

NORTHERN ILLINOIS HYDROPOWER, LLC. DRESDEN ISLAND HYDROELECTRIC PROJECT (FERC No. 12626)

EXHIBIT E

ENVIRONMENTAL REPORT

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NORTHERN ILLINOIS HYDROPOWER, LLC. DRESDEN ISLAND HYDROELECTRIC PROJECT (FERC No. 12626)

EXHIBIT E

ENVIRONMENTAL REPORT

1.0 GENERAL DESCRIPTION OF LOCALE

The Dresden Island Hydroelectric Project (FERC No. 12626) (Project) is a proposed hydropower project, to be owned and operated by Northern Illinois Hydropower, LLC ("NIH" or "Applicant") located at the existing U.S. Army Corps of Engineers (ACOE) Dresden Island Lock and Dam. The Project is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River. The Project is located 271.5 miles above its confluence with the Mississippi River, and approximately 15 miles southwest of Joliet, Illinois. Figure 1-1 provides a map of the Project location.

1.1 Project Location and Regional Setting

The Illinois River Basin has a drainage area of 28,906 square miles and contains the following major subbasins: Kankakee, Iroquois, Fox, Des Plaines, Chicago, Vermilion, Mackinaw, Spoon, Sangamon and La Moine rivers. The Kankakee and Des Plaines together form the Illinois River. The Dresden Island Project is located 1.5 miles below the confluence of the Des Plaines and the Kankakee Rivers (Village of Channahon, 1983). The watershed drains portions of Illinois (24,778 sq. miles), Indiana (3,058 sq. miles), and Wisconsin (1,070 sq. miles) (Illinois State Water Survey, 2003). From the headwaters to the confluence with the Mississippi River in Grafton, Illinois, the Illinois River drains 43 percent of the state of Illinois. Flows in the Des Plaines River are derived principally from three sources: discharge from Chicago area storm drains and sewage treatment plants, flow diversion from Lake Michigan, and runoff from its 1,500 square-mile drainage area. The Des Plaines and the Kankakee rivers drain 2,111 and 5,165 square miles, respectively (Illinois State Water Survey, 2003). The navigational river system from Chicago to the Mississippi River is collectively known as the Illinois Waterway.

The Illinois Waterway provides transportation for barge traffic from Lake Michigan in Chicago, Illinois to the Mississippi River at Grafton, Illinois. The Illinois Waterway flows 327 miles through eight navigational pools from Lake Michigan to the Mississippi River. Locks and dams are located at Lockport (mile 291.1), Brandon Road (mile 286.0), Dresden Island (mile 271.5), Marseilles (247.0), Starved Rock (mile 231.0), Peoria (mile 157.7), and LaGrange (mile 80.2) (Village of Rockdale 1990). The locks and dams, including the Dresden Island Lock and Dam, are operated by the U.S. Army Corps of Engineers (ACOE).

The primary role of the dam and reservoir is to maintain water at an elevation acceptable for commercial navigation. At the time of construction (in the early 1930s), the ACOE considered but did not install hydropower; however, the dam and spillway structure design includes a headgate section to allow for future power plant construction at the dam. As described in Exhibit A, the dam consists of a headgate section, an ice chute, a tainter gate section, a fixed dam overflow section, and an arch dam. The arch is constructed over what was to be the sill of a smaller navigation lock that was never built. The total length of the lock and dam from abutment to abutment is approximately 1,320 ft. Exhibit A also provides a description of the proposed new Project facilities in relation to the existing Dresden Island Lock and Dam facilities.

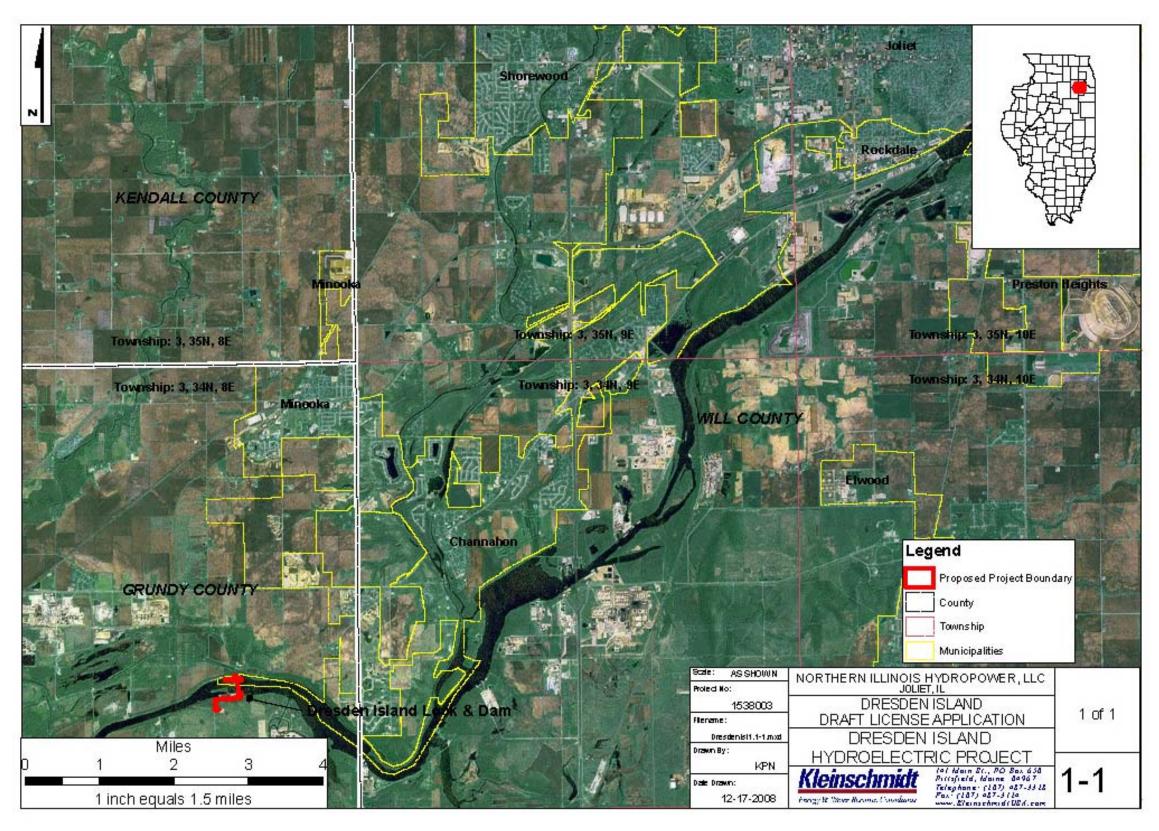


Figure 1-1: Dresden Island Hydroelectric Project

1.2 Climate

The frequency and duration of air originating over Canada and the Arctic, the Pacific Ocean, and the Gulf of Mexico generally influence the regional climate. Lake Michigan also affects the climate of northeastern Illinois, producing cooler summers and warmer winters. Temperatures in the region range from 39.2°F for the average daily minimum temperature, to 59.6°F for the average daily maximum temperature (Illinois State Water Survey, 2003). During the summer the large thermal mass of Lake Michigan tends to create cloudiness and precipitation (Illinois State Water Survey, 2003). Winter precipitation is enhanced by lake-effect snow. The region receives an average of 36.69 inches total precipitation annually, including about 30 inches of annual snowfall. (USDA, 1998).

1.3 Terrestrial and Wetland Resources

The slightly rolling topography in the Des Plaines river valley is the result of advance and retreat of the Wisconsin Glacier, some 10,000 to 14,000 years ago. The Des Plaines River bluffs typically rise 30-40 ft above the valley floor and consist of gravelly till deposited by glacial moraines (MWRD, 1999). The original vegetation along the river was a mosaic of upland forests, dolomite prairies, and wetlands. Much of this natural diversity was lost with industrial development of the area. Three dominant vegetation types – dry prairie/old field/shrub, forest, and wetland - occur near the Project area, as described in Section 3.5. These vegetative types are a result of past disturbance, but are now in a stable, somewhat natural state (MWRD, 1999). Bottomland forests border the Upper Illinois Waterway in many areas. These forests contain deciduous species typical of this forest type, and various undergrowth as described in Section 3.5. The wetland systems of the area are primarily associated with river hydrology (forested floodplains) or isolated depressions. Disturbance activities such as industrial or commercial excavation, dikes, and impoundments created many of the isolated wetlands (MWRD, 1999). The wetlands adjacent to the Project are described in more detail in Section 3.7.

1.4 <u>Development and Demographics</u>

As noted in Section <u>8.0</u>, land use in the immediate area around the Dresden Island project is largely agricultural; however, as a "collar" community of the Greater Chicago Metropolitan Area, the population has been dramatically increasing over the past decade, leading to an increased number of housing units and increased urban sprawl. Expansive multi-home developments, associated new support services, and commercial enterprises are replacing previously agricultural lands and open space at a rapid rate. Land use and demographics are discussed in more detail in Section <u>8.1</u>.

1.5 Flood Events and Regional Water Quality

Spring rains, snowmelt, wastewater treatment plan outflow, stormwater runoff in the Chicago area, and diversions from Lake Michigan for sanitary and navigational purposes are the principal flow sources to the Illinois Waterway. The average daily flow at the Dresden Island site is approximately 8,986 cfs with peak flows occurring in spring and minimum flows in late summer and fall. As recorded by the ACOE gaging data (period of record 1987-2008), high flows may occur at any point in the year. Midsummer to early fall high flows are generally associated with significant storm events; high flow events in the spring are related to runoff. Analysis of the ACOE gaging data showed that the maximum daily flow from 1987 to 2008 was 61,222 cfs.

Prior to the Clean Water Act, discharges from the Chicago area wastewater treatment facilities and chemical contamination from industrial waste polluted the river system heavily. In the early 20th century, aquatic organisms such as fish and mussels were virtually eliminated from the upper Illinois River (Starrett, 1971; Marseilles Hydro Power, 2001). Since the Clean Water Act, the water quality has significantly improved and aquatic life is beginning to recolonize the river system (Sietman *et al.*, 2001).

2.0 WATER USE AND QUALITY

The ACOE maintains the Dresden Island pool at 504.5 ft NGVD. The ACOE does not have data for the gross storage of the impoundment. Discharges from the Dresden Island Lock and Dam enter the reach of the Illinois River that includes the Marseilles Lock and Dam pool. Proposed power generation would take a secondary role to navigation and would not result in any changes to operations of the lock and dam system. The following sections discuss water resources relative to the Dresden Island Hydropower Project including water use and quality and the physical characteristics of water bodies associated with the Project.

2.1 <u>Affected Environment</u>

2.1.1 Water Use

The Illinois Department of Natural Resources (IDNR) notes that the State of Illinois owns the land and water rights at the Dresden Island Lock and Dam, that the IDNR administers the use of those lands and waters, and that it requires leases for occupancy of the land and use of the water for generation. Agreements between the State of Illinois and the United States recognize the ACOE as having sole jurisdiction and control of the waterway, structures and waterpower rights (Chief of Engineers, United States Army, 1930).

The primary roles of the dam and lock system and the reservoir are to maintain water at an elevation acceptable for commercial navigation. The ACOE operates the lock and dam system in a run-of-river mode and the navigational pool provides no storage. The Applicant proposes to operate the Project in a run-of-river mode as well. Accordingly inflow will equal outflow when the Project is operating. During extreme water conditions (*e.g.* flood events), the Applicant will cease operations and cede control of the Project to the ACOE. Exhibit B provides a more detailed description of proposed Project operations related to water use as well as additional flow data.

The Project boundary includes only a very distinct, limited area of the existing reservoir, directly adjacent to the powerhouse. Any existing water uses other than those described above are outside the Project boundary and unrelated to its operation. There are no opportunities for additional water uses or withdrawals within the Project boundary.

The average daily flow at the Dresden Island site is approximately 8,986 cfs; peak flows occur in spring and minimum flows in late summer and fall.

Table 2-1 provides the mean, minimum, and maximum recorded flow at the ACOE Dresden Island Lock and Dam gage. Analysis of the ACOE flow data showed that the maximum daily flow from 1987 to 2008 was 61,222 cfs. The minimum daily flow during this period was 631 cfs. (Kleinschmidt, unpublished data, 2008).

Table 2-1: Mean, Minimum, and Maximum Recorded Flow at Illinois River at Dresden Island Lock and Dam (Period of record: 1987 – 2008)

MONTH	MEAN (cfs)	MINIMUM (cfs)	MAXIMUM (cfs)
January	10,221	1,246	55,334
February	10,256	1,890	56,345
March	12,089	1,867	46,028
April	11,693	1,265	38,036
May	10,547	2,507	57,436
June	10,419	1,875	57,119
July	7,990	1,266	52,935
August	7,092	636	50,711
September	6,294	642	26,084
October	5,787	631	36,902
November	7,023	1,253	61,222
December	8,269	1,264	40,175

The ACOE Rock Island District (District) maintains the navigation channels on the Illinois Waterway by periodically dredging the deposited sediment. The Rivers and Harbors Acts of 1927, 1932, and 1935 stipulate that the District is to maintain a navigation channel not less than 9 feet deep and 300 feet wide, where feasible. A channel approximately 20 ft deep runs down the center

of the waterway, but angles towards the lock as it approaches the dam; the maximum depth of the reservoir is less than 30 ft. From the edges of the navigation channel, the streambed generally slopes upward to the shore. The Illinois Waterway from the Brandon Road Lock and Dam Project (approximately 14.5 mi upstream of the Dresden Island Lock and Dam) to the Starved Rock Dam (approximately 40 miles downstream of Dresden Island Lock and Dam) is a low-gradient system ranging from an upstream gradient of 1.1 ft/mi to a gradient of 0.2 ft/mi below Starved Rock.

2.1.2 Water Quality

Water quality standards provided herein are classified as General Use Water Quality Standards of the Illinois Administrative Code Title 35, Subtitle C, Chapter 1, Part 302, Subparts A through F, and apply to the proposed Project waters. The general use standards protect the state of Illinois' water for aquatic life, wildlife, agricultural use, secondary contact use, and most industrial uses. The standards also attempt to ensure the aesthetic quality of the state's aquatic environment.

2.1.2.1 Historic and Existing Water Quality

Historically, industrial, navigational and urban wastewater discharges in the 19th and 20th centuries resulted in highly contaminated reservoir water and sediments. Aquatic organisms such as fish and mussels were virtually eliminated from the upper Illinois River (Starrett, 1971; Marseilles Hydro Power, 2001).

Currently, the Illinois River at Dresden Island is managed for Secondary Contact and Indigenous Aquatic Life Standards. Dissolved oxygen (DO), according to the existing water quality standards in Title 35 of the Illinois Administrative Code, Section 302.206, shall not be less than 5.0 mg/L at any time from March through July and not be less than 6.25 mg/L as a daily mean averaged over 7 days; from August through

February DO shall not be less than 4.0 mg/L at any time, not be less than 4.5 mg/L as a daily minimum averaged over 7 days, and not less than 6.0 mg/L as a daily mean averaged over 30 days. The temperature shall not exceed 34°C (93°F) more than 5% of the time or 37.8°C (100°F) at any time. The water quality standard for Total Dissolved Solids is 1,500 mg/L.

DO levels in the Illinois River can be low, particularly in the summer months, because the assimilation of waste by the river consumes DO from the water. The natural replenishment of DO from air is a slow process. In a slow-moving, pooled river such as the Illinois, it may require many days before DO levels are replenished. In this navigational system, aeration at locks and dams provides increases in DO. In May, August, and October of 2006, the MWRD measured DO concentrations along the Illinois Waterway. The average DO concentration in upper Dresden Island reservoir (mile 285) was 8.4 mg/L; DO fell slightly to 7.9 mg/L at mile 272.4 above Dresden Island Dam. Below the Dam, at mile 270.0, the average DO concentration was 9.0 mg/L (Metropolitan Water Reclamation District of Greater Chicago, 2007).

2.1.2.2 Sediment Quality

As the existing sediment data was not specific to the proposed Project forebay, the Applicant conducted an additional sediment analysis in four locations within the Dresden Island impoundment and in two locations downstream of the Dresden Island dam. The Applicant developed its sampling and testing protocol in coordination with the Illinois Environmental Protection Agency (IEPA) and the Illinois Department of Natural Resources (IDNR). Contractors collected two samples from outside the existing skimmer wall and four samples from within the confines of the skimmer wall, dam and guide wall in August 2008. They subsequently analyzed the samples for chemicals and

pollutants.

The survey detected several metals in concentrations exceeding the IEPA's Tiered Approach to Corrective Action Objectives (TACO) Tier 1 Soil Remediation Objectives standards in the impoundment during the 2008 survey. Sediment analysis detected Arsenic at 26.2 mg/kg, chromium at 478 mg/kg, lead at 482 mg/kg, and mercury at 0.83 mg/kg. Downstream of the dam, mercury was detected at 0.15 mg/kg. No PCBs or pesticides were detected either upstream or downstream of the dam (Patrick Engineering, 2008). Appendix A provides the complete survey report containing detailed information regarding the analytes considered and detected in the 2008 sediment survey along with the TACO Tier 1 standards.

2.2 <u>Potential Effects of Proposed Project on Water Resources</u>

2.2.1 Water Use

Proposed power generation would take a secondary role to navigation and would not result in any changes to operation of the lock and dam system. As the Applicant proposes to operate the Project as a run-of-river facility, the proposed action would not affect water quantity in terms of river flows below the dam. The Project would not increase water levels or affect the volume of impounded water at any time. Accordingly, the Project would have no effect on the occurrence or extent of flooding in the vicinity of the project.

The ACOE requested hydrologic/hydraulic modeling to assess if the Project may affect flow patterns that could subsequently affect navigation; IDNR and the USFWS requested modeling to assess the potential effects of sediment transport on aquatic resources. Both of these requests for modeling have been discussed with the agencies, the Applicant will provide the requested modeling after the final configuration and specifications of the turbine are available. The ACOE is providing the applicant with the model that will provide the necessary

information. The Applicant anticipates modeling results to be available in the early fall of 2009.

2.2.2 Water Quality

Available data indicate that current water quality standards are met in both the Dresden Island Pool and below the Dresden Island lock and Dam the greater majority of time (Metropolitan Water Reclamation District of Greater Chicago, 2002, 2003, 2004, 2005, and 2006). Because DO rarely falls below water quality standards in the Dresden Island pool, the Applicant expects that the proposed Project will not result in degradation of the states waters.

While operations of the proposed Project are not expected to decrease water quality below the existing standards; spill over the Dresden Island Dam does provide increased DO concentrations by aerating the water. Adding generating capacity to the Dresden Island Dam would reduce the amount of time spill occurs by approximately 53% over the course of an average year; however, river flow would exceed the hydraulic capacity of the proposed powerhouse (7,500 cfs) 47% of the time. The Applicant expects some aeration by Project discharges; however, it is not likely that diverting water through the turbines will provide as much benefit to the DO as spill. Table 2-2 shows the average reduction in spill for each month based on a period of record from January 1987 to June 2008.

Table 2-2: Expected Percentage of Time Water Would Spill Over the Dam Based on the Proposed Hydraulic Capacity of the Powerhouse

MONTH	PERCENTAGE OF TIME IN RIVER FLOWS WOULD EXCEED PROPOSED HYDRAULIC CAPACITY
January	50%
February	58%
March	73%
April	71%

MONTH	PERCENTAGE OF TIME IN RIVER FLOWS WOULD EXCEED PROPOSED HYDRAULIC CAPACITY
May	61%
June	57%
July	37%
August	30%
September	26%
October	19%
November	36%
December	44%

In January 2006 USFWS commented on the Preliminary Permit Application for the Dresden Island Project. In a subsequent letter dated January 2009, USFWS reiterated concerns for potential cumulative effects on water quality resulting from cooling water discharges at the upstream nuclear plant, combined with altered flow patterns in the discharge mixing zone resulting from proposed hydropower operations. Consultation with IDNR and IEPA also indicated concerns with the Project's effect on water quality. October 2008, in response to IDNR, IEPA, and USFWS requests (see Appendix B, Consultation Record), the Applicant began monitoring DO and temperature upstream and downstream of the Dresden Island dam. Downstream of the dam, the minimum DO recorded in October was 9.1 mg/L and the average DO was 10.3 mg/L. The average temperature in October was 60.7°F downstream of the dam. During the same time period, the minimum DO upstream of the dam was 8.2 mg/L, the average DO was 9.8 mg/L, and the average temperature was 71.7°F. All measurements exceeded water quality standards; however, the critical time period for dissolved oxygen would normally occur earlier in the year than the 2008 study period. The Applicant proposes to continue monitoring the Project through September 2009 to develop a more complete record of DO and water temperature at the Project. The objective of this monitoring will be to identify trends and/or specific times and river conditions that may present DO values below the existing standards. The Applicant will provide this data to IDNR, IEPA, and USFWS and, if necessary will develop protocols or design enhancements to augment DO at the Project. The Applicant does not have any ability to control DO upstream of the Project.

2.2.3 <u>Sediment Quality</u>

The Applicant anticipates dredging sediment and other materials directly upstream and downstream of the proposed powerhouse as part of the proposed construction activities. Concerns regarding sediment quality were discussed in an August 6, 2008 meeting with INDR, USFWS, SHPO and the ACOE (Appendix B).

There may be temporary sediment redistribution from upstream to downstream associated with construction of the Project. Additionally, construction related dredging activities may temporarily increase turbidity downstream of the project. The channel immediately downstream of the Project is shallow to bedrock with few fines. As such, there is limited potential for long-term sediment disturbance or deposition related to Project outflow in this area. The Applicant will conduct sediment modeling to examine the potential redeposition of materials related to construction and operations. The Applicant anticipates modeling results to be available in the early fall of 2009.

As discussed in Section 2.1.2.2, the river reach is known to have some level of sediment contamination, and the construction of the Project has the potential to disturb and distribute these contaminants. The Applicant, in consultation with the IEPA, conducted a sediment survey to characterize the sediments at the Project. Study results indicate sediments in the Dresden Island forebay contain detectable levels of arsenic, chromium, lead, and mercury.

The Applicant will develop protocols and Best Management Practices (BMPs) related to the removal, use, transport and disposal of all dredged materials to minimize the release of sediments and minimize any temporary increase in turbidity in direct consultation with the ACOE, IEPA and IDNR. The Applicant will address details regarding the volume, composition, location, and BMPs related to the required dredging and spoil disposal in the 404 permit application and the state required construction permits.

2.3 <u>Measures Proposed by Applicant related to Water Resources</u>

2.3.1 Studies

In consultation with the appropriate agencies the Applicant developed a study plan and protocol for collecting dissolved oxygen and temperature data at the Project. Data collection began in the fall of 2008 and is scheduled to begin again in Spring 2009 continuing through September 2009. Data will be provided to all consulting agencies and to FERC and data will be used to provide information requested by the agencies. The Applicant estimates the cost of the dissolved oxygen study at \$25,000.

2.3.2 Modeling

As described in Section 2.2 the agencies have requested modeling related to water quality and sediment. These requests have been discussed with the agencies, the Applicant will provide the requested modeling after the final configuration and specifications of the turbine are available. The ACOE is providing the applicant with the model that will provide the necessary information. The Applicant anticipates modeling results to be available in the early fall of 2009. The Applicant estimates the cost to complete the requested modeling at \$15,000.

2.3.3 Protection, Mitigation and Enhancement Measures

The State of Illinois has indicated that any proposed facility must comply with the state's water quality standards. The applicant is conducting the necessary studies to collect additional data and will conduct modeling appropriate to determine potential effects of operations on water quality. To insure that operations do not impair water quality, the Applicant is designing the turbine/generator units with 'venting' features to permit the introduction of air into the discharge to maintain or increase the DO concentrations.

As part of the operations plan for the proposed development, the licensee is committed to modifying operations to maintain water quality standards.

The Applicant estimates additional engineering costs at \$230,000, increased equipment costs estimated at approximately \$1,000,000 (\$500,000 per unit), and efficiency reductions in operations of approximately 4% of the gross generation.

3.0 FISH, WILDLIFE AND BOTANICAL RESOURCES

3.1 Affected Environment – Aquatic Resources

3.1.1 Overview of Fish Resources

Due to historic high levels of pollution, the Illinois river did not support a significant fishery of any kind by the late 1920s; however, with improvement of water quality since the 1970's, the Illinois River now has an improving fishery. The Illinois Waterway provides a means by which Great Lakes species such as yellow perch and alewife can enter the Illinois River from Lake Michigan – it also provides a means for Mississippi River basin species to enter the Great Lakes. The state of Illinois has developed a fish barrier system at the Lockport Lock and Dam to prevent or retard the spread of species between the two systems.

The Illinois Natural History Survey (INHS) documented the increase of fish species and populations from 1957 to the present (INHS, 2006). The Metropolitan Water Reclamation District of Greater Chicago (MWRD) has also sampled the Upper Illinois Waterway for over 10 years. A study of the Upper Illinois Waterway conducted for Commonwealth Edison (CE) in 1993 and 1994 involved sampling the Dresden Pool, including collection of larval and juvenile fish (CE, 1996a). In addition, Midwest Biodiversity conducted fisheries surveys throughout the Des Plaines River and Illinois River in 2006 (Midwest Biodiversity, unpublished data, 2006). These fishery studies indicate that aquatic resources remain limited by water quality and lack of suitable habitat in the manmade canals that make up the impoundments both upstream and downstream of the Project.

DO improves below the lock and dam due to the turbulence associated with the structures; however, the overall improvement in water quality in the Illinois Waterway is due to increased treatment or elimination of contaminated discharges into the system. These improvements are due in part to implementation of the Clean Water Act and subsequent and related environmental

regulations. Regardless, it is likely the improved water quality has produced an improved fishery.

Currently, approximately 46 species may be found in the Project area; however, only a few species dominate the fish community (Table 3-1). A combination of prolific pelagic species (*e.g.*, gizzard shad and emerald shiner) and highly pollution tolerant species (*e.g.*, bluntnose minnow and common carp) now dominate the fishery. In the INHS study, nine species accounted for 95.5% of the total catch in the upper Illinois River near the project. These species included gizzard shad (*Dorosoma* cepedianum), bluntnose minnow (*Pimephales* notatus), emerald shiner (*Notropis atherinoides*), spotfin shiner (*Cyprinella spiloptera*), blackstripe topminnow (*Fundulus notatus*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), orangespotted sunfish (*Lepomis humilis*), and rock bass (*Ambloplites rupestris*) (INHS, 2006). Bluegill and bluntnose minnow were the two most dominant species totaling 36.4% and 24.3% of the catch, respectively. Bluegill was also dominant downstream of Dresden Island, however; gizzard shad became more dominant than bluntnose minnow (INHS, 2006).

The CE report notes that the fish communities in the upper and lower Dresden Pool and downstream of Dresden Lock and Dam are similar and noticeably more diverse than upstream of Brandon Road Lock and Dam (CE, 1996b). The majority of spawning in Upper Dresden Pool (RM 285.5-284.4) is by rough and forage fish species (CE, 1996b). Together the gizzard shad, common carp, and bluntnose minnow accounted for 49 percent of the larval and juvenile fish in Upper Dresden Pool. Approximately 35 percent of the larval and juvenile fish in the Upper Dresden Pool were from the sunfish family, *Lepomis spp.* (CE, 1996b). The spatial distribution and abundance of larvae/juvenile fishes was expected based on the trends observed in the adult populations (CE, 1996b). The CE study did not sample larvae/juvenile fish near the Dresden Island Lock and Dam.

Several piscivorous fish species occur in the Illinois River. Walleye, sauger (*Stizostedion vitreum*), smallmouth bass (*Micropterus dolomieu*) and white bass (*Morone chrysops*) tend to favor swift moving cooler river channels and eddies behind boulders and rock piles in faster waters. These habitats tend to occur just below lock and dam structures. Largemouth, black crappie (*Pomoxis nigromaculatus*), and sunfish species such as the bluegill prefer shorelines with aquatic plants that provide cover to ambush prey and to hide from predatory mammals and birds. Channel catfish and grass pickerel (*Essox americanus vermiculatus*) occur in all areas of the Illinois River. Fish deformities, eroded fins, lesions and tumors associated with chemical contamination occurred in less than seven percent of the sampled piscivorous species (CE, 1996b).

Other species found in the Illinois River are scavengers and insectivores that feed on detritus, macroinvertebrates, and decaying matter in the benthos of the river. These species include the common carp, redhorse (*Castomid. Spp.*), smallmouth buffalo (*Ictiobus bubalus*), freshwater drum (*Aplodinotus grunniens*), and catfish. Catfish will feed in the benthos, but are also successful predators of living fish (Marseilles Hydro Power, LLC, 2001). These bottom feeding habits have made these species the most susceptible to fish abnormalities associated with polluted sediments (CE, 1996b). Most (65.8 percent) channel catfish were affected as well as 47.4 percent of the silver redhorse (*Moxostoma anisurum*) and 14 to 30 percent of carp, goldfish, their hybrids, black bullhead (*Ameiurus melas*) and freshwater drum. White sucker (*Catostomus comershonii*) and yellow bullhead (*Ameiurus natalis*) were affected less than other bottom feeders.

Smaller non-game fish include the bluntnose minnow, bullhead minnow, emerald shiner, red shiner (*Cyprinella lutrensis*), golden shiner (*Notemigonus crysoleucas*), silverband shiner (*Notropis shumardi*), and gizzard shad that provide the forage base for the predatory fish. Shad also play a role as host for the glochidial stages of mussels and therefore spread and maintain the freshwater mussel populations of the Illinois River (Marseilles Hydro Power, LLC, 2001). Fish abnormalities associated with water pollution were also less than seven percent in this group of species. Section <u>4.1</u> discusses state protected species.

Table 3-1: Fish Species Likely to be Found in the Project Area

SPECIES NAME
Alosa pseudoharengus
Ameiurus melas
Pomoxis nigromaculatus
Fundulus notatus
Lepomis macrochirus
Pimephales notatus
Pimephales vigilax
Cyprinus carpio
Umbra limi
Campostoma anomalum
Ictalurus punctatus
Luxilus cornutus
Notropis atherinoides
Pimephales promelas
Aplodinotus grunniens
Dorosoma cepedianum
Notemigonus crysoleucas
Carassius auratus
Esox americanus vermiculatus
Moxostoma valenciennesi
Lepomis cyanellus
Micropterus salmoides
Gambusia affinis
Esox lucius
Lepomis humilis
Lepomis gibbosus
Cyprinella lutrensis
Carpoides carpio
Moxostoma carinatum
Ambloplites macropterus
Sander Canadensis
Moxostoma macrolepidotum
Moxostoma anisurum
Notropis shumardi
Alosa chrysochloris
Micropterus dolomieu
Ictiobus bubalus
Cyprinella spiloptera
Notropis hudsonius
Noturus gyrinus
Sander vitreus
Morone chrysops
Morone Americana
Catostomus commersonii
Ameiurus natalis
Perca flavescens

3.1.1.1 Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Act strengthened the ability of National Marine Fisheries Service (NMFS) and the Fishery Management Councils to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. This habitat is termed Essential Fish Habitat (EFH) - broadly defined to include waters and substrate necessary for fish spawning, breeding, feeding, or growth to maturity. The river in the vicinity of the proposed Dresden Island Project is not designated an EFH accordingly, the Project would have no effect on EFH.

3.1.1.2 Fish Passage and Collection Facilities

There are currently no fish passage or collection facilities at the Dresden Island Lock and Dam. Operation of the lock system provides some level of upstream and downstream passage for resident species. There are no known anadromous species requiring seasonal passage. Neither IDNR nor USFWS indicate any fisheries management goals that include the need for such facilities.

3.1.2 <u>Amphibians and Aquatic Reptiles</u>

A number of reptile and amphibian species occur in Grundy County. Some of the more common species may also use Project waters and adjacent lands. <u>Table 3-2</u> lists species that may occur within the Project Boundary.

Table 3-2: Reptiles and Amphibian Species of Grundy County (INHS, 2003)

SCIENTIFIC NAME	COMMON NAME
Ambystoma tigrinum	Tiger Salamander
Bufo americanus	American Toad
Bufo fowleri	Fowler's Toad
Acris crepitans	Cricket Frog
Rana blairi	Plains Leopard Frog
Rana clamitans	Green Frog
Rana pipiens	Northern Leopard Frog
Chelydra serpentina	Snapping Turtle
Chrysemys picta	Painted Turtle
Emydoidea blandingii	Blanding's Turtle
Graptemys geographica	Map Turtle
Apalone spinifera	Spiny Shoftshell
Ophisaurus attenuatus	Slender Glass Lizard
Cnemidophorus sexlineatus	Six-Lined Racerunner
Coluber constrictor	Racer
Elaphe vulpine	Fox Snake
Heterodon platirhinos	Eastern Hognose Snake
Nerodia sipedon	Northern Water Snake
Pituophis melanoleucus	Bull Snake
Regina septemvittata	Queen Snake
Thamnophis radix	Plains Garter Snake
Thamnophis sirtalis	Common Garter Snake

3.1.3 Overview of Benthic Macroinvertebrates

Studies conducted by MWRD and CE in 1989, 1991, 1993, and 1994 indicated low quality habitat and a relatively pollution-tolerant invertebrate community in the Upper Illinois Waterway. Habitat condition, sediment and water quality, rather than temperature, appeared to be the primary factors determining benthic invertebrate community composition. Dominant species in the benthic community included sludgeworms (Tubifix), and bloodworms (*Chironomus sp.*), with sludgeworms occurring in massive quantities in the Dresden Island pool (Butts, 1974). These taxa characteristically are capable of

surviving low-DO environments such as the soft, fine sediments of many depositional habitats. The 1999 MWRD study found a greater number of less tolerant taxa such as caddisflies (*Trichoptera spp.*) and mayflies (*Ephemeroptera spp.*) within the water column where dissolved oxygen was more favorable. Below the Dresden Island lock and dam, the river has a rocky bottom which was relatively devoid of benthic organisms (Village of Channahon, 1983).

The INHS conducted a freshwater mussel study from 1993-1995 on the Illinois River (Whitney et al., 1997). The study found a developing mussel bed on the downstream end of Big Dresden Island, downstream of the Dresden Island Lock and Dam. At this location the investigators found mucket (Actinonaias ligamentina), elktoe (Alasmidonta marginata), threeridge (Amblema plicata), white heelsplitter (Lasmigona complanata), flutedshell (Lasmigona costata), fragile papershell (Leptodea fragilis), giant floater (Pyganodon grandis), pimpleback (Quadrula pustulosa), mapleleaf (Quadrula quadrula), and creeper mussels (Strophitus undulates). The most abundant species was fragile papershell.

At the request of IDNR, the Applicant undertook a survey from September 29 to 30, 2008 in the Illinois River from Dresden Island Dam downstream approximately 0.5 miles. The survey found 206 live unionids representing 14 species. No federally or state listed species were observed. Four species (mucket [11.3%], threeridge [50.7%], pimpleback [7.9%], and mapleleaf [14.3%]) comprised over 80% of the individuals collected. Plain pocketbook (*Lampsilis cardium*), white heelsplitter, flutedshell, fragile papershell, washboard (*Megalonaias nervosa*), threehorn wartyback (*Obliquaria reflexa*), pink heelspliter (*Potamilus alatus*), giant floater, lilliput (*Toxolasma parvus*), and deertoe (*Truncilla truncata*) made up less than 5% each of the total live unionids.

Habitat was relatively consistent along the right descending bank and varied along the descending side of Dresden Island. Substrate along the right descending bank consisted of cobble, gravel, and sand with occasional boulder. Depths along the bank consistently increased from the bank (3-6 feet) to 328 ft

riverward (9-10 feet). Depths along right descending side of Dresden Island also increased consistently from the bank (3 - 6 feet) to 164 ft riverward (7-9 feet), however substrate varied. Silt accumulated below the first riffle along the right descending side of Dresden Island. This area appeared to be protected from the higher flows typical within the rest of the survey area. Substrate at the downstream end of Dresden Island was mostly gravel and sand with some cobble toward the tip of the island.

Two areas within the study area appeared to harbor aggregations of unionids in the upstream half of the sample site, while few were found downstream. Aggregations were found in an area along the right descending bank within 0 ft to 164 ft of the bank and an area along the right descending bank of Dresden Island 66 ft to 131 ft from the bank. Both locations were approximately one third of a mile downstream of Dresden Island Dam. Qualitative samples near the island yielded 41 live unionids and 67 live were collected along the right descending bank. A qualitative sample was also conducted at the tip of the island, however unionid habitat was poor (mostly silt) and no live unionids were collected.

3.2 Potential Effects of Proposed Project on Aquatic Resources

3.2.1 Fisheries

The IDNR, in correspondence dated August 12 and December 5, 2008 noted that hydropower operations may affect fisheries resources depending on turbine design, screening, and other project details. The IDNR cited entrainment and impingement of fish as potential effects of hydropower operations. IDNR also requested the Applicant provide estimated velocities for the proposed designs at the Projects. The USFWS in an August 6, 2008 meeting also requested the Applicant to perform entrainment studies. IDNR and USFWS concurred at the meeting that adult mortality is a potential concern. In its December 5, 2008 letter IDNR initially recommended use of 1.5" trashrack spacing and intake velocities not to exceed 1.5 ft/sec to reduce entrainment. In a subsequent phone call

(Personal Communication, Jeremiah L. Maher, Kleinschmidt Associates representing the Applicant with Bob Schanzle, IDNR – March 27, 2009), IDNR indicated that based upon previous actions, they would allow trash racks with openings up to two inches but maintained the request for velocities of 1.5 ft/sec.

At the request of IDNR and USFWS, the Applicant conducted a desktop analysis of entrainment at the proposed Project (Appendix A). The analysis indicates that potential entrainment is relatively low in comparison with other similar regional river systems and that the proposed Project will have limited effect on fish populations. The species present in the project are highly fecund, reproduce at a high rate and are subject annually to large mortality. When potential Project mortality is considered as part of the population within the river, the percentage of fish potentially entrained combined with the low entrainment mortality results in a minor or fractional potential loss compared with a natural mortality of many of the species present well exceeding 50%. Appendix A contains the results of this study.

The proposed Project may also have temporary effects on fish due to displacement from habitats at dredging locations and the powerhouse construction site. The upstream area proposed for dredging would likely remove sediment that contains sludgeworms and bloodworms (Butts, 1974). Bottom feeding fish species such as the common carp, redhorse, smallmouth buffalo, freshwater drum, and catfish may temporarily lose this foraging opportunity; however, the community would reestablish after dredging is complete. The Applicant proposes to include in its Construction Plan for the proposed Project appropriate best management practices to avoid or minimize any effect of construction activities on fish habitat.

The construction activity below the Dresden Island Dam may temporarily prevent fish from using some of the habitat below the dam. This area, because of habitat conditions, likely contains a greater number of less pollution tolerant taxa such as caddisflies and mayflies. The increased diversity of insects makes this habitat more suitable for fish foraging. Construction of the Project powerhouse, r

may directly impact the immediate downstream area.

Project operations may create higher water velocities below the powerhouse at a regular duration; however, much of this habitat already experiences highly turbulent water during high flows. The diversion of water may prevent flows from refreshing some areas directly below the dam spillway. Therefore the macroinvertebrate community may become less diverse (consisting of more pollution tolerant taxa) in some areas; however flow redistribution may result in increased diversity in others. While potentially changing the distribution of some macrointervertebrates, it is unlikely there will be any net loss in the overall community. This may also result in a re-distribution of abundance and diversity of fish using the habitat for foraging, but again, operations are unlikely to affect overall habitat availability.

3.2.2 <u>Amphibians and Aquatic Reptiles</u>

Construction activities associated with the Project are limited to immediately up and downstream of the existing dam. Accordingly they have limited potential to affect amphibians and aquatic reptiles. The Applicant received no comments from agencies indicating a concern with these species.

3.2.3 Benthic Macroinvertebrates

Construction activities and sediment displacement related to hydroelectric generation have the potential to displace or harm mussels and cover mussel beds with sediment. In the August 6 2008 meeting with resource agencies and in a subsequent letter dated December 5, 2008, IDNR requested that the Applicant conduct a survey of the banklines and other accessible areas downstream of the dam. The Applicant conducted this survey from September 29 to 30, 2008.

