC
Falco peregrinus	Peregrine Falcon		E
Gavia immer	Common Loon		T

TABLE 5-11
MARQUETTE COUNTY THREATENED AND ENDANGERED SPECIES LIST
(CONTINUED)

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Gentiana linearis	Narrow-leaved Gentian		T
Granite Bedrock Glade			
Granite Bedrock Lakeshore			
Granite Cliff			
Great Blue Heron Rookery	Great Blue Heron Rookery		
Great Lakes Marsh			
Gymnocarpium jessoense	Northern Oak Fern		E
Gymnocarpium robertianum	Limestone Oak Fern		T
Haliaeetus leucocephalus	Bald Eagle		T
Hardwood-Conifer Swamp			
Huperzia selago	Fir Clubmoss		SC
Intermittent Wetland	Infertile Pond/marsh, Great Lakes Type		
Juncus stygius	Moor Rush		T
Limestone Cliff			
Lycaeides idas nabokovi	Northern Blue		T
Lynx canadensis	Canada Lynx	LE	T
Mesic Northern Forest			
Myriophyllum alterniflorum	Alternate-leaved Water-milfoil		SC
Myriophyllum farwellii	Farwell's Water-milfoil		T
Nicrophorus americanus	American Burying Beetle	LE	E
Northern Shrub Thicket	Wet Scrubland, Upper Midwest Type		
Nuphar pumila	Small Yellow Pond-lily		E
Opuntia fragilis	Fragile Prickly-pear		E
Oryzopsis Canadensis	Canada Rice-grass		T
Pandion haliaetus	Osprey		T
Pinguicula vulgaris	Butterwort		SC
Planorbella multivolvis	Acorn Ramshorn		E
Poor Conifer Swamp			
Pterospora andromedea	Pine-drops		T
Rallus elegans	King Rail		E
Ribes oxyacanthoides	Northern Gooseberry		SC
Rich Conifer Swamp			
Rumex occidentalis	Western Dock		E
Sagina nodosa	Pearlwort		T
Salix pellita	Satiny Willow		SC
Sandstone Lakeshore Cliff			
Scirpus clintonii	Clinton's Bulrush		SC

TABLE 5-11
MARQUETTE COUNTY THREATENED AND ENDANGERED SPECIES LIST
(CONTINUED)

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Tanacetum huronense	Lake Huron Tansy		T
Thalictrum venulosum var. confine	Veiny Meadow-rue		SC
Trisetum spicatum	Downy Oat-grass		SC
Umbilicaria torrefacta	Lichen		
Vaccinium cespitosum	Dwarf Bilberry		T
Viola novae-angliae	New England Violet		T
Wooded Dune and Swale Complex			
Woodsia alpine	Northern Woodsia		T
Woodsia obtuse	Blunt-lobed Woodsia		T

(http://web4.msue.msu.edu/mnfi/data/county.cfm, as of 8/20/2008)

Key to State and Federal Status Designations

Federal Status
Listed Endangered (LE)
Listed Threatened (LT)
Candidate (C)

State Status
Endangered (E)
Threatened (T)
Special Concern (SC)
Presumed Extirpated (X)

The U.S. Department of Interior (USDOI) identified four federally listed endangered or threatened bird and animal species that may occur in the greater Project area. They are the peregrine falcon (*Falco peregrinus*), Kirtland's warbler (*Dendroica kirtlandii*) (listed as endangered), the gray wolf (*Canis lupus*) (listed as endangered), and the bald eagle (formerly listed as threatened and since removed from the Federal list). However, bald eagles will continue to be monitored, and both bald and golden eagles are protected under the Eagle Protection Act of 1940 as amended (16 United States Code (U.S.C). §§ 668-668d, June 8, 1940, amended 1959, 1962, 1972, and 1978) (UPPCO, 1994). UPPCO was also required to develop a Bald Eagle Protection Plan as a condition of the final FERC EA Report and license for the Dead River Hydroelectric Project (which includes the McClure Powerhouse and Penstock) (FERC, 2002).

Peregrine Falcon

Peregrine falcons nest almost exclusively on cliffs. They feed on a wide variety of small- to medium-sized birds. No suitable nesting habitat is present in the Dead River Hydroelectric Project area (UPPCO, 1994).

Kirtland's Warbler

Although nearly extinct 20 years ago, the Michigan DNR annual survey information for 2008 indicating the state's population of the endangered Kirtland's warbler is the highest number of birds recorded since monitoring began in 1951, with 1,791 singing males observed during this year's census. This year, singing males (numbers in parentheses) were found in 12 northern Lower Peninsula counties: Alcona (207), Clare (141), Crawford (288), Grand Traverse (2), Iosco (192), Kalkaska (10), Montmorency (11), Ogemaw (627), Oscoda (209), Otsego (40), Presque Isle (5), and Roscommon (25). Surveyors identified 34 singing males in five Upper Peninsula counties: Chippewa (12), Delta (10), Luce (1), Marquette (6), and Schoolcraft (5).

In the Upper Peninsula, additional effort is made to locate females and several were observed with the males, indicating nesting activity. Although Kirtland's warblers have begun to expand into new areas, the core of the population remains dependent on northern Michigan's jack pine barrens ecosystem for nesting habitat. The warblers nest on the ground and typically select nesting sites in stands of jack pine between 4 and 20 years old. Historically, these stands of young jack pine were created by natural wildfires that frequently swept through northern Michigan. Modern fire suppression programs altered this natural process, reducing Kirtland's warbler habitat. The result was that the population of Kirtland's warblers declined to the point that they were listed as endangered. To mimic the effects of wildfire and ensure the future of this species, the Michigan DNR and its partners at the state and federal level manage the forests through a combination of clear cutting, burning, seeding, and replanting to promote warbler habitat. Approximately 3,000 acres of jack pine trees are planted or seeded annually on state and federal lands, primarily for the purpose of providing habitat for Kirtland's warblers (DNR, 2008).

Although there were none sighted within the Project boundary during KME's ecological survey, suitable habitat is present within one mile of the Hoist Storage Basin (UPPCO, 1994), which is more than 2 miles from McClure Dam.

Gray Wolf

The gray wolf is present at very low population densities in the Upper Peninsula and is a State threatened and federally listed endangered species. Gray wolves use all forest habitat types and prefer areas with minimum human intrusion. They feed on a variety of prey species but prefer large ungulates, particularly deer (Baker, 1983). Gray wolf tracks and scat have been observed in the greater Dead River area during 2006 and 2007. However, no gray wolf dens were confirmed or are known to exist within close proximity to the Project area (UPPCO, 1994; KME, 2007; KME, 2008).