No federal or state listed species were observed during this survey and therefore are unlikely to be affected by the Dresden Island project; however, a unionid community does exist below the first riffle approximately one third of a mile downstream below Dresden Island. During Project operations, flow will be

diverted from spilling over the dam to the powerhouse proposed to be constructed nearer the right descending bank. This may potentially affect flow velocities along the right descending bank and consequently may affect unionid habitat. Changes in sediment deposition patterns may also affect unionids. The Applicant will work with the appropriate agencies to minimize the effect on mussel species along the right descending bank.

Benthic macroinvertebrates are likely to occur in the Project area. The Applicant proposes to dredge the soft fine sediments immediately upstream of the powerhouse to reduce downstream sedimentation and contamination by released chemicals. The species expected to use this sediment are the sludgeworms and bloodworms that are characteristic of poor water quality and species diversity. Project construction would also affect the substrate buried or excavated for the construction of temporary in-river access roads, cofferdams, and the permanent powerhouse. The result would be some temporary impacts to habitat upstream and downstream of the Project until macroinvertebrates reestablish in disturbed substrates.

3.3 Affected Environment- Wildlife Resources

The Project is located within an industrialized section of the Upper Illinois Waterway. This does not prevent wildlife from using the land, but it does limit the species to generalist species adapted to human occupation of the land. Wildlife species in the project area include large and small mammals, migratory and resident waterfowl, songbirds, reptiles, and amphibians. Wildlife species commonly found in the forest habitat include white-tailed deer (*Odocoileus virginianus*), opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), and black-capped chickadee (*Poecile atricapilla*). The forest habitat is not ideal due to the lack of large continuous tracts of habitat that would provide an interior core for shelter or corridors for migration. Migratory waterfowl such as mallard (*Anas platyrhynchos*), black duck (*Anas rubripes*), and Canada goose (*Branta canadensis*) nest near the lock and dam because the area provides productive foraging habitat. Bald eagle (*Haliaeetus leucocephalus*) also use the Illinois Waterway in the winter and fall (Village of

3.4 Potential Effects of Proposed Project on Wildlife Resources

Construction of the project may temporarily displace waterfowl from using the construction area. After the project is constructed, the tailrace would continue to provide foraging habitat. Maintaining low turbidity in the powerhouse discharge will be important for birds to see their prey. Fish eating birds will likely take advantage of the flows in the powerhouse tailrace. The Project would not affect the current operation of the Dresden Island Pond. Therefore the Project would not affect near shore habitat for mammals and birds upstream of the dam.

The Project transmission line will be constructed using best management practices to minimize bird mortality due to power line strikes or electrocution. The proposed transmission line right of way would follow the dam and pass under the navigation channel. After emerging the overhead portion of the line would likely follow existing powerlines to the CE substation as shown in Exhibit G. The proposed path would not disturb foreasted habitat. The USFWS has requested that the applicant install 'bird diverters' to minimize avian collisions. The applicant will consult with the agencies on installing diverters once the final transmission path is established. Because the proposed transmission path follows existing right-of-way structures, the transmission line right of way would likely not affect wildlife species.

The Applicant received no agency comments or study requests regarding wildlife in and around the proposed Project.

3.5 Botanical Resources

The original vegetation along the river was a mosaic of upland forests, dolomite prairies, and wetlands. Much of this natural diversity was lost with industrial development of the area. Three dominant vegetation types - upland, riparian, and wetland habitats presently occur within the project vicinity, though the project area itself does not contain any terrestrial habitats.

3.5.1 <u>Upland Habitats</u>

In the Project vicinity these vegetation types are a result of past disturbance, but are now in a stable, somewhat natural state (MWRD, 1999). The prairie/old field/shrub communities previously disturbed by various activities are in the process of reverting to a more natural setting. The vegetation in these communities is a mixture of dry prairie species and species that typically colonize cleared areas. Typical species include little bluestem (*Schizachyrium scoparium*), side-oats (*Bouteloua curtipendula*), hairy aster (*Aster sp.*), wild carrot (*Daucus sp.*), tall goldenrod (*Solidago sp.*), yarrow (*Achillea sp.*), whorled milkweed (*Asclepias verticillata*), and white sweet clover (*Melilotus sp.*), with common buckthorn (*Rhamnus cathartica*) and tree of heaven (*Alanthus altissima*) as a shrub layer (MWRD, 1999).

The upland forest in the project area consists of deciduous species, such as box elder (*Acer negundo*), silver maple (*Acer saccharinum*), rock elm (*Ulmus thomasii*), Chinese elm (*Ulmus parvifolia*), hackberry (*Celtis sp.*), green ash (*Fraxinus pennsylvanica*), tree-of-heaven, red oak (*Quercus rubra*), white oak (*Quercus alba*), slippery elm (*Ulmus rubra*), and hickories (*Carya sp.*). Sumac (*Rhus sp.*) and gooseberry (*Ribes sp.*) grow as shrubs in the understory and along the forest edges (Village of Rockdale, 1983).

3.5.2 Riparian Habitats

Bottomland forests border the Upper Illinois Waterway in many areas. These forests contain a variety of deciduous species typical of these forests, including hackberry, American elm (*Ulmus americana*), green ash, white ash (*Fraxinus americana*), silver maple, box elder, sandbar willow (*Salix sp.*), black willow (*Salix nigra*) and cottonwood (*Populus deltoides.*). Undergrowth species that grow in these communities include elderberry (*Sambucus sp.*), dogwood (*Cornus sp.*), riverbank grape (*Vitis sp.*), poison ivy (*Toxicodendron radicans*), giant ragweed (Ambrosia sp.), Virginia creeper (*Parthenocissus quinquefolia*), and black snakeroot (*Sanicula sp.*) (MWRD, 1999).

3.5.3 Wetland Habitats

The wetland systems of the area are primarily associated with river hydrology or isolated depressions. Disturbance activities such as excavation, dikes, or impoundments created many of the isolated wetlands (MWRD, 1999). Cattail (*Typha sp.*), arrowhead (*Sagittaria sp.*), and sedge (*Carex sp.*) growing along the water's edge dominate emergent wetlands in the vicinity of the project (Village of Rockdale, 1983). Figure 3.5.2-1 shows the known wetlands near the Dresden Island Lock and Dam. National Wetland Inventory (NWI) surveys indicate a 4.92 acre bottomland forested wetland adjacent to the proposed location of the Dresden Island powerhouse (USFWS, 1987). Soil surveys in this area also indicate the presence of possible hydric or wetland soils (NRCS, 2007). Wetland species found in scrub-shrub or bottomland forests include reed canarygrass (*Phalaris arundinacea*), with shrub species such as riverbank grape, smartweed (*Polygonum sp.*), dogwood, sandbar willow, and with a sparse tree cover of black willow, green ash, and cottonwood (MWRD, 1999).

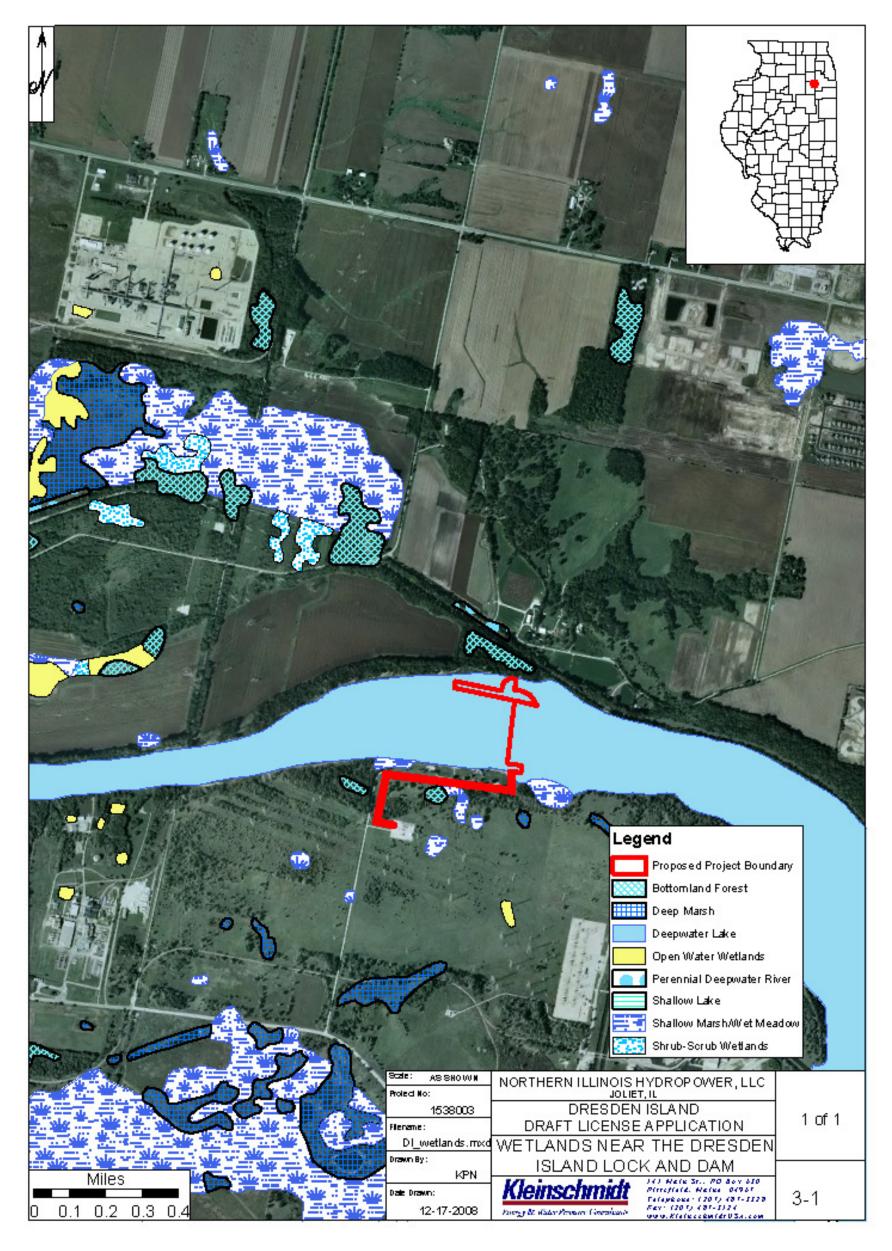


Figure 3-1: Wetlands Near the Dresden Island Lock and Dam

3.5.4 Littoral Habitat

CE studied aquatic macrophytes in the Upper Illinois Waterway from 1992 through 1995. The investigations resulted in the identification of 34 distinct aquatic macrophyte taxa, most of which are common and relatively pollution tolerant. Total macrophyte cover strongly correlated with nitrogen levels in interstitial water at the rooting depths. Correlation and ordination analyses showed that macrophyte cover related to sediment type and density. Macrophyte cover negatively correlated with water depth and turbidity. Temperature positively correlated with total macrophyte cover. These studies also indicated that macrophyte distribution and abundance is most limited by available habitat (CE 1996a). Several areas contained small, submersed beds of *Potomageton sp.* and *Elodea canadensis* (MWRD, 1999).

3.6 Potential Effects of Proposed Project on Botanical Resources

The construction and operation of the Project powerhouse will occur exclusively adjacent to and upon the existing dam structures, and will not result in any changes to water levels or shoreline habitat that could potentially affect botanical resources, including wetlands.

Project lay down areas and construction access would be either via the existing towpath paralleling the Illinois and Michigan (I&M) Canal or by a direct crossing of the I&M Canal. IDNR requested that any proposed disturbance of woodland or wetland habitat would include an analysis of potential effects, such analysis to be performed in consultation with the agencies. Although the Applicant anticipates minimal disturbance of woodland or wetland habitat, the Applicant agrees that any plans related to the construction of the Project or access would be prepared in consultation with the agencies.

The transmission line as described earlier is unlikely to affect forested or other habitats, as the proposed path follows existing structures.

3.7 <u>Measures Proposed by Applicant related to Fish, Wildlife and Botanical</u> Resources

3.7.1 Studies

In consultation with the appropriate agencies the Applicant developed a study plan and protocol for a survey of mussels below Dresden Island Dam. The study was completed in 2008 and is attached in <u>Appendix A</u>. The study cost approximately \$25,000.

In consultation with the appropriate agencies the Applicant developed a study plan and protocol for a desktop analysis of potential entrainment at the proposed Project. The Applicant completed the study in March 2009 and it is attached in <u>Appendix A</u>. The Study cost approximately \$25,000. The Applicant estimates the cost to complete the requested modeling at \$15,000.

3.7.2 Modeling

The agencies have requested information regarding flow velocities at the intake of the proposed Project. The applicant will calculate intake velocities after receiving the turbine specifications and preliminary design of the intake structures. Applicant anticipates having this information sometime in the summer of 2009. The Applicant estimates the cost to complete the requested modeling at \$5,000.

The agencies requested modeling related to sediment deposition and its potential effects on established mussel populations below the proposed Project. As described in Section 2.3.2 the applicant will perform the modeling in 2009. The Applicant estimates the cost to complete the requested modeling at \$15,000.

3.7.3 Protection, Mitigation and Enhancement Measures

IDNR has requested no greater than 2 inch trash racks for the proposed facility. The Applicant proposes 2 inch trash racks.

The Applicant will design the project to meet IDNR's request for intake velocities of 1.5ft/sec. The applicant can not estimate the potential cost at this time pending final turbine specifications and intake design. Additional excavation and width requirements to meet the 1.5ft/sec requirement are likely to be substantial. Estimated costs should be available by end of summer 2009.

The Applicant proposes to provide bird diverters on any newly installed transmission lines as directed in consultation with the agencies. The Applicant estimates the additional cost to add bird diverters at \$25,000.

The Applicant proposes to incorporate sediment transport analysis as part of overall hydraulic modeling, to ascertain the potential for downstream deposition. Additionally, the Applicant proposes a post-construction survey of mussels below the Project and a subsequent survey two years after commencement of operations.

The Applicant proposes preparing an assessment of any unavoidable tree clearing as requested by IDNR and consult with IDNR prior to tree clearing, if any. The applicant estimates the costs for both surveys at \$50,000.

4.0 RARE, THREATENED, ENDANGERED AND SPECIAL STATUS SPECIES

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or result in the destruction or adverse modification of the critical habitat of such species. In addition to the federal list of RTE species, the state of Illinois has a separate list of species that are listed as threatened or endangered.

4.1 <u>Affected Environment – Rare, Threatened, Endangered, and Special Status</u> <u>Species</u>

The Project is within the known historic range of one federally and state endangered species, the Indiana bat (*Myotis sodalis*). The USFWS also lists the Hine's emerald dragonfly (*Somatochlora hineana*) as an endangered species. The USFWS lists the Sheepnose mussel (*Plethobasus cyphyus*) and Spectaclecase mussel (*Cumberlandia mondonta*) as candidate species in the county. Additionally, the Illinois River Waterway may contain the state endangered snuffbox, salamander mussel, greater redhorse (*Moxostoma valenciennesi*), and pallid shiner (*Hybopsis amnis*) as well as the state threatened butterfly mollusk and river redhorse (*Moxostoma carinatum*).

4.1.1 Federally Listed Species

4.1.1.1 Indiana Bat

On March 10, 1967 the USFWS listed the Indiana bat as an endangered species. The Indiana bat is also an Illinois state endangered species. The Indiana bat may use the proposed Project area for foraging and roosting and/or for wintering. Its habitat typically consists of riparian, bottomland, or upland forest, as well as old fields or pastures with scattered trees. These bats hibernate in caves and abandoned mine shafts (hibernacula) from October through April. From April through August, Indiana bats inhabit floodplain, riparian, and upland forests for roosting and foraging habitat. Roosting and maternity habitat consists primarily of

live or dead hardwood tree species which have exfoliating crevices, splits, or hollow portions of tree boles and limbs also provide roost sites. Indiana bats are threatened by disturbance or killing of hibernating and maternity colonies; vandalism and improper gating of hibernacula; fragmentation, degradation, and destruction of forested summer habitats; and use of pesticides and other environmental contaminants (USFWS, 2007).

4.1.1.2 Sheepnose

On April 16, 2007 the USFWS began reviewing the sheepnose mussel for listing as a threatened species. The sheepnose is primarily a larger-stream species. It frequents shallow shoal habitats with moderate to swift currents over coarse sand and gravel (Oesch, 1984). The species occurs in the Kankakee River in Illinois. Creation of impoundments may be one reason for the decline of this species. Impoundments that modify riffle and shoal habitat and generally disrupt hydrology limit this species (USFWS, 2007). Remnant habitats typically occur just downstream of dams.

4.1.1.3 Spectaclecase

On April 3, 2007 the USFWS began reviewing the spectaclecase for listing as a threatened species. The spectaclecase occurs in large rivers and, relative to other mussel species is a habitat specialist. It occurs on outside river bends below bluff lines. It most often inhabits riverine microhabitats sheltered from the main force of current (Baird 2000). This species was historically found in the Des Plaines and Kankakee Rivers (USFWS, 2007).

4.1.1.4 <u>Hine's Emerald Dragonfly</u>

On January 26, 1995 the USFWS listed the Hines's emerald dragonfly (*Somatochlora hineana*) as an endangered species. The Hine's emerald dragonfly lives in calcareous spring-fed marshes and sedge meadows overlaying dolomite bedrock. The species is currently known to occur in the lower Des Plaines River valley. This species is most threatened by the destruction of habitat for development or conversion of land for agriculture (USFWS, 2001).

4.1.2 <u>State Listed Species</u>

4.1.2.1 <u>Butterfly Mussel</u>

The butterfly freshwater mollusks prefer sand and gravel bottom habitats generally found in faster moving water of river narrows and rapids. This species is an obligate riverine mussel, preferring clean water with good current over gravel substrate. It is known to occur along the Illinois and Mississippi rivers.

4.1.2.2 Greater Redhorse, River Redhorse, and Pallid Shiner

The greater redhorse was caught downstream of Dresden Island in 1985. The river redhorse was found within the Dresden pool in 1985; river redhorse was detected more recently in 2006 in the tailwater of Dresden Island (IDNR, 2008; Midwest Biodiversity Institute, 2008). Redhorse species feed mostly on aquatic insects and detritus in the benthos of rivers and lakes (Marseilles Hydro Power, LLC, 2001).

The pallid shiner was also found within the Dresden pool at the mouth of the Kankakee River in 1985 (IDNR, 2008). The Kankakee River provides habitat for what is thought to be an isolated population of pallid shiner in the state of Illinois (Kwak, 1991). The pallid shiner is intolerant

of excessive turbidity, siltation, and pollution. The specimen captured at the mouth of the Kankakee likely washed down from upstream.

4.2 <u>Potential Effects of Proposed Project on Rare, Threatened, Endangered and Special Status Species</u>

The Dresden Island Lock and Dam is within the known historic range of the Indiana bat (*Myotis sodalis*), a federal and state endangered species. The Indiana bat may use the proposed Project area for foraging and roosting and/or for wintering. The island adjacent to Dresden Island does not appear to contain a suitable forest for Indiana bat; however the adjacent floodplain may provide habitat. The Applicant is not proposing tree clearing related to Project construction; therefore the construction activities would not disturb roosting bats. The presence of construction near potential feeding areas may temporarily disturb foraging bats. To address the potential affect of construction, the Applicant proposes to conduct a survey of the dam structure prior to construction. The Applicant will develop the survey in coordination with the agencies. If Indiana bats presently use the dam or adjacent forested floodplain adjacent to the construction area, the Applicant will develop an appropriate management plan at that time.

The Hine's emerald dragonfly occurs in wetlands that may be hydraulically controlled by the Des Plaines River; however, the Project would not affect the water levels upstream or downstream of the project. There are no proposed construction activities within wetlands. Therefore the Project would have no affect on this species.

In a meeting on August 6, 2008, the IDNR expressed interest in mussels at the Project. The Applicant undertook a mussel survey from September 29 to 30, 2008. No federally or state listed species were observed from Dresden Island dam to 0.5 miles downstream of the Project. Qualitative mussel surveys were completed to determine the probability of finding rare, threatened, or endangered species in the area. EIS determined that rare, threatened, or endangered mussel species were not likely to be found in the affected mussel beds. Therefore the Project would not likely affect the sheepnose, spectaclecase, or butterfly mussels.

The greater redhorse, river redhorse, and pallid shiner are likely to occur in the Project Vicinity. The redhorse may forage in the silty substrate found behind Dresden Island Dam. This may make these species more susceptible to swimming near the intake of the proposed powerhouse, putting them at greater risk of entrainment. The Applicant is proposing to consult with IDNR and USFWS to determine appropriate intake velocities and designs to minimize the potential for entrainment. The redhorse species may also be temporarily displaced during dredging and construction of the Project. Downstream of the Project the redhorse species may find better foraging opportunities in the tailwater of the proposed powerhouse.

Pallid shiner occur in the Kankakee River; however this species is unlikely to occur in habitat adjacent to the Project. A specimen found in Dresden Pool was likely washed downstream during high flows but would not be regularly found in Dresden Pool. It is unlikely the construction or operation of the Project would affect this species. The Applicant received no comments regarding the river redhorse, greater redhorse, and pallid shiner related to the Project. As the Applicant would operate the Project as run-of-river, there will be no change to downstream water levels or flow patterns, therefore the Project would not likely have long-term impacts to the habitat for these species.

4.3 <u>Measures Proposed by Applicant related to Rare, Threatened, Endangered and Special Status Species</u>

4.3.1 Studies

Applicant will survey the construction area prior to construction for bat use. The Applicant estimates the cost of the bat survey at \$25,000.

4.3.2 Protection, Mitigation and Enhancement Measures

If Indiana bats are using the immediate area of construction, Applicant will comply with the Indiana Bat Recovery Plan (USFWS, 2007), consult with the USFWS and as required, employ avoidance measures.

5.0 GEOLOGY AND SOILS

5.1 Affected Environment

5.1.1 Geology

Glacial scour during the Ice Age and filling by glacial melt water formed the Great Lakes Basin. During the Pleistocene, at least four great ice sheets are thought to have influenced the Great Lakes region. These glaciers occurred during the Nebraskan, Kansan, Illinoian, and Wisconsinan glacial ages. The slightly rolling topography in the Des Plaines river valley is the result of advance and retreat of the Wisconsin Glacier, some 10,000 to 14,000 years ago. The Des Plaines River bluffs typically rise 30-40 feet above the valley floor and consist of gravelly till deposited by glacial moraines (MWRD, 1999).

The upper layer of bedrock varies across the area, being primarily of Silurian or Ordovician age, with a smaller portion being of Pennsylvanian age. Precambrian granitic rocks underlie the area at depths ranging from about 1,000 ft below land surface in the northern part of the basin to about 7,000 ft in the southeastern part. Ordovician-aged rocks (Maquoketa Shale) overlie the Cambrian rocks and are composed predominately of limestone and dolomite, but also include some sandstone and shale (MWRD, 1999). The Dresden Island Lock and Dam lies on Ordovician-aged bedrock (Maquoketa shale) (ISGS, 1996).

The topography of Dresden Island is relatively flat with elevations varying from 509 ft to 526 ft (NGVD). The only significant topographic feature are the Kankakee Bluffs, which are 70 to 100 feet high to elevation 624 ft (NGVD), located east of the lock and dam on the north side of the river (Village of Channahon, 1983).

5.1.2 <u>Soils</u>

The Project lies in the Central Lowland physiographic area, - a great basin stretching from the Appalachians to the Rocky Mountains. The Central Lowland is one of the richest agricultural areas in the world with extensive flat to rolling topography (MWRD, 1999; USGS, 2003). Black silt with some sand, clay, and organic material compose the surface soil. Soils classified as sawmill silty clay loam with 0 to 2 percent slope occur in the area proposed for the Dresden Island powerhouse. The soil survey also indicates that this property is frequently flooded (NRCS, 2007). Figure 5-1 shows other soils near the Dresden Island Lock and Dam.

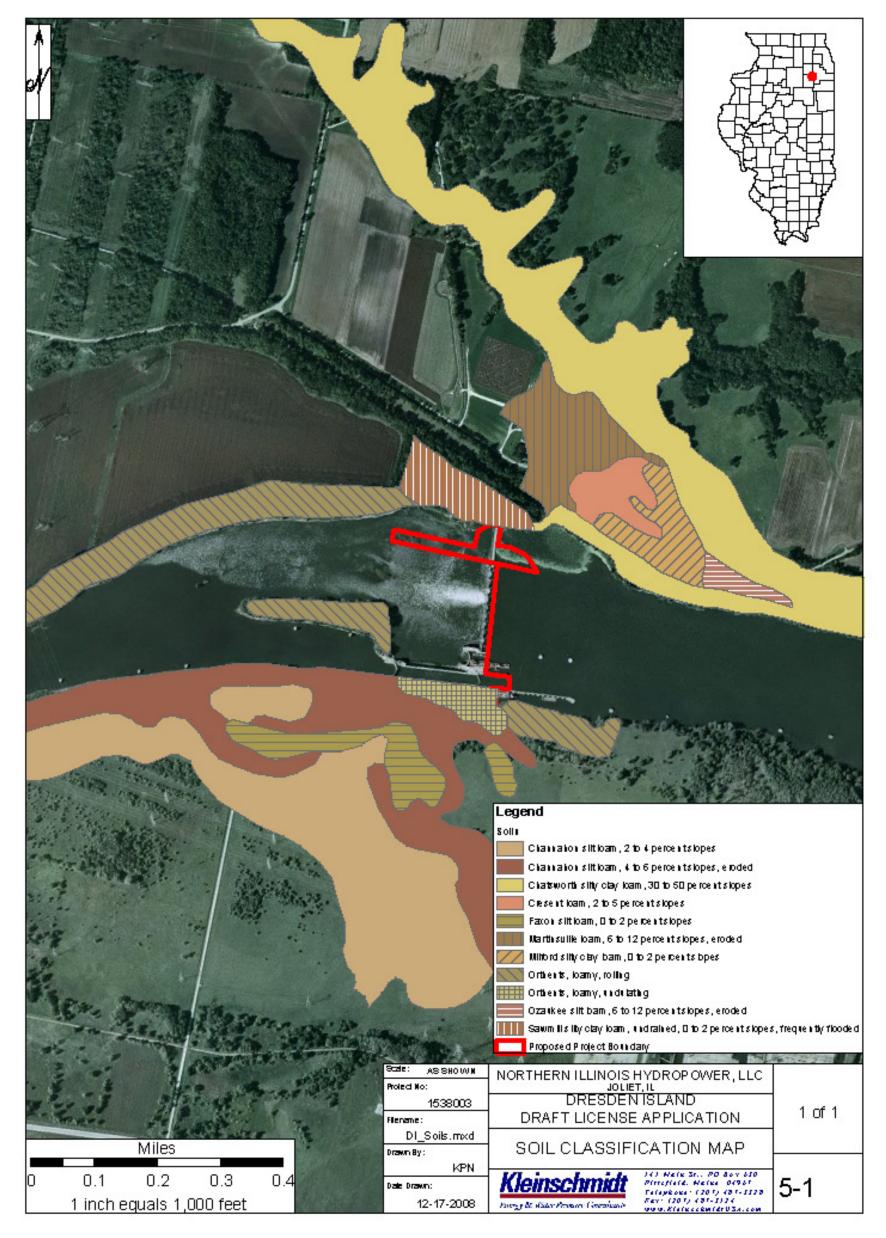


Figure 5-1: Soil Classification Map

5.2 Potential Effects of the Proposed Project on Geology and Soils

Construction of the existing lock, dam, and roads previously disturbed much of the land surrounding the Project. The proposed 9,375 sq. ft. powerhouse and 2,500 sq. ft. switchyard would be constructed on rock and sediment found just below the Dresden Island Dam. Construction activities may require a temporary road to access the powerhouse. The Applicant would use existing road surfaces where possible but may need to augment access by placing fill over in-river sediment. In-river access roads could be subject to washout during high flow events that could result in the deposition of roadway materials (generally 2A stone, a coarse aggregate with rocks approximately 2 inches in size) into downstream channel areas.

The proposed transmission line would be constructed across the top of the dam and under the navigation channel (lock) to a substation along Lock Road. The soils around the Dresden Island Lock and Dam are mapped by the USDA as orthents, which are erosional soils. The other dominant soil near the project is Channahon silt loam. The transmission line would only disturb soils along Lock Road. This area has likely already been disturbed during the construction of the existing road.

The Project has the potential to alter flow patterns in the vicinity of the powerhouse which could result in additional silt movement from upstream and released downstream until equilibrium conditions are reestablished in the forebay area. The downstream reaches are composed of mostly rock that would not move easily under new flow patterns.

Material would be dredged from upstream and downstream of the project to minimize the release of sediments from new flow patterns caused by project operation. This will also secure potential sediments that have been contaminated by harmful substances. The Applicant is currently evaluating sediment disposal options

5.3 Measures Proposed by Applicant related to Geology and Soils

5.3.1 Studies

None proposed

5.3.2 Modeling

The Applicant proposes to undertake sediment transport analysis as part of the proposed hydrologic/hydraulic study. The cost of this analysis is included with the earlier reference to sediment modeling.

5.3.3 Protection, Mitigation and Enhancement Measures

All work to be performed as part of this project would be undertaken in accordance with sediment and erosion control plans to be developed by the Applicant and local, state, and federal agencies to ensure that any release of sediments to the nearby water would be minimized.

The Applicant proposes to develop a Construction Erosion and Sedimentation Plan to address the volume, composition, and location of required dredging and spoil disposal and sediment and erosion control during and after construction. The Applicant will develop this plan in consultation with the appropriate agencies and will be filed prior to commencement of any construction activities.

The Applicant proposes to develop a Post Construction Monitoring Plan to be filed following construction. The Applicant will develop the plan in consultation with the appropriate agencies and would address any needs to monitor the Project for erosion or runoff.

The costs of the above measures are included in the estimated construction costs provided in Exhibit D.

6.0 HISTORICAL AND ARCHAEOLOGICAL RESOURCES

6.1 <u>Affected Environment – Historical Properties and Archaeological Resources</u>

Under the National Historic Preservation Act (NHPA) and its implementing regulations (36 CFR §800m) the term "historic properties" is applied to any prehistoric or historic district, site, building, structure, object, or Traditional Cultural Property (TCP) included in, or eligible for inclusion in, the National Register of Historic Properties (NRHP) (36 CFR §800.16(l)). This application uses the term "cultural resources" to discuss any prehistoric or historic district, site, building, structure or TCP regardless of the resource's individual NRHP eligibility.

A Project's Area of Potential Effects (APE) is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historical resources if any such cultural resources exist" (36 CFR § 800.16(d)). For the purposes of this document, the proposed APE for the Project is defined as all lands within the proposed Project boundary and any lands outside of the project boundary that Project-related activities may affect.

The proposed Project is located within the Dresden Island Lock and Dam Historic District, which was listed on the National Register of Historic Places on March 10, 2004.

6.2 Tribal Interests

A confederation of tribes known as the Illini originally inhabited areas in and beyond the present-day State of Illinois, including areas to the west of the Mississippi River and areas south to the Arkansas River. At the time of the arrival of the Europeans around 1600 there were as many as sixty Illini villages. The numbers of Illini reported by the French in the mid 1650s varied considerably from 2,000 to as many as 20,000 due to constant migration by many bands; scholars estimate a population of about 12,000.

The tribe population declined due to the Beaver Wars and epidemics introduced by the Europeans. By 1768 there were only about 1,800 Illini. When tribal enemies attacked this band, that number was further reduced to 600. By 1854, there were just 84 left. At this time, they united with the Wea and Piankashaw and became the United Peoria Tribe. Today the remnants of the Illini can be found among the Peoria Nation of about 2,000 people living on their Oklahoma reservation (500 Nations 2008).

There are no known tribal cultural or economic interests within the Project boundary or within an area that may be affected by the Project. In correspondence dated July 30, 2008 (See <u>Appendix B</u>), the Peoria Tribe noted that they have no objection to the proposed construction. Project construction and operation should not affect any Indian tribal interests.

6.3 Potential Effects of Proposed Project on Historic and Archaeological Resources

Construction of the new powerhouse has the potential to adversely affect the dams, which are historic properties. In a meeting on August 6, 2008, and again on March 17, 2009 the Illinois Historic Preservation Agency (IHPA) noted that in general, IHPA did not have significant concerns with construction of the hydroelectric facilities; The ACOE at the March 17 meeting indicated the ACOE had recently completed historic documentation of the structures. Correspondence from the IHPA dated August 7, 2008 states that an IHPA staff member would need to inspect the site before determining if the proposed Project would affect the historic property. IHPA requested that the Applicant provide them with an opportunity to review and approve plans and specifications as they are developed to ensure that the Project meets the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings."

The proposed Project is unlikely to affect tribal resources, as there are no known tribal interests in the area. In correspondence dated July 30, 2008, the Peoria Tribe noted that they are unaware of any documentation directly linking Indian Religious Sites to the proposed construction, and that the Peoria Tribe has no objection to the proposed construction. If during the course of construction or operation, archaeological, tribal, or historic artifacts are discovered within the APE, the Applicant would notify the SHPO.

6.4 <u>Measures Proposed by Applicant related to Historical Properties and Archaeological Resources</u>

6.4.1 Studies

None proposed or requested.

6.4.2 Protection, Mitigation and Enhancement Measures

Prior to any construction, and in accordance with the correspondence from IHPA, the Applicant will conduct additional consultation with the IHPA and ACOE to ensure that the proposed construction is compatible with the guidelines.

As the IHPA staff noted during the August 6, 2008 meeting, the Applicant would also document any historic properties that would be affected by the proposed project in accordance with recommendations by the IHPA. The type of documentation that the Applicant performs will be determined in consultation with the IHPA.

If the SHPO determines in consultation with the FERC and the ACOE that the Applicant will, in fact, be *managing* historic properties during the term of the license, the Applicant will development a Historic Properties Management Plan (HPMP), otherwise the applicant will conform its operations and maintenance activities with the existing ACOE procedures for managing the historic properties.

Construction/installation of any new transmission lines or facilities will likely occur within existing, previously disturbed transmission right of ways. Should the Applicant find it needs to construct these facilities in previously undisturbed locations, it will consult with IHPA to assess the potential for adverse effects to archaeological resources.

The applicant estimates that compliance with NHPA and consultation with the ACOE and ISHPO will cost an additional \$25,000.

7.0 RECREATION RESOURCES

7.1 Affected Environment – Recreation Resources

7.1.1 Existing Recreational Resources in the Project Boundary

As the Project boundary encompasses only portions of the Dresden Island Dam and adjacent waters required for Project operations, there are no recreational facilities located within the Project boundary.

7.1.2 <u>Regional Recreational Resources</u>

Recreation along the river in the vicinity of the Dresden Island Lock and Dam (or proposed Project) primarily includes bank fishing and boating. The ACOE maintains a visitor's observation area located south of and adjacent to the Dresden Island Lock. The observation area is open to the public during daylight hours.

The 96-mile Illinois and Michigan Canal (I&M Canal), completed in 1848, connected the Great Lakes to the Mississippi watershed along an Indian portage route and runs parallel to the Illinois River in the vicinity of the Dresden Island Project. The canal helped to transform Chicago from a small settlement to a critical transportation hub between the East and the developing Midwest. Currently, the towpath trail along the canal is an Illinois state park and runs through a rural and wooded landscape linking a number of towns laid out by the original canal commission. The I&M Canal is not in the proposed Project boundary. Additional state parks are located along the canal, including Channahon State Park, William G. Stratton State Park, Gebhard Wood State Park, and Buffalo Rock State Park.

In 1984, the I&M Canal was designated as a National Heritage Corridor. Congress establishes National Heritage Areas and conservation, interpretation, and other activities are managed by partnerships among federal, state, and local

governments and the public sector. The National Park Service does not operate any facilities within the I&M Canal corridor; however, the NPS provides technical assistance as well as financial assistance for a limited number of years following designation of National Heritage Areas. The Illinois and Michigan Canal National Heritage Corridor is currently managed by the non-profit Canal Corridor Association. The Association partners with state governments and federal agencies, including the NPS, to manage the corridor.

The I&M Canal is also listed under the National Register of Historic Places and is registered as a National Historic Landmark. The I&M Canal corridor offers recreational opportunities for automobile touring, biking, boating, fishing, hiking, camping, and hunting, as well as other outdoor activities and winter activities.

Downstream of the Dresden Island Project is the Starved Rock Lock and Dam, which is adjacent to the Starved Rock State Park. In addition to a Visitor's Center providing historic information about the Illinois Waterway, the park offers hiking, camping, picnicking, hunting, horseback riding, and water-based recreation including fishing and boating. Cross-country skiing and eagle watching are also popular activities within the park (Illinois Department of Natural Resources 2008).

7.1.3 Current ACOE Recreation Use Levels

In 2007, 724 completed lockages were made for recreational watercraft at the Dresden Island Lock. During that time, a total of 3,411 total lockages were completed. <u>Table 7-1</u> shows the seasonal distribution of recreational lockages and total lockages in 2007 (ACOE 2008).

Table 7-1: Seasonal Distribution of Lockages at Dresden Island Lock

MONTH	RECREATIONAL WATERCRAFT	TOTAL VESSELS
January	0	222
February	0	100
March	7	234
April	43	239
May	98	356
June	111	358
July	129	389
August	102	306
September	121	391
October	98	352
November	13	252
December	2	212
Total	724	3,411

7.1.4 <u>Specially Designated Recreation Areas</u>

There are no known areas within the proposed Project boundary included in or designated for study for inclusion in the National Wild and Scenic Rivers system. There are no areas within the proposed Project boundary that are under the provisions of the Wilderness Act, or that have been designated as a wilderness area or wilderness study area.

7.2 <u>Potential Effects of Proposed Project on Recreational Resources</u>

The proposed development will occur at an existing lock and dam structure operated by the ACOE. It will incur only minor modifications to the existing structures and result in a limited project footprint in the adjacent waters. It will not affect water flow or levels in the waterway. The Project boundary is limited to project facilities and a limited instream area up and downstream of the powerhouse and is not currently available or appropriate for recreation use. There are currently no recreational opportunities within the proposed Project boundary. After final design, the proposed project may be adjacent to the right descending bank of the river. Currently bank

fisherman use this area is occasionally. Project construction may temporarily restrict access to this area. Location of the powerhouse and ancillary equipment may restrict access to some of the area after construction is complete.

The Applicant received an informal comment from ACOE staff regarding future access for bank fishing below the powerhouse. The Applicant received no other comments or study requests from agencies or other interested parties regarding recreational resources in the proposed Project boundary.

7.3 <u>Measures Proposed by Applicant related to Recreational Resources</u>

7.3.1 Studies

None proposed or requested.

7.3.2 <u>Protection, Mitigation and Enhancement Measures</u>

The Applicant proposes to construct an appropriate fishing access point adjacent to the proposed development upon completion of construction. The proposed access would be designed to protect the security of the ACOE facilities and the proposed Project and would be designed in consultation with the ACOE and IDNR. The Applicant anticipates additional engineering costs at \$10,000, and additional construction at \$40,000 to develop public access and the necessary security precautions.

8.0 LAND MANAGEMENT AND AESTHETICS

The Project boundary includes only existing structures associated with the Dresden Island Lock and dam facility and the immediate adjacent waterway. Accordingly, it is not accessible to the public and contains no wetlands or floodplains.

8.1 Affected Environment – Land Management and Aesthetics

8.1.1 Land Use

The Project lies wholly within Grundy County, Illinois, which covers approximately 430 square miles. Land cover types for the Des Plaines subbasin are provided in <u>Table 8-1</u>.

Table 8-1: Land Cover Information for the Des Plaines Subbasin

LAND COVER TYPES	ACRES	PERCENTAGE
Agricultural Land	10,468,901	66.7 %
Forest Cover	1,702,586	10.8 %
Grassland	1,654,417	10.5 %
Urban Lands	1,517,660	10.0 %
Open Water	229,405	1.3 %
Wetlands	112,468	.7 %
Total	15,685,437	100 %

Source: Charles W. Foors, IDNR, October 30, 2003. Compiled from Land Sat 7 Imagery based on 1999 - 2000 data.

The Des Plaines sub-basin is predominantly agricultural land with about 66 percent of lands classified as croplands or pasture. Forestlands make up the next highest percentage of land use, with about 10 percent of lands.

The Grundy County Land Use Department regulates land uses on privately owned properties in the Project vicinity. The ACOE requires shoreline permits for any activities involving dredging, wetlands or waterway structures such as

docks or piers on the Illinois River. The Applicant would not have jurisdiction on any shoreline permitting above or below the Dresden Island Dam.

The *Grundy County 2020 Comprehensive Land Use Plan* (Grundy County 2004) describes the County's vision for land-use and describes existing recreational areas, public spaces, and significant features including: the two state parks (William G. Stratton and Gebhard Woods); the Goose Lake Prairie State Natural Area; Heidecke State Fish and Wildlife Area and Lake; the I&M Canal National Heritage Corridor; Dresden Island Lock and Dam; Dresden Nuclear Power Station; and the various private hunting and swimming clubs. According to population projections, by 2020 the northeastern Illinois area population will increase by 1,700,000 persons bringing the total to approximately 9,000,000. (Grundy County 2004).

8.1.2 <u>Demographics</u>

While land use around the Dresden Island project is largely agricultural, as a "collar" community of the Greater Chicago Metropolitan Area, the population has been dramatically increasing over the past decade, leading to an increased number of housing units and increased urban sprawl. Expansive multi-home developments, associated new support services, and commercial enterprises are replacing previously agricultural lands and open space at a rapid rate.

The population of Channahon has recently undergone a sharp population increase. Between 1990 and 2000, the population increased from 4,266 to 7,344, a 72% change (Grundy Economic Development Council 2008). <u>Table 8-2</u> provides a summary of population distribution information in the vicinity of the Dresden Island project.

Table 8-2: Population Distribution Information Near the Dresden Island Project

	CHANNAHON	GRUNDY COUNTY	ILLINOIS
2000 Population	7,344	37,535	12,419,293
Average Household Size (2000)	3.22	2.6	2.63
Average Family Size (2000)	3.47	3.09	3.23
Total Housing Units (2000)	2,346	15,040	4,885,615

Source: U.S. Census Bureau 2008

8.1.3 Aesthetics

The Project lies in a largely agricultural area along the outside extent of what is considered the Greater Chicago Metropolitan area. The surrounding landscape is relatively flat, although adjacent to the Dresden Island Lock and Dam the topography shifts from approximately 500 feet to approximately 600 feet in a short distance. A small ridge of bluffs rise abruptly from the floodplain north of the project, running adjacent to the river for several miles. The Dresden Island Nuclear Station lies immediately upstream of the lock and dam and an active railway crosses the Illinois River immediately downstream of the lock and dam. The Dresden Island Lock and Dam itself is composed of a lock chamber and a concreate gravity dam.

8.2 Potential Effects of Proposed Project on Land Management and Aesthetics

The Applicant has not received any comments or study requests from agencies or other interested parties regarding land use and aesthetic resources.

8.2.1 Potential Effects on Land Use

There will be minimal permanent effects on land use in the Project Area. An area of less than an acre will be used as a temporary construction laydown area. The proposed lay-down area is currently used as parking and is formed by the right abutment of the dam. The Applicant proposes to construct an expanded laydown area adjacent to the existing right abutment of the dam by constructing a retaining wall and using materials removed from the river bed for fill to create an expanded lay-down area. The area will be incorporated into the design of the powerhouse and ultimately will provide access for recreation as described in Section 7.3.2 as well as access to the powerhouse.

8.2.2 Potential Effects on Aesthetics

The proposed Project will incur both temporary and permanent effects to aesthetic resources. The construction of a new powerhouse, transmission facilities, the construction laydown area, and a widening of an access road are the primary items that will alter the aesthetics of the area.

The Applicant proposes to construct an attractive powerhouse designed to blend with the existing structures immediately below the existing dam. The powerhouse will be approximately 60 ft by 148 ft and will improve the overall aesthetics of the Project area infrastructure. An artist's rendering of the proposed powerhouse is provided in Figure 8-1.

The proposed Project is approximately 0.8 miles from a Commonwealth Edison (CE) Substation, and will require the installation of new overhead transmission lines; however the area immediately surrounding the proposed project already contains numerous transmission and distribution lines because of the adjoining Dresden Island Nuclear Station. The aesthetics of the Project Area are not expected to be negatively impacted by the relatively small footprint of the project infrastructure.

Two temporary laydown areas will be created and used during construction. The laydown areas will total approximately 0.3 acres; one 0.15-acre laydown area will be located adjacent to the northern shore dam abutment and the other 0.15-acre laydown are will be approximately 300 ft northeast of the northern dam abutment along the access road. The laydown areas will be used to place

construction equipment and supplies when not in use.

In addition to the laydown area, the access road to the Dresden Island Lock and Dam may also be altered to accommodate construction activities. The access road may need to be widened to meet adequate access to the Project area. Because modifications to the road may occur within a historic property, (but outside of the Project Boundary) any design, construction, mitigation and restoration would occur in consultation with the SHPO and the managing entity for the property. The existing road is shown in Photo 8-1.



Figure 8-1: Artist's Rendering of the Proposed Powerhouse



Photo 8-1: Existing Access Road at Dresden Island

8.2.3 Ability to Provide Buffers

The proposed Project will be integral to the Dresden Island Lock and Dam and the Applicant does not own lands around the impoundment and shoreline. As a result, it is not feasible for the Applicant to provide a buffer zone around all or any part of the impoundment and shoreline for the purpose of ensuring public access to Project lands and waters or protecting the recreational and aesthetic values of the impoundment and its shoreline.

8.2.4 Applicant's Permitting Policies

The Applicant does not own the land or control the impoundment above the dam, and the proposed Project boundary is limited to the footprint of the construction for the powerhouse and intakes. Therefore, the Applicant will not manage the shoreline above or below the dam, nor will it issue permits for piers, docks, boat landings, bulkheads, or other shoreline facilities.

8.3 Measures Proposed by Applicant related to Land Management and Aesthetics

8.3.1 Studies

None proposed or requested.

8.3.2 Protection, Mitigation and Enhancement Measures

The Applicant proposes no measures for Land Management and Aesthetics

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APPENDIX A STUDY REPORTS



4970 Varsity Drive Lisle, IL 60532 Tel: (630) 795-7200 Fax: (630) 724-1681

August 25, 2008

Mr. Jesse Wechsler Kleinschmidt Associates Energy and Water Resource Consultants 141 Main St., PO Box 650 Pittsfield, Maine 04967

Subject:

Report of Investigation - Sediment Sampling

Brandon Road and Dresden Island Northern Illinois Hydropower

Joliet, Illinois

Reference:

Patrick Project No. 20802.059

Dear Mr. Wechsler:

Patrick Engineering Inc. (Patrick) is pleased to submit this brief letter report and attachments that present the results of our sediment sampling investigation at the Brandon Road and the Dresden Island Lock and Dam facilities near Joliet, Illinois and Channahon, Illinois respectively.

The Brandon Road Lock and Dam is located on the Des Plaines River, southwest of Joliet, Illinois. The Dresden Island Lock and Dam is located on the Illinois River, near Channahon, Illinois.

PROJECT DESCRIPTION

Patrick understands that each of these facilities is being considered for the installation of a hydropower operation by Northern Illinois Hydropower (NIH). In order to install this at each location, dredging activities, both upstream and downstream, of the dams will likely be necessary. To assist in the permitting of the hydropower developments, NIH requested a study to characterize the sediment at each site.

The purpose of this investigation was to obtain samples from the upstream and downstream sides of each dam to analyze the sediment for future dredging activities. Analytical testing was completed on multiple sediment samples for the purpose of assessing dredging and disposal requirements.

SITE INVESTIGATION

Between August 4 and August 6, 2008, Patrick completed sampling at six locations from a pontoon boat at each of the facilities to obtain samples of the sediment on the river bottom. The boring locations were provided by Kleinschmidt in the RFP and identified in the field by Patrick personnel using GPS coordinates. The approximate locations at each Site are shown on

the boring location sketches provided in Appendix A. The GPS coordinates of each test location are shown in Table 1.

One location (DI-5) at the Dresden Island Lock could not be sampled. At the sample location. no sediment was encountered at the lake bottom.

The investigation was performed under the direction of an experienced engineer. Soil samples were collected continuously using a piston sampler from each of the river bottoms. The soil samples were placed in jars and carefully transported to First Environmental Laboratories in Naperville, Illinois, for laboratory analysis. Results of the testing program are attached in Appendix B.

The testing (pesticides, PCBs and metals) was performed to obtain parameters that can be used to design a dredging program and to submit a permit application to the IEPA for dredging. The permit application will be completed by others.

RESULTS

The results of the tests were summarized and compared to the IEPA's Tiered Approach to Corrective Action Objectives (TACO) Tier 1 Soil Remediation Objectives. The summary of the results is attached in Tables 2 and 3 in Appendix B. A copy of the laboratory analytical results provided by First Environmental Laboratories is provided in Appendix C. At both sites, several metals, arsenic, chromium, lead and mercury were detected above the TACO Tier 1 standard concentrations. At the Brandon Road site, one PCB contaminant was determined to be above the detection limits; no pesticides were detected above the limits. At the Dresden Island location, no pesticides or PCBs were detected above the standard concentrations.

Thank you again for this opportunity. If you have any questions, please feel free to contact either of us at (630) 795-7200.

Sincerely,

PATRICK ENGINEERING INC.

Waun Edgell Dawn Edgell, P.E.

Project Manager

Bora Batúray, Ph.D., P.E.

Senior Geotechnical Engineer

de;smc

Enclosures:

Report (2 copies)

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Table 1 Brandon Road Lock and Dam Sample Coordinate Locations

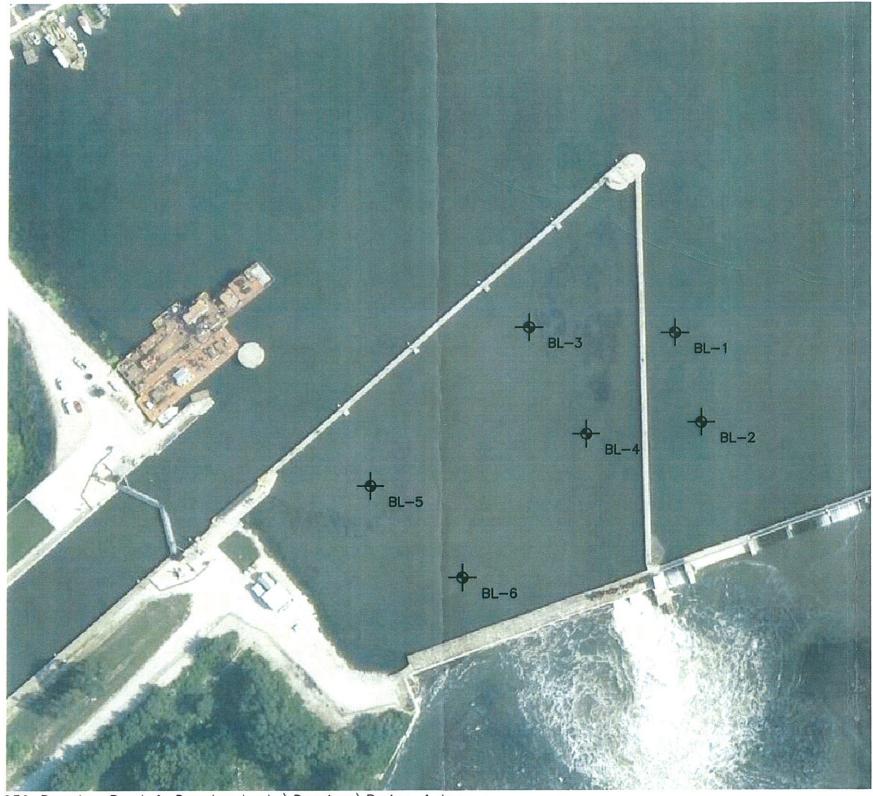
Sample ID	Latitude	Longitude
BL-1	41.50453	88.09967 W
BL-2	41.50425	88.09956 W
BL-3	41.50461	88.10036 W
BL-4	41.50422	88.10011 W
BL-5	41.50403	88.10114 W
BL-6	41.50372	88.10072 W

Table 2
Dresden Island Lock and Dam
Sample Coordinate Locations

Sample ID	Latitude	Longitude
DI-1	41.40128	88.28097 W
DI-2	41.40086	88.28097 W
DI-3	41.40067	88.28108 W
DI-4	41.40072	88.28056 W
DI-6	41.40080	88.28201 W

APPENDIX A BORING LOCATIONS





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PATRICK ENGINEERING INC.

4970 Varsity Drive TEL. (630) 795-7200
Lisle, Illinois 60532-4101 FAX (630) 724-1681
http://www.patrickengineering.com
PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000409

NORTHERN ILLINOIS HYDROPOWER BRANDON ROAD LOCK AND DAM

SEDIMENT COLLECTION AND POLLUTANT ANALYSIS
BORING LOCATION PLAN

DATE: 08-19-08

PROJ. NO.: 20802.059

APP. BY: DE





allprojects\Lisle\Kleinschmidt\20802.059 Brandon Road & Dresden Locks\Drawings\Boring-2.dwg

PATRICK ENGINEERING INC.

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http://www.patrickengineering.com
PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000409

NORTHERN ILLINOIS HYDROPOWER DRESDEN ISLAND LACK AND DAM

SEDIMENT COLLECTION AND POLLUTANT ANALYSIS
BORING LOCATION PLAN

DATE: 08-19-08

PROJ. NO.: 20802.059

APP. BY: DE

APPENDIX B
TEST RESULTS

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		1	Exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		BL-1 Aug. 4-'08 (mg/kg)
ENGINEERING INC.		dential	Industrial	/Commercial	Constuct	ion Worker	THE PARTY OF THE P	ponent of ter Ingestion	
	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Class I	Class II	(mg ng)
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES									
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS	2					1/2011/19/19	The section of		
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.08
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.08
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.08
Arocler 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	1.48
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.08
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.249
METALS		-							01842
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	21.4
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	416
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	68.4
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	660
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	533
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	47,700
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	633
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	591
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.88
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	205
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3,080
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	2.9
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	3,160

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram N.S. = No standard

Organophosphorous Pesticides									
Aceochlor									< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)		Teles Colo		and the second					< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									< 0.10
Total Solids (as %)									46.81
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									173
Total Volatile Solids (as %)		21							11.25
FOC (0.58 conversion) (as %)									5.28
Organic Matter @ 440 (as %)									9.1
Kjeldahl Nitrogen						-			3,230

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		1	Exposure Ro	ute-Specific Va	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.		dential	Industrial	/Commercial	Constucti	ion Worker	Soil Component of Groundwater Ingestion		BL-2 Aug. 4-'08 (mg/kg)
ANALUME	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	(110)
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES		11.0		11.0	***	11.0		-	
I,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
I,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
ilpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
lpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
amma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	<0.008
amma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
leptachlor	23	110	1	11	28	16	23	110	<0.032
deptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
CBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	1.81
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.346
METALS									
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	20
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	444
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	70.2
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	685
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	530
ron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	50,500
ead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	681
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	613
Mercury	23	10	610	16	61	0,1	N.S.	N.S.	1
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	199
otassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3,020
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	3
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	2,700

Notes:									
Highlighted items indicate a concentration	on exceeding TACO	Tier 1 standard	e e						
ng/kg = Concentration in milligrams per		Taca I Sumumic							
N.S. = No standard	Karogram								
Organophosphorous Pesticides									
Aceochlor									< 0.10
Alachlor (Lasso)							-		< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)		1-1-1							< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)						V			<0.10
Total Solids (as %)									47.19
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									190
Total Volatile Solids (as %)									11.8
FOC (0.58 conversion) (as %)									5.5
Organic Matter @ 440 (as %)									9.49
Kjeldahl Nitrogen									3,180

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		1	Exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.	Resi	dential	Industrial	/Commercial	Constuct	ion Worker	Soil Component of Groundwater Ingestion		BL-3 Aug. 5-'08 (mg/kg)
ANALYTE	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	(mg/ mg)
PESTICIDES									
4.4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4.4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4.4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0,6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	2.01
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
METALS									
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	19.7
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	395
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	68.1
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	668
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	511
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	45,300
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	602
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	557
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.71
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	214
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2,850
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	2.6
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	2,560

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram

Organophosphorous Pesticides									
Aceochlor									< 0.10
Alachlor (Lasso)						440			< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)			0						< 0.20
Metribuzin (Sencor, Lexone)									<0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									<0.10
Total Solids (as %)									47.81
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									173
Total Volatile Solids (as %)									11.92
FOC (0.58 conversion) (as %)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1								5.62
Organic Matter @ 440 (as %)						11111			9.7
Kjeldahl Nitrogen									2,550

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		1	Exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.	Resi	dential	Industrial	/Commercial	Constuct	ion Worker	Soil Component of Groundwater Ingestion		BL-4 Aug, 5-'08 (mg/kg)
	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Class I	Class II	(110,10)
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES									
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	1.61
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.329
METALS									
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	14.1
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	310
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	42.9
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	437
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	346
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	37,900
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	463
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	483
Mercury	23	10	610	16	61	0,1	N.S.	N.S.	1.06
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	134
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2,580
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	2.2
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	1,760

Notes:
Highlighted items indicate a concentration exceeding TACO Tier 1 standards.
mg/kg = Concentration in milligrams per kilogram
N S = No standard

N.S. = No standard									
Organophosphorous Pesticides									
Aceochlor									< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)				(ECHTHE)					< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									<0.10
Total Solids (as %)									48.31
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									81
Total Volatile Solids (as %)				***					11.25
FOC (0.58 conversion) (as %)									5.09
Organic Matter @ 440 (as %)									8.78
Kjeldahl Nitrogen									3,350

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		I	Exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.		dential	Industrial	/Commercial	Constuct	ion Worker	Soil Component of Groundwater Ingestion		BL-5 Aug. 5-'08 (mg/kg)
	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II	(mg/ ng)
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES		110	24	11.0	220	11.0		-	
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	<0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	<0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	<0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	<0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	2.74
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.497
METALS									
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	18.6
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	382
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	60.8
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	620
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	469
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	46,100
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	591
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	559
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	1.14
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	218
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2,430
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	2.3
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	2,320

Notes:									
Highlighted items indicate a concentration		Tier 1 standard	ls.						
mg/kg = Concentration in milligrams per	kilogram								
N.S. = No standard	-						_		
Organophosphorous Pesticides					-				
Aceochlor									<0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									< 0.10
Total Solids (as %)									49.93
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									191
Total Volatile Solids (as %)									11.7
FOC (0.58 conversion) (as %)						-			5.65
Organic Matter @ 440 (as %)									9.74
Kjeldahl Nitrogen									2,600

Table 3. Pesticides, PCBs, and Metals Analytical Results Brandon Road Lock and Dam Sediment Sampling Joliet, Illinois Patrick Project No. 20802.059

PATRICK		1	Exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.		dential	Industrial	/Commercial	Constucti	ion Worker	Soil Component of Groundwater Ingestion		BL-6 Aug. 4-'08 (mg/kg)
	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Class I	Class II	(ing ng)
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES	The state of the s								
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS		-					100		491000
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	i	N.S.	1	N.S.	N.S.	N.S.	2.82
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	î	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.591
METALS		11.00		14.05		14.00	19,55	17.62.	0.371
Arsenic	13	750	13	1,200	61	25000	N.S.	N.S.	22.6
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	466
Cadmium	78	1,800	2000	28,000	200	59,000	N.S.	N.S.	77.5
Chromium	230	270	6,100	420	4100	690	N.S.	N.S.	836
	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	567
Copper	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	48,600
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	724
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	574
	23	10	610	16	61	0.1	N.S.	N.S.	1.08
Mercury Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	179
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3,180
Selenium	390	N.S.	10,000	N.S.	1000	N.S.	N.S.	N.S.	3,180
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	2,940

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram

Organophosphorous Pesticides									
Aceochlor									<0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)		-							< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									<0.10
Total Solids (as %)									47.4
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									40
Total Volatile Solids (as %)									12.21
FOC (0.58 conversion) (as %)									5.25
Organic Matter @ 440 (as %)									9.05
Kjeldahl Nitrogen									4,790

Table 4. Pesticides, PCBs, and Metals Analytical Results Dresden Island Lock and Dam Sediment Sampling Channahon, Illinois Patrick Project No. 20802.059

PATRICK		F	exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	r 1)		
ENGINEERING INC.	Residential		Industrial/Commercial		Constuction Worker		Soil Component of Groundwater Ingestion		DI-1 Aug. 5-'08 (mg/kg)
	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Class I	Class II	
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES								-	
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.846
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.08
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.494
METALS									-
Arsenic	13	750	13	1,200	61	25,000	N.S.	N.S.	26.2
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	552
Cadmium	78	1,800	2,000	28.000	200	59,000	N.S.	N.S.	56
Chromium	230	270	6,100	420	4,100	690	N.S.	N.S.	478
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	407
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	48,000
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	482
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	619
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.75
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	109
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3,570
Selenium	390	N.S.	10,000	N.S.	1,000	N.S.	N.S.	N.S.	2.5
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	2,450

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram

N.S. = No standard									
Organophosphorous Pesticides									
Acetochlor									< 0.10
Alachlor (Lasso)		Land to be							< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)						and the			< 0.10
Pendimethaline (Prowl)									< 0.10
Frifluralin (Treflan)								Ver to the	<0.10
Total Solids (as %)									46.87
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									37.8
Total Volatile Solids (as %)									11.02
OC (0.58 conversion) (as %)									4.64
Organic Matter @ 440 (as %)									8
Kjeldahl Nitrogen									3,330

Table 4. Pesticides, PCBs, and Metals Analytical Results Dresden Island Lock and **Dam Sediment Sampling** Channahon, Illinois

Patrick Project No. 20802.059

PATRICK		I	exposure Ro	ute-Specific V	alues for Soi	ls (TACO Tie	er 1)		
ENGINEERING INC.	Resi	Residential I		ndustrial/Commercial		Constuction Worker		Soil Component of Groundwater Ingestion	
ANALYTE	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	(mg/kg)
PESTICIDES									
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	<0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	<0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	<0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	<0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	<0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	<0.320
Heptachlor	23	110	1	11	28	16	23	110	<0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS		11.01		11.01		11.01	100	700	40.520
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	0.176
METALS		13.02.		14.0.		14.5.	14.05.	14.5.	0.170
Arsenic	13	750	13	1,200	61	25,000	N.S.	N.S.	17.1
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	333
Cadmium	78	1,800	2,000	28,000	200	59,000	N.S.	N.S.	25.3
Chromium	230	270	6,100	420	4,100	690	N.S.	N.S.	219
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	207
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	41,200
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	235
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	601
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.83
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	65.2
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	3,460
Selenium	390	N.S.	10,000	N.S.	1,000	N.S.	N.S.	N.S.	1.5
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	990

Notes:									
Highlighted items indicate a concentration	on exceeding TACO	Tier 1 standard	s.						
ng/kg = Concentration in milligrams per									
N.S. = No standard									
Organophosphorous Pesticides									
Acetochlor							2		< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									< 0.10
Total Solids (as %)									43.26
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									580
Total Volatile Solids (as %)									10.69
FOC (0.58 conversion) (as %)									4.92
Organic Matter @ 440 (as %)									8.49
Kjeldahl Nitrogen									3,700

Table 4. Pesticides, PCBs, and Metals Analytical Results Dresden Island Lock and **Dam Sediment Sampling** Channahon, Illinois Patrick Project No. 20802.059

PATRICK	Exposure Route-Specific Values for Soils (TACO Tier 1)								
ENGINEERING INC.	Residential		Industrial/Commercial		Constuction Worker		Soil Component of Groundwater Ingestion		DI-3 Aug. 6-'08 (mg/kg)
	Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation	Class I	Class II	1
ANALYTE	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
PESTICIDES									
4,4-DDD	3	N.S.	24	N.S.	520	N.S.	16	80	< 0.064
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	54	270	< 0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100	32	160	< 0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	<0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS	1								
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
METALS		11.00		1101		11/6/	31.0.	11.55	40.100
Arsenic	13	750	13	1,200	61	25,000	N.S.	N.S.	18.4
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	381
Cadmium	78	1,800	2,000	28,000	200	59,000	N.S.	N.S.	35.1
Chromium	230	270	6,100	420	4,100	690	N.S.	N.S.	296
	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	252
Copper	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	36,000
Iron Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	288
	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	436
Manganese Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.74
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	69.8
TOTAL CONTRACTOR OF THE PARTY O				N.S.					
Potassium	N.S.	N.S.	N.S.		N.S.	N.S.	N.S.	N.S.	2,950
Selenium Zinc	23,000	N.S.	10,000 610,000	N.S.	1,000 61,000	N.S.	N.S.	N.S.	1.5

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram N.S. = No standard

Organophosphorous Pesticides									
Acetochlor									< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									<0.10
Total Solids (as %)									49.9
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									58.1
Total Volatile Solids (as %)									11.20
FOC (0.58 conversion) (as %)									4.99
Organic Matter @ 440 (as %)									8.60
Kjeldahl Nitrogen									4170

Table 4. Pesticides, PCBs, and Metals Analytical Results Dresden Island Lock and Dam Sediment Sampling Channahon, Illinois Patrick Project No. 20802.059

PATRICK		I	Exposure Ro	ute-Specific V	alues for Soi	ils (TACO Tie	er 1)		
ENGINEERING INC.	Residential		Industrial/Commercial		Constuction Worker			ponent of ter Ingestion	DI-4 Aug. 6-'08 (mg/kg)
ANALYTE	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	(mg ng)
PESTICIDES	(1115/115)	(mg/mg/	(mg/ng/	(mg/ng)	(mg/ng)	(mg/ng)	(mg/ng)	(mg/kg)	the state of the state of
4.4-DDD	3	N.S.	24	N.S.	520	N.S.	1/	80	-0.004
4,4-DDE	2	N.S.	17	N.S.	370	N.S.	16 54	80	<0.064
4,4-DDT	2	N.S.	17	1,500	100	2,100		270	<0.064
Aldrin	0.04		0.3				32	160	<0.064
		3		6.6	6	9.3	0.5	2.5	<0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	< 0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	< 0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
METALS									
Arsenic	13	750	13	1,200	61	25,000	N.S.	N.S.	16.8
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	243
Cadmium	78	1,800	2,000	28,000	200	59,000	N.S.	N.S.	19.6
Chromium	230	270	6,100	420	4,100	690	N.S.	N.S.	163
Copper	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	175
Iron	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	25,100
Lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	225
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	370
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.7
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	31.5
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	2,180
Selenium	390	N.S.	10,000	N.S.	1.000	N.S.	N.S.	N.S.	1
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	689

Notes: Highlighted items indicate a concentration exceeding TACO Tier 1 standards. mg/kg = Concentration in milligrams per kilogram N.S. = No standard

N.S NO Standard									
Organophosphorous Pesticides			_						
Acetochlor									< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)									< 0.10
Total Solids (as %)									51.38
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									20.6
Total Volatile Solids (as %)									6.21
FOC (0.58 conversion) (as %)						155 F 155 /			2.87
Organic Matter @ 440 (as %)									4.96
Kjeldahl Nitrogen									1880

Table 4. Pesticides, PCBs, and Metals Analytical Results Dresden Island Lock and Dam Sediment Sampling Channahon, Illinois

Patrick Project No. 20802.059

PATRICK		I	Exposure Ro	ute-Specific V	alues for Soi	ils (TACO Tie	er 1)		
ENGINEERING INC.	Residential		Industrial/Commercial		Constuction Worker		Soil Component of Groundwater Ingestion		DI-6 Aug. 6-'08 (mg/kg)
ANALYTE	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	(mg/mg)
PESTICIDES	(mg/ng/	(mg/mg/	(and ad)	(mg/ng)	(mg/ng/	(mg/ng)	(mg/ng)	(mg/ng)	
4,4-DDD	- 1	NC	24	MC	520	NIC	1/		-0.044
	3	N.S.	17	N.S.	520 370	N.S.	16	80	<0.064
4,4-DDE	2		17	1,500		N.S.	54	270	< 0.064
4,4-DDT		N.S.			100	2,100	32	160	<0.064
Aldrin	0.04	3	0.3	6.6	6	9.3	0.5	2.5	< 0.032
alpha-BHC	0.1	0.8	0.9	1.5	20	2.1	0.0005	0.003	<0.002
alpha-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Dieldrin	0.04	1	0.4	2.2	8	3.1	0.004	0.02	< 0.064
Endrin	23	N.S.	610	N.S.	61	N.S.	1	5	< 0.064
gamma-BHC	0.5	N.S.	4	N.S.	96	N.S.	0.009	0.047	<0.008
gamma-Chlordane	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	< 0.320
Heptachlor	23	110	1	11	28	16	23	110	< 0.032
Heptachlor epoxide	0.7	5	0.6	9.2	3	13	0.7	3.3	< 0.032
Methoxychlor	390	N.S.	10,000	N.S.	1,000	N.S.	160	780	< 0.320
PCBS									
Aroclor 1016	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1221	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	<0.080
Aroclor 1232	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1242	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1248	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.080
Aroclor 1254	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
Aroclor 1260	1	N.S.	1	N.S.	1	N.S.	N.S.	N.S.	< 0.160
METALS									
Arsenic	13	750	13	1,200	61	25,000	N.S.	N.S.	7.5
Barium	5,500	690,000	140,000	910,000	14,000	870,000	N.S.	N.S.	85.4
Cadmium	78	1,800	2,000	28,000	200	59,000	N.S.	N.S.	0.7
Chromium	230	270	6,100	420	4,100	690	N.S.	N.S.	19.1
Соррег	2,900	N.S.	82,000	N.S.	8,200	N.S.	N.S.	N.S.	36.4
ren	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	20,600
lead	400	N.S.	800	N.S.	700	N.S.	N.S.	N.S.	30.4
Manganese	1,600	69,000	41,000	91,000	4,100	8,700	N.S.	N.S.	571
Mercury	23	10	610	16	61	0.1	N.S.	N.S.	0.15
Nickel	1,600	13,000	41,000	21,000	4,100	440,000	N.S.	N.S.	19
Potassium	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	1,890
Selenium	390	N.S.	10,000	N.S.	1,000	N.S.	N.S.	N.S.	<0.2
Zinc	23,000	N.S.	610,000	N.S.	61,000	N.S.	N.S.	N.S.	101

Notes:
Highlighted items indicate a concentration exceeding TACO Tier 1 standards.

mg/kg = Concentration in milligrams per kilogram

N C = No standard

N.S. = No standard									
Organophosphorous Pesticides									
Acetochlor									< 0.10
Alachlor (Lasso)									< 0.040
Atrazine (Aatrex)	2,700	N.S.	72,000	N.S.	7,100	N.S.	0.066	0.33	< 0.060
Captan									< 0.10
Cyanazine (Bladex)									< 0.20
Metolachlor (Dual, Bicep)									< 0.20
Metribuzin (Sencor, Lexone)									< 0.10
Pendimethaline (Prowl)									< 0.10
Trifluralin (Treflan)		-							<0.10
Total Solids (as %)									74.21
Hexachlorobenzene	0.4	1	4	1.8	78	2.6	2	11	< 0.330
Phosphorus (as P)									5.7
Total Volatile Solids (as %)									4.35
FOC (0.58 conversion) (as %)								_	2.05
Organic Matter @ 440 (as %)									3.54
Kjeldahl Nitrogen									402

APPENDIX C
LABORATORY RESULTS



IL ELAP / NELAC Accreditation # 100292

1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

August 19, 2008

Mr. Marcin Gliszewski
PATRICK ENGINEERING
4970 Varsity Drive
Lisle, IL 60532

Project ID: 20802.059

First Environmental File ID: 8-3513 Date Received: August 07, 2008

Dear Mr. Marcin Gliszewski:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 002045: effective 05/14/08 through 02/28/09.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Stan Zaworski Project Manager



IL ELAP / NELAC Accreditation # 100292

1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Case Narrative

PATRICK ENGINEERING

Project ID:

20802.059

First Environmental File ID: 8-3513

Date Received: August 07, 2008

Flag	Description	Flag	Description
<	Analyte not detected at or above the reporting limit.	L+	LCS recovery outside control limits; high bias.
В	Analyte detected in associated method blank.	L-	LCS recovery outside control limits; low bias.
C	Identification confirmed by GC/MS.	M	MS recovery outside control limits; LCS acceptable.
D	Surrogates diluted out; recovery not available.	M+	MS recovery outside control limits high bias; LCS acceptable
E	Estimated result; concentration exceeds calibration range.	M-	MS recovery outside control limits low bias; LCS acceptable.
F	Field measurement.	N	Analyte is not part of our NELAC accreditation.
		ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.
G	Surrogate recovery outside control limits; matrix effect.	P	Chemical preservation pH adjusted in lab.
Н	Analysis or extraction holding time exceeded.	Q	The analyte was determined by a GC/MS database search.
J	Estimated result; concentration is less than calib range.	S	Analyte was sub-contracted to another laboratory for analysis.
K	RPD outside control limits.	T	Sample temperature upon receipt exceeded 0-6°C
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	w	Reporting limit elevated due to sample matrix.

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

Sample Batch Comments:

Sample acceptance criteria were met.

Method	Comments
TITCERIOR	Comments

Tizethou Commi		
Lab Number	Sample ID	Comments:
8-3513-001	BL-1	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-002	BL-2	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-003	BL-3	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-004	BL-4	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-005	BL-5	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-006	BL-6	Pesticides/PCBs The reporting limits are elevated due to matrix interference.



IL ELAP / NELAC Accreditation # 100292

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Case Narrative

PATRICK ENGINEERING

Project ID:

20802.059

First Environmental File ID: 8-3513
Date Received: August 07, 2008

Flag	Description	Flag	Description
<	Analyte not detected at or above the reporting limit.	L+	LCS recovery outside control limits; high bias.
В	Analyte detected in associated method blank.	L-	LCS recovery outside control limits; low bias.
C	Identification confirmed by GC/MS.	M	MS recovery outside control limits; LCS acceptable.
D	Surrogates diluted out; recovery not available.	M+	MS recovery outside control limits high bias; LCS acceptable
Е	Estimated result; concentration exceeds calibration range.	M-	MS recovery outside control limits low bias; LCS acceptable.
F	Field measurement.	N	Analyte is not part of our NELAC accreditation.
		ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.
G	Surrogate recovery outside control limits; matrix effect.	P	Chemical preservation pH adjusted in lab.
H	Analysis or extraction holding time exceeded.	Q	The analyte was determined by a GC/MS database search.
J	Estimated result; concentration is less than calib range.	S	Analyte was sub-contracted to another laboratory for analysis
K	RPD outside control limits.	T	Sample temperature upon receipt exceeded 0-6°C
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	w	Reporting limit elevated due to sample matrix.

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

8-3513-007	DI-1	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-008	DI-2	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-009	DI-3B	Pesticides/PCBs The reporting limits are elevated due to matrix interference.
8-3513-010	DI-4	Pesticides/PCBs The reporting limits are elevated due to matrix interference.



IL ELAP / NELAC Accreditation # 100292

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Analytical Report

Client:

PATRICK ENGINEERING

Project ID: 20802.059

Sample ID:

Sample No:

BL-1

8-3513-001

Date Collected: 08/04/08 Time Collected: 8:45

Date Received:

08/07/08

Date Reported:

08/19/08

Analyte		Result	R.L.	Units	Flag
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		46.01		0/	
Total Solius		46.81		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 3540 Date: 08/11/08	OC
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	8082		Method 3540 Date: 08/11/08	C
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		1,480	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		249	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
Cyanazine (Bladex)		< 200	200	ug/kg	NS
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

20802.059

Project ID: Sample ID:

BL-1

8-3513-001 Sample No: Results are reported on a dry weight basis. Date Collected: 08/04/08

Time Collected: 8:45 Date Received:

08/07/08

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Trifluralin (Treflan)	<	100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B Preparation Method 30 Preparation Date: 08/12/0				
Arsenic		21.4	0.2	mg/kg	
Barium		416	0.1	mg/kg	
Cadmium		68.4	0.1	mg/kg	
Chromium		660	0.1	mg/kg	
Copper		533	0.1	mg/kg	
Iron		47,700	1.0	mg/kg	
Lead		633	0.2	mg/kg	
Manganese		591	0.1	mg/kg	
Nickel		205	0.1	mg/kg	
Potassium		3,080	10	mg/kg	
Selenium		2.9	0.2	mg/kg	
Zinc		3,160	0.5	mg/kg	
Total Metals Analysis Date: 08/08/08	Method: 7470A				
Mercury		0.88	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B,l	E			
Phosphorus (as P)		173	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/07/08	Method: 2540G				
Total Volatile Solids		11.25	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/07/08	Method: D2974-00				
FOC (0.58 conversion factor)		5.28		%	N
Organic Matter @ 440°C		9.10		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.0				
Total Kjeldahl Nitrogen (TKN)		3,230	100	mg/kg	



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID:

20802.059

Sample ID:

BL-2

Sample No:

Cyanazine (Bladex)

Metolachlor (Dual, Bicep)

Pendimethaline (Prowl)

Metribuzin (Sencor, Lexone)

8-3513-002

Date Collected: 08/04/08

Time Collected: 11:30

Date Received: Date Reported: 08/19/08

08/07/08

Results are reported on a dry weight basis.

Analyte		Result	R.L.	Units	Flags
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		47.19		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 354 Date: 08/11/08	
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/	8082	Preparation I	Method 354 Date: 08/11/08	10C
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		1,810	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		346	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
a . m					31.0

< 200

< 200

< 100

< 100

200

200

100

100

ug/kg

ug/kg

ug/kg

ug/kg

NS

NS

NS

NS



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Analytical Report

Client: Project ID: PATRICK ENGINEERING

20802.059

Sample ID:

BL-2

Sample No:

8-3513-002

Date Collected: 08/04/08 Time Collected: 11:30

Date Received: 08/07/08

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Trifluralin (Treflan)		< 100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B Preparation Method 305 Preparation Date: 08/12/08				
Arsenic		20.0	0.2	mg/kg	
Barium		444	0.1	mg/kg	
Cadmium		70.2	0.1	mg/kg	
Chromium		685	0.1	mg/kg	
Copper		530	0.1	mg/kg	
Iron		50,500	1.0	mg/kg	
Lead		681	0.2	mg/kg	
Manganese		613	0.1	mg/kg	
Nickel		199	0.1	mg/kg	
Potassium		3,020	10	mg/kg	
Selenium		3.0	0.2	mg/kg	
Zinc		2,700	0.5	mg/kg	
Total Metals Analysis Date: 08/08/08	Method: 7470A				
Mercury		1.00	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B	,E			
Phosphorus (as P)		190	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/07/08	Method: 2540G				
Γotal Volatile Solids		11.80	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/07/08	Method: D2974-0	0			
FOC (0.58 conversion factor)		5.50		%	N
Organic Matter @ 440°C		9.49		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.	0			
Total Kjeldahl Nitrogen (TKN)		3,180	100	mg/kg	
otal Kjeldahl Nitrogen (TKN)		3,180	100	mg/kg	



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID: 20802.059

Sample ID:

BL-3

Sample No:

8-3513-003

Date Collected: 08/05/08 Time Collected: 8:15

Date Received: 08/07/08

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flag
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		47.81		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 35400 Date: 08/11/08	C
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	3082		Method 35400 Date: 08/11/08	2
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		2,010	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		< 160	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
lpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
trazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
yanazine (Bladex)		< 200	200	ug/kg	NS
fetolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected:

08/05/08

Project ID:

20802.059

Time Collected: 8:15

Sample ID: BL-3 Date Received:

08/07/08

Date Reported:

08/19/08

8-3513-003 Sample No: Results are reported on a dry weight basis.