Bald Eagle

Bald eagles nest in large trees near water (Snow, 1973). In the Upper Peninsula, they prefer large pines or deciduous trees that extend above the canopy of the surrounding forest. Nest trees must have a branch configuration that will support a large nest and allow eagles to enter and exit easily. Bald eagles feed primarily on fish, but they will also take waterfowl, hares, and carrion, particularly during winter (Snow, 1973). An aerial survey of the Dead River Hydroelectric Project in a one mile radius was performed in May 1992. The purpose of the aerial survey was to identify occupied and potential bald eagle nesting habitat. Although some habitat was rated as having medium to high nesting potential, no bald eagle nests were found. Michigan DNR reported in 1991 that bald eagles were last known to actively nest in the area in 1962.

Bald eagles were the only federally listed wildlife species observed in the vicinity of the Dead River Hydroelectric Project during 1991 and 1992 USDOI surveys. During the wildlife survey conducted at the time of the original license application, bald eagles were observed on ten occasions. Five of the observations occurred during the breeding season, and six of the observations were on or near the Silver Lake Basin. More recently, one nest was known to occur in the vicinity of Silver Lake, but it was not actively used during inspections in 2005 or 2006. During a recent field survey by UPPCO's consultant in August and September 2007, a wildlife biologist reported observing a bald eagle flying over the Dead River canyon. However, no concentration of eagles is known to occur within or close to the McClure Penstock Project area and no active nesting sites were observed or known to occur on or near the areas of potential disturbance or within the 400-foot corridor Project limits (UPPCO, 1994; KME, 2007).

Merlins, Osprey, Loons

At the time of the original license application, in addition to the four species listed by the USDOI, the State of Michigan listed two additional species as endangered and eight additional species as threatened. Three of these species, merlins, osprey, and common loons, each listed as

threatened, were observed in the greater Dead River Hydroelectric Project area. No nests of any of these species were found; however, on one occasion, two merlins were observed together (UPPCO, 1994). Loons and ospreys are diving fish eaters. Merlins are raptors that prefer open areas where they can swoop low fly close along the ground and capture prey. None were identified during the recent survey of the McClure Penstock Replacement Project area. If present in the greater Dead River area, they would likely be in the vicinity of the Reservoirs or in the case of merlins, near larger open areas or fields.

Cisco Herring

The Cisco herring is of particular concern since it is considered a State Threatened species and historically was known to inhabit waters of the Dead River Drainage Basin. The fish is a salmon-like species that migrates from deeper fresh waters to spawn. During spawning, it is sometimes observed in shallow waters with rocky bottoms that provide good surface for egg laying. In an area survey completed in 2005, all of the primary species identified in the 1992 survey for the licensing application (UPPCO, 1994) were also identified, except for the Cisco herring. It was concluded by Normandeau and reported to Michigan DNR in the 2005 assessment that because of the similarity in appearance to the Lake Whitefish and the lack of additional sightings of the Cisco herring since 1987, the 1992 assessment finding was most likely a misidentified Lake Whitefish rather than the Cisco Herring (Normandeau, 2006).

The Michigan NFI indicated the last confirmation of the Cisco Smelt (Herring) in Marquette County was in 1988 (State University, 2007). Based on these reports, there appears to be no evidence to indicate the Cisco Herring or any other rare, threatened, and endangered fish species are currently present in the drainage or reaches that would be impacted by the Project.

5.9.2 Environmental Impacts and Recommendations

There is no expectation that the proposed option to replace the McClure Penstock would have any long term effect on upland vegetation along the downstream portions of the Dead River in the vicinity of the Dead River bypass reach. In the immediate Project area and where access roads are constructed, some disturbance will occur. During the implementation of the Project, care will be taken to avoid disturbance or clearing of large trees that could potentially be used for nesting. Wetlands would also be conserved to the extent possible. Other measures, such as sedimentation control, will be implemented to avoid impacts on fishery resources. Any construction noise that may disturb terrestrial wildlife or birds would be limited to the immediate Project area and kept to a minimum. Construction activities are not expected to have an impact

on potential gray wolf habitat. No federal, state, or local listed rare, threatened, or endangered plants, or plant species of concern, or potential habitat or county conservation areas or areas of special significance, were encountered in the immediate vicinity of the McClure Penstock route during the KME survey in July 2008 (KME, 2008). The proposed option will not adversely impact upland vegetation resources long term. Existing forest management and vegetation management practices will remain in effect after the completion of the Project, and the forests immediately surrounding the Project area will continue to be conserved and managed according to UPPCO's forest management plan for the Dead River Hydroelectric Project. It is expected that disturbed areas, other than access roads that UPPCO may desire to leave accessible, would be revegetated as noted in the Project Revegetation Plan provided in ***Appendix B***. Disturbed areas are expected to fully recover within a period of several years.

5.9.3 Effects of No Action Alternative

The most significant impact of the No Action Alternative would be routinely higher flows passing through the Dead River gorge and River by-pass channel. Potentially, this could alter the landscape through the channel.

5.10 CULTURAL AND HISTORIC RESOURCES

This Section identifies cultural and archaeological resources in the Project area and summarizes potential impacts or disturbance that may result from the implementation of the remedy and mitigation or project modifications that may be required to conserve and protect such resources.

5.10.1 Affected Environment

In 1992, a Phase I archaeological survey was conducted in the original Hydroelectric Project study. The extensive historic properties investigation of the Dead River Project conducted by UPPCO as part of the FERC initial licensing process resulted in FERC approval of a Historical Properties Management Plan in March 2004. Some archaeological fieldwork was done at the garden and parking lot area in 2005 (Van Dyke, 2005).

In May 2008, AVD Archeological Services, Inc. was contracted by UPPCO to perform a Phase 1 archaeological survey along the McClure Penstock route in T48, R25W, Section 7 of Marquette Township, and in T48N, R26 W, Sections 12, 13, and 14 of Negaunee Township. No archaeological surveys had been previously conducted in this location (AVD, 2008). AVD's

field investigation consisted of shovel testing at selected locations to look for evidence containing remnants of potential archeological significance. Sections where previous major disturbance had occurred from construction activities were not shovel tested. Steep slope areas were not tested; this included much of Section 7 and all parts of Sections 12 – 14. Any portion of the corridor that was not on a steep slope or in a wet area or obviously disturbed was shovel tested. The exact locations that were evaluated were noted. The completed survey of the area found no archaeological sites were present and thus no further investigation was recommended (ADV, 2008). The results of the investigation along with a map noting the survey locations were provided to the Michigan SHPO by UPPCO.