Analyte Result R.L. Units Flags Organophosphorus Pesticides Method: 8141A Analysis Date: 08/19/08 NS Trifluralin (Treflan) < 100 100 ug/kg **Total Metals** Method: 6010B Preparation Method 3050B Analysis Date: 08/13/08 Preparation Date: 08/12/08 Arsenic 19.7 0.2 mg/kg Barium 395 0.1 mg/kg Cadmium 68.1 0.1 mg/kg Chromium 668 0.1 mg/kg 511 Copper 0.1 mg/kg Iron 45,300 1.0 mg/kg Lead 602 0.2 mg/kg Manganese 0.1 557 mg/kg Nickel 214 0.1 mg/kg Potassium 2,850 10 mg/kg Selenium 0.2 2.6 mg/kg Zinc 2,560 0.5 mg/kg **Total Metals** Method: 7470A Analysis Date: 08/08/08 Mercury 0.71 0.05 mg/kg Phosphorus (as P) Method: 4500P,B,E Analysis Date: 08/12/08 Phosphorus (as P) 173 0.5 mg/kg **Total Volatile Solids** Method: 2540G Analysis Date: 08/07/08 Total Volatile Solids 11.92 1.00 % FOC (0.58 conversion factor) Method: D2974-00 Analysis Date: 08/07/08 FOC (0.58 conversion factor) 5.62 % N Organic Matter @ 440°C 9.70 % N Total Kjeldahl Nitrogen (TKN) Method: 351.2R2.0 Analysis Date: 08/13/08 Total Kjeldahl Nitrogen (TKN) 100 2,550 mg/kg



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID:

20802.059

Sample ID:

BL-4

Sample No:

8-3513-004

Date Collected: 08/05/08

Time Collected: 7:45

Date Received: 08/07/08

Date Reported:

08/19/08

Results are reported on a dry weight	basis.				
Analyte		Result	R.L.	Units	Flag
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		48.31		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C	Method: 8270C Preparation Method 35400 Preparation Date: 08/11/08			
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/	8082		Method 354 Date: 08/11/08	
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		1,610	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		329	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
Cyanazine (Bladex)		< 200	200	ug/kg	NS
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID:

20802.059

Sample ID:

BL-4

Sample No:

8-3513-004

Date Collected: 08/05/08

Time Collected: 7:45

Date Received: 08/07/08

Date Reported: 08/19/08

Results are reported on a dry weight	basis.	Date Reported: 08/19				
Analyte		Result	R.L.	Units	Flags	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A					
Trifluralin (Treflan)		< 100	100	ug/kg	NS	
Total Metals Analysis Date: 08/13/08	Method: 6010B		Preparation Preparation	n Method 305 Date: 08/12/08	50B	
Arsenic		14.1	0.2	mg/kg		
Barium		310	0.1	mg/kg		
Cadmium		42.9	0.1	mg/kg		
Chromium		437	0.1	mg/kg		
Copper		346	0.1	mg/kg		
Iron		37,900	1.0	mg/kg		
Lead		463	0.2	mg/kg		
Manganese		483	0.1	mg/kg		
Nickel		134	0.1	mg/kg		
Potassium		2,580	10	mg/kg		
Selenium		2.2	0.2	mg/kg		
Zinc		1,760	0.5	mg/kg		
Total Metals Analysis Date: 08/08/08	Method: 7470A					
Mercury		1.06	0.05	mg/kg		
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B,	E				
Phosphorus (as P)		80.5	0.5	mg/kg		
Total Volatile Solids Analysis Date: 08/07/08	Method: 2540G					
Total Volatile Solids		11.25	1.00	%		
FOC (0.58 conversion factor) Analysis Date: 08/07/08	Method: D2974-00)				
FOC (0.58 conversion factor)		5.09		%	N	
Organic Matter @ 440°C		8.78		%	N	
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.0	0				
Total Kjeldahl Nitrogen (TKN)		3,350	100	mg/kg		
				0 0		



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID: 20802.059

Sample ID: BL-5

Sample No:

8-3513-005

Time Collected: 8:45 Date Received:

Date Collected: 08/05/08

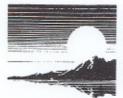
08/07/08

Date Reported:

08/19/08

Results are reported on a dry weight basis.

Analyte		Result	R.L.	Units	Flag
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		49.93		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 3540C Date: 08/11/08	:
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	8082		Method 3540C Date: 08/11/08	!
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		2,740	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		497	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
1,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
lpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
Cyanazine (Bladex)		< 200	200	ug/kg	NS
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



IL ELAP / NELAC Accreditation # 100292

1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/05/08

Project ID:

20802.059

Time Collected: 8:45

Sample ID:

BL-5

Date Received: 08/07/08

Sample No:

8-3513-005

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A			-	
Trifluralin (Treflan)		< 100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B	Method: 6010B Preparation Method 3050 Preparation Date: 08/12/08			
Arsenic		18.6	0.2	mg/kg	
Barium		382	0.1	mg/kg	
Cadmium		60.8	0.1	mg/kg	
Chromium		620	0.1	mg/kg	
Copper		469	0.1	mg/kg	
Iron		46,100	1.0	mg/kg	
Lead		591	0.2	mg/kg	
Manganese		559	0.1	mg/kg	
Nickel		218	0.1	mg/kg	
Potassium		2,430	10	mg/kg	
Selenium		2.3	0.2	mg/kg	
Zinc		2,320	0.5	mg/kg	
Total Metals Analysis Date: 08/08/08	Method: 7470A				
Mercury		1.14	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B	,E			
Phosphorus (as P)		191	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/07/08	Method: 2540G				
Total Volatile Solids		11.70	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/07/08	Method: D2974-0	0			
FOC (0.58 conversion factor)		5.65		%	N
Organic Matter @ 440°C		9.74		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.	0			
Total Kjeldahl Nitrogen (TKN)		2,600	100	mg/kg	



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Analytical Report

Client:

PATRICK ENGINEERING

20802.059

Project ID: Sample ID:

BL-6

Sample No:

8-3513-006

Time Collected: 13:15

Date Collected: 08/04/08

Date Received:

08/07/08

Date Reported:

08/19/08

Results are reported on a dry weight basis

Analyte		Result	R.L.	Units	Flag
Solids, total	Method: 2540B				-
Analysis Date: 08/07/08	Mariana 2070D				
Total Solids		47.40		%	
Semi-Volatile Compounds	Method: 8270C		Preparation	Method 3540C	,
Analysis Date: 08/13/08	natuou. ozive			Date: 08/11/08	
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs	Method: 8081A/	8082	Preparation	Method 3540C	
Analysis Date: 08/15/08				Date: 08/11/08	
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		2,820	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		591	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	N
Alachlor (Lasso)		< 40	40	ug/kg	N
Atrazine (Aatrex)		< 60	60	ug/kg	N
Captan		< 100	100	ug/kg	N:
Cyanazine (Bladex)		< 200	200	ug/kg	N
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/04/08

Project ID:

20802.059

Time Collected: 13:15

Sample ID:

BL-6

Date Received: 08/07/08

Sample No:

8-3513-006

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Trifluralin (Treflan)		< 100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B Preparation Method 3050E Preparation Date: 08/12/08				
Arsenic		22.6	0.2	mg/kg	
Barium		466	0.1	mg/kg	
Cadmium		77.5	0.1	mg/kg	
Chromium		836	0.1	mg/kg	
Copper		567	0.1	mg/kg	
Iron		48,600	1.0	mg/kg	
Lead		724	0.2	mg/kg	
Manganese		574	0.1	mg/kg	
Nickel		179	0.1	mg/kg	
Potassium		3,180	10	mg/kg	
Selenium		3.0	0.2	mg/kg	
Zinc		2,940	0.5	mg/kg	
Total Metals Analysis Date: 08/08/08	Method: 7470A				
Mercury		1.08	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B	,E			
Phosphorus (as P)		39.5	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/07/08	Method: 2540G				
Total Volatile Solids		12.21	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/07/08	Method: D2974-0	0			
FOC (0.58 conversion factor)		5.25		%	N
Organic Matter @ 440°C		9.05		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2	0			
Total Kjeldahl Nitrogen (TKN)		4,790	100	mg/kg	



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected:

08/05/08

Project ID:

20802.059

Time Collected: 12:15

12:15

Sample ID:

DI-1

Date Received:

08/07/08 08/19/08

Sample No:

Metolachlor (Dual, Bicep)

Pendimethaline (Prowl)

Metribuzin (Sencor, Lexone)

8-3513-007

Date Reported:

Results are reported on a dry weight basis.

Analyte		Result	R.L.	Units	Flags
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		46.87		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 3540 Date: 08/11/08	OC .
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/	8082		Method 3540 Date: 08/11/08	OC
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		846	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		494	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	. 16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
Cyanazine (Bladex)		< 200	200	ug/kg	NS
Marila 11 (D. 1 D')			200	48 48	

< 200

< 100

< 100

200

100

100

ug/kg

ug/kg

ug/kg

NS

NS

NS



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/05/08

Project ID:

20802.059

Time Collected: 12:15

Sample ID:

DI-1

Date Received: 08/07/08

Date Reported: 08/19/08

Sample No: 8-3513-007

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Trifluralin (Treflan)		< 100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B	I	Preparation	Method 305 Date: 08/12/08	50B
Arsenic		26.2	0.2	mg/kg	
Barium		552	0.1	mg/kg	
Cadmium		56.0	0.1	mg/kg	
Chromium		478	0.1	mg/kg	
Copper		407	0.1	mg/kg	
Iron		48,000	1.0	mg/kg	
Lead		482	0.2	mg/kg	
Manganese		619	0.1	mg/kg	
Nickel		109	0.1	mg/kg	
Potassium		3,570	10	mg/kg	
Selenium		2.5	0.2	mg/kg	
Zinc		2,450	0.5	mg/kg	
Total Metals Analysis Date: 08/08/08	Method: 7470A				
Mercury		0.75	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B	,E			
Phosphorus (as P)		37.8	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/08/08	Method: 2540G				
Total Volatile Solids		11.02	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/08/08	Method: D2974-0	0			
FOC (0.58 conversion factor)		4.64		%	N
Organic Matter @ 440°C		8.00		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.	0			
Total Kjeldahl Nitrogen (TKN)		3,330	100	mg/kg	



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID:

20802.059

Sample ID:

DI-2

Sample No:

8-3513-008

Date Collected: 08/05/08

Time Collected: 13:00

Date Received: 08/07/08

Date Reported: 08/19/08

Results are reported on a dry weight basis.						
Analyte		Result	R.L.	Units	Flag	
Solids, total Analysis Date: 08/07/08	Method: 2540B					
Total Solids		43.26		%		
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C		Preparation Method 3540C Preparation Date: 08/11/08			
Hexachlorobenzene		< 330	330	ug/kg		
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	8082		Method 354 Date: 08/11/08		
Aldrin		< 32.0	8.0	ug/kg		
Aroclor 1016		< 80.0	80.0	ug/kg		
Aroclor 1221		< 80.0	80.0	ug/kg		
Aroclor 1232		< 80.0	80.0	ug/kg		
Aroclor 1242		< 80.0	80.0	ug/kg		
Aroclor 1248		< 80.0	80.0	ug/kg		
Aroclor 1254		< 160	160	ug/kg		
Aroclor 1260		176	160	ug/kg		
alpha-BHC		< 2.0	2.0	ug/kg		
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg		
gamma-Chlordane		< 320	80.0	ug/kg		
4,4'-DDD		< 64.0	16.0	ug/kg		
4,4'-DDE		< 64.0	16.0	ug/kg		
4,4'-DDT		< 64.0	16.0	ug/kg		
Dieldrin		< 64.0	16.0	ug/kg		
Endrin		< 64.0	16.0	ug/kg		
Heptachlor		< 32.0	8.0	ug/kg		
Heptachlor epoxide		< 32.0	8.0	ug/kg		
Methoxychlor		< 320	80.0	ug/kg		
alpha-Chlordane		< 320	80.0	ug/kg		
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A					
Acetochlor		< 100	100	ug/kg	NS	
Alachlor (Lasso)		< 40	40	ug/kg	NS	
Atrazine (Aatrex)		< 60	60	ug/kg	NS	
Captan		< 100	100	ug/kg	NS	
Cyanazine (Bladex)		< 200	200	ug/kg	NS	
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS	
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS	
Pendimethaline (Prowl)		< 100	100	ug/kg	NS	



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Analytical Report

Client:

PATRICK ENGINEERING

20802.059

Project ID: Sample ID:

DI-2

Trifluralin (Treflan)

Sample No: 8-3513-008 Results are reported on a dry weight basis. Date Collected: 08/05/08

Time Collected: 13:00

Units

Date Received: Date Reported:

08/07/08 08/19/08

Analyte Organophosphorus Pesticides

Analysis Date: 08/19/08

< 100

Result

100 ug/kg

R.L.

NS

Flags

Total Metals Method: 6010B Preparation Method 3050B Analysis Date: 08/13/08 Preparation Date: 08/12/08 Arsenic 17.1 0.2 mg/kg 333 Barium 0.1 mg/kg Cadmium 25.3 0.1mg/kg Chromium 219 0.1 mg/kg 207 Copper 0.1 mg/kg Iron 41,200 1.0 mg/kg 235 Lead 0.2 mg/kg 601 0.1 Manganese mg/kg Nickel 65.2 0.1 mg/kg Potassium 3,460 10 mg/kg Selenium 1.5 0.2 mg/kg 990 0.5 Zinc mg/kg

Method: 8141A

Total Metals

Analysis Date: 08/08/08

Mercury

Phosphorus (as P)

Method: 4500P,B,E

Method: 7470A

Analysis Date: 08/12/08

Phosphorus (as P)

Method: 2540G

0.83

10.69

4.92

8.49

3,700

580 0.5 mg/kg

0.05

Total Volatile Solids Analysis Date: 08/08/08

Total Volatile Solids

1.00 %

FOC (0.58 conversion factor) Analysis Date: 08/08/08

FOC (0.58 conversion factor)

Method: D2974-00

mg/kg

N % N %

Total Kjeldahl Nitrogen (TKN)

Total Kjeldahl Nitrogen (TKN)

Analysis Date: 08/13/08

Organic Matter @ 440°C

Method: 351.2R2.0

100

mg/kg



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID:

20802.059

Sample ID:

DI-3B

Sample No:

8-3513-009

Date Collected: 08/06/08

Time Collected: 10:45

Date Received: Date Reported:

08/07/08 08/19/08

Results	are	reported	on	a	dry	weight	basis.

Analyte		Result	R.L.	Units	Flag
Solids, total	Method: 2540B				
Analysis Date: 08/07/08					
Total Solids		49.90		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C		Preparation Preparation	Method 354 Date: 08/11/08	0C
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	8082		Method 354 Date: 08/11/08	
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		< 80.0	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		< 160	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	N S
Cyanazine (Bladex)		< 200	200	ug/kg	N S
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	N S
Metribuzin (Sencor, Lexone)		< 100	100	ug/kg	NS
Pendimethaline (Prowl)		< 100	100	ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/06/08

Project ID:

20802.059

Time Collected: 10:45

Sample ID:

DI-3B

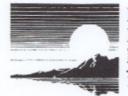
Date Received: 08/07/08

Sample No:

8-3513-009

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags		
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A						
Trifluralin (Treflan)		< 100	100	ug/kg	NS		
Total Metals Analysis Date: 08/13/08	Method: 6010B	Method: 6010B Preparation Method 3050B Preparation Date: 08/12/08					
Arsenic		18.4	0.2	mg/kg			
Barium		381	0.1	mg/kg			
Cadmium		35.1	0.1	mg/kg			
Chromium		296	0.1	mg/kg			
Copper		252	0.1	mg/kg			
Iron		36,000	1.0	mg/kg			
Lead		288	0.2	mg/kg			
Manganese		436	0.1	mg/kg			
Nickel		69.8	0.1	mg/kg			
Potassium		2,950	10	mg/kg			
Selenium		1.5	0.2	mg/kg			
Zinc		1,660	0.5	mg/kg			
Total Metals Analysis Date: 08/08/08	Method: 7470A						
Mercury		0.74	0.05	mg/kg			
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,B	,E					
Phosphorus (as P)		58.1	0.5	mg/kg			
Total Volatile Solids Analysis Date: 08/08/08	Method: 2540G						
Total Volatile Solids		11.20	1.00	%			
FOC (0.58 conversion factor) Analysis Date: 08/08/08	Method: D2974-0	0					
FOC (0.58 conversion factor)		4.99		%	N		
Organic Matter @ 440°C		8.60		%	N		
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2.	.0					
Total Kjeldahl Nitrogen (TKN)		4,170	100	mg/kg			



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/06/08

Project ID:

20802.059

Time Collected: 11:15

Sample ID:

DI-4

Metribuzin (Sencor, Lexone)

Pendimethaline (Prowl)

Date Received: 08/07/08

Sample No:

8-3513-010

Date Reported: 08/19/08

Results are reported on a dry weight basis.

Analyte		Result	R.L.	Units	Flags
Solids, total Analysis Date: 08/07/08	Method: 2540B				
Total Solids		51.38		%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C			Method 3540 Date: 08/11/08	С
Hexachlorobenzene		< 330	330	ug/kg	
Pesticides/PCBs Analysis Date: 08/15/08	Method: 8081A/8	3082		Method 3540 Date: 08/11/08	С
Aldrin		< 32.0	8.0	ug/kg	
Aroclor 1016		< 80.0	80.0	ug/kg	
Aroclor 1221		< 80.0	80.0	ug/kg	
Aroclor 1232		< 80.0	80.0	ug/kg	
Aroclor 1242		< 80.0	80.0	ug/kg	
Aroclor 1248		< 80.0	80.0	ug/kg	
Aroclor 1254		< 160	160	ug/kg	
Aroclor 1260		< 160	160	ug/kg	
alpha-BHC		< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)		< 8.0	8.0	ug/kg	
gamma-Chlordane		< 320	80.0	ug/kg	
4,4'-DDD		< 64.0	16.0	ug/kg	
4,4'-DDE		< 64.0	16.0	ug/kg	
4,4'-DDT		< 64.0	16.0	ug/kg	
Dieldrin		< 64.0	16.0	ug/kg	
Endrin		< 64.0	16.0	ug/kg	
Heptachlor		< 32.0	8.0	ug/kg	
Heptachlor epoxide		< 32.0	8.0	ug/kg	
Methoxychlor		< 320	80.0	ug/kg	
alpha-Chlordane		< 320	80.0	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Acetochlor		< 100	100	ug/kg	NS
Alachlor (Lasso)		< 40	40	ug/kg	NS
Atrazine (Aatrex)		< 60	60	ug/kg	NS
Captan		< 100	100	ug/kg	NS
Cyanazine (Bladex)		< 200	200	ug/kg	NS
Metolachlor (Dual, Bicep)		< 200	200	ug/kg	NS
Matiliania (Caraca Tarras)		- 100	100		31.0

< 100

< 100

100

100

ug/kg

ug/kg

NS

NS



IL ELAP / NELAC Accreditation # 100292

1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: Project ID: PATRICK ENGINEERING

20802.059

Sample ID:

DI-4

Sample No:

8-3513-010

Date Collected: 08/06/08

Time Collected: 11:15 Date Received: 08/07/08

Date Reported: 08/19/08

Analyte		Result	R.L.	Units	Flags	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A					
Trifluralin (Treflan)		< 100	100	ug/kg	NS	
Total Metals Analysis Date: 08/13/08	Method: 6010B					
Arsenic		16.8	0.2	mg/kg		
Barium		243	0.1	mg/kg		
Cadmium		19.6	0.1	mg/kg		
Chromium		163	0.1	mg/kg		
Copper		175	0.1	mg/kg		
Iron		25,100	1.0	mg/kg		
Lead		224	0.2	mg/kg		
Manganese		370	0.1	mg/kg		
Nickel		31.5	0.1	mg/kg		
Potassium		2,180	10	mg/kg		
Selenium		1.0	0.2	mg/kg		
Zinc		689	0.5	mg/kg		
Total Metals Analysis Date: 08/08/08	Method: 7470A					
Mercury		0.70	0.05	mg/kg		
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,E	3,E				
Phosphorus (as P)		20.6	0.5	mg/kg		
Total Volatile Solids Analysis Date: 08/08/08	Method: 2540G					
Total Volatile Solids		6.21	1.00	%		
FOC (0.58 conversion factor) Analysis Date: 08/08/08	Method: D2974-0	0				
FOC (0.58 conversion factor)		2.87		%	N	
Organic Matter @ 440°C		4.96		%	N	
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2	.0				
Total Kjeldahl Nitrogen (TKN)		1,880	100	mg/kg		
			12.7327			



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Analytical Report

Client:

PATRICK ENGINEERING

Project ID: 20802.059

Sample ID: DI-6

Sample No:

8-3513-011

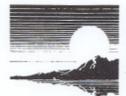
Date Collected: 08/06/08

Time Collected: 13:00

Date Received: 08/07/08

Date Reported: 08/19/08

Results are reported on a dry weight	basis.			
Analyte	Re	sult R.L.	Units	Flag
Solids, total Analysis Date: 08/07/08	Method: 2540B			
Total Solids	74	.21	%	
Semi-Volatile Compounds Analysis Date: 08/13/08	Method: 8270C		Method 354 Date: 08/11/08	
Hexachlorobenzene	< 33	0.70	ug/kg	
Pesticides/PCBs Analysis Date: 08/16/08	Method: 8081A/8082		Method 354 Date: 08/11/08	
Aldrin	< 8.0		ug/kg	
Aroclor 1016	< 80	.0 80.0	ug/kg	
Aroclor 1221	< 80	.0 80.0	ug/kg	
Aroclor 1232	< 80	.0 80.0	ug/kg	
Aroclor 1242	< 80	.0 80.0	ug/kg	
Aroclor 1248	< 80	.0 80.0	ug/kg	
Aroclor 1254	< 16		ug/kg	
Aroclor 1260	< 16	0 160	ug/kg	
alpha-BHC	< 2.0	2.0	ug/kg	
gamma-BHC (Lindane)	< 8.0	8.0	ug/kg	
gamma-Chlordane	< 80	.0 80.0	ug/kg	
4,4'-DDD	< 16	.0 16.0	ug/kg	
4,4'-DDE	< 16.	0 16.0	ug/kg	
4,4'-DDT	< 16.	0 16.0	ug/kg	
Dieldrin	< 16.	0 16.0	ug/kg	
Endrin	< 16.	0 16.0	ug/kg	
Heptachlor	< 8.0	8.0	ug/kg	
Heptachlor epoxide	< 8.0	8.0	ug/kg	
Methoxychlor	< 80.	0 80.0	ug/kg	
lpha-Chlordane	< 80.	0.08	ug/kg	
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A			
Acetochlor	< 100	100	ug/kg	NS
Alachlor (Lasso)	< 40	40	ug/kg	NS
Atrazine (Aatrex)	< 60	60	ug/kg	NS
Captan	< 100		ug/kg	NS
Cyanazine (Bladex)	< 200		ug/kg	NS
Metolachlor (Dual, Bicep)	< 200		ug/kg	NS
Metribuzin (Sencor, Lexone)	< 100		ug/kg	NS
endimethaline (Prowl)	< 100		ug/kg	NS



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Analytical Report

Client:

PATRICK ENGINEERING

Date Collected: 08/06/08

Project ID:

20802.059

Time Collected: 13:00

Sample ID:

DI-6

Date Received: 08/07/08

Sample No:

8-3513-011

Date Reported: 08/19/08

Results are reported on a dry weight basis.

Analyte		Result	R.L.	Units	Flags
Organophosphorus Pesticides Analysis Date: 08/19/08	Method: 8141A				
Trifluralin (Treflan)		< 100	100	ug/kg	NS
Total Metals Analysis Date: 08/13/08	Method: 6010B			Method 305 Date: 08/12/08	
Arsenic		7.5	0.2	mg/kg	
Barium		85.4	0.1	mg/kg	
Cadmium		0.7	0.1	mg/kg	
Chromium		19.1	0.1	mg/kg	
Copper		36.4	0.1	mg/kg	
Iron		20,600	1.0	mg/kg	
Lead		30.4	0.2	mg/kg	
Manganese		571	0.1	mg/kg	
Nickel		19.0	0.1	mg/kg	
Potassium		1,890	10	mg/kg	
Selenium		< 0.2	0.2	mg/kg	
Zinc		101	0.5	mg/kg	
Total Metals Analysis Date: 08/12/08	Method: 7470A				
Mercury		0.15	0.05	mg/kg	
Phosphorus (as P) Analysis Date: 08/12/08	Method: 4500P,E	3,E			
Phosphorus (as P)		5.7	0.5	mg/kg	
Total Volatile Solids Analysis Date: 08/08/08	Method: 2540G				
Total Volatile Solids		4.35	1.00	%	
FOC (0.58 conversion factor) Analysis Date: 08/08/08	Method: D2974-0	00			
FOC (0.58 conversion factor)		2.05		%	N
Organic Matter @ 440°C		3.54		%	N
Total Kjeldahl Nitrogen (TKN) Analysis Date: 08/13/08	Method: 351.2R2	.0			
Total Kjeldahl Nitrogen (TKN)		402	100	mg/kg	

First Environmental Laboratories, Inc.

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Page___ of ___ pgs

Environmental Laboratories, Inc.			Compa	any Name	Pat	rick	En	gin	eerina Drive	Inc.	×, *
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Naperville, Illinois 60563						73435					1 Dateick
Phone: (630) 778-1200 • Fax: (630) 778-1233			Phone:	650-	795-	2001	ix:	- b:	Via: Fax		e-mail engineering
E-mail: firstinfo@firstenv.com			Sampl	ed By:			iszew:	5/1	via. Pax		e-man
IEPA Certification #100292			Jampi	Lu Dy.	SOM	- Carlotte					
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BL-1 8/4/08 10W	8:45	4									8-3513-001
BL-2 18/4/08	11:30	1								****	002
BL-3 8/5/08 8:15	11.70										003
RL-4 8/5/08 7:49	5				1						004
	5		-								OUT
3L-6 8/4/08 8:49	5										<i>α</i> 06
NI-1 8/5/08 17:	15										007
DI-2 8/5/08 13:0											008
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FOR LAB USE ONLY:											
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4.0 PROPOSED METHODOLOGY

This study has two distinct components: (1) a sediment collection and pollutant analysis, and (2) a bathymetry survey. Each component of the study will be evaluated at both the Brandon Road and Dresden Island developments. This study plan discusses both of these components in additional detail below.

4.1 Sediment Collection and Analysis

Sediment samples will be collected at six sites at each development (twelve samples total) for submission to a certified laboratory for chemical and pollutant analysis. Analytical results for each constituent must be compared to current state and/or federal EPA standards, if identified, and a determination must be made as to whether the constituent meets or exceeds identified thresholds. Samples will be collected from substrates with a grain size smaller than sand (0.0625 mm). Table 4.1 depicts analytes that may require analysis for all samples. This list may change depending on subsequent agency consultation. Patrick Engineering Inc. 20802.059

Table 4.1 Target Analytes

Analyte Name

Acetochlor A

Alachlor

Aldrin

Arsenic

Atrazine

Barium

BHC-alpha

BHC-gamma (Lindane)

Cadmium

Captan

Carbon, organic (TOC)

Chlordane, cis

Chlordane, gamma

Chromium

Copper

Cyanazine

DDD, p,p'-

DDE, p,p'-

DDT, p,p'-

Dieldrin

Endrin

Heptachlor

Heptachlor epoxide

Hexachlorobenzene

Iron

Lead

Manganese

Mercury

Methoxychlor

Metolachlor

Metribuzin

Nickel

Nitrogen, Kjeldahl

PCBS, Polychlorinated Biphenyls,

(Unspecified Mix)

Pendimethalin

Phosphorus as P

Potassium

Selenium

Solids, Fixed

Solids, Volatile

V Trefluralin

V Zinc

The location of each sediment sample will be recorded using GPS. At Dresden Island, if substrate composition (*i.e.*, size) is appropriate, two sediment samples will be collected downstream of the dam, one of which must specifically be within the area identified as the footprint for the proposed new powerhouse. At Brandon Road, two samples will be outside the existing skimmer wall, with the remaining four samples to be contained within the confines of the skimmer wall, dam, and guide wall (Appendix B). The approximate location of sediment sample locations for both sites is given in Appendix B, although their precise location will be left to the discretion of the Consultant based on circumstances encountered in the field. All samples must be contained within the identified Survey Area(s) as shown on Appendix B.

Final Report: Characterization of Unionid Communities Downstream of Two Lock and Dams on the Illinois River

Prepared for:

Kleinschmidt Associates

Pittsfield, ME

Prepared by:

Ecological Specialists, Inc.

O'Fallon, Missouri

November 2008

(ESI Project No. 08-015)

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Acknowledgements

This project was funded by Northern Illinois Hydropower. Mr. Nicholas Morgan coordinated the project for Kleinschmidt Associates. Mr. Eric Belt directed the project and was field team leader and primary author of the report for Ecological Specialists, Inc. (ESI). Mr. Kendall Cranney (ESI) was the dive team supervisor; Mr. Nathan Badgett (ESI) and Mr. Nathan Wurmb provided diving and field assistance.

1.0 Introduction

Northern Illinois Hydropower (NIH) plans to develop hydroelectric capacity on the existing Brandon Road Lock and Dam Project and the Dresden Island Lock and Dam Project on the Des Plaines River and Illinois River in Will County and Grundy County, Illinois (Figure 1-1). Installation of hydropower facilities may require dredging activity. This activity has the potential for directly impacting unionids within the dredge area and displacing sediment to downstream reaches of the river where unionid (freshwater mussel) beds likely occur. Hydropower operation can also change river hydraulics, which can change substrate, current velocity, and depths and potentially influence unionid distribution.

North America's unionid fauna is the most diverse in the world, and consists of nearly 300 nominal species (Turgeon *et al.*, 1988; Williams *et al.*, 1993). This diverse group of sedentary filter feeding animals is an important ecological component of benthic communities in many riverine systems, including the Mississippi River; however, pollution and modification of riverine systems has resulted in the decline of many unionid species. Over 10% of North American unionid species are already presumed to be extinct (McMahon and Bogan, 2001) and approximately one-third of the species in North America are listed or are proposed for listing on the Federal List of Endangered and Threatened Wildlife and Plants. Factors that appear to be contributing to the decline of unionids in the Mississippi River include damming, dredging, siltation of backwater areas, navigation, floodplain development, commercial harvest, and zebra mussel infestation (Tucker and Theiling, 1999).

The Illinois River once harbored a diverse freshwater mussel fauna of approximately 49 species, including two federally endangered species *Lampsilis higginsii* and *Potamilus capax* (Whitney *et al.*, 1997; Table 1-1). However, the unionid fauna declined sharply after opening of the Chicago Sanitary and Ship Canal in the early 1900's. By the late 1960's Starrett (1971) concluded that more than half of the unionid species had been extirpated, and did not observe live unionids within the reach from Starved Rock Dam to the confluence of the Des Plaines and Kankakee Rivers. However, during the past decade, drastic improvement of Illinois River water quality has coincided with an improvement of the general aquatic community, including the return of unionid species once listed as extirpated (Whitney *et al.*, 1997; Sietman *et al.*, 2001).

The Illinois Department of Natural Resources has expressed concern regarding potential effects to unionid species found near the proposed hydropower development at the Dresden Island Lock and Dam and Brandon Road Lock and Dam. Pre-Application Documents developed by NIH for both projects identified potential issues associated with unionid species and habitats for which the existing, relevant, and reasonably available information was insufficient to address. This study's goal is to provide the information necessary to assess the potential effects of the construction and operation of the projects on unionid species within the proposed tailraces and in areas extending 0.5 miles to below the Dresden Island and Brandon Road Dams.

The objectives of this study were to identify existing unionid species and relative abundance, qualitatively evaluate the habitat potentially affected during construction and operation, and analyze the potential effects construction and operation of the hydropower facilities may have on unionid communities and their present habitat. Fieldwork was conducted 29-30 September 2008.

2.0 Methods

2.1 Brandon Road

The shoreline, islands, and accessible wadable areas within the Brandon Road project survey area were searched for indications (dead unionid shells or middens) of unionid presence (Figure 2-1). Habitat, depth (from depthfinder), flow (Marsh McBirney Flowmate 2000), and GPS coordinates (Trimble GeoXT with sub-meter accuracy) were recorded throughout the survey area. Unionid shells collected were identified to species and recorded as freshly dead unionids (with or without meat, nacre lustrous, valves still intact, periostracum present; animal likely dead less than one year); weathered dead shells (no meat, nacre chalky, valves may or may not be intact, periostracum present; animal probably dead more than one year) or subfossil (entire shell chalky, valves not intact, no periostracum; animal dead from several years to centuries). The areas indicated on Figure 2-1 were searched for approximately 6 person-hours.

2.2 Dresden Island

Sampling methods included semi-quantitative transects, qualitative timed dives, riverbank searches, and habitat characterization to assess unionid habitat suitability and estimate unionid distribution and species richness in the study area. Qualitative sampling was conducted in areas where unionid concentration appeared higher. No federally or state listed species were collected therefore quantitative sampling was not required. Sampling was not possible within the restricted zone due to high current velocities that created hazardous navigating and diving conditions.

The objective of semi-quantitative sampling is to determine unionid distribution. Four 100m transect lines were established parallel with the current approximately 100m apart along the right descending bank (Figure 2-2). In addition, four 50m transects were established along the right descending bank of Dresden Island. Lines were marked at 10m intervals. A diver visually and tactually searched for unionids in each 10m transect interval for 2 to 4 min (depending on river conditions). Collected unionids were brought to the surface, identified to species and counted. Up to 25 individuals of each species were also measured (length in mm) and aged (external annuli count). Unionids were returned to the river following processing. The riverbanks along the right descending bank and the right descending side of Dresden Island were searched for unionid shells.

The objective of qualitative sampling is to estimate species richness. The effort required to find protected species is often considerable and they are rarely collected by brailing or in quantitative samples (Kovalak et al., 1986). Therefore, qualitative samples were used to estimate the species composition of the community and estimate the probability of endangered species. Unionids were collected during timed searches (5 to 10min) in areas with high unionid density. Two 10min samples were conducted along the right descending bank, two along the right descending bank of Dresden Island, and one 5min sample at the downstream, left descending side of the island.

Substrate and depth were recorded for each 10m interval; water temperature, dissolved oxygen (DO), and flow were measured within the study area. The diver visually characterized substrate.

3.0 Results

3.1 Brandon Road

No live unionids were observed at the Brandon Road survey area and the habitat was not suitable for unionids. Substrate consisted mostly of gravel and cobble with little sand and silt throughout the survey area Only weathered shells of three common species were identified (*Lampsilis siliquoidea*, *Pyganodon grandis*, and *Utterbackia imbecillis*). Depths ranged from 0.3-1.0m and flow was 0.23ft/sec.

3.2 Dresden Island

Although no federally or state listed species were observed, 206 live unionids representing 14 species were collected (Table 3-1). Four species (*Actinonaias ligamentina* [11.3%], *Amblema plicata* [50.7%], *Quadrula p. pustulosa* [7.9%], and *Quadrula quadrula* [14.3%]) comprised over 80% of the individuals collected. *Lampsilis cardium, Lasmigona c. complanata, Lasmigona costata, Leptodea fragilis, Megalonaias nervosa, Obliquaria reflexa, Potamilus alatus, P. grandis, Toxolasma parvus*, and *Truncilla truncata* made up less than 5% each of the total live unionids (see Table 3-1).

Habitat was relatively consistent along the right descending bank and varied along the right descending side of Dresden Island, likely affected by hydraulics. Substrate along transects 1 to 4 consisted of cobble, gravel, and sand with occasional boulder (Table 3-2). Depths along transects 1 to 4 consistently increased from the bank (0.9-1.8m) to 100m riverward (2.7-3.0m). Depths along transects 5 to 8 also increased consistently from the bank (0.3-0.9m) to 50m riverward (2.1-3.0m), however substrate varied. The areas from 0-10m along transect 5 and 0-50m along transect 6 appeared to be protected from the higher flows typical within the rest of the survey area, therefore silt could accumulate in the substrate. Substrate along transects 7 and 8 was mostly gravel and sand with some cobble at transect 7 (see Table 3-2).

Two areas appeared to harbor aggregations of unionids in the upstream half of the sample site, while few were found downstream: an area along the right descending bank within 0-50m of the bank at transects 1 and 2 and an area along the right descending bank of Dresden Island 20-40m from the bank near transects 5 and 6. These locations were targeted for qualitative samples. Qualitative samples near the island yielded 41 live unionids and 67 live were collected along the right descending bank (Table 3-4). A qualitative sample was also conducted at the foot of the island, however unionid habitat was poor (mostly silt) and no live unionids were collected.

4.0 Discussion

4.1 Brandon Road

Construction activities for the Brandon Road project are unlikely to affect the unionid community within the Illinois River. It is unlikely a significant unionid community inhabits the area surveyed downstream of the Brandon Road Lock and Dam. No live unionids were observed and only weathered shells of three common species were collected. These shells may have drifted down from an upstream community.

4.2 Dresden Island

No federal or state listed species were observed during this survey and therefore are unlikely to be affected by the Dresden Island project, however, a unionid community does exist within the survey area and potential impact area. High current velocities were observed within the center of the survey area between Dresden Island and the right descending bank. Unionid aggregates occur in areas with slower current velocity and were absent from the center of the channel where current velocity was highest. During hydropower generation times, flow will be diverted from spilling over the dam to the facility proposed to be constructed nearer the right descending bank. This may potentially affect flow velocities along the right descending bank and consequently may affect unionid habitat. Unionids may also be affected by changes in sediment deposition patterns.

5.0 Literature Cited

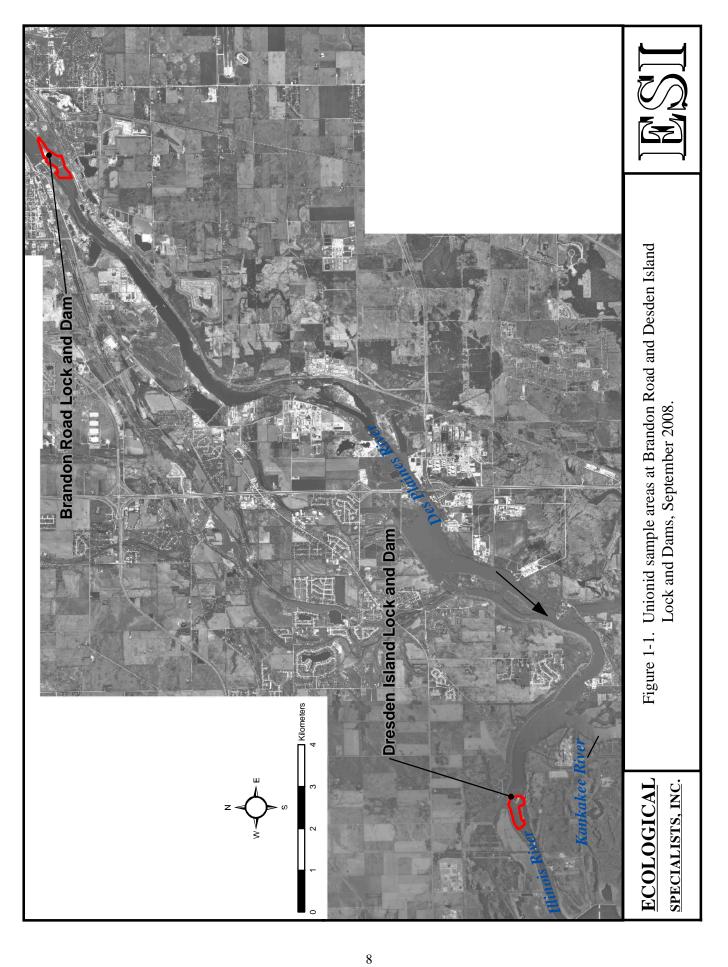
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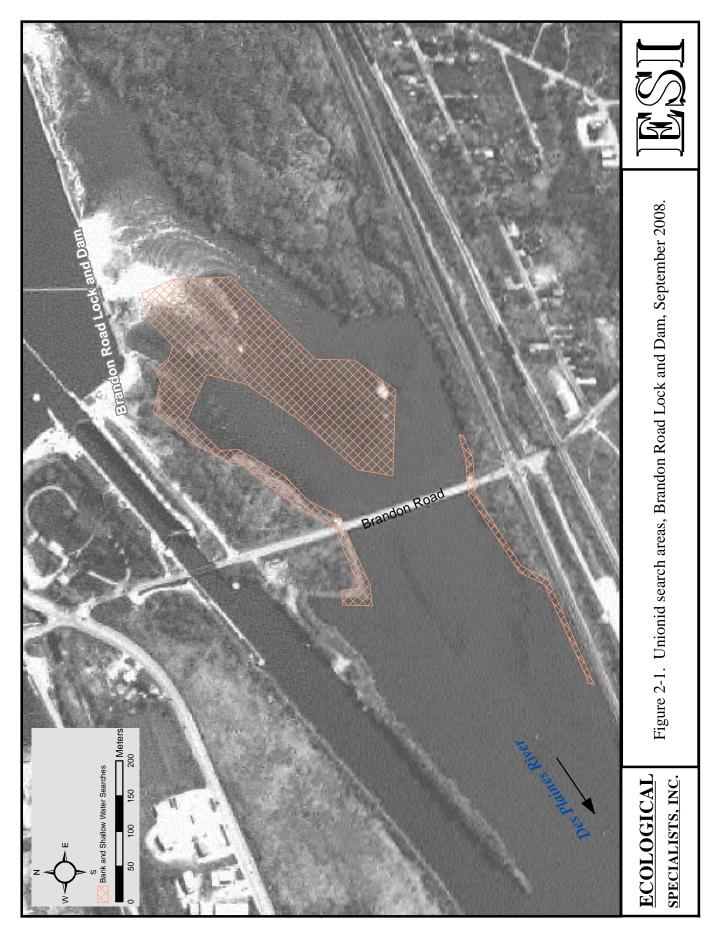
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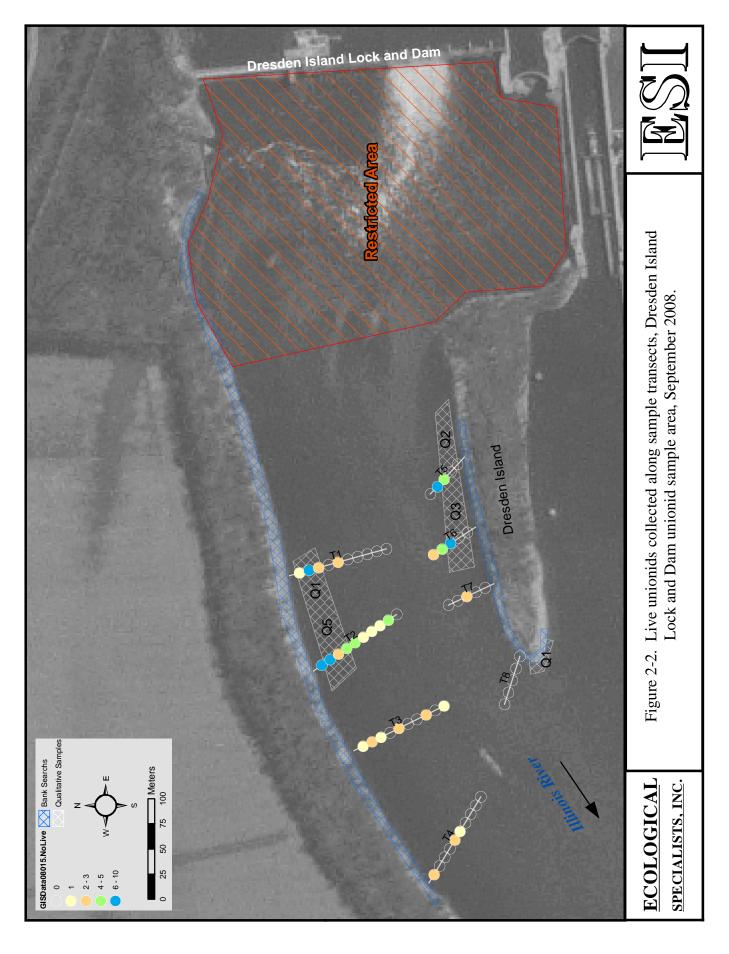
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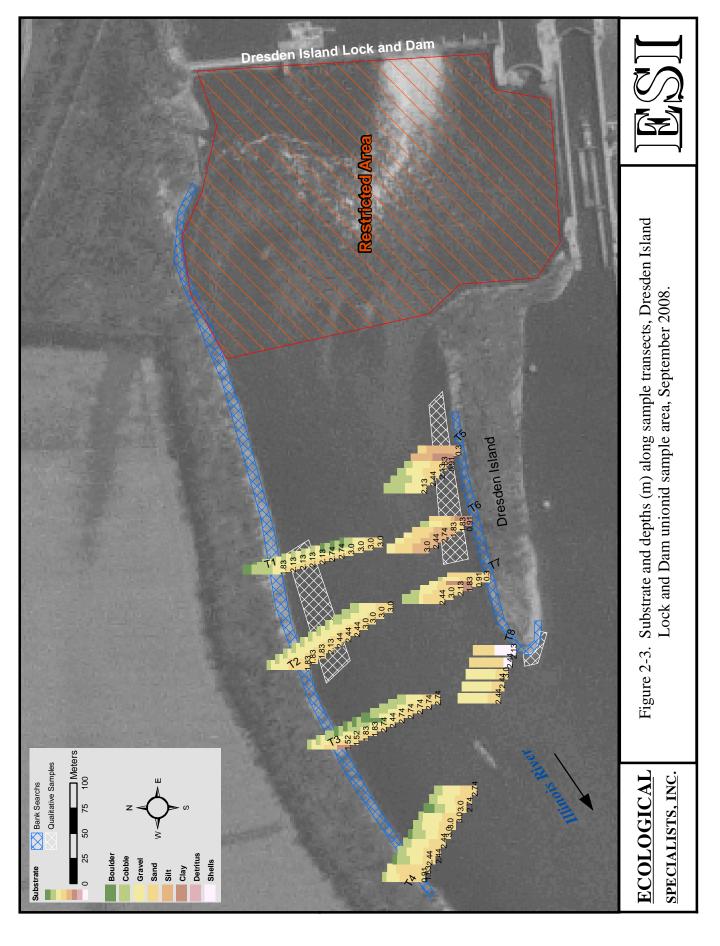
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Figures









<u>Tables</u>

Table 1-1. Unionids previously recorded from the Illinois River.

			Illinois	Ur	oper Illinois Ri	ver ⁴	Dresde	n Island
Species ¹	Common name ¹	Status ²	River ³	<1900 ³	1963-1663	1993-1955	1993-1995 ⁵	1994-1999 ⁶
•								
Actinonaias ligamentina	mucket		X	X		X	X	X
Alasmidonta marginata	elktoe		X	X		X	X	X
Alasmidonta viridis	slippershell	IT	X	X				
Amblema p. plicata	threeridge		X	X		X	X	X
Anodonta suborbiculata	flat floater		X			X		
Anodontoides ferussacianus	cylindrical papershell		X					
Arcidens confragosus	rock-pocketbook		X					
Cumberlandia monodonta	spectaclecase	IE	X					
Cyclonaias tuberculata	purple wartyback	IT	X	X				
Ellipsaria lineolata	butterfly	IT	X	X				
Elliptio crassidens	elephant ear	IT	X	X				
Elliptio dilatata	spike	IT	X	X				
Epioblasma triquetra	snuffbox	ΙE	X	X				
Fusconaia ebena	ebonyshell	IT	X	X				
Fusconaia flava	Wabash pigtoe		X	X				
Lampsilis cardium	plain pocketbook		X	X		X	X	X
Lampsilis higginsi	Higgin's eye	FE/IE	X	X		74	21	21
Lampsilis siliquoidea	fat mucket	I L/IL	X	X				
Lampsilis teres	vellow sandshell		X	X				
Lasmigona c. complanata	white heelsplitter		X	X		X	X	X
-	creek heelsplitter		X	Λ		Λ	Λ	Λ
Lasmigona compressa	*			v				v
Lasmigona costata	fluted-shell		X	X		37	37	X
Leptodea fragilis	fragile papershell		X	X		X	X	X
Leptodea leptodon	scaleshell	IT	X	***				
Ligumia recta	black sandshell	IT	X	X				
Ligumia subrostrata	pondmussel		X					
Megalonaias nervosa	washboard		X					
Obliquaria reflexa	threehorn wartyback		X	X				
Obovaria olivaria	hickorynut		X	X				
Plethobasus cyphyus	sheepnose	IE	X	X				
Pleurobema sintoxia	round pigtoe		X	X?				X
Pleurobema rubrum	pyramid pigtoe	ΙE	X	X?				
Potamilus alatus	pink heelsplitter		X					X
Potamilus capax	fat pocketbook	FE/IE	X	X				
Potamilus ohiensis	pink papershell		X			X		
Pyganodon grandis	giant floater		X	X		X	X	X
Quadrula metanevra	Monkey face		X	X				
Quadrula nodulata	wartyback		X	X				
Quadrula p. pustulosa	pimpleback		X	X		X	X	X
Quadrula quadrula	mapleleaf		X	X		X	X	X
Simpsonaias ambigua	salamander mussel	IE	X					
Strophitus undulatus	squawfoot		X			X	X	X
Toxolasma parvus	lilliput		X					
Tritogonia verrucosa	pistolgrip		X	X				X
Truncilla donaciformis	fawnsfoot		X	X				
Truncilla truncata	deertoe		X	X				X
Uniomerus tetralasmus	pondhorn		X					
Utterbackia imbecillis	paper pondshell		X	X				
Villosa iris	rainbow	IE	X	X				
Total			49	35	0	12	10	15

¹Nomenclature follows Turgeon et al. (1998)

²Illinois Endangered Species Protection Board (2008); FE=federally endangered, IE=IL endangered, IT=IL threatened

³Starrett (1971)

³Collected live

⁴Confluence of the Kankakee and Des Plaines Rivers to Starved Rock dam

⁵Whitney et al. (1997), collected live

⁶Sietman et al. (2001)

Table 3-1. Characteristics of unionids collected downstream of Dresden Island and Brandon Road Locks and Dams, Illinois River September 2008.

	Number Live	Relative Abundance	Average Age	Average Length
		(%)	(external annuli count)	(mm)
Species ¹				
Dresden Island				
Actinonaias ligamentina	23	11.3	13.2	123
Amblema plicata	103	50.7	14.7	99
Lampsilis cardium	1	0.5	$Adult^2$	
Lasmigona c. complanata	2	1.0	14.5	151
Lasmigona costata	2	1.0	15.5	146
Leptodea fragilis	9	4.4	9.0	106
Megalonaias nervosa	3	1.5	13.0	110
Obliquaria reflexa	6	3.0	6.0	51
Potamilus alatus	5	2.5	13.0	143
Pyganodon grandis	1	0.5	12.0	140
Quadrula p. pustulosa	16	7.9	11.1	64
Quadrula quadrula	29	14.3	11.7	76
Toxolasma parvus	1	0.5	Adult	
Truncilla truncata	2	1.0	7.5	52
Total Live	203			
Total Number of Species	14			
Brandon Road				
Lampsilis siliquoidea	Weathered Dead Shell			
Pyganodon grandis	Weathered Dead Shell			
Utterbackia imbecillis	Weathered Dead Shell			

¹Turgeon *et al.*, 1998. ²Not aged

Table 3-2. Depths, substrate, and number live unionids collected along sample transects, Dresden Island Lock and Dam, September 2008.

		ce from				Sı	ıbstrate (%	6)			Unionids
Transect			Depth (m)	Boulder	Cobble	Gravel	Sand	Silt	Clay	Detritus	No. Live
1	0	0	1.8	20	50	30	0	0	0	0	
-	0	10	2.1	10	30	30	30	0	0	0	1
	10	20	2.1	0	10	40	50	0	0	0	8
	20	30	2.1	0	10	40	50	0	0	0	3
	30	40	2.1	0	10	40	50	0	0	0	0
	40	50	2.7	0	10	40	50	0	0	0	3
	50	60	2.7	0	10	40	50	0	0	0	0
	60	70	3.0	0	10	40	50	0	0	0	0
	70	80	3.0	10	20	30	40	0	0	0	0
	80	90	3.0	10	20	30	40	0	0	0	0
	90	100	3.0	10	20	30	40	0	0	0	0
2	0	0	1.8	0	10	40	50	0	0	0	
	0	10	1.8	0	10	20	70	0	0	0	10
	10	20	1.8	0	10	40	50	0	0	0	7
	20	30	2.1	0	10	40	50	0	0	0	3
	30	40	2.4	0	10	40	50	0	0	0	4
	40	50	2.4	0	10	40	50	0	0	0	4
	50	60	2.4	0	10	40	50	0	0	0	1
	60	70	3.0	0	10	40	50	0	0	0	1
	70	80	3.0	0	20	40	40	0	0	0	1
	80 90	90 100	3.0	$0 \\ 0$	20 20	40 40	40 40	0	0	0	4 0
	90	100	3.0	0	20	40	40	0	0	0	<u> </u>
3	0	0	1.5	0	10	30	30	0	30	0	
	0	10	1.5	0	10	20	70	0	0	0	1
	10	20	1.8	0	20	40	40	0	0	0	2
	20	30	1.8	10	10	40	40	0	0	0	1
	30	40	2.7	10	30	30	30	0	0	0	0
	40	50	2.4	10	30	30	30	0	0	0	3
	50	60	2.7	50	10	20	20	0	0	0	0
	60	70	2.7	0	20	40	40	0	0	0	0
	70	80	2.7	0	20	40	40	0	0	0	3
	80	90	2.7	0	20	40	40	0	0	0	0
	90	100	2.7	0	20	40	40	0	0	0	1
4	0	0	0.9	0	10	30	60	0	0	0	
	0	10	1.8	0	0	20	80	0	0	0	3
	10	20	2.4	10	30	30	30	0	0	0	0
	20	30	2.4	0	20	40	40	0	0	0	0
	30	40	2.4	0	20	40	40	0	0	0	0
	40	50	3.0	10	30	30	30	0	0	0	3
	50	60	3.0	0	20	40	40	0	0	0	1
	60	70	3.0	0	10	45	45	0	0	0	0
	70	80	3.0	25	25	25	25	0	0	0	0
	80	90	2.7	0	20	40	40	0	0	0	0
	90	100	2.7	0	20	40	40	0	0	0	0

Table 3-3. Depths, substrate, and number of live unionids collected along sample transects at the right descending island bank, Dresden Island Lock and Dam, September 2008.

		ce from					Cubete	ate (%)				Unionids
Transact		Mov	Depth (m)	Boulder	Cabbla	Gravel	Sand	Silt	Clay	Detritus	Shells	No. Live
Transect	IVIIII.	wax.	Deptii (iii)	Doulder	Cobble	Gravei	Sand	SIII	Clay	Detritus	Shens	No. Live
5	0	0	0.3	0	0	0	20	80	0	0	0	
	0	10	0.9	0	0	0	0	50	50	0	0	0
	10	20	1.8	0	20	40	40	0	0	0	0	0
	20	30	2.1	0	20	40	40	0	0	0	0	5
	30	40	2.4	0	50	30	20	0	0	0	0	7
	40	50	2.1	0	50	40	10	0	0	0	0	0
6	0	0	0.9	0	0	0	50	10	40	0	0	
	0	10	1.8	0	20	30	50	0	0	0	0	0
	10	20	1.8	0	0	0	50	50	0	0	0	0
	20	30	2.7	0	0	20	40	40	0	0	0	8
	30	40	2.4	0	0	20	40	40	0	0	0	5
	40	50	3.0	0	0	20	40	40	0	0	0	2
7	0	0	0.3	0	0	0	100	0	0	0	0	
	0	10	0.9	0	10	40	50	0	0	0	0	0
	10	20	1.8	0	0	20	20	0	60	0	0	0
	20	30	2.1	0	0	40	60	0	0	0	0	3
	30	40	3.0	0	20	30	50	0	0	0	0	0
	40	50	2.4	0	40	10	50	0	0	0	0	0
8	0	10	2.1	0	0	0	50	0	0	0	50	0
	10	20	2.4	0	0	0	80	0	0	0	20	0
	20	30	3.0	0	0	70	30	0	0	0	0	0
	30	40	2.4	0	0	70	30	0	0	0	0	0
	40	50	2.4	0	0	70	30	0	0	0	0	0

Table 3-4. Number of live unionids collected during qualitative samlpling downstream of Dresden Island Lock and Dam, Illinois River September 2008.

Sample Number	Duration (min)	Location	Number Live Unionids
1	10	Foot of Dresden Island	0
2	10	Dresden Island-Right Descending Bank	24
3	10	Dresden Island-Right Descending Bank	17
		Total	41
4	10	Right Descending Bank	31
5	10	Right Descending Bank	36
		Total	67
		Total Qualitative	108
		Total Qualitative	108

NORTHERN ILLINOIS HYDROPOWER CORPORATION

BRANDON ROAD AND DRESDEN ISLAND HYDROELECTRIC PROJECTS

(FERC NOS. 12717 AND 12626)

FISH ENTRAINMENT ANALYSIS

FINAL

MARCH 2009

Prepared By:



NORTHERN ILLINOIS HYDROPOWER CORPORATION BRANDON ROAD AND DRESDEN ISLAND HYDROELECTRIC PROJECTS (FERC NOS. 12717 AND 12626) FISH ENTRAINMENT ANALYSIS **FINAL MARCH 2009**

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FISH ENTRAINMENT ANALYSIS

FINAL

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NORTHERN ILLINOIS HYDROPOWER CORPORATION

BRANDON ROAD AND DRESDEN ISLAND HYDROELECTRIC PROJECTS (FERC NOS. 12717 AND 12626)

FISH ENTRAINMENT ANALYSIS

FINAL

1.0 PROJECT BACKGROUND

Northern Illinois Hydropower (NIH) submitted Pre-Application Documents (PADs) for the Brandon Road and Dresden Island Projects (Projects) in July of 2006. The PADs identified potential fish entrainment and subsequent turbine mortality as a potential issue for both Projects. The Illinois Department of Natural Resources and US Fish and Wildlife Service indicated that an analysis of potential fish entrainment at the projects would be necessary to determine the potential impact of the project operations on the fishery resource. NIH proposed to develop an order-of-magnitude entrainment and mortality estimate for the projects based on both site-specific biological and engineering data and the extensive database of entrainment and mortality information that currently exists from previous hydroelectric relicensing studies. The goals of this "desktop" entrainment study were to:

- 1) Define the entrainment database that could be applied to the Brandon Road and Dresden Island Projects;
- 2) Calculate a potential estimated fish entrainment rate(s) (with seasonal rates if possible);
- 3) Characterize the species composition of potential fish entrainment;
- 4) Estimate the size of fish potentially entrained;
- 5) Estimate the potential total annual entrainment for the Brandon Road and Dresden Island Projects; and
- 6) Estimate potential turbine mortality for fish entrainment based on turbine mortality estimates from similar project studies.

2.0 PROJECT DESCRIPTION AND PROPOSED OPERATIONS

2.1 Brandon Road

The US Army Corps of Engineers (ACOE) operates the Brandon Road Lock and Dam. The facility lies on the Des Plaines River at the southwest edge of Joliet, Illinois, 13.3 miles upstream from the confluence with the Kankakee River. There are no existing hydropower facilities within the proposed Project boundary. The ACOE constructed the existing lock and dam as part of the Illinois Waterway System to create a navigational pool for the original 9-ft deep channel. The reservoir, with a water surface elevation held constant at 539.0 ft NGVD, extends upstream just over 5 miles to the Lockport Dam. Water is released from the facility at the same rate as it enters the Project.

NIH proposes to install an intake structure, powerhouse, discharge works, and transmission line at the Brandon Road Project. The Project (land and water within the Project boundary) will include a 10.2 MW capacity, 75-ft by 125-ft power plant between headgate sections 1 through 6 immediately below the existing dam. The powerhouse will contain two 3.76 meter diameter S-type turbines with an estimated hydraulic capacity of 4,500 cfs. The project will have an anticipated average annual energy production of 59,100 MWh. A 50-ft by 50-ft switchyard will be adjacent to the west side of the powerhouse.

NIH proposes to operate the plant on a strict run-of-river mode in compliance with the ACOE's reservoir regulation and navigation guidelines. NIH will control the Project with an automated system that will automatically start up, run, and shut down the turbines. The system will allow the ACOE to modify hydroelectric operations in response to emergencies related to the Lock operation or flood control instantaneously. The proposed development is similar to the Recommended Plan contained within the November 1981 Draft Feasibility Report for Hydropower, Brandon Road Lock and Dam, Illinois Waterway, Main Report with an environmental assessment (EA) prepared by the ACOE, Rock Island District.

2.2 Dresden Island

The ACOE operates the existing Dresden Island Lock and Dam. The facility is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River near the town of Morris. The lock and dam is located 271.5 miles above its confluence with the Mississippi River, and about 15 miles southwest of Joliet, Illinois. There are no existing hydropower facilities within the proposed Project boundary. The ACOE constructed the lock and dam as part of the Illinois Waterway System to create a navigational pool for the original 9-ft deep channel.

NIH proposes to install a 10.2 MW capacity powerhouse on the spillway side of the Dresden Island Lock and Dam, with an estimated annual energy production of 59,300 MWh pending final design and economic analysis. This plant would have three 3.35-m runner diameter Bulb-type Kaplan turbines with a total estimated hydraulic capacity of 7,500 cfs.

NIH proposes to operate the plant on a strict run-of-river mode in compliance with the ACOE's reservoir regulation and navigation guidelines. NIH will control the project with an automated system that will automatically start up, run, and shut down the turbines. The system will allow the ACOE to modify hydroelectric operations in response to emergencies related to the Lock operation or flood control instantaneously. NIH will purchase new turbines and generators for this hydropower project. The proposed plan is similar to the Recommended Plan contained within the November 1981 Draft Feasibility Report for Hydropower, Dresden Island Lock and Dam, Illinois Waterway, Main Report with an environmental assessment prepared by the ACOE, Rock Island District.

3.0 PROJECTS FISHERY RESOURCE

Due to historic high levels of pollution, the Des Plaines and Illinois River did not support a significant fishery of any kind in the first half of the twentieth century; however, with improvement of water quality the fishery grew in the 1970's and showed marked improvement at that time (Village of Rockdale, 1983). The Illinois Natural History Survey (INHS) documented increased fish species and populations from 1957 to the present (INHS, 2006). Metropolitan Water Reclamation District of Greater Chicago (MWRD) has also sampled the Upper Illinois Waterway for over 10 years. A study of the Upper Illinois Waterway conducted for Commonwealth Edison (CE) in 1993 and 1994 included samples from the Brandon and Dresden Island Pools (CE, 1996). In addition, Midwest Biodiversity Institute (MBI) conducted fisheries surveys throughout the Des Plaines River and Illinois River in 2006 (MBI, unpublished data, 2006).

In the INHS (2006) study, nine species accounted for 95.5% of the total catch in the upper Illinois River near the Brandon Road Project. These species included gizzard shad, bluntnose minnow, emerald shiner, spotfin shiner, blackstripe topminnow, bluegill, green sunfish, largemouth bass, orangespotted sunfish, and rock bass. Bluegill and bluntnose minnow were the two most dominant species totaling 36.4% and 24.3% of the catch, respectively. Bluegill was also dominant downstream of Dresden Island, however; gizzard shad became more dominant than bluntnose minnow (INHS, 2006).

The Illinois Waterway provides a means by which Great Lakes species such as yellow perch and alewife can enter the Illinois River from Lake Michigan. The diverse Mississippi River fauna, including many minnows and suckers, can access Lake Michigan through the waterway as well. Currently, approximately 46 species may be found in the Brandon Road Project area; however, only a few species dominate the fish community. A combination of prolific pelagic species (*e.g.*, gizzard shad and emerald shiner) and highly pollution tolerant species (*e.g.*, bluntnose minnow and bluegill now dominate the fishery (Figure 3-1).

The 1994 CE study of Lockport and Brandon Pools (CE, 1996) included collection of larval and juvenile fish. The majority of spawning in both pools is by rough and forage fish species. Together the common carp and bluntnose minnow accounted for 66 percent of the larval and juvenile fish in Brandon Pool. Larval and juvenile sportfish, including channel catfish, unidentified yellow bass/white perch, unidentified sunfish/bass family, bluegill, unidentified sunfish and yellow perch accounted for 0.4 percent in Brandon Pool (MWRD, 1999).

The CE Report notes that the fish communities in the upper and lower Dresden Pool and downstream of Dresden Lock and Dam are similar and noticeably more diverse than upstream of Brandon Lock and Dam (Figure 3-2) (CE, 1996). The majority of spawning in the upper Dresden Pool (RM 285.5-284.4) is by rough and forage fish species (CE, 1996). Together the gizzard shad, common carp, and bluntnose minnow accounted for 49 percent of the larval and juvenile fish in the upper Dresden Pool were from the sunfish family, Lepomis spp. (CE, 1996). The spatial distribution and abundance of larvae/juvenile fishes was expected based on the trends observed in the adult populations (CE, 1996). The CE study did not sample larvae/juvenile fish near the Dresden Island Lock and Dam.

Several other piscivorous fish species occur in the Illinois River. Walleye, sauger, smallmouth bass and white bass tend to favor swift moving cooler river channels and eddies behind boulders and rock piles in faster waters. These habitats tend to occur just below the lock and dam structures of each Project. Largemouth, black crappie, and sunfish species such as the bluegill prefer shorelines with aquatic plants that provide cover to ambush prey and to hide from predatory mammals and birds. Channel catfish and grass pickerel can be found in all areas of the Illinois River (CE, 1996). There are no specific fishery management goals for the Upper Illinois Waterway in the vicinity of the Brandon Road and Dresden Island Project areas.

Other species found in the Illinois River are scavengers and insectivores that feed on detritus, macroinvertebrates, and decaying matter in the benthos of the river. These species include the common carp, redhorse, smallmouth buffalo, freshwater drum, and catfish (CE, 1996).

Smaller non-game fish within the waterway include the bluntnose minnow, bullhead minnow, emerald shiner, red shiner, golden shiner, silverband shiner, and gizzard shad. These fish species provide the forage base for the predatory fish (Marseilles Hydro Power, LLC, 2001).

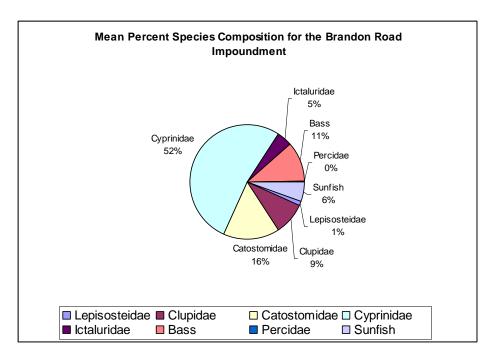


Figure 3-1: Generalized Species Percent Composition for the Brandon Road Impoundment

(Source: Illinois Natural History Survey (INHS), 2006)

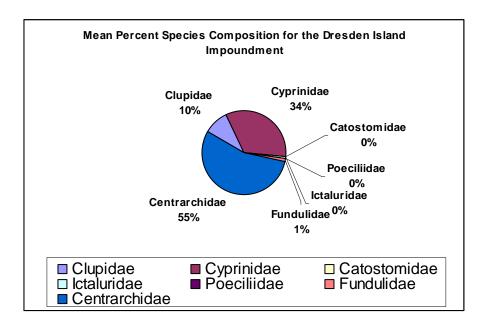


Figure 3-2: Generalized Species Percent Composition for the Dresden Island Impoundment

(Source: Illinois Natural History Survey (INHS), 2006)

4.0 METHODOLOGY

During the 1980's and early-1990's, numerous field studies documented fish entrainment and turbine mortality trends at hydropower projects throughout the United States. These data were subsequently compiled into a comprehensive database of fish entrainment information by the Electric Power Research Institute (EPRI, 1992).

Since the mid 1990's, the transfer of entrainment information from project to project utilizing the EPRI database has been widely accepted by state and federal resource agencies, including the FERC, United States Fish and Wildlife Service and National Marine Fisheries Service, as a means of providing "desktop" estimates of fish entrainment and mortality. In these studies, the estimated turbine-induced mortality rates (based on mortality studies for similar type turbines) were applied to the fish entrainment estimates to determine potential project-related impacts to the local fisheries resources (FERC, 1995). Agency-accepted examples of these "desktop" assessments include: Markland Hydroelectric Project Desktop Fish Entrainment and Turbine Mortality Analysis (Kleinschmidt Associates, 2008); Claytor Hydroelectric Project Fish Entrainment and Impingement Desktop Assessment (Normandeau Associates, Inc, 2009); and Saluda Hydro Project Desktop Fish Entrainment and Turbine Mortality Report (Kleinschmidt Associates, 2007).

The following sections detail the steps taken to calculate the potential annual estimated fish entrainment and potential turbine-induced mortality for the Brandon Road and Dresden Island Projects.

4.1 Entrainment

Fish entrainment at the Brandon Road and Dresden Island Projects was assessed through a desktop study, the goal of which was to provide an order-of-magnitude estimate of potential fish entrainment, using existing literature and site specific information. The primary steps in this analysis include:

 Obtain literature with potential sources to contribute to a site-specific database;

- Define the subset of studies that form the database to be applied to the Brandon Road and Dresden Island Projects;
- Use the entrainment database to develop potential fish entrainment rates as a function of fish/unit flow volume, species composition and size classes;
- Estimate the average monthly turbine flows for the Brandon Road and Dresden Island Projects; and
- Estimate the number, species composition, and size of fish potentially entrained through the Brandon Road and Dresden Island Projects.

4.2 Define the Entrainment Database

Over sixty (60) site specific "desktop" analyses that provide order-of-magnitude estimates of annual resident fish entrainment at hydroelectric sites in the United States have been reported by FERC (1995) (<u>Appendix A</u>). These studies were derived from the 1992 EPRI report entitled *Fish Entrainment and Turbine Mortality Review and Guidelines*. The EPRI Report includes descriptive information gathered from each entrainment study, which includes:

- Project name and FERC project number;
- Location: state and river:
- Project size: discharge capacity and power production;
- Physical project characteristics: trash rack spacing, intake velocity, etc.;
- Project operation: e.g., peaking, run-of-river, etc.;
- Biological factors: fish species composition; and
- Impoundment characteristics: general water quality, impoundment size, flow regime.

This information was assembled into a "screening matrix" of data that could potentially be used for this study. There are a number of entrainment reports available on a national level, but not all of the studies are applicable given the differences in project features, fish assemblages and other obvious parameters. Specific studies were selected

from the screening matrix that was most applicable to the Brandon Road and Dresden Island Projects. Criteria used in selecting specific studies were as follows:

- Similar geographical location, with preference given to projects located in the same basin;
- Similar station hydraulic capacity;
- Similar station operation (run-of-river);
- Biological similarities: fish species, assemblage and water quality; and
- Availability of entrainment data netting or hydroacoustics.

4.3 Fish Entrainment Rates

Fish entrainment rates for Brandon Road and Dresden Island were estimated at monthly time steps. The entrainment rate from each source-site study in the entrainment database was reported as the number of fish entrained per hour of sampling. The monthly rate is the mean of all hourly sampling rates for each sample month. In order to extrapolate entrainment rates (fish/hour) from the source-site studies to the Brandon Road and Dresden Island Projects, the rates were converted to monthly entrainment density (fish per million cubic feet of water). The conversion was based on total monthly volume flow (million cubic feet) and monthly fish entrainment rates (fish per hour).

Entrainment densities for the Brandon Road and Dresden Island Projects were calculated by dividing the entrainment rate (fish/hour) by the source site study hydraulic capacity (cubic feet/hour), which results in fish per cubic feet. The number was multiplied by 1,000,000 to yield fish per million cubic feet. For example:

 $0.2 \, fish \, per \, hour \, / \, 12,240,000 \, cubic \, feet \, per \, hour \, (1,000,000) = 0.02 \, fish \, per \, million \, cubic \, feet$

The monthly entrainment rates or densities (fish per million cubic feet) from each of the source studies were averaged to develop a single monthly entrainment density for each of the two target (Brandon Road and Dresden Island) Projects. Monthly entrainment densities were collapsed to seasonal levels, using the following seasonal groupings:

Winter: December, January, February, March

Spring: April, May

Summer: June, July, August, September

Fall: October, November

The **total number of fish entrained by month** for each target project was calculated by multiplying the monthly fish entrainment rate (number of fish/million cubic feet of water for the month of January) by the monthly volume of water estimated to pass through the turbines of each target Project (million cubic feet of water/month). These calculations are based on maximum hydraulic capacity of each proposed project, for example:

0.17 fish/mcf (January) * 7,881 mcf/month (January) = 1,339 fish entrained for the month of January

The annual entrainment estimate derived using this methodology likely somewhat overestimates the number of fish entrained since the project likely does not operate at the maximum hydraulic capacity year around.

The **total number of fish entrained by season** was the sum of the total number of fish entrained/month for each season.

4.4 Species Composition and Length Frequency Analysis

Species composition data from the Brandon Road and Dresden Island project vicinities was compared to species composition of potential source studies to identify entrainment data that most closely matched the local fish community. Species

4-4

composition data for the Brandon Road and Dresden Island project vicinities was provided by the *Long Term Illinois River Fish Population Monitoring Program – 1996 Annual Report* (CE, 1996). Some source studies (i.e., Brule, Constantine and Centralia projects) with species composition data available differed when compared to Brandon Road and Dresden Island. Moore's Park, Rothschild and Wisconsin River Division Projects did not have complete species composition data available. The Twin Branch entrainment study was chosen for use because the species composition data was most similar to that of the Brandon Road and Dresden Island Projects. The Twin Branch Project was also chosen because it was located on the St. Joseph's River in Indiana, which was geographically closer to both the Brandon Road and Dresden Island Projects than the other candidate source studies.

The species composition data were grouped by family to produce a percentage for each fish family by season. The Centrarchidae family was divided into bass and sunfish genera because of obvious differences in body morphology type. To calculate the total number of fish entrained within each family-genus group by season, the total number of entrained fish for each season was multiplied by the family-genus percent composition and then divided by 100. For example:

6,445 (fish entrained for winter) * 10.9% (species comp. % for Cyprinidae)/100 = 702 Cyprinidae entrained during the winter

Length frequency (total length) data was not provided with the Twin Branch Hydroelectric Project species composition entrainment data, nor were length frequency data collected during the INHS and MBI fish surveys. Length frequency distributions derived from the Long Term Illinois River Fish Population Monitoring Program 1996 Annual Report (CE, 1996) conducted in the Brandon Road and Dresden Island pools were analyzed to estimate the sizes (total length) of entrained fish during each season. However, length frequency data were only available for four of the family/genus groups: Catostomidae (white sucker), Sunfish (bluegill), Bass (largemouth bass) and Ictaluridae (channel catfish). These length frequency data were grouped into small fish (<150mm) or into large fish (>150mm) for each family/genus group available on a seasonal basis. However, length frequency data was limited to three seasons spring (May), summer

(June, July, August and September) and fall (October and November). Literature was not available to estimate length frequencies for the remaining family/genus groups: Cyprinidae, Percidae, Percichthyidae, Esocidae, Umbridae, Atherinidae, and Lepisosteidae. Since these fish were a very small component of the estimated entrainment composition at Brandon Road and Dresden Island Projects, entrainment estimates were not developed for these family/genus groups.

These data were grouped by small (1-149mm) and large (150-900mm) size classes, family group, and season to produce length frequency distributions of observed entrainment. The data were then summed across family groups to produce length distribution by season.

To calculate the estimated number of entrained fish for each length group (small and large); each seasonal family/genus group entrainment estimate was multiplied by the corresponding length frequency distribution percentage, for example:

of entrained fish in each family/genus group per season * percentage of seasonal size category for each family/genus group = # of fish for each size class, family genus group for each season

4.5 Turbine Mortality Rate Estimate

Turbine characteristics of the Brandon Road and Dresden Island Projects were compared to those of potential source studies to identify appropriate turbine mortality rates. Since the Brandon Road and Dresden Island Projects are equipped with s-type and bulb-type turbines, respectively, studies from the turbine mortality database were separated based on whether they were performed at sites with Kaplan or Francis-type turbines. Since s-type and bulb-type are similar to horizontal Kaplan turbines, these were included in the selection of mortality studies. The sites were then sorted based on the following characteristics: gross operating head, runner diameter, and runner speed. Information on each turbine mortality study is provided in Appendix B. The study information contained in Appendix B includes (where available): species tested, size class/range tested, number of fish tested (test and control), and survival results. The

study information is sorted by species type tested. Study sites were initially accepted on the basis of turbine design, availability of sufficient turbine descriptions, and species/family types relevant to the Brandon Road and Dresden Island Projects. Other screening criteria included operating head and availability of 48-hour post testing survival data.

4.6 Calculation of Turbine Mortality Estimate

For purposes of this report, fish mortality is defined as turbine interaction with a fish that results in death of the fish. Mortality rates selected for the target Projects were sorted by family/genus groups consistent with those used to estimate entrainment rates. Data were also stratified according to "small" or "large" fish sizes based on size cutoffs used in the original test data sets, if available. 150mm (TL) was used as the cutoff between small and large fish. Once sorted, the mortality rate from each family/genus group tested was averaged among source studies to estimate turbine mortality for each family/genus group.

Turbine mortality was estimated by multiplying the mortality rate of each family-genus group by the seasonal entrainment estimates of the corresponding family/genus group. For example:

Mortality Rate for Ictalurid * Ictalurid Entrained for Winter / 100 = Estimated

Ictalurid Winter Entrainment Mortality

5.0 RESULTS AND DISCUSSION

5.1 Fish Entrainment Rate

Table 5-1 depicts the projects initially considered for entrainment rate analyses at the Brandon Road and Dresden Island Projects. Although some projects were located somewhat north of Illinois, the similarities of the infrastructure and fish assemblages justified their initial selection.

Table 5-1: Summary of Candidate Source-Study Projects Considered for Entrainment Rate Data Transfer for the Brandon Road (highlighted in yellow) and Dresden Island (highlighted in blue) Projects

PROJECT NAME	ST	RIVER	CAPACITY (cfs)	MODE OF OPERATION	FISHERY TYPE	ENTRAINMENT SAMPLING (Full or Partial Netting)
Brandon Road Project	IL	Des Plaines	4,500	Run-of-River	Warm/Cool	N/A
Brule Project	WI	Brule River	1,500	Run-of-River	Cool	Full
Escanaba, Dam No. 3	MI	Escanaba River	3,400	Run-of-River	Cool	Full
Rogers Project	MI	Muskegon River	2,400	Run-of-River	Cool	Full/Partial
Centralia Project	WI	Wisconsin River	3,900	Run-of-River	Cool	Full
Moore's Park	MI	Grand River	1,200	Run-of-River	Warm/Cool	Full
Constantine	MI	St. Joseph River	1,200	Run-of-River	Cool	Full
Park Mill	WI	Menominee River	2,543	Run-of-River	Cool	Partial
Twin Branch	IN	St. Joseph River	2,400	Run-of-River	Warm/Cool	Full
Rothschild Project	WI	Wisconsin River	3,386	Run-of-River	Warm	Full
Mc Clure	MI	Dead River	460	Run-of-River	Warm/Cool	Full
Hoist	MI	Dead River	760	Run-of-River	Warm/Cool	Full
Dresden Island Project	IL	Illinois River	7,500	Run-of-River	Warm/Cool	N/A
Wisconsin River Division	WI	Wisconsin River	5,141	Run-of-River	Cool	Full
Rothschild Project	WI	Wisconsin River	3,386	Run-of-River	Cool	Full
Buchanan	MI	St. Joseph River	4,569	Run-of-River	Cool	Partial
Twin Branch	IN	St. Joseph River	2,400	Run-of-River	Warm/Cool	Full
Foote	MI	Au Sable River	4,050	Pulsed	Cool	Partial

Upon further screening, studies were excluded if: (1) peaking was the primary form of operation, (2) the site had either very large or deep impoundments where the intake waters are influenced by stratification (in contrast with the proposed projects that have shallow, unstratified riverine impoundments), (3) the site lacked similar species composition, and (4) the site lack full draft-tube netting data, which are generally considered more reliable (EPRI, 1995). Using these criteria, the candidate studies were further examined and refined to eight source studies for the Brandon Road Project and three source studies for the Dresden Island Project (Table 5-2).