Artifacts and cultural resource areas have been identified in other areas of the Dead River Hydroelectric Project. Thus, the possibility exists that disturbance during construction could uncover previously unknown and undocumented archaeological finds. The Historical Properties Management Plan will be followed should any evidence be uncovered indicating the presence of archaeological resources or artifacts.

Michigan SHPO was contacted by UPPCO as part of the consultation process regarding the use of the parking area near the Powerhouse for staging during construction. Also, UPPCO has been in discussions with Michigan SHPO regarding the historic nature of the Garden Area and other features such as the existing substation near the Powerhouse and the potential for disturbance of these areas during construction. UPPCO will continue to manage these properties in accordance with the Historic Properties Management Plan and will keep Michigan SHPO fully apprised of any potential cultural resource impacts that may result from the Project.

5.10.2 Environmental Impacts and Recommendations

Construction activities could impact presently unknown areas containing cultural or archaeological resources. Procedures to conserve any archaeological evidence or artifacts identified or uncovered during construction will be followed as noted in UPPCO's approved Historical Properties Management Plan. There is a limited potential that excavation activities might unearth artifacts leading to previously unidentified artifact sites. Should that occur, construction at that location would be stopped until a proper evaluation can be conducted, the nature and significance of any artifacts can be confirmed, and Michigan SHPO is informed of the finding.

5.10.3 Effects of No Action Alternative

The No Action Alternative could impact cultural resources in the Dead River Basin. Under the No Action Alternative, without the hydraulic carrying capacity of the Penstock, periods of high or extreme precipitation could produce swift full bank flow or overflow resulting in extensive erosion. This may result in disturbance, exposure, or loss of yet to be identified cultural resources.

5.11 RECREATIONAL RESOURCES

This Section addresses the impacts from the proposed restoration on local recreational resources and recreational opportunity afforded by the area. Reservoirs and land in the Dead River Region have historically been used for boating, fishing, hiking, and winter activity such as snowmobiling. The area remains remote and rural, with a short summer season and colder winters.

5.11.1 Affected Environment

The Dead River Hydroelectric Project is located in the central region of Michigan's Upper Peninsula, where there is an abundance of natural recreation resources including lakes, streams, waterfalls, and forests. Nearly one-quarter of the land in the county is publicly owned (national forests, state forests, state parks, and state boating/fishing sites). Traditional spring, summer, and fall recreation opportunities provided by these resources are fishing, hunting, boating, canoeing, and camping. Snowmobiling, skiing, and ice-fishing are the traditional winter activities.

The major recreation resources at the Dead River Hydroelectric Project are provided by the three Reservoirs (Silver Lake Reservoir, Hoist Reservoir, and McClure Reservoir), the Dead River, and the surrounding lands. The Project's diverse recreation settings range from the natural character of Silver Lake Basin, to the more developed recreation facilities and private cottages on Hoist and McClure Reservoirs. Steep gorges and forests line the banks of the Dead River. The value of the Project's recreation resources is directly related to the variety of recreation opportunities and settings that are provided within close proximity to the largest urban area in the Upper Peninsula of Michigan, the City of Marquette. Public access is provided to the Project for fishing, boating, and other recreational activities. Developed recreation opportunities are provided at the three Reservoirs.

UPPCO owns only a small portion of the land along the McClure Dam and Powerhouse. UPPCO retains easements along the McClure Penstock right-of-way for the purposes of maintaining, operating, repairing, replacement, and security of the Penstock, and associated Project facilities. Recreational use of the area is at the discretion of the land owners, except for the recreational opportunities required to be maintained by UPPCO per the FERC operating license.

At the time of original license application, UPPCO conducted a recreation resources inventory in 1991 and 1992, and obtained information on Project recreation resources and the recreation resources of Marquette County from the local, state, and tourism agencies. The Dead River Hydroelectric Project provides water-based recreation opportunities that center around the Reservoirs. Recreation opportunities are also provided by UPPCO lands. UPPCO provides public access to Silver Lake Basin and the Dead River. UPPCO operates two areas of public access on Dead River Storage Basin and McClure Reservoir. Public access to the Project's recreation resources is provided to support fishing, boating, canoeing, and other traditional recreation activities.

In addition, private timber companies maintain commercial forest reserves that provide opportunities for dispersed recreation within the Project boundary. Commercial forest reserves are tracts of land that are used for growing merchantable timber. These reserves cannot be developed for industrial or recreational uses; however, the public can use them for hunting, fishing, and other dispersed recreational activities, not including camping. Commercial forest reserves are located in a few areas along the shores of the Project Reservoirs and the Dead River.

UPPCO maintains a FERC approved Recreation Plan, which governs public access and recreation opportunity provided for the public and by UPPCO's hydroelectric developments on the Dead River. The lands within the Project boundary comprise 6,300 acres, of which nearly 4,800 are surface water, along with 11.9 miles of free flowing river.

McClure Storage Basin, at the head of the McClure Penstock behind McClure Dam, is the smallest of the three Project Reservoirs. Forest-covered, steeply sloping hills surround the Reservoir. Summer cottages occupy the more level areas along the shoreline. One public recreation facility, developed and managed by UPPCO, serves the 96-acre Reservoir. The area provides a hard surfaced ramp for launching boats from trailers. The parking lot capacity is four cars/trailer units, and a handicapped accessible vault toilet serves the access. No additional improvements are needed or proposed at this Site.

The McClure Powerhouse road is not gated and the parking area at the Powerhouse accommodates ten cars. UPPCO also provides and maintains a vaulted toilet facility. The tailwater below the McClure Powerhouse is accessible on only one side because a residence is located on the other bank. In addition to the anglers who access the Powerhouse tailwater, hikers, and sightseers use the McClure Powerhouse parking area to access a trail that runs along the bypassed reach of the Dead River. The bypassed river channel is a narrow, scenic canyon with bedrock outcrops and small waterfalls.

As a condition of the License, the following environmental and specific provisions were required and have been provided by UPPCO:

- Maintain specified minimum flows and maximum seasonal drawdown limits as specified; and
- Develop a Wildlife Management Plan that includes a provision to install in cooperation with resource agencies a purple martin house, bat house, bluebird box, owl box, and kestrel box with a 3-year assessment of effectiveness.

In addition to other requirements of licensing, UPPCO in support of recreation and local tourism is required and has provided or maintains the following related to the McClure Bypassed Reach Trail:

- Conduct annual cleanups of the existing informal McClure Bypassed Reach Trail above the McClure Powerhouse.
- Install pack-in/pack-out signage.
- Provide a vault toilet facility, or equivalent, at the McClure Powerhouse parking lot to avoid potential sanitation problems along the existing informal McClure Bypassed Reach Trail.
- Provide directional signage at the junction of the access site road with County Road 573.

Along the Penstock route, a number of recreational uses were confirmed during the environmental survey, which include hunting, hiking, bird watching, day camping, picnicking, swimming fishing, sightseeing, bird watching, mountain biking, ATV use, and wildlife observation. Winter recreation opportunity for the area likely includes snowmobiling and snow-shoeing similar to other parts of the Dead River Hydroelectric Project.

5.11.2 Environmental Impacts and Recommendations

Long term, the proposed option will not likely improve nor detract from recreational resources available within the immediate area of the McClure Penstock or region. There will be temporary restrictions during construction that may limit access to some areas immediate to the construction activity, and some delays may occur on access roads into the area due to truck traffic hauling construction materials. Restrictions would be primarily due to public safety concerns and will not prevent residents from access to their facilities.

There will be no significant recreation changes at McClure Reservoir under the proposed option. There are no additional recreational amenities planned for the area.

5.11.3 Effects of No Action Alternative

Under the No Action Alternative or current condition, recreational resources would be impacted. The McClure Powerhouse and Penstock are aesthetic resources that are often the subject of interest by hikers and other visitors. Not restoring the function of the Penstock would eventually result in deterioration of the associated structures. The right-of-way is currently maintained and allows access to inland areas for hiking, hunting, and other "on-foot" recreation. If the Penstock is not replaced, there would be no reason to maintain the right-of-ways, which other than the easement for the 33 KV power line, would soon over grow limiting recreational access. Also, as the easements may be removed from the property pertaining to the Penstock development, the property would become unencumbered private property subject to the owner's development plans.

5.12 AESTHETICS, AIR QUALITY, AND NOISE

This Section evaluates the aesthetic-visual impact of the Project along with air quality impacts and noise. The evaluation considers short term and long term impacts associated with the current condition as well as the period of construction and long term operation after completion of the Project.

5.12.1 Affected Environment

Aesthetic Resources

Aesthetic management is an effort toward greater integrated management of the total forest resource and regional features. It emphasizes management and development toward more visually pleasing landscapes, enhanced visual diversity, landscapes more beneficial and attractive to wildlife, more diverse habitats, and a greater richness of border vegetation. Aesthetic management is used when the timber, vegetative, terrestrial, or land resources begin to degrade in any of the above-mentioned factors. Techniques such as the reduction of slash, visibility, selective timber removal, trail construction, and improving recreational access, may be used to increase the aesthetic value of a forest. Vegetative management may be appropriate in some instances for resource maintenance and also to maintain access right-of-way (UPPCO, 2004). These rights of way often provide easier recreational access to interior features, which would be more difficult to reach otherwise. Areas that utilize aesthetic techniques are areas of high public use adjacent to the Project facilities, reservoirs, rivers, and highways.

The area in the vicinity of the Penstock route is natural and rural and contains a diversity of vegetation although the right-of-way is maintained using various vegetation management practices for the Project facilities and for the 33 kV powerline right-of-way that parallels the Penstock. The area provides opportunity for various aesthetic type recreational activities (e.g., wildlife observation, hiking, bird watching). In addition to the natural diversity and environments along the route, notable natural features associated within the immediate area of McClure Penstock include the Dead River Gorge and Dead River Falls. These are high quality aesthetic resources and local area tourist attractions. Additionally, the manmade structures associated with the McClure Penstock and Powerhouse are interesting historic and aesthetic artifacts of turn of the century construction methods and industry.

Air Quality

Execution of the Project is expected to produce a limited amount of air emissions including dust, and exhaust from the operation of heavy equipment. Increased truck traffic may also have a minor but *de minimis* impact on air quality immediately adjacent to haul roads.

The Site is remote and air emissions will not be observed beyond the immediate areas of construction activity. It is anticipated that natural means (e.g., chipping, brush piling, mulching, etc.) will be used to dispose of cleared and grubbed material to the extent possible. Some burning may be conducted after obtaining appropriate permits. Also, some blasting may be

performed by fully licensed and qualified contractor personnel. A blasting plan will be developed, which will include measures to control dust and contain shot rock. Mainly to avoid noise disturbances, but also to maintain air quality, blasting would be limited to no more than 3 shots per day. There will be a temporary increase in truck traffic along public roads for delivery of raw materials, which may result dust creation. However, if this becomes excessive, dust control measures such as water spraying would be implemented.

After the proposed option is completed, there will be no air quality impacts from normal operation.

Noise

The construction-site is in a remote area. The area is surrounded by state and private land that is densely wooded and used mostly for seasonal recreation and logging in selected areas. There are a handful of primary and secondary (vacation) residences within the vicinity of the Project area. Construction work will likely take place during both daylight and evening/night hours. There is the remote potential for the noise of construction to be heard by the public that may use the surrounding area; however, the surrounding vegetation should serve as an effective noise barrier. Increased truck traffic may have a minor but *de minimis* impact on noise immediately adjacent to haul roads. Some blasting may be performed and would be performed according to a prepared blasting plan. Noise from these operations is expected to be limited primarily to the immediate area of construction. To limit the noise impact from any blasting, blasting operations would be limited to no more than 3 blasts per day. After construction is completed, there will be no noise impacts from normal operations of the Penstock and Dam other than the natural noise from the turbulence of water flowing over the Spillway and tailrace discharge from the Powerhouse.

5.12.2 Environmental Impacts and Recommendations

Restoration of the Penstock will avoid the potential for more significant failures that could result in washouts and related environmental damage. Washouts cause heavy sedimentation, erosion, and scaring, which may take an extended period of time to revegetate and reforest. These impacts on local streams, rivers, and reservoirs harm fish and degrade water quality. Restoration of integrity and reliability to the Penstock is the only way operation of the McClure Powerhouse can continue. The net short-term negative environmental impact on visual aesthetics, noise, and air quality as a result of implementing the proposed option would be negligible. Water sprays would be used to control dust during excavation and hauling in the vicinity of construction and over unimproved area access roads.