Table 5-2: Source Studies Chosen for Entrainment Data Transfer for the Brandon Road (highlighted in yellow) and Dresden Island (highlighted in blue) Projects

PROJECT NAME	ST	RIVER	CAPACITY (cfs)	MODE OF OPERATION	FISHERY TYPE	ENTRAINMENT SAMPLING (Full or Partial Netting)
Brandon Road Project	IL	Des Plaines	4,500	Run-of-River	Cool	N/A
Brule Project	WI	Brule River	1,500	Run-of-River	Cool	Full
Escanaba, Dam No. 3	MI	Escanaba River	3,400	Run-of-River	Cool	Full
Moore's Park	MI	Grand River	1,200	Run-of-River	Cool	Full
Twin Branch	IN	St. Joseph River	2,400	Run-of-River	Warm/Cool	Full
Centralia Project	WI	Wisconsin River	3,900	Run-of-River	Cool	Full
Moore's Park	MI	Grand River	1,200	Run-of-River	Warm/Cool	Full
Constantine	MI	St. Joseph River	1,200	Run-of-River	Cool	Full
Rothschild Project	WI	Wisconsin River	3386	Run-of-River	Warm	Full
Dresden Island Project	IL	Illinois River	7,500	Run-of-River	Cool	N/A
Wisconsin River Division	WI	Wisconsin River	5,141	Run-of-River	Cool	Full
Twin Branch	IN	St. Joseph River	2,400	Run-of-River	Warm/Cool	Full
Rothschild Project	WI	Wisconsin River	3,386	Run-of-River	Warm	Full

Average monthly entrainment density at Brandon Road ranged from 0.11 fish/million cu ft (January) to 1.69 fish/million cu ft (July) (Table 5-3). Average monthly entrainment density at Dresden Island ranged from 0.01 fish/million cu ft (March) to 1.12 fish/million cu ft (July) (Table 5-4). Although there was variability within months among source sites, other months had relatively close estimated rates, and rates at most sites generally followed a similar temporal pattern.

Table 5-3: Mean Monthly Fish Entrainment Rates (fish/million cu ft) from the Entrainment Database Used for the Brandon Road Project

SITE NAME	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC
Brule Project	NA	NA	0.02	0.13	1.49	3.78	3.09	0.50	0.46	0.69	0.20	NA
Escanaba River,												
Dam No. 3	0.02	0.01	0.02	0.95	0.40	0.46	0.11	0.06	0.05	0.16	0.20	0.02
Moore's Park	0.08	0.40	1.76	3.78	1.45	1.57	2.72	7.76	4.52	1.92	0.08	0.32
Rothschild	0.03	0.04	0.01	0.17	0.14	0.93	2.77	0.46	0.70	0.33	0.07	0.03
Twin Branch	NA	NA	NA	0.14	0.14	0.18	0.26	0.37	0.28	0.17	0.04	NA
Constantine	0.38	0.38	0.38	1.30	0.76	NA	0.97	0.00	0.16	0.16	0.38	0.38
Centralia	0.02	0.02	NA	NA	0.01	0.20	1.89	0.58	0.28	0.19	0.25	NA
Average	0.11	0.17	0.44	1.08	0.63	1.19	1.69	1.39	0.92	0.52	0.17	0.19

Table 5-4: Mean Monthly Fish Entrainment Rates(fish/million cu ft) from the Entrainment Database Used for the Dresden Island Project

SITE NAME	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wisconsin River												
Division	0.02	NA	NA	0.13	0.10	0.19	0.31	0.13	0.06	0.04	0.08	NA
Rothschild	0.03	0.04	0.01	0.17	0.14	0.93	2.77	0.46	0.70	0.33	0.07	0.03
Twin Branch	NA	NA	NA	0.14	0.14	0.18	0.26	0.37	0.28	0.17	0.04	NA
Average	0.02	0.04	0.01	0.15	0.13	0.43	1.12	0.32	0.35	0.18	0.06	0.03

5.2 Estimated Total Number of Fish Entrained by Month and Season

Using the average data from the selected comparative studies, the estimated total number of fish entrained annually at the Brandon Road Project is 81,752 fish¹, with approximately 63% of all entrainment occurring in the summer season, followed by spring (22%) (Table 5-5). The peak month of entrainment is estimated to be July (n= 16,176), and the least entrainment is expected to occur in January (n=830).

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5-3

¹ See discussion of comparative entrainment rates in Report Addendum Section.

Table 5-5: Estimated Number of Fish Entrained (Month, Season, and Year) at the Brandon Road Project Based on Projected Maximum Project Generation

SEASON	MONTH	SEASONAL ENTRAINMENT RATE (FISH/MCF)	TOTAL MONTHLY PROJECT FLOWS (MCF)	TOTAL ESTIMATED FISH ENTRAINED BY MONTH	TOTAL ESTIMATED NUMBER OF FISH ENTRAINED BY SEASON
	December	0.19	7,000	1,307	
Winter	January	0.11	7,881	830	7,527
	February	0.17	7,439	1,268	
	March	0.4	9,458	4,122	
Spring	April	1.08	10,531	11,354	17,776
	May	0.63	10,240	6,422	
Summer	June	1.19	10,164	12,055	51,618
	July	1.69	9,581	16,176	
	August	1.39	10,897	15,143	
	September	0.92	8,936	8,244	
Fall	October	0.52	7,059	3,636	4,831
	November	0.17	6,856	1,194	
				Total	81,752

Using the average data from the selected comparative studies, the total estimated number of fish entrained annually at the Dresden Island project is 53,411 fish², with approximately 79% of all entrainment occurring in the summer season, followed by spring (11%) (Table 5-6). The peak month of entrainment is estimated to be July (n= 22,407), and the least entrainment is expected to occur in March (n=165).

² See discussion of comparative entrainment rates in Report Addendum.

Table 5-6: Estimated Number of Fish Entrained (Month, Season, and Year) at the Dresden Island Project Based on Projected Maximum Project Generation

SEASON	MONTH	SEASONAL ENTRAINMENT RATE (FISH/MCF)	TOTAL MONTHLY PROJECT FLOWS (MCF)	TOTAL ESTIMATED FISH ENTRAINED BY MONTH	TOTAL ESTIMATED NUMBER OF FISH ENTRAINED BY SEASON
	December	0.0328	20,088	659	
Winter	January	0.0245	20,088	492	2,061
	February	0.0410	18,144	744	
	March	0.0082	20,088	165	
	April	0.15	19,440	2,897	5,463
Spring	May	0.13	20,088	2,567	
	June	0.43	19,440	8,385	
	July	1.12	20,088	22,407	42,124
Summer	August	0.32	18,360	5,860	
	September	0.35	15,700	5,473	
	October	0.18	14,865	2,662	3,763
Fall	November	0.06	17,589	1,100	
				Total	53,411

5.3 <u>Estimated Total Number of Fish Entrained in Each Family/Genus Group and Length Frequency Family/Genus Group</u>

Seasonal composition of each family/genus group used for the Brandon Road and Dresden Island Projects species composition calculations is presented in Table 5-7. The estimated seasonal total number of fish for each family/genus group of the Brandon Road and Dresden Island Projects is presented in Table 5-8 and Table 5-9, respectively. This calculation applied the seasonal entrainment estimates (Table 5-5 and Table 5-6) to the seasonal family/genus composition data (Table 5-7) to produce a seasonal total for each family/genus group. For the two Projects, Ictalurids were the most numerically abundant in entrainment; Sunfish were the second most entrained family; Catostomids were the third most entrained family, followed by Cyprinids and Percids. Collectively, these families comprise approximately 95% of all entrainment estimates. Other families such

as Bass, Esocidae and Percichthyidae were consistently the minor component of the entrainment estimates.

The estimated numbers of entrained fish in each length frequency for specific family/genus groups are presented in Table 5-10 and Table 5-11. The total numbers of small and large fish estimated to be annually entrained at the Brandon Road Project were 15,330 and 43,544 fish respectively. The total numbers of small and large fish estimated to be annually entrained at the Dresden Island Project were 12,389 and 28,788 fish, respectively. For both Projects most ictalurids and catostomids estimated to be entrained at each project were large, most sunfish were small, and black bass were approximately evenly divided between size categories. This would indicate that both juvenile and adult fish are potentially susceptible to entrainment at each project.

Table 5-7: Seasonal Percent Composition of Each Family/Genus Group Used for the Brandon Road and Dresden Island Entrainment. Calculations derived from the Twin Branch Entrainment Study

FAMILY	WINTER	SPRING	SUMMER	FALL
Ictaluridae	25	36	53	23
Sunfish	19	17	16	40
Bass	2	4	2	0
Cyprinidae	13	11	11	8
Catostomidae	9	15	12	3
Percidae	31	17	3	12
Percichthyidae	0	0	2	14
Esocidae	0	0	1	0
Umbridae	0	0	0	0
Atherinidae	1	0	0	0
Lepisosteidae	0	0	0	0
Total	100	100	100	100

Table 5-8: Estimated Seasonal Number of Fish Entrained, by Family/Genus Group at the Brandon Road Project

FAMILY	WINTER	SPRING	SUMMER	FALL	TOTAL
Ictaluridae	1,845	6,376	27,602	1,096	36,919
Sunfish	1,435	2,991	8,486	1,910	14,821
Bass	166	750	900	0	1,816
Cyprinidae	951	1,884	5,583	392	8,811
Catostomidae	699	2,643	5,984	135	9,462
Percidae	2,324	3,038	1,558	576	7,496
Percichthyidae	0	0	911	687	1,598

Lepisosteidae Total	18 7,527	41 17,738	26 51,584	4.831	84 81,680
	1.0	41	26	0	0.4
Atherinidae	83	0	0	20	102
Umbridae	6	16	28	6	56
Esocidae	0	0	505	10	515

^{*}Annual totals may differ due to rounding

Table 5-9: Estimated Seasonal Number of Fish Entrained, by Family/Genus Group at the Dresden Island Project

FAMILY	WINTER	SPRING	SUMMER	FALL	TOTAL
Ictaluridae	505	1,960	22,526	853	25,844
Sunfish	393	919	6,925	1,487	9,725
Bass	46	230	735	0	1,011
Cyprinidae	260	579	4,556	305	5,701
Catostomidae	191	812	4,883	105	5,993
Percidae	636	934	1,272	449	3,290
Percichthyidae	0	0	744	535	1,279
Esocidae	0	0	412	7	420
Umbridae	2	5	23	5	34
Atherinidae	23	0	0	15	38
Lepisosteidae	5	12	21	0	38
Total	2,061	5,452	42,097	3,763	53,372

^{*}Annual total may differ due to rounding

Table 5-10: Estimated Seasonal Number of Fish Entrained, by Family/Genus Group for Length Frequency Groups of Small and Large Fish at the Brandon Road Project*

FAMILY	SPRING	SUMMER	FALL	TOTAL
Ictaluridae 1-149 mm (small)	0	0	0	0
Ictaluridae 150-610+ mm (large)	6,376	27,602	1,096	35,074
Sunfish 1-149 mm (small)	2,564	7,354	1,910	11,828
Sunfish 150-209 mm (large)	427	1,131	0	1,559
Bass 1-149 mm (small)	211	592	0	803
Bass 150-469 mm (large)	539	308	0	847
Catostomidae 1-149 mm (small)	529	2,060	110	2,699
Catostomidae 150-419 mm (large)	2,115	3,924	25	6,064
Total	12,760	42,972	3,141	58,873

^{*}Annual totals of length frequency groups (Table 8) differ to the annual totals of the family/genus group entrainment (Table 5-5) because length frequency data was not available for winter and specific family/genus groups.

Table 5-11: Estimated Seasonal Number of Fish Entrained, by Family/Genus Group for Small and Large Fish Length Frequency Groups at the Dresden Island Project*

FAMILY	SPRING	SUMMER	FALL	TOTAL
Ictaluridae 1-149 mm (small)	43	0	14	57
Ictaluridae 150-610+ mm (large)	1,918	22,526	839	25,282
Sunfish 1-149 mm (small)	829	6,637	1,487	8,953
Sunfish 150-209 mm (large)	90	29	0	119
Bass 1-149 mm (small)	24	449	0	474
Bass 150-469 mm (large)	206	285	0	491
Catostomidae 1-149 mm (small)	812	2,093	0	2,905
Catostomidae 150-419 mm (large)	0	2,791	105	2,896
Total	3,923	34,809	2,446	41,178

^{*}Annual totals of length frequency groups (Table 9) differ to the annual totals of the family/genus group entrainment (Table 5-6) because length frequency data was not available for winter and specific family/genus groups.

5.4 Turbine Characteristics and Fish Mortality

The most frequently cited significant mortality factors relating to the hydraulic passage environment for Kaplan runners are runner speed, peripheral runner velocity, and cavitations (Semple, 1979; Turbak, et al., 1981; Ruggles and Palmeter, 1989; Cada, 1990; EPRI, 1992). For a given turbine size, the faster the runner is rotating, the opening through which the fish must pass is effectively clear less often. Revolutions per minute (rpm) therefore dictates the frequency and duration of the opening between the turbine and the unit housing through which the fish pass. Head indirectly affects turbine mortality by dictating Kaplan turbine design and operating characteristics, such as peripheral runner velocity and cavitation, which in turn are believed to directly affect fish survival. Literature suggests, that for large fish, size of wicket gates, number of blades, and guide vane clearances may be the most important mortality factors, along with operating efficiency (EPRI, 1992). While larger fish stand the greatest chance of experiencing mortality due to collision with turbine hardware, such as blades (Cada, 1990), smaller fish are less likely to strike gates and guide vanes but are more prone to runner injury and hydraulically-related mortality, such as cavitation (Eicher, 1987).

The proposed Brandon Road and Dresden Island turbines are s-type and bulb-type turbines, respectively, which are similar in design to Kaplan runners. These units would have an operating head of 29 and 17.5 ft, respectively. Each unit would have a rotational speed of 120 rpm and runner diameter of 148 and 132 in, respectively. Although limited fish mortality studies exist for s-type and bulb type turbines, horizontal Kaplan turbines are better studied, and are similar in nature. The limited information available on bulb turbines indicates that mortality may be somewhat lower than that reported for Kaplan turbines (EPRI, 1997). Thus fish mortality source studies with horizontal Kaplan turbines were considered as conservative (they likely overestimate mortality) in this mortality analysis.

A number of studies summarized in the EPRI (1997) database utilize Kaplan turbines and thus were potential source studies for estimating fish mortality at the Brandon Road and Dresden Island Projects. (Table 5-12). Of these, 6 were identified for use in the mortality estimates based on turbine parameters (head, runner speed, runner diameter, peripheral runner velocity)

Operating head for source studies applied to the Brandon Road Project ranged from 15 to 31.5 feet and 15 to 22 feet for the Dresden Island Project (Table 5-13). Turbines sizes ranged in diameter from 110 to 240 inches for source studies applied to Brandon Road and 110 to 175 inches for source studies applied to Dresden Island. Runner speeds from source studies were 120-212 rpm for the Brandon Road Project and ranged from 62.1 to 229 rpm for Dresden Island Project. The operating heads of the Brandon Road and Dresden Island Projects were intermediate relative to chosen mortality source studies. The turbine speeds of the Brandon Road and Dresden Island Projects were somewhat intermediate relative to the source studies. These source studies provide reasonable estimates of entrainment mortality for the intended purpose for two reasons:

They have been selected based on turbine and biological criteria
representative of Brandon Road and Dresden Island from prior studies of
similar fish and turbines which have been reviewed and accepted by
FERC.

2. Multiple test results are available as input for the most dominant entrainment fish types(i.e. Centrarchidae, Ictalurid and Catostomidae) for the Brandon Road and Dresden Island Projects. These tests indicate relatively consistent trends. Multiple test data minimize the risk of relying on only a single data point.

Table 5-12: Turbine Characteristics of Kaplan Turbines Tested for Entrainment Mortality (EPRI, 1997)

			Ra	ted	Rated	Rated	Ra	ted		Ru	nner	Perij	pheral	No. of	No. of	No. of
Site Name	Unit # Tested	Turbine Type	Не	ead	Power	Power	Fl	ow	Speed	Dia	meter	Runner	Velocity	Runner	Wicket	Stay
	resteu		(ft)	(m)	(HP)	(MW)	(cfs)	(cms)	(rpm)	(in)	(cm)	(ft/sec)	(m/sec)	Blades	Gates	Vanes
Brandon Roads	N/A	s-type	29	8.8	13678	10.2	4,500	NA	120	148	375	74.0	NA	4	20	3
Dresden Island	N/A	Bulb type	17.5	5.3	13678	10.2	7,500	NA	120	132	335	69.0	NA	3	18	3
Craggy Dam	2	Bulb (s-type)	19.7	6.0			635.6	18.0	229	175	445	174.8	53.3	4		
Hadley Falls	2	Fixed Propeller	50	15.2		15.8	3750	106.2	150	156	396	102.1	31.1	5		
Rocky Reach	8	Fixed Propeller	86.5	26.4	177000	130	21000	594.7	85.7	311	790	116.0	35.4	5	20	
Racine	1	Horizontal Bulb	22	6.7		24	8000	226	62.1	307				4	NA	
Vanceburg	2	Horizontal Bulb	30	9.1		23	11866	336		240					NA	
Thornaple	1	Kaplan	15	4.5			700	19.8	120	110		58.0				
Thornaple	1	Kaplan	15	4.5			700	19.8	120	110		58.0			NA	
Crescent	3	Kaplan	27	8.2	4200	3.1	1520	43.0	144	108	274	67.8	20.7	5	16	
Marshall	2	Kaplan	31.4	9.5		5	1250		212	144					NA	
Hadley Falls	1	Kaplan	50	15.2		15	4000	113.3	128	170	432	94.9	28.9	5	20	
Wilder	2	Kaplan	51	15.5	22000	17	4500	127.4	112.5	108	274	53.0	16.2	5	21	
Safe Harbor	7	Kaplan	55	16.8	42000	32	8300	235.1	109	220	559	104.6	31.9	5	20	
Wanapum	9	Kaplan	80	24.4					85.7	285	724	106.5	32.5	5		
Rocky Reach	3	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Rocky Reach	5	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Rocky Reach	6	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Crowley	8	Kaplan			1600	1.2	1200	34.0	150	93	236	60.8	18.5			
Townsend Dam	2	Kaplan (horiz)	16	4.9		2.5	2200	62.3	152	113	288	75.0	22.9	3		
Twin Branch	1/5	Kaplan (horiz)	21.1	6.4			400	11.3		60	152					
Conowingo	8	Kaplan (mixed flow)	90	27.4	85000	62	10000	283.2	120	225	572	118.0	36.0	6	24	
Chalk Hill	1	Kaplan (vert)	28	8.5	3570	2.6	1331	37.7	150	102	259	66.7	20.3	4	16	
Buzzard's Roost	2	Kaplan (vert)	55	16.8	7400	5	1310	37.1	240							
Lower Granite	4	Kaplan (vert)	98	29.9		135	19000	538.1	90	312	792	122.5	37.3	6		
Safe Harbor	9	Mixed Flow	55	16.8	52000	37.5	9200	260.5	77	240	610	80.6	24.6	7	20	
Herrings	2	Propeller (vert)	19.5	5.9	2250	1.8	1203	34.1	138.5	113	287	68.3	20.8			
Fourth Lake	1	tube (S-type)	75.5	23.0	4000	3.1	530	15.0	360	65	165	105.3	32.1	6	13	

Table 5-13: Turbine Characteristics of Kaplan, Sorted by Operating Head and Turbine Speed

Highlighted In Yellow Are Studies Used For Dresden Island, Highlighted In Blue Are Studies Used For Brandon Road. And The Mortality Study

Highlighted In Yellow Are Studies Used For Dresden Island, Highlighted In Blue Are Studies Used For Brandon Road, And The Mortality Study Highlighted In Grey Was Used For Both Dresden Island And Brandon Road Projects

		Rated	Rated	Rated		Runner	Peripheral	No. of	No. of
Site Name	Turbine Type	Head	Power	Flow	Speed	Diameter	Runner Velocity	Runner	Wicket
	1,00	(ft)	(MW)	(cfs)	(rpm)	(in)	(ft/sec)	Blades	Gates
Thornaple	Kaplan	15	NA	700	120	110	58.0	NA	NA
Dresden Island	Bulb type	17.5	10.2	7,500	120	132	69.0	3	18
Herrings	Propeller (vert)	19.5	1.8	1203	138.5	113	68.3	NA	NA
Craggy Dam	Bulb (s-type)	19.7	NA	635.6	229	175	174.8	4	NA
Racine	Horizontal Bulb	22	24	8,000	62.1	307	NA	4	NA
Brandon Road	s-type	29	10.2	4,500	120	148	74.0	4	20
Vanceburg	Horizontal Bulb	30	23	11,866	NA	240	NA	NA	NA
Marshall	Kaplan	31.4	5	1,250	212	144	NA	NA	NA

5.5 Turbine Mortality Calculations

All test data and mortality percentages for each species are presented in Table 5-14. The mortality studies shaded in blue were applied to Brandon Road, the yellow shaded columns were applied to Dresden Island, and the study shaded in grey was applied to both projects Table 5-15 and Table 5-16 depict the average mortality rate for each family and size class for each project, respectively.

Size-specific mortality rates for the Brandon Road Project were not available from the source mortality studies chosen for this Project. However, it was possible to estimate size-specific turbine mortality for the Dresden Island Project. At both the Brandon Road and Dresden Island Projects, the Cyprinid mortality rate was consistently higher than the other groups, which was probably at least in part an artifact of the small sample size of tests available for this particular family. The catostomid, bass and sunfish family/genus group mortality rates were similar for both Brandon Road and Dresden Island Project.

Although literature was not available to estimate turbine mortality for four families (Percichthyidae (striped bass), Umbridae (mud minnows), Atherinidae (silversides), and Lepisosteidae (gars) these fish are a very small component of the estimated fish entrainment composition. Consistent with other studies, representative mortality data were matched to unstudied fish groups based primarily on similar physical characteristics, such as skeletal structure, and body shape (FERC, 1995). The bass family/genus group mortality rate was used as a surrogate for the Percichthyidae (temperate basses), Percidae (perches and darters) was used as a surrogate for Umbridae (silversides) and Atherinidae (mud minnows), and Catostomidae was used as a surrogate for Lepisosteidae (gars).

A total of 7,404 and 7,396 fish were estimated to be killed annually by turbine entrainment at each respective project (Table 5-17 and Table 5-18). Estimated entrainment fish loss was highest for Ictalurids and Cyprinids. These two families represent 77% of the projected fish loss at Brandon Road and 58% of the fish loss at Dresden Island, where the sunfish group accounted for another approximately 10.8% and 18.8% of entrainment loss for each respective project.

Size specific mortality data were only available for the Dresden Island Project mortality rates; length frequency turbine mortality estimates are presented in Table 5-19. Estimated fish losses were greatest for the large Ictalurid group and small and large Catostomids relative to the other family/genus size groups.

The methodologies and rates presented in this report for estimating annual fish entrainment at the Brandon Road and Dresden Island Projects were based on similar approaches used in other hydro licensing/relicensing efforts and incorporated data from numerous FERC-accepted studies (EPRI, 1992). The results of this study will be used in the final assessment of the impacts of the Brandon Road and Dresden Island Projects.

Table 5-14: Summary of Mortality Data Used to Calculate Mortality Rates for the Brandon Road and Dresden Island Projects

Studies Highlighted in yellow are used for Dresden Island, blue-highlighted studies are used for Brandon Road, and the study highlighted in grey was used for both Projects

SITE NAME	SPECIES TESTED	LENGTH (mm)	MORTALITY (%)	TEST DURATION	COMMENTS
Craggy	bluegill				NA
Dam		99	5.7	Immediate	
Craggy	bluegill				NA
Dam	1 1 (C) 1	166	13.6	Immediate	NT A
Craggy	channel catfish	162	7.5	latant (10 hma)	NA
Dam Craggy	channel catfish	102	1.3	latent (48 hrs)	NA
Dam	channel Catrish	183	11.2	latent (48 hrs)	IVA
Craggy	channel catfish	103	11.2	intent (10 ms)	NA
Dam		272	6.7	latent (48 hrs)	
Craggy	channel catfish				NA
Dam		283	20.6	latent (48 hrs)	
Herrings	bluegill	91	5.1	latent (48 hrs)	September Sample
Herrings	bluegill	97	0.6	latent (48 hrs)	May Sample
Herrings	golden shiner	130	20.0	latent (48 hrs)	November Sample
Herrings	largemouth bass	185	14.9	latent (48 hrs)	May Sample
Herrings	largemouth bass	191	8.1	latent (48 hrs)	September Sample
Herrings	largemouth bass	219	15.0	latent (48 hrs)	May Sample
Herrings	largemouth bass	253	15.0	latent (48 hrs)	November Sample
Herrings	largemouth bass	302	15.0	latent (48 hrs)	September Sample
Herrings	largemouth bass	315	17.5	latent (48 hrs)	May Sample
Herrings	walleye	210	9.0	latent (48 hrs)	November Sample
Herrings	white sucker	78	15.4	latent (48 hrs)	May Sample
Herrings	white sucker	83	19.2	latent (48 hrs)	September Sample
Herrings	white sucker	91	10.5	latent (48 hrs)	September Sample
Herrings	white sucker	175	19.4	latent (48 hrs)	May Sample
Herrings	white sucker	190	19.4	latent (48 hrs)	May Sample
Herrings	white sucker	193	5.0	latent (48 hrs)	September Sample
Herrings	white sucker	200	19.4	latent (48 hrs)	September Sample
Herrings	white sucker	236	19.4	latent (48 hrs)	September Sample
Herrings	white sucker	251	19.4	latent (48 hrs)	September Sample
Herrings	white sucker	305	20.7	latent (48 hrs)	May Sample
Herrings	white sucker	317	20.7	latent (48 hrs)	May Sample
Herrings	white sucker	321	20.7	latent (48 hrs)	November Sample
Herrings	yellow perch	69	15.0	latent (48 hrs)	September Sample
Herrings	yellow perch	74	15.0	latent (48 hrs)	September Sample
Herrings	yellow perch	95	15.0	latent (48 hrs)	May Sample
Herrings	yellow perch	173	8.9	latent (48 hrs)	May Sample
Herrings	yellow perch	191	8.9	latent (48 hrs)	May Sample
Herrings	yellow perch	276	8.9	latent (48 hrs)	May Sample
Herrings	yellow perch	280	8.9	latent (48 hrs)	May Sample
Thornaple	Walleye	Not given	4.6	latent (48 hrs)	NA

SITE NAME	SPECIES TESTED	LENGTH (mm)	MORTALITY (%)	TEST DURATION	COMMENTS
Thornaple	Muskellunge	Not given	1	latent (48 hrs)	NA
	Smallmouth/largemouth				
Thornaple	Bass	Not given	11.7	latent (48 hrs)	NA
Thornaple	Sunfish	Not given	35.8	latent (48 hrs)	NA
Thornaple	yellow perch	Not given	35.8	latent (48 hrs)	NA
Thornaple	Cyprinidae	Not given	32.9	latent (48 hrs)	NA
Thornaple	Suckers/Redhorses	Not given	4.7	latent (48 hrs)	NA
Thornaple	Catfish	Not given	7.6	latent (48 hrs)	NA
Racine	Bass	269	6	latent (48 hrs)	NA
Marshall	Bluegill	Not given	5.4	latent (48 hrs)	NA
Vanceburg	Percidae	252	0.6	latent (48 hrs)	NA

Mean Turbine Mortality Rates for Family/Genus Groups at the Brandon **Table 5-15: Road Project**

FAMILY/GENUS GROUP	MORTALITY RATE (%)
Ictaluridae	7.6
Sunfish	5.4
Bass	11.7
Cyprinidae	32.9
Catostomidae	4.7
Percidae	0.6
Percichthyidae ^A	11.7
Esocidae	1.0
Umbridae ^B	0.6
Atherinidae ^B	0.6
Lepisosteidae ^C	4.7

ABass morality rate was used as a surrogate
BPercidae was used as a surrogate
Catostomidae was used as a surrogate

Table 5-16: Mean Turbine Mortality Rates for Family/Genus and Size Groups at the **Dresden Island Project**

FAMILY/GENUS GROUP	AVERAGE MORTALITY RATE
Ictaluridae	10.7
Sunfish (small)	3.8
Sunfish (large)	24.7
Average Sunfish	14.2
Bass	13.2
Cyprinidae (large)	32.9
Cyprinidae (small)	20.0
Average Cyprinidae	26.45
Catostomidae (small)	15.0
Catostomidae (large)	16.9
Average Catostomidae	16.0
Percidae (large)	12.7
Percidae (small)	15.0
Average Percidae	13.9
Percichthyidae*	13.2
Esocidae	1.0
Umbridae*	15.0
Atherinidae*	15.0
Lepisosteidae*	16.9

ABass morality rate was used as a surrogate
BPercidae was used as a surrogate
CCatostomidae was used as a surrogate

Summary of Estimated Total Entrainment Fish Loss by Season, and **Table 5-17:** Family/Genus for the Brandon Road Project

FAMILY	WINTER	SPRING	SUMMER	FALL	TOTAL
Ictaluridae	140	485	2,098	83	2,806
Sunfish	77	162	458	103	800
Bass	19	88	105	0	213
Cyprinidae	313	620	1,837	129	2,899
Catostomidae	33	124	281	6	445
Percidae	14	18	9	3	45
Percichthyidae	0	0	107	80	187
Esocidae	0	0	5	0	5
Umbridae	0	0	0	0	0
Atherinidae	0	0	0	0	1
Lepisosteidae	1	2	1	0	4
Total	598	1,498	4,902	406	7,404

^{*}Total numbers may differ due to rounding

Table 5-18: Summary of Estimated Total Entrainment Fish Loss by Season and Family/Genus for the Dresden Island Project

FAMILY		WINTER	SPRING	SUMMER	FALL	TOTAL
Ictaluridae		54	210	2,413	91	2,768
Sunfish		56	131	986	212	1,385
Bass		6	30	97	0	133
Cyprinidae		69	153	1,205	81	1,508
Catostomidae		31	130	779	17	956
Percidae		88	129	176	62	456
Percichthyidae		0	0	98	71	169
Esocidae		0	0	4	0	4
Umbridae		0	1	3	1	5
Atherinidae		3	0	0	2	6
Lepisosteidae		1	2	4	0	6
	Total	308	786	5,765	537	7,396

^{*}Total numbers may differ due to rounding

Table 5-19: Estimated Total Entrainment Fish Loss for Seasonal Length Frequency by Family/Genus Groups for the Dresden Island Project

FAMILY	SPRING	SUMMER	FALL	TOTAL
Ictaluridae 1-149 mm (small)	5	0	2	6
Ictaluridae 150-610+ mm (large)	205	2,413	90	2,708
Sunfish 1-149 mm (small)	32	252	57	340
Sunfish 150-209 mm (large)	22	7	0	29
Bass 1-149 mm (small)	3	59	0	63
Bass 150-469 mm (large)	27	38	0	65
Catostomidae 1-149 mm (small)	122	314	0	436
Catostomidae 150-419 mm (large)	0	472	18	489
T	otal 416	3,555	166	4.136

^{*}Annual mortality of length frequency groups (Table 5-19) differ to the annual mortality totals of the family/genus group (Table 5-18) because length frequency data was not available for winter and specific family/genus groups.

6.0 REPORT ADDENDUM

The following questions were raised by the Illinois Department of Natural Resources during the March 17, 2009 with Northern Illinois Hydropower and Kleinschmidt Associates.

1) Table 5-3 Moore's Park has several very high numbers in August and September. Why are these so different? Are these outliers explainable, and/or should the data be included?

The Moore's Park study used to estimate Brandon Road entrainment rates had two outliers for the months of August and September. The Moore's Park Entrainment Report noted that the elevated entrainment rates for the months of August and September were caused by the entrainment of young-of-the-year fish, which primarily consisted of sunfish, bass and catfish. The Brandon Road average entrainment rate for the months of August and September were 1.39 and 4.52 mcf, respectively. The average entrainment rate of August and September for the Brandon Road Project without including the Moore's Park entrainment rates would be 0.33 and 0.32 mcf (0.3 fish entrained for every million cubic feet of water passing through the project turbines), respectively. Although, the Moore's Park entrainment rates for these two months may be considered outliers when compared to the other entrainment rates used, they were included because the difference in averages was not an order of magnitude higher than the other entrainment rates chosen for the Brandon Road Project.

Intuitively the Dresden Island Project should have a higher entrainment than the Brandon Project, because the fishery is in better shape and represented by more genera (and numbers of individuals)... it is below the Kankakee, which is a much higher quality stream... so why the difference?

Theoretically, the Dresden Island Project would likely have a higher entrainment estimate than the Brandon Road Project because the hydraulic capacity is larger. The Brandon Road Project has a higher entrainment estimate because the studies chosen for entrainment rate transfer had higher entrainment rates. Although the estimated number of fish entrained at the Brandon Road Project was higher than the Dresden Island Project, it was not an order of magnitude higher in the comparison.

Table 5-14 has a few extreme outliers (mortalities of 50% and greater and a few at 80% or above). Either the numbers are the inverse or something occurred (like the sample was so small that one or two deaths was an extremely high percentage) to make the data 'unusual' and therefore we questioned whether it should be included in any comparative analysis. Also Tables 5-15 and 5-16 seem to have some of this effect...

Fish mortality data in Table 5-14 includes a few noticeably high mortality rates reported from the Herrings mortality study. The November bluegill sample had a 93.4% mortality rate, while the other two bluegill species tested during this study had a mortality rate of 5.1 and 0.6%. Other test groups such as largemouth bass and cyprinids also had a few extreme outliers. We compared the mortality estimates from the 1997 EPRI mortality database to the original Herrings study (Kleinschmidt, 1995). Some species data (bluegill, golden shiner, largemouth bass, walleye, white sucker and yellow perch) were inconsistent with the original Herrings study. The mortality rates and related annual fish loss estimates for Dresden Island have been revised to reflect mortality estimates used in the original Herrings study.