5.12.3 Effects of No Action Alternative

The visual aesthetics of the area would eventually be impacted by the effects of No Action. Any continued operation of the Penstock without replacement risks failures that could lead to washout, sedimentation, erosion, and scaring of the land surface and related environmental damage from excess sedimentation and erosion into the Dead River drainage basin. Under No Action, without maintenance, the existing features the Penstock and Powerhouse would deteriorate becoming more unsightly and potentially unsafe. The present condition also may impact flood control resulting in higher flows and more erosion through the steeper part of the Dead River channel.

5.13 SOCIOECONOMICS

5.13.1 Affected Environment

The evaluation of socioeconomics involves determining the effect of the Project on the local economy and economical viability/prosperity of the local population.

Table 5-12 provides a socioeconomic summary from Year 2000 U.S. Census Bureau Data for Marquette County, Michigan. ***Table 5-13*** provides a business economic summary by North American Industrial Classification (NAIC) code based on 2005 U.S. Census Business Data.

The Project would have a net positive socioeconomic impact on the local population. There would be short-term opportunity for local contractors and suppliers to provide construction services and materials to the Project. Restoration of the Penstock would restore power generation capacity and the related revenue generation. This capital is invested by UPPCO back into the region through payroll wages to employees and through the maintenance of recreational facilities associated with the Dead River Hydroelectric Project.

TABLE 5-12
MARQUETTE COUNTY, MICHIGAN, SOCIOECONOMIC AND DEMOGRAPHIC SUMMARY CENSUS YEAR 2000

SOURCE: U.S. CENSUS BUREAU, 2000 CENSUS

Census 2000 Demographic Profile Highlights:

General Characteristics - show more >>	Number	Percent	U.S.
Total population	64,634		
Male	32,457	50.2	49.1%
Female	32,177	49.8	50.9%
Median age (years)	37.5	(X)	35.3
Under 5 years	3,275	5.1	6.8%
18 years and over	50,818	78.6	74.3%
65 years and over	8,739	13.5	12.4%
One race	63,788	98.7	97.6%
White	61,478	95.1	75.1%
Black or African American	853	1.3	12.3%
American Indian and Alaska Native	964	1.5	0.9%
Asian	319	0.5	3.6%
Native Hawaiian and Other Pacific Islander	14	0.0	0.1%
Some other race	160	0.2	5.5%
Two or more races	846	1.3	2.4%
Hispanic or Latino (of any race)	444	0.7	12.5%
Household population	60,598	93.8	97.2%
Group quarters population	4,036	6.2	2.8%
Average household size	2.35	(X)	2.59
Average family size	2.90	(X)	3.14
Total housing units	32,877		
Occupied housing units	25,767	78.4	91.0%
Owner-occupied housing units	17,985	69.8	66.2%
Renter-occupied housing units	7,782	30.2	33.8%
Vacant housing units	7,110	21.6	9.0%

Social Characteristics - show more >>	Number	Percent	U.S.
Population 25 years and over	41,934		
High school graduate or higher	37,101	88.5	80.4%
Bachelor's degree or higher	9,943	23.7	24.4%
Civilian veterans (civilian population 18 years and over)	8,303	16.4	12.7%
Disability status (population 5 years and over)	9,271	15.6	19.3%
Foreign born	937	1.4	11.1%
Male, Now married, except separated (population 15 years and over)	14,210	52.9	56.7%
Female, Now married, except separated (population 15 years and over)	14,064	52.5	52.1%
Speak a language other than English at home (population 5 years and over)	2,723	4.4	17.9%

Economic Characteristics - show more >>	Number	Percent	U.S.
In labor force (population 16 years and over)	32,710	62.1	63.9%
Mean travel time to work in minutes (workers 16 years and over)	17.7	(X)	25.5
Median household income in 1999 (dollars)	35,548	(X)	41,994
Median family income in 1999 (dollars)	46,281	(X)	50,046
Per capita income in 1999 (dollars)	18,070	(X)	21,587
Families below poverty level	996	6.0	9.2%
Individuals below poverty level	6,592	10.9	12.4%

Housing Characteristics - show more >>	Number	Percent	U.S.
Single-family owner-occupied homes	13,988		
Median value (dollars)	77,200	(X)	119,600
Median of selected monthly owner costs	(X)	(X)	
With a mortgage (dollars)	761	(X)	1,088
Not mortgaged (dollars)	258	(X)	295

TABLE 5-13
MARQUETTE COUNTY, MICHIGAN
SELECTED ECONOMIC STATISTICS DATA BY BUSINESS SECTOR
NUMBER OF BUSINESS ESTABLISHMENTS BY NAICS CODE EMPLOYING FIVE OR MORE PERSONS

NOTE. Data based on the U.S. Census Bureau 2005 County Business Patterns.
Excludes most government employees, railroad employees, and self-employed persons.

Reported Total Number of Paid Employees All Businesses

21,731

Annual Payroll All Businesses

$657,681,000

NO. OF ESTABLISHMENTS	NAICS CODE	INDUSTRY DESCRIPTION
61	813110	Religious organizations
49	722110	Full-service restaurants
46	621111	Offices of physicians (except mental health specialists)
46	722211	Limited-service restaurants
44	236115	New single-family general contractors
41	722410	Drinking places (alcoholic beverages)
34	541110	Offices of lawyers
32	621210	Offices of dentists
26	236118	Residential remodelers
26	447110	Gasoline stations with convenience stores
26	522110	Commercial banking
25	524210	Insurance agencies & brokerages
24	721110	Hotels (except casino hotels) & motels
22	813410	Civic & social organizations
20	812112	Beauty salons
19	445110	Supermarkets & other grocery (except convenience) stores
18	238220	Plumbing and HVAC contractors
18	624410	Child day care services
18	811111	General automotive repair
17	113310	Logging
16	238210	Electrical contractors
15	238910	Site preparation contractors
15	451110	Sporting goods stores
15	523120	Securities brokerage
15	621310	Offices of chiropractors
14	441310	Automotive parts & accessories stores
14	541211	Offices of certified public accountants
14	561720	Janitorial services

TABLE 5-13
MARQUETTE COUNTY, MICHIGAN
SELECTED ECONOMIC STATISTICS DATA BY BUSINESS SECTOR
NUMBER OF BUSINESS ESTABLISHMENTS BY NAICS CODE EMPLOYING FIVE OR MORE PERSONS
(CONTINUED)

NO. OF ESTABLISHMENTS	NAICS CODE	INDUSTRY DESCRIPTION
14	624190	Other individual & family services
14	722213	Snack & nonalcoholic beverage bars
13	444190	Other building material dealers
13	453220	Gift, novelty, & souvenir stores
13	531110	Lessors of residential buildings & dwellings
13	531120	Lessors of nonresidential buildings (except mini-warehouses)
13	531210	Offices of real estate agents & brokers
13	621610	Home health care services
13	813930	Labor unions and similar labor organizations
11	561730	Landscaping services
10	238140	Masonry contractors
10	441120	Used car dealers
10	446110	Pharmacies & drug stores
10	447190	Other gasoline stations
10	541611	Admin management & general management consulting services
10	811121	Automotive body, paint, and interior repair & maintenance
9	236220	Commercial building construction
9	238990	All other specialty trade contractors
9	441110	New car dealers
9	445120	Convenience stores
9	451211	Book stores
9	452990	All other general merchandise stores
9	541330	Engineering services
8	442110	Furniture stores
8	443112	Radio, television, & other electronics stores
8	448120	Women's clothing stores
8	484220	Specialized freight (except used goods) trucking, local
8	541219	Other accounting services
8	541921	Photography studios, portrait
8	713940	Fitness & recreational sports centers
7	238320	Painting and wall covering contractors
7	423810	Construction & mining machinery &

TABLE 5-13
MARQUETTE COUNTY, MICHIGAN
SELECTED ECONOMIC STATISTICS DATA BY BUSINESS SECTOR
NUMBER OF BUSINESS ESTABLISHMENTS BY NAICS CODE EMPLOYING FIVE OR MORE PERSONS
(CONTINUED)

NO. OF ESTABLISHMENTS	NAICS CODE	INDUSTRY DESCRIPTION
		equipment merchant wholesalers
7	444130	Hardware stores
7	453110	Florists
7	453310	Used merchandise stores
7	517110	Wired telecommunications carriers
7	532230	Video tape & disc rental
7	551114	Corporate, subsidiary, & regional managing offices
7	621320	Offices of optometrists
7	623312	Homes for the elderly
6	238110	Poured concrete structure contractors
6	441320	Tire dealers
6	442210	Floor covering stores
6	448210	Shoe stores
6	484121	General freight trucking, long-distance, truckload
6	524126	Direct property & casualty insurance carriers
6	541213	Tax preparation services
6	541940	Veterinary services
6	621330	Offices of mental health practitioners (except physicians)
6	621340	Offices of physical, occupational, & speech therapists and audiologists
6	623110	Nursing care facilities
5	238310	Drywall and insulation contractors
5	441221	Motorcycle dealers
5	448310	Jewelry stores
5	522130	Credit unions
5	524291	Claims adjusting
5	624110	Child & youth services
5	712110	Museums
5	811192	Car washes
5	812199	All other personal care services
5	812210	Funeral homes & funeral services

5.13.2 Environmental Impacts and Recommendations

Under the proposed option there would be a short term economic benefit to the region resulting from the construction due to worker expenditures, and procurement of materials and construction services. Under the No Action Alternative, the region is suffering economically from the loss of the revenue gained from power generation at McClure, loss of reserve capacity, and reduced electric reliability while the McClure Powerhouse remains idle. As a regional company, the economic impact of this loss is potentially significant. On an annualized basis between 1983 and 1992, the McClure Powerhouse generated a reported average of 4,845 MWh of electricity. Assuming an average electric rate of $0.10 per KWh, loss of this generating capacity represents an economic loss of nearly a half million dollars annually to UPPCO. When UPPCO generates power through its own facilities, no additional purchase or distribution costs are incurred. If UPPCO cannot generate the necessary reserve capacity internally, then the reserve capacity loss must be made up from other sources, which may include fossil fuel power generation, other hydroelectric plants in or out of the region, or buying electrical power from the national grid. Power purchased externally or outside the region likely would incur an increased distribution cost that is typically passed along to rate payers.

5.13.3 Effects of No Action Alternative

The socioeconomic effect of the current condition (the No Action Alternative) is the continued loss of any economic contribution to the regional economy that might have been derived from electric power generation at McClure and subsequent electric energy sale by UPPCO. No Action requires obtaining reserve capacity from other sources including fossil fuels, the consumption of which would have a greater impact on the environment. Although UPPCO has more than adequate reserve capacity without the contribution of McClure for customers throughout its service area, not having the reserve generating capacity available from the McClure Powerhouse has a negative potential impact on overall electric reliability for the region.

Additionally, having the Penstock available to divert water from the McClure Reservoir helps with flood and bank erosion control through the steeper part of the Dead River, limiting potential flood damage and any associated economic loss.

5.14 REASONABLY FORESEEABLE ACCIDENTS CONSIDERED AND POTENTIAL EFFECTS

The most significant foreseeable negative consequence of this proposed option is the potential for disturbance of some sensitive wetland areas and sedimentation and erosion during placement, construction, grading, excavation, compacting, etc., of materials when building any access roads, working alongside the Penstock, or in the vicinity of stream crossings. There is no reasonable expectation of a construction-induced accidental failure that would result in release of a significant quantity of impounded water or landslide (i.e., as a result of a release from McClure Reservoir or Penstock failure after construction is complete) that would result in catastrophic environmental damage.

To reduce the potential for accidents and limit the potential environmental damage from a leak, flow monitoring instrumentation will be provided in the new penstock system at the upstream and downstream ends of the system to detect differences in flows that would indicate a significant pipe failure. Flow meters will be installed at the upstream end near the intake valve, and the downstream end near the powerhouse. Flow data will be monitored and evaluated, comparing upstream flow measurement to downstream flow measurement. When a significant difference in flow is detected between the two measurements, an alarm will trigger for a response. The response could be an emergency call out for inspection and evaluation of further response actions, or the response could be penstock intake valve closure. The type of flow monitoring equipment to be used will be evaluated during the detailed design phase.

Engineering controls as described in the replacement contractor's construction sedimentation and erosion control plan will be in place to minimize the potential impact of erosion or sedimentation in the immediate area and on the downstream environment. In any conceivable worst case scenario, all impacts would remain within the limits of construction. There are no public roads or other points of public habitation or access of surface water bodies that would be affected by the movement of soil materials during construction or in the event of a hypothetical minor subsidence or slide due to excavation.

As with any heavy construction program, construction type accidents involving personal injury due to the use of heavy equipment, excavation, etc., are possible. UPPCO and its contractors are committed to the best practices for safe work, and the Work Plan will be developed with careful consideration of maintaining a safe work environment at all times.

Under the No Action Alternative, there is potential for higher rates of bank erosion and flood damage through the steeper section of the Dead River between the McClure and Forestville Reservoirs.