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APPENDIX A

SCREENING MATRIX OF FISH ENTRAINMENT STUDIES FROM VARIOUS HYDROELECTRIC PROJECTS

Table A-1: Screening Matrix of Fish Entrainment Studies from Various Hydroelectric Projects

PROJECT	L	OCATION		TURBINE	CONFIGURAT	ION]	INTAKE F	PARAMETERS	OPERATION	IMPOUNDME	NT/ POW	ER CANAI	DATA			CAL DATA A	VAILABLE
Name FERC NO.	State	River	Capacity (MW) (CFS)	Turbine Type	Number of Turbines	Rated Head (ft)	Intake Velocity (ft/s)	Bar Rack Spacing (in)	Depth of Intake (ft)	Peaking or Run of River	Impoundment / Power Canal	Surface Acres	Volume (acre/ ft.)	Ave. Depth (ft)	Baseline Survey	Fishery Type	Entrain Netting	nment Sampling Hydroacoustics
Brandon Roads No. 12717	IL	Des Plaines	10.2 4,500 cfs	S-Type	2	29		1.5		Run-of-River	Riverine Impoundment			9	yes			
Dresden Island No. 12626	IL	Illinois	10.2 7,500 cfs	Bulb-Type Kaplan	3	17.5		1.5		Run-of-River	Riverine Impoundment			9	yes			
Ninety-nine Islands No. 2331	SC	Broad	18 MW 3992 cfs	Horizontal Francis	6 @ 3000 kW	72	2.3 70% clear		Bottom oriented 11.5 ft. below the water surface	Modified Peaking	Impoundment	433	2300	> 6	YES	Warm	Full Recovery Netting on Unit 4	YES
Neals Shoals No. 2315	SC	Broad	4.42 MW 4000 cfs	Horizontal Francis	4 @ 1100 kW	24	3.4 70% clear		Intake pulls from entire water column	Run of River	Impoundment	600	1500		YES	Warm	Full Recovery Netting on Unit 3	YES
Hollidays Bridge No. 2465	SC	Saluda	3.5 MW 1850 cfs	Horizontal Francis Vertical Francis	3 @ 1250 kW 1 @ 600 kW	41.5	1.2 70% clear	2	Bottom oriented 18 ft. below the water surface	Modified Peaking	Impoundment Power Canal	466 1.5	6000	> 6	YES	Warm	Full Recovery Netting on Unit 3	YES
Saluda Station No. 2406	SC	Saluda	2.4 MW 1280 cfs	Horizontal Francis	4 @ 600 kW	38	2.0 70% clear		Bottom oriented 14 ft. below the water surface	Modified Peaking	Impoundment	556	7228	6	YES	Warm	Full Recovery Netting on Unit 1	YES
Gaston Shoals No. 2332	SC	Broad	9.1 MW 2800 cfs	Horizontal Francis Vertical Francis	1 @ 2320 kW 3 @ 1440 kW 1 @ 2500 kW	43 . 51	0.7 70% clear	2.5	Bottom oriented 13.5 ft below the water surface	Modified Peaking	Impoundment	300	2500	> 30	YES	Warm	Full Recovery Netting on Unit 6	YES
Richard B. Russell	GA/SC	Savannah	648 MW 60,000 cfs	Francis	4@ 80MW 4@ 82MW	144		8	Mid-depth 100 ft. below normal pool	peaking	Impoundment	26,653	1,026,244		YES	Warm	Full Recovery Netting on 1 unit	YES
Hawks Nest	OH/KY	New	102 MW 11,866	Semi-Kaplan Runners	3 @ 23 MW			4		Peaking	Impoundment	n/a	n/a	n/a	YES	Warm	Partial Recovery Net	YES
High Falls	NC	Deep	0.66 MW	Francis	3 units	17		2.375			Impoundment				YES	Warm	Partial	NO
Steven's Creek No. 2535	GA	Savannah	18.9 MW	Vertical Francis		28				Run-ofRiver contraolled by upstream releases	Impoundment				YES	Warm	Full Recovery	YES
King Mill No. 9988	GA	Augusta Canal Savannah	2.05 MW 950 cfs	Horizontal Francis	1 @ 650 kW 1 @ 1400 kW	30	1.5 ft/s	2	Intake pulls from entire water column	Run of River	Power Canal			7 11	YES	Warm	Partial Recovery Net in tailrace	NO
Four Mile	MI	Thunder Bay	1.8 MW 1,800 cfs	Horizontal	3 @ 600 kW	29	n/a	n/a	n/a	n/a	Impoundment	n/a	n/a	n/a	n/a	Warm/Cool	Full Recovery on Unit 1	NO
Moore's Park	MI	Grand	1.8 MW 1,200 cfs	Horizontal Francis	2 @ 540 kW	15	3.67	1.62	17	Run of river	Impoundment	240	2,000	n/a	YES	Warm/cool	Full recovery	YES
Belding	MI	Flat	n/a 416 cfs	Kaplan	2	11	n/a	2	n/a	Run of River	Impoundment	n/a	n/a	n/a	n/a	Cool	Full Recovery	NO
La Barge	MI	Thornapple	1.6 MW	Horizontal Francis	2 @ 800 kW	15	n/a	n/a	n/a	Run of River	Impoundment	100	n/a	n/a	n/a	Warm	Full Recovery	NO
Mio	MI	Au Sable	5 MW 4950 cfs	tbd	n/a	35	2.3	2.94	20	Run of River	Impoundment	880	12,000	n/a	n/a	Cool	Partial Recovery Net	YES
Alcona	MI	Au Sable	8.0 MW 8000 cfs	Vertical Francis	n/a	43	2.2	3.12	25	Pulsed	Impoundment	1075	25,000	n/a	n/a	Cool	Partial Recovery Net	YES
Loud	MI	Au Sable	4.0 MW 4444 cfs	tbd	n/a	40	1.5	1.69	22.6	Pulsed	Impoundment	780	12,600	n/a	n/a	Cool	Partial Recovery Net	YES
Five Channels	MI	Au Sable	6 MW 3,000 cfs	Horizontal Francis	n/a	36	1.4	1.75	22.2	Pulsed	Impoundment	250	4,000	n/a	n/a	Cool	Partial Recovery Net	YES

PROJECT	L	OCATION	-	TURBINE	E CONFIGURAT	ION]	INTAKE PAR	RAMETERS	OPERATION	IMPOUNDMENT/ POWE		WER CANAL DATA		D1:		CAL DATA A	VAILABLE
Name	State	River	Capacity	Turbine	Number	Rated	Intake	Bar Rack	Depth	Peaking or	Impoundment /	Surface	Volume	Ave.	Baseline Survey		Entrain	ment Sampling
FERC NO.			(MW) (CFS)	Туре	of Turbines	Head (ft)	Velocity (ft/s)	Spacing (in)	of Intake (ft)	Run of River	Power Canal	Acres	(acre/ ft.)	Depth (ft)		* **	Netting	Hydroacoustics
Cooke	MI	Au Sable	9 MW 3,600 cfs	tbd	n/a	50	1.7	1.75	28.5	Pulsed	Impoundment	1800	30,000	n/a	n/a	Cool	Partial Recovery Net	YES
Foote	MI	Au Sable	9 MW 4,050 cfs	tbd	n/a	40	22	2.87	22	Pulsed	Impoundment	1800	30,000	n/a	n/a	Cool	Partial Recovery Net	YES
Rogers	MI	Muskegon	8.8 MW 2,400 cfs	Vertical Francis	n/a	39.2	n/a	1.75	23	Run of River	Impoundment	810	10,000	n/a	n/a	Cool	Full/Partial Recovery Net	YES
Hardy	MI	Muskegon	30 MW 37,500 cfs	Vertical Francis	n/a	100.2	n/a	n/a	n/a	Pulsed	Impoundment	3902	134,973	n/a	n/a	Cool	Partial Recovery Net	YES
Croton	MI	Muskegon	8.8 MW 10,510 cfs	tbd	n/a	50	n/a	1.75	21	Run of River	Impoundment	1209	21,932			Cool	Partial Recovery Net	YES
Morrow	MI	Kalamazoo	880 cfs	rim-drive	4	13	n/a	n/a	n/a	Run of River	Impoundment	1000	n/a	n/a	n/a	Cool	Full Recovery on one unit	NO
Kleber	MI	Black	1.2 MW 1,200	Vertical Kaplan	2 @ 600kW	44	1.41	3	15	Run of River	Impoundment	270	3,000	n/a	n/a	Warm/cool	Full Recovery on one Unit	YES
Constantine	MI	St. Josephs	1.2 MW 1,200 cfs	n/a	4	11	1.3	3	13.74	Run of River	Impoundment	525	n/a	n/a	n/a	Cool	Full Recovery	No
Buchanan	MI	St. Josephs	4.1 MW 4,569 cfs	Vertical Francis	10	12.8	0.7	3	13.87	Run of River	Impoundment	525	3,895	n/a	YES	Cool	Partial Recovery Net	NO
Mc Clure	MI	Dead	460 cfs	Pelton	2	410	tbd	3	tbd	Run of River	Impoundment	tbd	tbd	tbd	Yes	Warm/cool	Full recovery	No
Ninth Street	MI	Thunder Bay	1650 cfs	tbd	3 @ 460 kW	tbd	tbd	1.0	tbd	Run of rier	Impoundment	tbd	tbd	n/a	n/a	Warm	Full recovery	NO
Hillman	MI	Thunder Bay	550 cfs	tbd	1 @ 460 kW	tbd	tbd	tbd	tbd	Run of River	Impoundment	tbd	tbd	n/a	n/a	Warm	Full recovery 1 Unit	NO
Hoist	MI	Dead	760 cfs	Francis	2	84	tbd	3	tbd	Run of river	Impoundment	tbd	tbd	tbd	Yes	Warm/cool	Full Recovery	No
Prickett	MI	Sturgeon	2.2 MW 2220 cfs	Vertical Francis	2 @ 1100 kW	54	1.6	2	17	Modified ROR	Impoundment	773	13,987	n/a	n/a	Warm/cool	Full Recovery	NO
Escanaba Dam 3	MI	Escanaba	2.5 MW 3400 cfs	n/a	2	30.5	3	1.62	16.5	Run of River	Impoundment	182	1,100	n/a	n/a	Cool	Full Recovery	NO
Escanaba Dam 1	MI	Escanaba	1.95 MW 1,600 cfs	n/a	3	23.2	3	1.62	18.2	Run of River	Impoundment	75	375	n/a	n/a	Cool	Full Recovery	NO
Stewart's Bridge No. 2047	NY	Sacandaga	36 MW 5,400	Francis	1 @ 5400 cfs		n/a	n/a	n/a		Impoundment	480	18,600	n/a	YES	n/a	n/a	n/a
E.J. West No. 2318	NY	Sacandaga	5400	Vertical Francis	2 @ 2700 cfs	63	2.8 fps	4.5		Peaking	Impoundment	25,940	681,000	n/a	YES State	n/a	Full Netting Unit 2	NO
Sherman Island No. 2482	NY	Hudson	6600 cfs 30 MW	Vertical Francis	4 @ 1650 cfs	69	2.2 fps	3.13		Peaking	Impoundment Power Canal	305	6,960	n/a	YES YES	n/a	Full Netting Units 2,3, & 5	NO
Feeder Dam	NY	Hudson	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Impoundment	n/a	n/a	n/a		n/a	Full Netting Units 1,3, & 5	NO
Minetto	NY	Oswego	7500 cfs	Vertical Francis	5 @ 1500 cfs	17.3	2.6 fps	2		Peaking	Impoundment	350	4,730	n/a	YES	Cool/cold	Full Netting Units 3, 4, & 5	NO
Schagticoke	NY	Hoosic	1640 cfs	Vertical Francis	4 @ 410 cfs	153	1.6 fps	2.25		Peaking	Impoundment Power Canal	164	1,150	n/a	YES	Warm/cool	Full Netting Unit 4	NO
Johnsonville	NY	Hoosic	1288 cfs	Horizontal Francis	2 @ 644 cfs	38	0.9 fps	2		Peaking	Impoundment	450	6,430	n/a	YES	Warm/cool	Full Netting Units 1 & 2	NO
Higley	NY	Middle Racquette	2045 cfs	Horizontal Francis	2 @ 675 cfs 1@ 695 cfs	46 45	1.5 fps	3.63		Peaking	Impoundment Power Canal	742	4,496	n/a	YES	Cool/cold	Full Netting Units 1, 2, & 3	NO
Colton	NY	Middle Racquette	1503 cfs	Vertical Francis	2 @ 497 cfs 1 @ 509 cfs	285 285	2.7 fps	2		Peaking	Impoundment	195	620	n/a	YES	Cool/cold	Full Netting Unit 1	NO

PROJECT	LOCATION			TURBINE	E CONFIGURATI	ION		INTAKE PAI	RAMETERS	OPERATION	IMPOUNDMI	ENT/ POW	ER CANAL	DATA			CAL DATA A	VAILABLE
Name EEDC NO	State	River	Capacity	Turbine	Number	Rated	Intake	Bar Rack	Depth	Peaking or	Impoundment /	Surface	Volume	Ave.	Baseline Survey	Fishery Type		nment Sampling Hydroacoustics
FERC NO.			(MW) (CFS)	Туре	of Turbines	Head (ft)	Velocity (ft/s)	Spacing (in)	of Intake (ft)	Run of River	Power Canal	Acres	(acre/ ft.)	Depth (ft)			Netting	Hydroacoustics
Raymondville	NY	Lower Racquette	1640 cfs	Fixed Propeller	1 @ 1640 cfs	21.5	1.9 fps	3		Peaking	Power Canal	50	264	n/a	YES	Cool/cold	Full Netting Unit 1	NO
East Norfolk	NY	Lower Racquette	1635 cfs	Fixed Propeller	1 @ 1635 cfs	31.4	4.2 fps	8.75		Peaking	Impoundment Power Canal	135	287.9	n/a		Cool/cold	Full Netting Power Canal	NO
High Falls	NY	Beaver	900 cfs	Vertical Francis	3 @ 300 cfs	100	0.9 fps	1.81		Peaking	Impoundment	290	1,059	n/a	YES	Cool/cold	Full Netting Unit 1	NO
Moshier	NY	Beaver	660 cfs	Vertical Francis	2 @ 330 cfs	196	1.3 fps	1.5		Peaking	Impoundment	690	7,339	n/a	YES	Cool/cold	Full Netting Unit 2	NO
Herrings	NY	Black	3609 cfs	Fixed Propeller	3 @ 1203 cfs	19.5	2.3 fps	3.5		Run-of-River	Impoundment	140	n/a	n/a	YES	Cool	Full Netting Unit 2	NO
Station 26	NY	Genessee	3.0 MW	n/a	n/a	n/a	n/a	n/a	n/a	N/a	Impoundment	n/a	n/a	n/a	n/a	Cool	n/a	n/a
Little Quinnesec	WI	Menominee	9.1 MW 2,176	Francis Horizontal Vertical	5 1@1,00 hp 2@1,400 hp 1 @ 2600 hp 1 @ 2800 hp 1 @ 3240 hp	65	n/a	2	n/a	Peaking	Impoundment	349	3,000	n/a	n/a	Warm	No	n/a
Chalk Hill	WI	Menominee	7.8 MW 3993 cfs	Kaplan	3	28	n/a	4.5	n/a	Peaking	Impoundment	n/a	n/a	n/a	n/a	Warm/cool	No	No
Grand Rapids	WI	Menominee	7.02 MW 3870 cfs	Francis	5 3 @1,700 1 @ 2,500 1 @ 2,400	28	n/a	1.75	n/a	Peaking	Canal	n/a	n/a	n/a	n/a	Warm/cool	Partial	n/a
White Rapids	WI	Menominee	8.0 MW 3,994	Francis	3 units 2 @ 4,385 1 @ 3,100	29	1.9	2.5	23.9	Run of river	Impoundment	435	5,155	n/a	Yes	Warm/cool	Partial	YES
Park Mill	WI	Menominee	4.6 MW 2543 cfs	V. Francis H. Francis		16	2.06	3	16	Run of river	Impoundment Power Canal 2400 ft. long	539	3788		n/a	Cool	Partial Netting of Power Canal for species	YES
Brule	WI	Brule	5.3 MW 1500 cfs	Francis	3 @ 1760 kW	63	1	1.375	22 ft	Run of river	Impoundment	545	8,800		YES	Cool	Full Recovery on Two Units	YES
Upper	WI	Flambeau	0.9 MW 720 cfs	n/a	n/a		2	1.75	13.6	Run of River	Impoundment	431	3280	n/a	n/a	n/a	NO	Yes
Lower	WI	Flambeau	1.2 MW 930 cfs	n/a	n/a	n/a	1.7	3.5	12.2	Run of River	Impoundment	71	570	570	n/a	n/a	NO	Yes
Pixley	WI	Flambeau	.96 MW 675 cfs	n/a	n/a	n/a	2	1.75	16	Run of River	Impoundment	193	1757	n/a	n/a	n/a	NO	Yes
Crowley	WI	Flambeau	1.74 MW 1480 cfs	n/a	n/a	n/a	1.4	2.38	20.7	Run of River	Impoundment	422	3539	n/a	YES	Warm	Full Recovery	YES
Thornapple	WI	Flambeau	1.4 MW 1400 cfs	Propeller	2 @ 700 kW	15	1.22	1.69	13.1	Run of River	Impoundment	295	1000	n/a	YES	Warm	Full Recovery on One Unit	NO
Rothschild	WI	Wisconsin	3.64 MW 3386 cfs	H. Francis Vert. Propeller	6 units 1 unit	n/a	2.15	1.38	15	Run of River	Impoundment	1,604	13,900	n/a	YES	Warm	Full Recovery on Two Units	NO
Wis. River Div.	WI	Wisconsin	1.8 MW 5141 cfs	Horizontal Francis Tube Turbine	9 units hydromechanical 1 unit hydroelectric	20	n/a	n/a	19	Run of River	Impoundment Mainstem of the Wisconsin River	240	1,120	n/a	n/a	Warm	Full Recovery Netting in Tailrace	NO
Centralia	WI	Wisconsin	3.2 MW 3900 cfs	Vertical Francis	4 @ 400 kW	15.5	n/a	3.5	n/a	Run of River	Impoundment Power Canal	250	n/a	n/a	n/a	Warm/cool	Full Recovery on Unit # 2 Vertical	NO
				Vertical	2 @ 800 kW	15.5					200 ft. long						Francis	

PROJECT	L	OCATION		TURBINE CONFIGURATION			1	INTAKE PAI	RAMETERS	OPERATION	IMPOUNDME	L DATA	BIOLOGICAL DATA AVAILABLE					
Name FERC NO.	State	River	Capacity (MW)	Turbine Type	Number of Turbines	Rated Head	Intake Velocity	Bar Rack Spacing	Depth of Intake	Peaking or Run of River	Impoundment / Power Canal	Surface Acres	Volume (acre/ ft.)	Ave. Depth	Baseline Survey	Fishery Type	Entrair Netting	nment Sampling Hydroacoustics
-			(CFS)	Propeller		(ft)	(ft/s)	(in)	(ft)					(ft)				
Shawano	WI	Wolf	0.7 MW 835 cfs		1	18.5	1.48	5	16	Run of River	Impoundment	155	1,090	n/a	n/a	n/a	YES	YES
Townsend	PA	Beaver	5.0 MW								Impoundment	n/a	n/a	n/a			Full Recovery	
Youghiogheny	PA	Youghiogheny									Impoundment	n/a	n/a	n/a			Full Recovery	
Dam #4	WV	Potomac	1.0 MW 1082 cfs	Horizontal Francis	2 @ 500 kW	17.3					Impoundment	n/a	n/a	n/a			Full Recovery on Unit # 1	NO
Millville	WV	Shenandoah	2.8 MW 1970 cfs	Francis Propeller Kaplan	1 @ 840 kW 1 @ 1000 kW 1 @ 1000 kW	22.4 24 24					Impoundment						Full Recovery on Unit # 1 Francis	NO

APPENDIX B MORTALITY STUDIES

Table B-1: Site Characteristics Relevent to Turbine Passage Survival

	ı	İ	Ra	ited	Rated	Rated	Ra	ited	I	Ru	nner	Peri	pheral	No. of	No. of	No. of
	Unit #			ead	Power	Power		ow	Speed	Dia	neter		Velocity	Runner	Wicket	Stay
Site Name	Tested	Turbine Type	(ft)	(m)	(HP)	(MW)	(cfs)	(cms)	(rpm)	(in)	(cm)	(ft/sec)	(m/sec)	Blades	Gates	Vanes
	•		•	•	•	•	•		•	•		•	•	•	•	•
Peshtigo	4	Francis (vert)	13	4.0		0.36	460	13.0	100	80	203	35.0	10.7			
Townsend Dam	2	Kaplan (horiz)	16	4.9		2.5	2200	62.3	152	113	288	75.0	22.9	3		
Potato Rapids	2	Francis (vert)	17	5.2		0.44	440	12.5	135	80	203	47.0	14.3			
Potato Rapids	1	Francis (vert)	17	5.2		0.5	500	14.2	123	84	213	45.0	13.7			
Minetto	3/4	Francis (vert)	17.3	5.3		1.6	1500	42.5	72	139	353	43.6	13.3	16	28	
Dresden Island	N/A	Bulb type	17.5	5.3	13678	10.2	7,500		120	132	335	69.0		3	18	3
Herrings	2	Propeller (vert)	19.5	5.9	2250	1.8	1203	34.1	138.5	113	287	68.3	20.8			
Craggy Dam	2	Bulb (s-type)	19.7	6.0			635.6	18.0	229	175	445	174.8	53.3	4		
Twin Branch	1/5	Kaplan (horiz,subm. induction)	21.1	6.4			400	11.3		60	152					
Crescent	3	Kaplan	27	8.2	4200	3.1	1520	43.0	144	108	274	67.8	20.7	5	16	
Grand Rapids	1/2	Francis (horiz)	28	8.5		1.2	645	18.3								
Grand Rapids	4	Francis (horiz)	28	8.5		1.7	926	26.2								
Stevens Creek	3	Francis (vert)	28	8.5		2.35	1000	28.3	75	135	343	44.2	13.5	14	20	
Chalk Hill	1	Kaplan (vert)	28	8.5	3570	2.6	1331	37.7	150	102	259	66.7	20.3	4	16	
White Rapids	1	Francis (vert)	29	8.8	4385	3.27	1540	43.6	100	134	340	58.4	17.8	14	20	
Brandon Roads	N/A	s-type	29	8.8	13678	10.2	4,500		120	148	375	74.0		4	20	3
Vernon	4	Francis (vert)	34	10.4		2.5	1280	36.2	133.3	62	158	36.3	11.1	14	16	
Vernon	10	Francis (vert)	34	10.4		4.2	1834	51.9	74	156	396	50.3	15.3	15	20	
Hollidays Bridge	1	Francis (horiz, triple runner)	35	10.7		0.9	370	10.5								
Five Channels	2	Francis (horiz, quad)	36	11.0		3	1500	42.5	150	55	140	36.0	11.0	16	18	
Rogers	2	Francis (vert)	39.2	11.9		1.7	727	41.2	150	60	152	39.3	12.0	15		
Sandstone Rapids	1	Francis (vert)	42	12.8		1.9	650	18.4	150	87	220	57.0	17.4			
Alcona	2	Francis (vert)	43	13.1		4	1600	45.3	90	100	254	39.3	12.0	16	18	
Higley	3	Francis (horiz)	45	13.7	2800	2.1	695	19.7	257	48	121	53.2	16.2	13	16	16
Finch Pruyn	5	Francis (horiz, double)	49	14.9		14	4600	130.3								
Finch Pruyn	4	Francis (horiz, quad)	49	14.9		14	4600	130.3								
Hadley Falls	2	Fixed Propeller	50	15.2		15.8	3750	106.2	150	156	396	102.1	31.1	5		
Hadley Falls	1	Kaplan	50	15.2		15	4000	113.3	128	170	432	94.9	28.9	5	20	
Wilder	2	Kaplan	51	15.5	22000	17	4500	127.4	112.5	108	274	53.0	16.2	5	21	
Prickett	1	Francis (vert)	54	16.5		1.1	326	9.2	257	53	136	59.9	18.2			
Buzzard's Roost	2	Kaplan (vert)	55	16.8	7400	5	1310	37.1	240							
Safe Harbor	7	Kaplan	55	16.8	42000	32	8300	235.1	109	220	559	104.6	31.9	5	20	
Safe Harbor	9	Mixed Flow	55	16.8	52000	37.5	9200	260.5	77	240	610	80.6	24.6	7	20	
Holtwood	3	Francis (vert, double-runner)	61.5	18.7	19840	14.95	3500	99.1	102.8	112	284	50.2	15.3	17	20	
Holtwood	10	Francis (vert)	62	18.9	20000	14.9			94.7					16		
E. J. West	2	Francis (vert)	63	19.2	17150	12.8	2450	69.4	112.5	131	332	64.1	19.5	15	28	19
Ninety-Nine Islands	3	Francis (horiz, twin runner)	74	22.6	4700	3	584	16.5	225							
Fourth Lake	1	tube (S-type)	75.5	23.0	4000	3.1	530	15.0	360	65	165	105.3	32.1	6	13	
Caldron Falls	1	Francis (vert)	80	24.4		3.2	650	18.4	226	72	182	71.0	21.6			
Wanapum	9	Kaplan	80	24.4					85.7	285	724	106.5	32.5	5		
High Falls - Peshtigo R.	5	Francis (horiz)	83	25.3		1.4	275	7.8	359	39	99	61.0	18.6			
Rocky Reach	8	Fixed Propeller	86.5	26.4	177000	130	21000	594.7	85.7	311	790	116.0	35.4	5	20	
Conowingo	8	Kaplan (mixed flow)	90	27.4	85000	62	10000	283.2	120	225	572	118.0	36.0	6	24	
Rocky Reach	3	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Rocky Reach	5	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Rocky Reach	6	Kaplan	92	28.0	140000	104	16000	453.1	90	280	711	110.0	33.5	6	20	
Lower Granite	4	Kaplan (vert)	98	29.9		135	19000	538.1	90	312	792	122.5	37.3	6		
Hardy	2	Francis (vert)	100	30.5		10	1500	42.5	163.6	84	213	59.8	18.2	16		
Hoist	3	Francis (vert)	142	43.3	2400	1.8	4		360				1			
Schaghticoke	4	Francis (vert)	153	46.6	6300	4.7	410	11.6	300	51	128	66.1	20.1	17	28	8
Bond Falls	1	Francis (vert)	210	64.0	9300	6	450	12.7	300				1			
Colton	1	Francis (vert)	258	78.6	15080	11.2	450	12.7	360	59	150	92.6	28.2	19	2.8	
Crowley	8	Kaplan			1600	1.2	1200	34.0	150	93	236	60.8	18.5			

Table B-2: Turbine Mortality Study Data from Other Hydroelectric Sites

	TEST	ID INFO	SURVIVAL ESTIMATES									
			Based o	on number r	eleased	Based or	n number re	ecovered	Based on number recovered			
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour	
AC-01	Alcona	bluegill	1.028	1.028	1.000	1.000	1.000	0.973		1.000	1.000	
AC-02	Alcona	bluegill	1.000	0.886	0.831	1.000	0.886	0.831	1.000	1.000	0.957	
AC-03	Alcona	rainbow trout	1.182	1.182	1.136		0.929	0.893		1.000	1.000	
AC-04	Alcona	rainbow trout	1.333	1.333	1.333	1.000	1.000	1.000		1.000	1.000	
AC-05	Alcona	spottail shiner	0.825	0.871	0.520	0.943	0.995	0.594	1.000	0.775	0.625	
AC-06	Alcona	yellow perch	1.008	1.120	0.968	1.008	1.120	0.968		0.818	0.818	
AC-07 AC-08	Alcona Alcona	bluegill bluegill	0.772 0.736	0.711 0.855	0.631 0.842	0.863 0.780	0.795 0.906	0.705 0.893	1.000 1.000	0.839 0.817	0.806 0.717	
AC-08 AC-09	Alcona	golden shiner	0.736	0.805	0.842	0.780	0.906	1.080		0.817	0.717	
AC-09 AC-10	Alcona	golden shiner	0.837	0.803	0.993	0.909	0.874	0.809	1.000	0.946	0.730	
AC-10 AC-11	Alcona	northern pike	0.902	0.837	0.777	0.558	0.871	0.809		1.000	1.000	
AC-11 AC-12	Alcona	grass pickerel	0.967	0.900	0.300	0.967	0.900	0.312	1.000	1.000	1.000	
AC-12 AC-13	Alcona	walleye	1.106	0.900	0.867	0.956	0.796	0.386		0.921	0.921	
AC-13 AC-14	Alcona	walleye	0.951	1.839	1.404	0.930	1.739	1.328		0.921	0.921	
AC-14 AC-15	Alcona	white sucker	1.037	0.996	0.975	0.899	0.924	0.905		0.133	0.090	
AC-16	Alcona	white sucker	0.883	0.897	0.962	0.883	0.897	0.962	1.000	0.967	0.883	
AC-17	Alcona	yellow perch	0.581	0.641	0.513	0.625	0.689	0.551	1.000	0.907	0.907	
AC-18	Alcona	yellow perch	0.565	0.484	0.484	0.452	0.387	0.387	1.000	0.083	0.083	
	Bond	rainbow trout										
BF-01	Falls					0.829	0.666	0.645	1.000	1.000	1.000	
	Bond	yellow perch										
BF-02	Falls	J I				0.798	0.771	0.768	0.995	0.991	0.991	
	Bond	golden shiner										
BF-03	Falls					0.744	0.615	0.579	0.967	0.924	0.890	
	Bond	bluegill										
BF-04	Falls					0.816	0.752	0.781	0.984	0.959	0.900	
	Buzzards	bluegill										
BR-01	Roost					0.931	0.759	0.759	1.000	1.000	1.000	
		bluegill										
BR-02	Roost		1.000	0.870	0.870	1.000	0.870	0.870	1.000	1.000	1.000	
		bullhead spp										
BR-03	Roost		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
		bullhead spp										
BR-04	Roost		0.774	0.774	0.774	0.774	0.774	0.774	1.000	1.000	1.000	
DD 05		bluegill	0.00		<u> :</u>	0.0.55	4 40-	2 - 2 :		0.555	0.105	
BR-05	Roost	1.1 '11	0.960	1.189	2.704	0.960	1.189	2.704	1.000	0.538	0.192	
DD 06		bluegill	0.005	0.551	2 27-	0.000	0.551	2.25-	1.000	0.541	0.146	
BR-06	Roost	1.141	0.893	0.771	3.375	0.893	0.771	3.375	1.000	0.741	0.148	
DD 07	Buzzards	white perch	0.022	1.615		0.022	1.615		1 000	0.500		
BR-07	Roost	1.1	0.923	1.615		0.923	1.615		1.000	0.500		
DD 00	Buzzards Roost	bluegill	0.021	2.066	1.070	0.021	2.066	1.070	1 000	0.200	0.200	
BR-08		bluegill	0.931	3.966	1.970	0.931	3.966	1.970	1.000	0.200	0.280	
BR-09	Roost	biuegiii	0.931	0.828	1 624	0.021	0.828	1.634	1.000	1 000	0.464	
DK-09		bullhead spp	0.931	0.626	1.634	0.931	0.828	1.034	1.000	1.000	0.464	
BR-10	Roost	bullileau spp	0.963	0.963	0.963	0.963	0.963	0.963	1.000	1.000	1.000	
DIX-10	Caldron	bluegill, bluegill x	0.903	0.903	0.503	0.303	0.303	0.903	1.000	1.000	1.000	
CF-01	Falls	green sunfish hybrid	1.413	1.386	1.386	0.981	0.962	0.962	1.000	1.000	1.000	
C1 -01	Caldron	bluegill, bluegill x	1.713	1.500	1.500	0.701	0.702	0.702	1.000	1.000	1.000	
CF-02	Falls	green sunfish hybrid	0.935	0.947	1.038	0.924	0.936	1.026	0.769	0.731	0.615	
01 02		0	0.733	0.747	1.030	0.724	0.730	1.020	0.707	I 0.751	0.013	

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate		48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Caldron	bluegill, bluegill x									
CF-03	Falls	green sunfish hybrid	1.048	1.048	1.048	1.048	1.048	1.048	0.935	0.935	0.935
	Caldron	fathead minnow, creek									
	Falls	chub, white sucker, golden/shorthead									
		redhorse									
CF-04		realierse	0.820	0.794	0.741	0.883	0.855	0.798	0.900	0.900	0.900
C1 01	Caldron	fathead minnow, creek	0.020	0.771	0.741	0.003	0.033	0.770	0.500	0.500	0.500
	Falls	chub, white sucker,									
		golden/shorthead									
		redhorse									
CF-05	Caldron	fathead minnow, creek	0.515	0.515	0.515	0.613	0.613	0.613	0.971	0.971	0.971
	Falls	chub, white sucker,									
		golden/shorthead									
		redhorse									
CF-06			0.956	0.956	0.969	0.991	0.991	1.005	0.964	0.964	0.929
	Caldron	bluegill, bluegill x								0.044	
CF-07	Falls Caldron	green sunfish hybrid bluegill, bluegill x	1.132	1.153	1.131	0.999	1.018	0.999	0.966	0.931	0.931
CF-08	Falls	green sunfish hybrid	0.803	0.843	0.890	0.906	0.951	1.004	1.000	0.920	0.840
C1*-08	Caldron	bluegill, bluegill x	0.803	0.043	0.090	0.900	0.931	1.004	1.000	0.920	0.840
CF-09	Falls	green sunfish hybrid	0.744	0.744	0.744	0.941	0.941	0.941	1.000	1.000	1.000
	Caldron	fathead minnow, creek									
	Falls	chub, white sucker,									
		golden/shorthead redhorse									
CF-10		reditorse	1.191	1.191	1.108	0.945	0.945	0.879	0.875	0.875	0.875
C1'-10	Caldron	fathead minnow, creek	1.191	1.191	1.106	0.943	0.943	0.879	0.873	0.673	0.873
	Falls	chub, white sucker,									
		golden/shorthead									
		redhorse									
CF-11	C 11	C.1. 1	0.555	0.579	0.588	0.572	0.596	0.605	0.926	0.889	0.778
	Caldron Falls	fathead minnow, creek chub, white sucker,									
	i ans	golden/shorthead									
		redhorse									
CF-12			0.934	0.934	0.912	0.974	0.974	0.951	0.939	0.939	0.939
	Caldron	bluegill, bluegill x									
CF-13	Falls	green sunfish hybrid	0.867	0.800	0.800	0.867	0.800	0.800	1.000	1.000	1.000
CF-14	Caldron Falls	bluegill, bluegill x green sunfish hybrid	0.934	0.934	0.885	0.934	0.934	0.885	1.000	1.000	1.000
C1 -14	Caldron	fathead minnow, creek	0.734	0.734	0.003	0.734	0.734	0.003	1.000	1.000	1.000
	Falls	chub, white sucker,									
		golden/shorthead									
		redhorse									
CF-15	G 11	6.1.1.	0.792	0.771	0.911	0.884	0.860	1.017	1.000	1.000	0.824
	Caldron Falls	fathead minnow, creek chub, white sucker,									
	1 4115	golden/shorthead									
		redhorse									
CF-16			0.320	0.320	0.200	0.333	0.333	0.208	1.000	1.000	1.000
CF-16			0.320	0.320	0.200	0.333	0.333	0.208	1.000	1.000	1.000

	TEST	ID INFO		SURVIVAL ESTIMATES									
			Based of	on number i	eleased	Based of	n number re	ecovered	Based o	n number re	ecovered		
Test		Species	Immediate		48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	val		
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour		
		fathead minnow, creek											
		chub, white sucker, golden/shorthead											
		redhorse											
CF-17			0.723	0.751	0.729	0.723	0.751	0.729	0.931	0.897	0.897		
	Caldron	fathead minnow, creek											
		chub, white sucker,											
		golden/shorthead redhorse											
CF-18		reunorse	0.800	0.783	0.767	0.800	0.783	0.767	1.000	1.000	1.000		
C1-16	Caldron	fathead minnow, creek	0.000	0.763	0.707	0.800	0.763	0.707	1.000	1.000	1.000		
	Falls	chub, white sucker,											
		golden/shorthead											
CE 10		redhorse	0.404	0.404	0.250	0.455	0.455	0.255	0.000	0.000	0.000		
CF-19	Caldron	fathead minnow, creek	0.494	0.494	0.378	0.465	0.465	0.356	0.938	0.938	0.938		
		chub, white sucker,											
		golden/shorthead											
		redhorse											
CF-20	California	f-4h1	0.784	0.757	0.730	0.784	0.757	0.730	1.000	1.000	1.000		
		fathead minnow, creek chub, white sucker,											
		golden/shorthead											
		redhorse											
CF-21			0.857	0.829	0.829	0.811	0.784	0.784	1.000	1.000	1.000		
		fathead minnow, creek											
	Falls	chub, white sucker, golden/shorthead											
		redhorse											
CF-22			0.675	0.675	0.638	0.450	0.450	0.425	0.909	0.909	0.909		
		fathead minnow, creek											
		chub, white sucker, golden/shorthead											
		redhorse											
CF-23			0.597	0.597	0.597	0.597	0.597	0.597	1.000	1.000	1.000		
		fathead minnow, creek						,		,,,,,,			
		chub, white sucker,											
		golden/shorthead redhorse											
CF-24		reditorse	0.530	0.507	0.461	0.469	0.449	0.408	1.000	1.000	1.000		
C1 -24	Caldron	fathead minnow, creek	0.550	0.507	0.401	0.409	0.449	0.400	1.000	1.000	1.000		
	Falls	chub, white sucker,											
		golden/shorthead											
CF-25		redhorse	0.367	0.341	0.301	0.259	0.241	0.213	1.000	1.000	0.958		
C1 -23	Caldron	fathead minnow, creek	0.307	0.341	0.301	0.239	0.241	0.213	1.000	1.000	0.938		
		chub, white sucker,											
		golden/shorthead											
gr. s.:		redhorse	2 :-	2 :-	2 :-								
CF-26	Chalk Hill	bluegill	0.455	0.455	0.455	0.465	0.465	0.465	1.000	1.000	1.000		
CH-01	Chair Hill	orucgiii	0.909		0.909	0.969		0.969	0.976		0.976		
· × ·	1		0.707	<u> </u>	0.707	0.707		0.707	J.,, O	1	0.7,0		

	TEST	ID INFO	SURVIVAL ESTIMATES								
			Based o	on number i	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Chalk Hill	bluegill									
CH-02	C1 11 TT'11	1 / 1 1	0.984		1.125	0.974		1.113	0.985		0.862
CIL 02	Chalk Hill	white sucker/rainbow	0.054		0.064	0.012		0.022	0.005		0.010
CH-03	Challe Uill	trout white sucker/rainbow	0.854		0.864	0.912		0.923	0.985		0.910
CH-04	Chaik Hill	trout	0.974		0.896	0.974		0.896	1.000		0.822
CT-04	Colton	white sucker	0.974		0.090	1.319		0.890	0.158		0.622
CT-01	Colton	white sucker				0.635	0.721	0.641	1.000	0.720	0.540
CT-03	Colton	white sucker				0.567	0.376		1.000	0.842	0.719
CT-04	Colton	bluegill				0.044	0.000	0.000		0.244	0.171
CT-05	Colton	largemouth bass				0.956	0.077	0.042		0.404	0.250
CT-06	Colton	largemouth bass				0.356	0.337	0.000	1.000	0.653	0.286
CT-07	Colton	brook trout				0.670	0.678	0.667	1.000	0.941	0.941
CT-08	Colton	rainbow trout				0.339	0.321	0.250	1.000	1.000	1.000
CT-09	Colton	rainbow trout				0.065	0.059	0.061	0.958	0.792	0.771
CT-10	Colton	white sucker				0.536	0.686	0.802	0.957	0.532	0.404
CT-11	Colton	white sucker				0.284	0.280	0.292	1.000	0.960	0.920
CT-12	Colton	white sucker				0.128	0.118			0.980	0.980
CT-13		bluegill				0.082	0.028	0.000		0.458	0.438
CT-14	Colton	largemouth bass				0.000	0.000			0.900	0.880
CT-15	Colton	largemouth bass				0.000	0.000	0.000		0.800	0.780
CT-16	Colton	yellow perch				0.499	0.567	0.433		0.706	0.647
CT-17	Colton	walleye				0.092	0.084	0.099	0.940	0.820	0.700
CT-18 CT-19	Colton Colton	brook trout rainbow trout				0.735 0.472	0.699 0.404	0.687 0.363	1.000 0.978	1.000 0.913	1.000 0.804
CT-19 CT-20	Colton	rainbow trout				0.472	0.404	0.363	1.000	0.913	0.804
CT-20	Colton	white sucker				0.302	1.097	1.185		0.643	0.595
CT-21	Colton	bluegill				0.300	0.104	0.056		0.620	0.580
CT-23	Colton	largemouth bass				0.111	0.014	0.030		1.000	1.000
CT-24		largemouth bass				0.025	0.025				0.980
CT-25	Colton	yellow perch				0.855	0.899			0.406	0.406
CT-26	Colton	walleye				0.323	0.269	0.176		1.000	0.979
		American shad									
CW-01	0		0.949		0.929	0.949		0.929	0.917		0.917
	Craggy	channel catfish									
CD-01	Dam		0.889	0.889	0.873	0.903	0.903	0.887	1.000	1.000	1.000
	Craggy	channel catfish									<u></u>
CD-02	Dam		0.692	0.692	0.692	0.794	0.794	0.794	1.000	1.000	1.000
	Craggy	channel catfish									
CD-03	Dam		0.860	0.860	0.860	0.925	0.925	0.925	1.000	1.000	1.000
	Craggy	channel catfish		_	_	_	_	_			_
CD-04	Dam	1.1 '11	0.875	0.875	0.875	0.933	0.933	0.933	1.000	1.000	1.000
CD 05	Craggy	bluegill	0.020			0.046			1.000		
CD-05	Dam	1.1 '11	0.928			0.943			1.000		
CD OC	Craggy Dam	bluegill	0.001			0.064			1 000		
CD-06 CS-01		hluahaak hamina	0.801	0.990	1 000	0.864	1.006	1 017	1.000 0.878	0.789	0.707
CS-01 CL-01	Crescent Crowley	blueback herring white sucker	0.944 0.979	1.024	1.000 1.100		1.006 1.046			0.789	0.707
CL-01 CL-02	Crowley	white sucker	0.979	0.563	0.300		0.643	0.343		0.894	0.638
CL-02 CL-03	Crowley	walleye	1.200	0.363	2.080	1.019	0.867	2.080		0.741	0.038
CL-03 CL-04	Crowley	walleye	0.833	0.639	0.519	1.000	0.867	0.623		0.113	0.038
CL-04 CL-05	Crowley	largemouth bass	0.833	0.039	0.319		1.020				
CL-03	Clowley	rargemouni bass	0.941	0.960	0.960	0.960	1.020	1.020	1.000	0.800	0.360

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	n number i	released		n number re		Based or	n number re	ecovered
Test		Species	Immediate		48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	E.J. West	bluegill									
EJW-01	E.J. West	yellow perch	1.261		1.714	1.108		1.506	0.793		0.362
EJW-02	L.J. West	yenow peren	1.098		3.000	1.117		3.051	0.850		0.217
	E.J. West	rainbow trout									
EJW-03	E.J. West	rainbow trout	1.020		1.000	0.945		0.927	1.000		1.000
EJW-04	L.J. West	rambow trout	1.429		0.818	0.870		0.498	1.000		0.786
EWY 05	E.J. West	golden shiner	0.012		0.667	0.025		0.750	0.070		0.055
EJW-05	E.J. West	golden shiner	0.813		0.667	0.925		0.759	0.970		0.955
EJW-06	2.0.7 77 0.50	gordon sinner	1.171		0.630	0.850		0.457	0.946		0.730
EWY 07	E.J. West	rainbow trout	0.745		0.745	0.022		0.000	0.000		0.000
EJW-07	E.J. West	largemouth bass	0.746		0.746	0.932		0.932	0.983		0.983
EJW-08			0.802		0.664	0.870		0.720	1.000		0.986
EWY 00	E.J. West	largemouth bass	0.000		0.750	0.055		0.906	1 000		0.066
EJW-09	E.J. West	bluegill	0.800		0.750	0.955		0.896	1.000		0.966
EJW-10		_	0.436		0.412	0.696		0.657	0.932		0.576
EW 11	E.J. West	bluegill	0.200		0.220	0.502		0.675	0.005		0.610
EJW-11	E.J. West	largemouth bass	0.209		0.238	0.592		0.675	0.985		0.618
EJW-12		_	1.929		1.924	0.816		0.814	1.000		0.952
EWV 12	E.J. West	largemouth bass	0.044		0.427	1.052		0.476	0.050		0.200
EJW-13	E.J. West	yellow perch	0.944		0.427	1.053		0.476	0.950		0.300
EJW-14		-	0.952		1.261	0.856		1.133	0.792		0.434
EJW-15	E.J. West	yellow perch	1.810		2.000	1.329		1.469	0.583		0.361
EJ W-13	E.J. West	rainbow trout	1.010		2.000	1.329		1.409	0.363		0.301
EJW-16			1.517		1.800	0.971		1.152	0.906		0.625
EJW-17	E.J. West	rainbow trout	0.854		1.000	0.874		1.024	0.953		0.721
±3 vv −1 /	E.J. West	rainbow trout	0.654		1.000	0.074		1.024	0.333		0.721
EJW-18			1.625		1.581	0.909		0.884	0.970		0.939
EJW-19	E.J. West	rainbow trout	1.526		1.600	0.935		0.981	1.000		0.789
23 17 -17	E.J. West	white sucker	1.520		1.000	0.733		0.701	1.000		0.709
EJW-20	D 1 111	1	0.695		0.162	0.813		0.189	0.738		0.452
EJW-21	E.J. West	white sucker	0.625		0.541	0.773		0.668	0.984		0.689
20 11 -21	E.J. West	white sucker	0.023		0.541	0.773		0.008	0.764		0.009
EJW-22	D 1 111	1	0.684		0.680	0.722		0.718	1.000		0.877
EJW-23	E.J. West	white sucker	0.799		1.250	0.767		1.200	1.000		0.528
	Finch	smallmouth bass	3.177		1.230	0.707		1.200	1.000		0.520
FPU4-01	Pruyn		0.939			0.949			1.000		
FPU4-02	Finch Pruyn	smallmouth bass	0.838			0.909			1.000		
110102	Finch	smallmouth bass	0.030			0.505			1.000		
FPU4-03	Pruyn		0.954			0.926			1.000		