5.15 TERRORISM AND SECURITY

The Penstock is designed to withstand seismic events as well as the constant water pressure experienced by normal operations. The goal of a terrorist act is to create fear through random unpredictable acts that inflict mortal injury, destruction, confusion, and disruption affecting substantial numbers of individuals or inflicting significant financial loss resulting in economic instability, panic, and disruption. A terrorist act against this structure involving explosives or other means is an unlikely reasonably foreseeable event. Although there is an access road into the area, accessibility is limited and the area is rural. If the Penstock were the object of such an attack, the flow through the line could easily be controlled before catastrophic downstream damage resulted in loss of life or property. Thus, it is unlikely that this structure would be a terrorist target.

5.16 SUMMARY OF IMPACTS FROM THE NO ACTION ALTERNATIVE

The No Action Alternative is the current situation. The capacity of the Penstock is no longer available for power generation or to aid in flood control and water management. The loss of power generation capacity results in a regional lost economic opportunity. Regional air quality could be impacted if the lost electrical power capacity is generated by burning of fossil fuels. The permanent loss of the hydraulic capacity of the Penstock could lead to a higher degree of bank erosion and heavier flooding along the steeper part of the Dead River channel.

REFERENCES

REFERENCES
AND SOURCES OF INFORMATION

AVD Archaeological Services, Inc., 2008, "Phase I Archaeological Survey for McClure Hydroelectric Project Penstock (FERC Project Number 10857)," July 25, 2008, Letter Report to Mr. Shawn C. Puzen, Wisconsin Public Service Corporation from Allen P. Vandyke, R.P.A., AVD Archaeological Services.

Baker, R.H., 1983, "Mammals in Michigan," Michigan State University Press.

Barr Engineering Company, 2008, "McClure Hydroelectric Project, FERC Project No. 10855-03, Penstock Replacement Project Preliminary Concept Design Report," August 2008.

Diem, Christopher, December 2007, "Park dam a done deal", Mining Journal, (http://www.miningjournal.net/page/content.detail/id/503196.html?nav=5006), site visited August 25, 2008.

E/PRO Engineering and Environmental Consulting, LLC, 2007, "Dead River Hydroelectric Project (FERC No. 10855), Silver Lake Dam Rebuild Consultation Document," Document # GB-1378, January 2007.

Ehrlich, P.R., D.S. Dobkin, and D. Wheye, 1988, "The Birder's Handbook, A Field Guide to the Natural History of North American Birds," Simon & Schuster Inc., New York.

Federal Energy Regulatory Commission (FERC), 2002, "Final Environmental Assessment for Hydropower License, Dead River Hydroelectric Project, FERC Project No. 10855-002, Marquette Hydroelectric Project FERC Project No. 2589-024, Michigan," Federal Energy Regulatory Commission, Office of Energy Projects, Division of Environmental and Engineering Review, July 2002.

Herman, K., L. Masters, M. Penskar, A. Reznicek, G. Wilhelm, W. Brodovich, K. Gardiner, 2001, "Floristic Quality Assessment with Wetland Categories and Examples of Computer Applications for the State of Michigan," Revised, 2nd Edition, Michigan Department of Natural Resources.

Hubbs, C., and K. Lagler, 1964, Fishes of the Great Lakes Region, Second Edition, The University of Michigan Press, Ann Arbor, MI, 213 pp.

Jackson, H., 1961, "Mammals of Wisconsin," University of Wisconsin Press, Madison, Wisconsin.

King and MacGregor Environmental, Inc. (KME), 2004, "Macro Invertebrate Survey Report of the Dead River," December 2004.

Karson, R. 1997. "Warren H. Manning: Pragmatist in the Wild Garden," Nature and Ideology: Natural Garden Design in the Twentieth Century, ed. Joachim Wolschke-Bulmahn, Volume 18 of Dumbarton Oaks Colloquium on the History of Landscape Architecture. Washington, D.C.: Dumbarton Oaks Research Library and Collection.

King & MacGregor Environmental, Inc. (KME), 2007, "Wetlands Investigation and Evaluation of Potential Threatened and Endangered Species within the Silver Lake Reservoir Reconstruction Project Area, Located in Sections 7, 8, 9, 17, and 18, Champion Township (T49N R28W), Marquette County, Michigan," October 2007.

King & MacGregor Environmental, Inc. (KME, 2008), "McClure Penstock Biological and Habitat Assessment: Characterization of Vegetation Communities, Land-use, and Streams," November 20, 2008.

Merritt, R., and K. Cummins. 1996, Aquatic Insects of North America, Kendall/Hunt Publishing Co., Dubuque, Iowa.

Marquette County, 2008, E-mail correspondence from Bill Rowe, GIS Coordinator/Systems Analyst, Marquette County Information Systems Department, to Jim Sloss, P.E., Paul C. Rizzo Associates, Inc., (RIZZO) regarding legend for Marquette County Information flood map at http://www.co.marquette.mi.us/information/Dead%20River%20Flood%20Plains.pdf, August 2008.

Merritt, R., and K. Cummins, 1996, Aquatic Insects of North America. Kendall/Hunt Publishing Co., Dubuque, Iowa.

Michigan Department of Environmental Health, (MDEH), 2007, "2007 Family Fish Consumption Guide, Important Facts to Know if You Eat Michigan Fish," http://www.michigan.gov/documents/FishAdvisory03_67354_7.pdf.

Michigan Department of Environmental Quality (DEQ), "Water Quality and Pollution Control in Michigan, Sections 303(d), 305(b), and 314 Integrated Report," State Publication No. MI/DEQ/WB-06/019, July 2006, http://www.michigan.gov/deq/1,1607,7-135-3313_3686_3728-12711--,00.html.

Michigan Department of Environmental Quality (DEQ), 1998, Surface Water Quality Division, Guidebook of Best Management Practices for Michigan Watersheds.

Michigan Department of Environmental Quality (DEQ), 2000, Surface Water Quality Division, Stream Crossing Watershed Survey Procedure.

Michigan Department of Natural Resources (DNR), 2001, Guidelines for Conducting Endangered and Threatened Species Surveys, www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/TE_surveyguide.pdf

Michigan Department of Environmental Quality (DEQ), 2006, "Michigan Contaminant Monitoring Program 2006 Annual Report."

Michigan Department of Environmental Quality (DEQ), 2006,"Water Quality and Pollution Control in Michigan 2006 Sections 303(d), 305(b) and 314 Integrated Report," Michigan Department of Environmental Quality Water Bureau, July 2006.

Michigan Department of Environmental Quality (DEQ), 2007a, "Michigan Contaminant Monitoring Program 2007 Annual Report."

Michigan Department of Natural Resources, 2007b, Sustainable Soil and Water Quality Practices on Forest Land, IC 4011.

Michigan Department of Environmental Quality (DEQ), 2008, "Water Quality and Pollution Control in Michigan 2008 Sections 303(d), 305(b) and 314 Integrated Report," Michigan Department of Environmental Quality Water Bureau, April 2008.

Michigan Department of Environmental Quality (DEQ), "Fish Contaminant Monitoring Program Online Database, Report for Edible Fish Portion, Station ID No. 93, Dead River, Forestville Basin, Location: 46.57366ºN x 87.45624ºW, United States Geological Survey Hydrologic Code # 04020105," August 2008, http://www.deq.state.mi.us/fcmp/.

Michigan Department of Information Technology (MDIT), 2008, Michigan Geographic Data Library (MGDL), www.mcgi.state.mi.us/mgdl/.

Michigan Department of Natural Resources (DNR), 2001, Guidelines for Conducting Endangered and Threatened Species Surveys, www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/ TE_surveyguide.pdf.

Michigan Department of Natural Resources (DNR), 2007, Sustainable Soil and Water Quality Practices on Forest Land, IC 4011.

Michigan Department of Natural Resources (DNR), "Michigan's 2008 Kirtland's Warbler Population Reaches Another Record High," Michigan DNR contact Sherry MacKinnon, http://www.michigan.gov/dnr/0,1607,7-153-10371_10402-200899--,00.html.

Michigan Department of Information Technology (MDIT), 2008, Michigan Geographic Data Library (MGDL), www.mcgi.state.mi.us/mgdl/.

Michigan State University Extension (MSUE), "Michigan Natural Features Inventory (NFI)," a conservation service of the Michigan State University Extension (http://web4.msue.msu.edu/mnfi/), August 2008.

Normandeau Associates, Inc., 2005, "Survey of the Freshwater Mussels (Unionidae) within the Dead River Recovery Area, Michigan, Document # GB-1079," March 2005.

Normandeau Associates, Inc., 2006, "Evaluation of Fisheries Resources in the Dead River Recovery Area, Dead River Michigan," Dead River Project Document # GB-1063b, October 2006.

Snow, C., 1973, Habitat Management Series for Endangered Species Report No. 5, Southern Bald Eagle (Haliaeetus leucocephalus leucocephalus) and Northern Bald Eagle (Haliaeetus leucocephalus a/ascanus), Technical Note T-N-171, U.S. Bureau of Land Management, Denver, Colorado.

STS/AECOM, 2008, "Structural Inspection of Penstock System McClure Hydroelectric Power Project, FERC Project No. P-180855, Upper Peninsula Power Company, Marquette County, Michigan," March 27, 2008.

State Historic Preservation Office, 2003, "Letter to UPPCO's Shawn C. Puzen from Brian D. Conway, State Historic Preservation Officer," regarding submittal of NPS Form 10-900 for listing of certain McClure Hydroelectric Development Features on the National Register of Historic Places, August 29, 2003.

United States Army Corps of Engineers (USACE), "Regulatory Guidance Letter No. 02-2," December 24, 2002.

United States Environmental Protection Agency (USEPA), "National Assessment Data Base, Assessment Data for Michigan, Dead-Kelsey Watershed, Year 2002," 2002a, http://iaspub.epa.gov/tmdl/w305b_Report_v2.huc?p_huc=04020105&p_state=MI.

United States Environmental Protection Agency (USEPA), "305(b) Lists/Assessment Unit Information" (for map data), 2002b, http://iaspub.epa.gov/waters/enviro.wcontrol?p_id305b=MI220602H.

United States Environmental Protection Agency (USEPA), "National Assessment Data Base, Assessment Data for Michigan, Dead-Kelsey Watershed, Year 2004," 2004a, http://iaspub.epa.gov/tmdl/w305b_Report_v4.huc?p_huc=04020105&p_state=MI&p_cycle=2004.

United States Environmental Protection Agency (USEPA), "305(b) Lists/Assessment Unit Information" (for map data), 2004b, http://iaspub.epa.gov/tmdl/enviro_v2.wcontrol?p_id305b=MI220602K.

United States Geological Survey (USGS), 2008, "United States Geological Survey USGS Surface-Water Daily Statistics for Michigan, USGS Gauge 04043800, McCLURE STORAGE BASIN RELEASE NEAR MARQUETTE," site visited August 26, 2008, MIhttp://waterdata.usgs.gov/mi/nwis/dvstat/?referred_module=sw&site_no=04043800&por_04043800_2=891094,00060,2,1990-03-28,2007-09-30&format=html_table&stat_cds=mean_va&date_format=YYYY-MM-DD&rdb_compression=file&submitted_form=parameter_selection_list.

Upper Peninsula Power Company (UPPCO), 1994, "Before the Federal Energy Regulatory Commission, Application for Initial License, Major Project – Existing Dam, Dead River Hydroelectric Project, (FERC Preliminary Permit Nos. 10855 and 10857), Dead River, Michigan," Stone & Webster Michigan, Inc., Denver, Colorado, April 1994.

Upper Peninsula Power Company (UPPCO), 2004, "Upper Peninsula Power Company, Dead River Hydroelectric Project (FERC Project No. 10855), Land Use Plan, Article 415 of October 3, 2002 Order Issuing License," March 2004.

Upper Peninsula Power Company (UPPCO), 2008a, "Letter of Correspondence from UPPCO's Terry P. Jensky, Vice President - Energy Supply Operations to Ms. Kimberly D. Bose, Secretary Federal Energy Regulatory Commission dated January 3, 2008 regarding Dead River Hydroelectric Project - 2007 Water Quality Monitoring Data."

Upper Peninsula Power Company (UPPCO), 2008b, "Statement of Generation Adequacy, before the State of Michigan Public Service Commission (MPSC), In the Matter of the Investigation on the Commission's Own Motion, into the Electric Case No. U-15481 Reliability Plan of Upper Peninsula Power Company for 2008," in response to MPSC order of January 29, 2008, by March 31, 2008.

U.S. Census Bureau, "Marquette County, Michigan, Socioeconomic and Demographic Summary," Census Year 2000, http://www.census.gov.

U.S. Census Bureau, "Socioeconomic and Business Data for Marquette County, Michigan," 2005, http://www.census.gov.

Van Dyke, A. P., 2005, "Report of Phase I Archeological Survey for Parking Lot at McClure Hydroelectric Project," June 2005, FERC #10857, AVD Archeological Services, Inc. Report of Investigations No. 105328.