	TEST	ID INFO	SURVIVAL ESTIMATES								
			Based o	on number i	eleased		n number re		Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Со	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Finch	smallmouth bass									
FPU5-01	Pruyn	smanmoun bass	0.655			0.941			1.000		
110301	Finch	smallmouth bass	0.033			0.541			1.000		
FPU5-02	Pruyn		0.706			0.815			1.000		
	Finch	smallmouth bass									
FPU5-03	Pruyn		0.720			0.707			1.000		
FG 04	Five	bluegill	0.500	0.720	0.404	0.044	0.070	0.540	1.000	0.074	0.044
FC-01	Channels Five	bluegill	0.583	0.530	0.401	0.944	0.859	0.649	1.000	0.971	0.941
FC-02	Channels	bluegili	1.762	1.850	1.875	1.000	1.050	1.064	1.000	0.952	0.762
1 C 02	Five	rainbow trout	1.702	1.030	1.075	1.000	1.030	1.001	1.000	0.732	0.702
FC-03	Channels		1.775	1.775	1.775	0.700	0.700	0.700	1.000	1.000	1.000
	Five	rainbow trout									
FC-04	Channels		0.852	0.852	0.852	0.958	0.958	0.958	1.000	1.000	1.000
FG 07	Five	spottail shiner		0.5=:	0.025	4.00-	0	2011	0.0=:	0.75	0.00-
FC-05	Channels Five	vollovy result	0.411	0.274	0.822	1.030	0.687	2.061	0.971	0.529	0.088
FC-06	Channels	yellow perch	0.818	1.058	1.455	0.818	1.058	1.455	1.000	0.688	0.250
1.C-00	Five	yellow perch	0.616	1.036	1.433	0.010	1.036	1.433	1.000	0.088	0.230
FC-07	Channels	Jenow peren	0.919	4.960	9.920	0.943	5.091	10.182	0.964	0.179	0.071
	Five	bluegill									
FC-08	Channels		1.002	1.002	0.984	0.967	0.967	0.950	1.000	1.000	1.000
	Five	bluegill									
FC-09	Channels		0.964	0.927	0.944	0.930	0.895	0.911	1.000	1.000	0.982
EC 10	Five Channels	golden shiner	0.782	0.778	0.808	0.827	0.823	0.854	1 000	0.002	0.045
FC-10	Five	golden shiner	0.782	0.778	0.808	0.827	0.823	0.834	1.000	0.982	0.945
FC-11	Channels	gorden sinner	0.900	0.846	0.752	0.980	0.921	0.818	1.000	0.958	0.958
	Five	walleye									
FC-12	Channels		0.862	0.844	0.809	0.817	0.800	0.767	1.000	1.000	1.000
	Five	walleye									
FC-13	Channels		0.896	0.734	0.764	0.836	0.685	0.713	1.000	0.982	0.893
FC-14	Five Channels	white sucker	0.770	0.770	0.749	0.725	0.725	0.714	1.000	1.000	1.000
1°C-14	Five	white sucker	0.770	0.770	0.748	0.735	0.735	0./14	1.000	1.000	1.000
FC-15	Channels		0.791	0.791	0.801	0.875	0.875	0.886	1.000	1.000	0.964
	Five	yellow perch	32		- /				,,,,,	,,,,,	
FC-16	Channels		0.895	0.942	0.720	0.944	0.994	0.760	1.000	0.950	0.950
	Five	northern pike									
FC-17	Channels	1 'C	1.258	1.258	1.258	0.941	0.941	0.941	0.952	0.952	0.952
EI O1	Fourth Lake	alewife	1 222			0.972			0.970		
FL-01	Fourth	alewife	1.333			0.873			0.879		
FL-02	Lake	uio Wiio	0.676			0.897			0.943		
	Fourth	alewife	3.2.0								
FL-03	Lake		0.770			0.845			0.913		
	Fourth	alewife									
FL-04	Lake	1 10	0.675			0.802			0.943		
EL 05	Fourth	alewife	0.530			0.707			0.000		
FL-05	Lake Fourth	alewife	0.539			0.707			0.900		
FL-06	Lake	aic wiic	0.506			0.851			0.340		
12:00		l	0.500			0.051			0.540	I	

	TEST	ID INFO		SURVIVAL ESTIMATES										
			Based o	on number i	eleased	Based o	n number re	ecovered	Based of	n number re	ecovered			
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val			
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour			
	Fourth	alewife												
FL-07	Lake	alewile	0.583			0.875			0.833					
120,	Fourth	Atlantic salmon	0.000			0.076			0.000					
FL-08	Lake		0.758			0.868			0.985					
	Fourth	Atlantic salmon												
FL-09	Lake		0.944			0.849			0.987					
EL 10	Fourth Lake	Atlantic salmon	0.565			0.014			1 000					
FL-10	Fourth	Atlantic salmon	0.565			0.814			1.000					
FL-11	Lake	Attance samon	0.669			0.695			0.986					
	Fourth	Atlantic salmon												
FL-12	Lake		0.967			0.777			1.000					
	Fourth	Atlantic salmon												
FL-13	Lake	A 41 and is1	0.747			0.754			0.943					
FL-14	Fourth Lake	Atlantic salmon	0.753			0.709			0.813					
I-L-14	Fourth	Atlantic salmon	0.755			0.709			0.013					
FL-15	Lake		0.628			0.691			0.971					
	Fourth	Atlantic salmon												
FL-16	Lake		0.930			0.871			0.963					
	Fourth	Atlantic salmon	0.101											
FL-17	Lake Fourth	Atlantic salmon	0.691			0.705			0.955					
FL-18	Lake	Attantic saimon	1.031			1.407			0.484					
1 L-10	Grand	bluegill	1.031			1.407			0.404					
GR-U1-01						1.000	1.000	0.999	1.000	1.000	0.975			
	Grand	bluegill												
GR-U1-02						0.982	0.930	0.929	1.000	1.000	0.982			
GR-U1-03		bluegill				0.005	0.021	0.015	1.000	0.010	0.010			
GR-U1-03	Grand	white sucker				0.905	0.931	0.815	1.000	0.818	0.818			
GR-U1-04		winte sucker				0.980	0.980	0.980	1.000	1.000	1.000			
011 01 01	Grand	white sucker				0.500	0.700	0.700	1.000	1.000	1.000			
GR-U1-05	Rapids					0.976	1.040	1.040	1.000	0.939	0.939			
	Grand	white sucker												
GR-U1-06						0.978	1.000	1.000	1.000	0.933	0.911			
GR-U1-07	Grand Papids	white sucker				1.000	1.061	1.065	1.000	0.897	0.872			
GK-U1-07	Grand	white sucker				1.000	1.001	1.003	1.000	0.897	0.872			
GR-U1-08						1.000	1.000	0.994	1.000	1.000	0.958			
	Grand	white sucker												
GR-U1-09						1.000	1.000	1.000	1.000	1.000	1.000			
CD 444 4.2	Grand	bluegill				0.000	0.000	0.050	4 000	4 000	0.050			
GR-U1-10	Grand	bluegill				0.980	0.980	0.978	1.000	1.000	0.960			
GR-U1-11		oruegiii				1.000	1.000	1.000	1.000	1.000	1.000			
	Grand	white sucker				1.000	1.000	1.000	1.000	1.000	1.000			
GR-U1-12						1.000	1.000	0.955	1.000	1.000	1.000			
	Grand	white sucker												
GR-U1-13		1				1.000	1.000	1.000	1.000	1.000	1.000			
GR-U1-14	Grand Rapids	white sucker				1 000	1 000	1 000	1 000	1 000	1 000			
GK-U1-14	rapius]	1.000	1.000	1.000	1.000	1.000	1.000			

	TEST	ID INFO	SURVIVAL ESTIMATES								
			Based o	on number i		Based or	n number re		Based or	n number re	ecovered
Test ID No.	Site Name	Species Tested	Immediate Survival	24 Hour Survival	48 Hour Survival	Immediate Survival	24 Hour Survival	48 Hour Survival	Co Immediate	ntrol Survi 24 hour	val 48 hour
GR-U1-15	Grand Rapids	white sucker				1.000	0.979	0.958	1.000	1.000	1.000
GR-U1-16	Grand	white sucker				1.000	0.980	0.980	1.000	1.000	1.000
GR-U1-17	Grand	white sucker				1.000	0.933	0.911	1.000	1.000	1.000
GR-U1-18	Grand	bluegill				1.133	1.075	1.053	0.653	0.633	0.551
GR-U1-19	Grand	bluegill				1.343	1.419	1.870	0.686	0.608	0.451
GR-U1-20	Grand Rapids	bluegill				0.929	0.961	0.957	1.000	0.967	0.933
GR-U1-21	Grand Rapids	white sucker				1.121	1.101	1.071	0.737	0.711	0.711
GR-U1-22	_	white sucker				0.999	1.020	1.042	0.980	0.960	0.940
GR-U1-23	_	white sucker				0.980	0.980	0.980	1.000	0.980	0.959
GR-U1-24		white sucker				0.907	0.888	0.829	0.980	0.939	0.939
GR-U1-25		white sucker				0.846	0.846	0.846	1.000	1.000	1.000
GR-U1-26	_	white sucker				0.913	0.913	0.913	1.000	1.000	1.000
GR-U2-01	_	bluegill				0.974	0.974	0.974	1.000	1.000	1.000
GR-U2-02	Rapids	bluegill				0.981	0.981	0.925	1.000	1.000	1.000
GR-U2-03		white sucker				0.950	0.960	0.960	1.000	0.833	0.833
GR-U2-04		white sucker				1.000	2.182	2.343	1.000	0.458	0.417
GR-U2-05		white sucker				1.026	1.002	1.002	0.975	0.975	0.975
GR-U2-06		white sucker				1.029	0.957	0.987	0.971	0.943	0.914
GR-U2-07	Rapids Grand	white sucker				1.000	1.000	0.920	1.000	1.000	1.000
GR-U2-08	Grand	white sucker				0.974	1.035	1.041	1.000	0.941	0.912
GR-U2-09	Grand	bluegill				1.000	0.957	0.957	1.000	1.000	1.000
GR-U2-10	Grand	bluegill				0.978	0.978	0.957	1.000	1.000	1.000
GR-U2-11	Grand	white sucker				1.000	1.000	1.146	1.000	1.000	0.872
GR-U2-12	Grand	white sucker				1.000	1.000	0.978	1.000	1.000	0.957
GR-U2-13	Grand	white sucker				1.000	1.001	0.981	1.000	0.980	0.959
GR-U2-14	Rapids					1.000	1.000	1.000	1.000	1.000	1.000

Grand GRU4-06 Rapids GRU4-07 Rapids Grand GRU4-07 Rapids GRU4-08 Rapids GRU4-09 R		TEST	ID INFO	SURVIVAL ESTIMATES								
D No. Size Name Tested Survival Su						released	Based or		ecovered	Based of	n number re	ecovered
GR-U2-18 Rapids White sucker			•			48 Hour						
GR-U2-15 Rapids	ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
GR-U2-15 Rapids												
Grand White sucker Grand White sucker Grand		Grand	white sucker									
GR-U2-16 Rapids	GR-U2-15						1.000	1.000	1.020	1.000	1.000	0.980
GR-U2-17 Rapids bluegill	CD 112 16		white sucker				1 000	1 000	1 000	1 000	1 000	1 000
GR-12-17 Rapids Grand	GK-02-10		bluegill				1.000	1.000	1.000	1.000	1.000	1.000
GR-U2-18 Rapids Grand GR-U2-19 Rapids Grand GR-U2-19 Rapids Grand GR-U2-19 Rapids GR-U2-19 Rapids GR-U2-19 Rapids GR-U2-19 Rapids GR-U2-19 Rapids GR-U2-20 Rapids Rapids GR-U2-20 Rapids Rapids GR-U2-20 Rapids R	GR-U2-17		orang				1.071	1.048	1.024	0.894	0.894	0.894
GR-U2-19 Rapids Multis sucker Grand White sucker Grand GR-U2-20 Rapids Grand White sucker GR-U2-21 Rapids Grand White sucker GR-U2-21 Rapids Grand White sucker GR-U2-21 Rapids Grand White sucker GR-U2-22 Rapids Grand White sucker GR-U2-22 Rapids Grand GR-U2-24 Rapids GR-U2-25 Rapids GR-U2-25 Rapids GR-U2-26 Rap			bluegill									
GR-U2-19 Rapids Grand White sucker Grand White sucker GR-U2-20 Rapids	GR-U2-18		1.1 '11				0.980	1.048	0.933	1.000	0.896	0.875
GR-U-2-Q Rapids	GR-112-19		bluegill				0 978	0.977	0.950	0.979	0.958	0.896
GR-U-2-1 Rapids White sucker GR-U-2-2 Rapids Grand Grand White sucker GR-U-2-2 Rapids GR-U-2-2 G	GR-02-17	_	white sucker				0.576	0.511	0.750	0.717	0.230	0.070
GR-U2-21 Rapids	GR-U2-20						0.974	0.879	0.900	0.918	0.898	0.878
GR-U2-22 Rapids Grand white sucker GR-U2-23 Rapids Grand GR-U2-23 Rapids Grand GR-U2-23 Rapids Grand White sucker GR-U2-24 Rapids Grand GR-U2-25 Grand Grand GR-U2-26 Grand GR-U2-27 Grand GR-U2-28			white sucker									
GR-U2-22 Rapids Grand Grand GR-U2-23 Rapids GR-U2-23 Rapids GR-U2-24 Rapids GR-U2-28 Rapids GR	GR-U2-21		white evalue				0.956	0.975	0.975	1.000	0.980	0.980
GR-U2-23 Rapids White sucker	GR-112-22		wnite sucker				0.957	0.936	0 996	1 000	1 000	0 940
GR-U2-24 Rapids	GR CZ ZZ		white sucker				0.737	0.230	0.770	1.000	1.000	0.540
GR-U2-24 Rapids 0.689 0.623 0.556 0.978 0.980 0.840 0.758 0.712 0.900 0.880 0.780 0.98	GR-U2-23	Rapids					1.000	1.000	0.957	1.000	1.000	1.000
GRU4-01 Rapids Dibugill Discription			white sucker									
GRU4-01 Rapids 0.840 0.758 0.712 0.900 0.880 0.780 GRU4-02 Rapids 0.960 0.940 0.940 1.000 1.000 1.000 GRU4-03 Rapids 0.884 0.884 0.884 0.952 0.980 0.840 GRU4-04 Rapids 0.884 0.884 0.952 0.980 0.980 0.840 GRU4-04 Rapids 1.067 1.091 1.116 0.938 0.917 0.896 GRU4-05 Rapids 1.000 1.000 0.980 1.000 1	GR-U2-24	_	bluogill				0.689	0.623	0.556	0.978	0.978	0.978
GRU4-02 Rapids bluegill	GRU4-01		bluegiii				0.840	0.758	0.712	0.900	0.880	0.780
Grand GRU4-03 Rapids	GRE 1 01	•	bluegill				0.010	0.750	0.712	0.500	0.000	0.700
GRU4-03 Rapids 0.884 0.884 0.952 0.980 0.980 0.840 GRU4-04 Rapids 1.067 1.091 1.116 0.938 0.917 0.896 GRU4-05 Rapids 1.000 0.980 <t< td=""><td>GRU4-02</td><td></td><td></td><td></td><td></td><td></td><td>0.960</td><td>0.940</td><td>0.940</td><td>1.000</td><td>1.000</td><td>1.000</td></t<>	GRU4-02						0.960	0.940	0.940	1.000	1.000	1.000
GRU4-04 Rapids Carand White sucker Carand Car	CDVV 02		bluegill				0.004	0.004	0.050	0.000	0.000	0.040
GRU4-04 Rapids 1.067 1.091 1.116 0.938 0.917 0.896 GRU4-05 Grand of Grand of Grand of Grand of Grand of GRU4-06 white sucker 1.000 1.000 0.980 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 0.980 1.000 1.000 0.980 0.380 0.380 0.380 0.380 0.380 0.380 0.380 0.380 0.380 0.380 0.980 0.980 0.980	GRU4-03		white sucker				0.884	0.884	0.952	0.980	0.980	0.840
GRU4-05 Rapids Grand White sucker GRU4-06 Rapids Grand White sucker GRU4-06 Rapids Grand White sucker GRU4-07 Rapids Grand GRU4-08 Rapids Grand White sucker GRU4-08 Rapids Grand GRU4-08 Rapids Grand GRU4-09 Rapids Grand GRU4-10 Rapids Grand White sucker Grand Grand White sucker Grand Grand Grand Grand White sucker Grand Gran	GRU4-04		willte sucker				1.067	1.091	1.116	0.938	0.917	0.896
Grand GRU4-06 Rapids Grand White sucker GRU4-07 Rapids Grand GRU4-08 Rapids GRU4-08 Rapids GRU4-08 Rapids GRU4-08 Rapids GRU4-08 Rapids GRU4-09 Rapids Grand GRU4-09 Rapids Grand GRU4-10 Rapids Grand GRU4-11 Rapids Grand GRU4-12 Rapids Grand GRU4-13 Rapids Grand GRU4-13 Rapids Grand GRU4-14 Rapids Grand GRU4-15 Rapids Grand GRU4-16 Rapids Grand GRU4-17 Rapids Grand GRU4-18 Rapids Grand GRU4-19 Rapids Grand White sucker Grand White s		_	white sucker									
GRU4-06 Rapids 0.979 0.958 0.978 1.000 1.000 0.980 GRU4-07 Rapids 0.961 0.960 0.960 1.000 0.980 0.980 GRU4-08 Rapids 0.827 0.750 0.731 1.000 1.000 1.000 GRU4-09 Rapids 0.783 0.739 0.674 1.000 1.000 1.000 GRU4-19 Rapids 0.783 0.739 0.674 1.000 1.000 1.000 GRU4-10 Rapids 1.053 0.994 0.877 0.380 0.380 0.380 GRU4-11 Rapids 1.103 0.923 0.789 0.796 0.776 GRU4-12 Rapids 0.938 0.872 0.810 1.000 0.980 0.990 GRU4-13 Rapids 0.938 0.872 0.810 1.000 0.980 0.980 GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 <tr< td=""><td>GRU4-05</td><td>_</td><td></td><td></td><td></td><td></td><td>1.000</td><td>1.000</td><td>0.980</td><td>1.000</td><td>1.000</td><td>1.000</td></tr<>	GRU4-05	_					1.000	1.000	0.980	1.000	1.000	1.000
Grand Grand Rapids Grand White sucker GRU4-07 Rapids Grand GRU4-08 Rapids GRU4-08 Rapids Grand GRU4-09 Rapids GRU4-09 Rapids Grand Grand Bluegill GRU4-10 Rapids Grand Grand Bluegill GRU4-11 Rapids Grand Grand Bluegill GRU4-12 Rapids Grand Grand GRU4-12 Rapids GRU4-13 Rapids GRU4-14 Rapids GRU4-15 Rapids GRU4-16 Rapids GRU4-17 Rapids GRU4-18 Rapids Grand Grand Bluegill GRU4-19 Rapids GRU4-19 Rapids GRU4-10 Rapids	CDIII 06		white sucker				0.070	0.050	0.070	1 000	1.000	0.000
GRU4-07 Rapids 0.961 0.960 0.960 1.000 0.980 0.980 Grand GRU4-08 Rapids 0.827 0.750 0.731 1.000 1.000 1.000 Grand GRU4-09 Rapids 0.783 0.739 0.674 1.000 1.000 1.000 GRU4-10 Rapids 0.783 0.739 0.674 1.000 1.000 1.000 GRU4-10 Rapids 1.053 0.994 0.877 0.380 0.380 0.380 GRU4-11 Rapids 1.103 0.923 0.789 0.796 0.796 0.776 GRU4-12 Rapids 0.938 0.872 0.810 1.000 0.980 0.900 GRU4-13 Rapids 0.938 0.872 0.810 1.000 0.980 0.980 GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 GRU4-14 Rapids 0.895 0.895 0.895 0.895 0.980	GRU4-06	_	white sucker				0.979	0.958	0.978	1.000	1.000	0.980
Grand Grand White sucker Grand	GRU4-07		Willto Sucker				0.961	0.960	0.960	1.000	0.980	0.980
GRU4-09 Rapids GRU4-09 Rapids GRU4-09 Rapids GRU4-10 Rapids GRU4-11 Rapids GRU4-12 Rapids GRU4-12 Rapids GRU4-13 Rapids GRU4-14 Rapids GRU4-14 Rapids GRU4-15 Rapids GRU4-16 GRU4-16 GRU4-17 Rapids GRU4-17 Rapids GRU4-18 GRU4-18 GRU4-18 GRU4-19 GRU			white sucker									
GRU4-09 Rapids 0.783 0.739 0.674 1.000 1.000 1.000 GRU4-10 Rapids 1.053 0.994 0.877 0.380 0.380 0.380 GRU4-10 Rapids 1.103 0.923 0.789 0.796 0.796 0.776 GRU4-11 Rapids 1.103 0.923 0.789 0.796 0.796 0.776 GRU4-12 Rapids 0.938 0.872 0.810 1.000 0.980 0.900 GRU4-13 Rapids 1.097 1.059 1.100 0.563 0.563 0.542 GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980	GRU4-08	•					0.827	0.750	0.731	1.000	1.000	1.000
Grand White sucker Grand	CDII4 00		white sucker				0.792	0.720	0.674	1 000	1 000	1 000
GRU4-10 Rapids 1.053 0.994 0.877 0.380 0.380 0.380 Grand bluegill 1.103 0.923 0.789 0.796 0.796 0.776 GRU4-12 Rapids 0.938 0.872 0.810 1.000 0.980 0.900 Grand white sucker 0.895 0.895 0.895 0.895 0.980 0.980 GRU4-13 Rapids 0.895 0.895 0.895 0.980 0.980 GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980	UKU4-09	_	bluegill				0.763	0.739	0.074	1.000	1.000	1.000
GRU4-11 Rapids 1.103 0.923 0.789 0.796 0.776 Grand bluegill 0.938 0.872 0.810 1.000 0.980 0.900 Grand white sucker 1.097 1.059 1.100 0.563 0.563 0.542 GRU4-13 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 GRU4-14 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980	GRU4-10		orang				1.053	0.994	0.877	0.380	0.380	0.380
Grand Bluegill GRU4-12 Rapids Grand White sucker GRU4-13 Rapids Grand White sucker GRU4-14 Rapids Grand White sucker GRU4-15 Rapids Grand White sucker GRU4-15 Rapids Grand White sucker GRU4-15 Rapids Grand White sucker GRU4-16 Rapids Grand White sucker GRU4-17 Rapids Grand White sucker GRU4-18 Grand White sucker GRU4-19 Grand Grand White sucker GRU4-19 Grand			bluegill									
GRU4-12 Rapids 0.938 0.872 0.810 1.000 0.980 0.900 GRU4-13 Rapids 1.097 1.059 1.100 0.563 0.563 0.542 GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 Grand white sucker 0.848 0.865 0.865 1.000 0.980 0.980	GRU4-11	_					1.103	0.923	0.789	0.796	0.796	0.776
Grand White sucker	CDIM 12		bluegill				0.029	0.872	0.810	1 000	0.080	0.000
GRU4-13 Rapids 1.097 1.059 1.100 0.563 0.563 0.542 Grand white sucker 0.895 0.895 0.895 0.980 0.980 0.980 GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 Grand white sucker 0.848 0.865 0.865 1.000 0.980 0.980	OKU4-12	_	white sucker				0.938	0.072	0.810	1.000	0.960	0.900
GRU4-14 Rapids 0.895 0.895 0.895 0.980 0.980 0.980 Grand GRU4-15 White sucker 0.848 0.865 0.865 1.000 0.980 0.980 Grand White sucker 0.848 0.865 0.865 1.000 0.980 0.980	GRU4-13						1.097	1.059	1.100	0.563	0.563	0.542
Grand White sucker			white sucker									
GRU4-15 Rapids 0.848 0.865 0.865 1.000 0.980 0.980 Grand white sucker 0.848 0.865 0.865 1.000 0.980 0.980	GRU4-14	_	voleita av -1 :				0.895	0.895	0.895	0.980	0.980	0.980
Grand white sucker	GR114-15		wnite sucker				0 848	0.865	0.865	1 000	U 98U	U86 U
	SILO 4-13		white sucker				0.040	0.003	0.003	1.000	0.700	0.700
	GRU4-16						0.860	0.816	0.816	1.000	0.980	0.980

	TEST	ID INFO		SURVIVAL ESTIMATES									
			Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered		
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val		
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour		
	Grand	white sucker											
GRU4-17	Rapids	winte sucker				0.900	0.900	0.900	1.000	1.000	1.000		
ORC 17	Grand	white sucker				0.500	0.500	0.500	1.000	1.000	1.000		
GRU4-18						0.880	0.796	0.829	1.000	0.980	0.941		
	Hadley	American shad											
HAFU1-01	Falls		1.039	1.333	1.714	1.039	1.333	1.714	0.770	0.390	0.140		
	Hadley	American shad											
HAFU1-02			0.973	0.816	0.286	0.973	0.816	0.286	0.750	0.380	0.140		
	Hadley	American shad											
HAFU2-01			0.890	0.659	0.750		0.659	0.750		0.342	0.233		
		bluegill	0.979	0.915	0.935	0.958	0.896	0.915		1.000	0.979		
HD-02	Hardy	bluegill	0.769	0.673	0.709	0.971	0.850	0.896		0.975	0.925		
	Hardy	golden shiner golden shiner	1.219	1.128	1.128	0.958	0.886	0.886		0.846	0.846		
	Hardy	C	1.067	0.909	0.930		0.835	0.854	1.000	0.978	0.956		
HD-05 HD-06	Hardy Hardy	largemouth bass northern pike	0.784 0.820	0.638 0.708	0.629 0.708	0.949 0.880	0.773 0.760	0.762 0.760	1.000 1.000	0.896 1.000	0.875 1.000		
	•	rainbow trout	0.820	0.708	0.708	0.880	0.760	0.780		1.000	0.972		
	•	rainbow trout	0.634	0.654	0.620	0.731	0.754	0.715		0.969	0.972		
	Hardy	walleye	0.833	0.833	0.806	0.800	0.734	0.713	0.969	0.938	0.938		
	Hardy	white sucker	0.752	0.527	0.527	0.909	0.637	0.637	1.000	0.964	0.964		
	Hardy	white sucker	1.180	1.180	1.180	0.769	0.769	0.769	1.000	1.000	1.000		
	Hardy	yellow perch	0.855	0.852	0.834	0.980	0.976	0.955		0.983	0.983		
	Hardy	yellow perch	0.900	0.842	0.789	0.947	0.886	0.831	1.000	0.950	0.950		
	•	bluegill	0.502		0.032	1.046		0.066	0.803		0.303		
HR-02	Herrings	largemouth bass	0.471		0.333	0.611		0.432	1.000		0.900		
HR-03	Herrings	yellow perch	1.751		1.832	1.081		1.130	0.872		0.821		
HR-04	Herrings	walleye	0.616		0.556	0.752		0.678	0.903		0.710		
HR-05	Herrings	golden shiner	4.174		4.749	1.381		1.571	0.600		0.200		
		white sucker	2.602		3.045	0.922		1.078			0.818		
		white sucker	0.432		0.370			0.522			0.821		
HR-08	U	rainbow trout	0.789		0.789	1.005		1.005	0.946		0.946		
		rainbow trout	0.767		0.743			0.846			0.976		
		rainbow trout	0.967		1.191	0.809		0.996			0.600		
		bluegill	0.833		1.046			1.277	0.983		0.712		
HR-12 HR-13		largemouth bass	0.935 1.201		0.818 1.096			0.851 0.850	1.000 1.000		0.952 0.935		
HR-13 HR-14		walleye	0.973		1.096			1.311	0.911		0.933		
HR-15	Herrings	rainbow trout	1.273		1.273			0.900			1.000		
HR-16		rainbow trout	17.878		17.878	0.875		0.875			1.000		
HR-17		bluegill	0.812		0.769	1.003		0.949			0.745		
HR-18	Herrings	largemouth bass	0.403		0.370			0.919			0.961		
HR-19		largemouth bass	0.705		0.408	0.935		0.541	1.000		0.321		
HR-20		yellow perch	1.113		0.945	0.818		0.694			0.917		
		yellow perch	2.333		2.400			0.974			0.893		
		white sucker	0.846		0.517	0.814		0.497	1.000		0.889		
HR-23	Herrings	white sucker	2.691		2.258	1.067		0.895	0.900		0.700		
HR-24	Herrings	white sucker	0.904		0.672	0.966		0.719	1.000		0.707		
HR-25	Herrings	white sucker	1.001		1.072	0.888		0.950			0.750		
HR-26	Herrings	white sucker	0.710		0.583	0.884		0.726			0.839		
HR-27	Herrings	white sucker	0.669		0.643			0.849			0.805		
HR-28	U	rainbow trout	1.446		1.929			1.043			0.625		
HR-29	Herrings	rainbow trout	0.429		0.383	0.848		0.758	1.000		0.880		

	TEST	ID INFO	SURVIVAL ESTIMATES								
			Based o	on number i	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
HR-30	U	rainbow trout	0.325		0.233	1.000		0.718			0.750
HR-31	Herrings	American eel	0.591		0.554	0.821		0.769	1.000		1.000
HR-32	Herrings	bluegill	0.995		1.007	0.981		0.994	0.984		0.613
HR-33 HR-34	Herrings Herrings	largemouth bass	0.915 0.844		1.013 0.753	0.964 0.925		1.067 0.825	1.000 1.000		0.836 1.000
HR-35	Herrings	yellow perch	0.844		0.733	0.923		0.823	1.000		0.636
HR-36	Herrings	yellow perch	0.902		0.779	0.947		0.817	1.000		0.881
HR-37	Herrings	yellow perch	0.959		0.910	0.970		0.940	1.000		0.881
HR-38	Herrings	yellow perch	0.939		0.830			0.873	1.000		0.983
HR-39	Herrings	yellow perch	0.844		0.810	0.962		0.910	1.000		0.986
HR-40	Herrings	white sucker	0.748		0.644	0.982		0.925	1.000		0.912
HR-41	Herrings	white sucker	0.736		0.787	0.969		1.036			0.742
HR-42	Herrings	white sucker	0.791		0.702	0.900		0.798	1.000		0.710
HR-43	Herrings	white sucker	0.671		0.588	0.933		0.816			0.551
HR-44	Herrings	white sucker	0.878		0.809	0.878		0.809	1.000		0.783
HR-45	Herrings	white sucker	0.836		0.715	0.909		0.777	1.000		0.953
HR-46	Herrings	rainbow trout	1.220		1.220	0.955		0.955	1.000		1.000
HR-47	Herrings	rainbow trout	1.058		1.058	0.987		0.987	1.000		1.000
HR-48		rainbow trout	0.867		0.934	0.986		1.062	1.000		0.929
HR-49	Herrings	alewife	0.966		4.337	0.907		4.070	1.000		0.043
HR-50	Herrings	alewife	0.889		1.136	0.946		1.209	0.988		0.100
	High Falls	bluegill, bluegill x									
HIF-01		green sunfish hybrid	1.044	0.992	0.977	0.967	0.919	0.904	0.880	0.880	0.800
	High Falls	bluegill, bluegill x									
HIF-02		green sunfish hybrid	0.931	0.931	0.931	0.955	0.955	0.955	0.963	0.963	0.963
	High Falls	bluegill, bluegill x									
HIF-03		green sunfish hybrid	0.874	0.874	0.845	0.721	0.721	0.698	1.000	1.000	1.000
	High Falls	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-04			0.801	0.874	0.736	0.830	0.904	0.762	0.964	0.821	0.750
	High Falls	fathead minnow, creek									
		chub, white sucker, golden/shorthead									
		redhorse									
HIF-05		reunoise	0.627	0.627	0.627	0.961	0.961	0.961	1 000	1.000	1 000
HIF-05	High Follo	fathead minnow, creek	0.637	0.637	0.637	0.861	0.861	0.861	1.000	1.000	1.000
	rigii raiis	chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-06			1.171	1.171	1.230	0.891	0.891	0.936	1.000	1.000	0.952
1111 -00	High Falls	bluegill, bluegill x	1.1/1	1.1/1	1.230	0.071	0.071	0.750	1.000	1.000	0.732
HIF-07	Trigit Turis	green sunfish hybrid	0.735	0.735	0.724	0.745	0.745	0.733	1.000	1.000	0.929
	High Falls	bluegill, bluegill x	0.733	0.733	0.724	0.773	0.773	0.733	1.000	1.000	0.727
HIF-08	J W.15	green sunfish hybrid	0.653	0.653	0.653	0.824	0.824	0.824	1.000	1.000	1.000
	High Falls	fathead minnow, creek	2.000	2.000	2.000	5.521		2.021	2,000		2.000
	3	chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-09	<u>L</u>		0.708	0.707	0.761	0.665	0.663	0.714	0.967	0.933	0.833
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	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based o	n number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test	G: M	Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-10			0.717	0.717	0.686	0.717	0.717	0.686	0.788	0.758	0.697
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-11			0.610	0.610	0.610	0.571	0.571	0.571	1.000	1.000	1.000
LHE 12	High Falls	bluegill, bluegill x green sunfish hybrid	1 250	1 250	1 150	0.614	0.569	0.522	1 000	1 000	1 000
HIF-12	High Falls	bluegill, bluegill x	1.350	1.250	1.150	0.614	0.568	0.523	1.000	1.000	1.000
HIF-13		green sunfish hybrid	1.120	1.120	1.120	0.622	0.622	0.622	1.000	1.000	1.000
	High Falls	bluegill, bluegill x									
HIF-14	High Falls	green sunfish hybrid fathead minnow, creek	0.974	0.974	0.974	0.613	0.613	0.613	1.000	1.000	1.000
	Tilgii Falis	chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-15	High Ealls	fathead minnow, creek	0.429	0.395	0.406	0.481	0.442	0.455	1.000	1.000	0.973
	High Falls	chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-16	II: 1 E II	C (1 1 1 1 1	0.601	0.578	0.511	0.528	0.508	0.449	1.000	0.966	0.966
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-17	TT: 1 E 11	6.1.1.1.1	0.511	0.523	0.535	0.511	0.523	0.535	0.978	0.957	0.935
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-18			0.473	0.798	0.468	0.585	0.987	0.580	0.964	0.571	0.929
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-19	*** 1 - 11		0.436	0.410	0.427	0.378	0.356	0.370	1.000	1.000	0.962
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-20	*** ** **		0.392	0.392	0.403	0.444	0.444	0.457	1.000	1.000	0.972
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-21			0.175	0.180	0.160	0.160	0.165	0.147	0.970	0.939	0.939

	TEST	ID INFO	SURVIVAL ESTIMATES								
			Based o	on number r	eleased		n number re		Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	High Falls	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead redhorse									
THE 22		reunorse	0.200	0.200	0.200	0.255	0.255	0.264	1.000	1.000	0.067
HIF-22	III. 1. E. 11.	f-41111	0.280	0.280	0.290	0.255	0.255	0.264	1.000	1.000	0.967
	High Falls	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-23			0.235	0.216	0.196	0.235	0.216	0.196	1.000	1.000	1.000
1111 23	High Falls	fathead minnow, creek	0.233	0.210	0.170	0.233	0.210	0.170	1.000	1.000	1.000
		chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-24			0.029	0.029	0.029	0.026	0.026	0.026	1.000	1.000	1.000
	High Falls	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
HIF-25			0.043	0.043	0.043	0.018	0.018	0.018	1.000	1.000	1.000
	High Falls	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead redhorse									
THE 26		reunorse	0.000	0.000	0.000	0.062	0.062	0.062	1.000	1.000	1 000
HIF-26 HL-01	Higher	brook trout	0.089	0.089	0.089	0.063	0.063	0.063		1.000	1.000 0.978
HL-01 HL-02	Higley Higley	rainbow trout				0.915 0.746	0.734 1.124	0.707 1.124	1.000	0.263	0.978
HL-02 HL-03	Higley	rainbow trout				0.746	0.927	0.829	1.000	0.263	0.263
HL-03		rainbow trout				0.334	0.327	0.329		0.525	0.230
	Higley	white sucker				0.907	0.630			0.979	
HL-06	Higley	yellow perch				0.919	0.410	0.385	0.927	0.561	0.561
HL-07	Higley	walleye				0.531	0.459	0.448		0.690	0.619
HL-08	Higley	walleye				0.501	0.403	0.418		0.592	0.571
HL-09	Higley	brook trout				0.765	0.721	0.691	1.000	0.979	0.894
HL-10	Higley	rainbow trout				0.511	0.444	0.582	1.000	1.000	0.688
HL-11	Higley	white sucker				0.714	0.549	0.549	1.000	0.953	0.953
HL-12	Higley	white sucker				0.690	0.633	0.713	0.980	0.939	0.796
HL-13	Higley	white sucker				0.429	0.446	0.373	1.000	0.960	0.920
HL-14		bluegill	ļ			0.851	0.877	0.828	1.000	0.783	0.739
HL-15	Higley	largemouth bass				0.392	0.342	0.234	1.000	1.000	0.974
HL-16	Higley	largemouth bass				0.375	0.304	0.277	1.000	1.000	0.967
HL-17	Higley	yellow perch				0.966	0.859	0.795		0.963	0.889
HL-18 HL-19	Higley Higley	golden shiner white sucker				0.416 0.901	0.000	0.000 0.734		0.163 0.723	0.163 0.681
HL-19 HL-20	Higley	white sucker				0.901	0.709	0.734		0.723	0.800
HL-20	Higley	bluegill				0.543	0.303	0.430	0.763	0.833	0.342
HL-21	Higley	largemouth bass				0.077	0.059	0.045	0.703	0.393	0.342
HL-23	Higley	largemouth bass				0.127	0.037	0.043		0.264	0.226
HL-24		yellow perch				0.913	0.000	0.000	0.095	0.048	0.048
HOI-01		brown trout	0.255			0.452	2.000	2.000	1.000	2.0.0	2.0.0
HOI-02	Hoist	brook trout	0.320			0.436			1.000		
HOI-03		brown trout	0.207			0.228			1.000		

i	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based o	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
HOI-04		bluegill	0.075			0.168			0.993		
HOI-05		bluegill	0.500			0.765			1.000		
HD 01		bluegill	1.000	1.007	0.060	1 000	1.007	0.060	1 000	0.040	0.760
HB-01	Bridge Hollidays	bluegill	1.000	1.007	0.860	1.000	1.007	0.860	1.000	0.840	0.760
HB-02	Bridge	bluegili	1.000	0.880	0.840	1.000	0.880	0.840	1.000	1.000	1.000
11D-02	_	catfish spp	1.000	0.880	0.040	1.000	0.000	0.040	1.000	1.000	1.000
HB-03	Bridge	санты эрр	1.000	1.042	1.087	1.000	1.042	1.087	1.000	0.960	0.920
110 03	Hollidays	catfish spp	1.000	1.042	1.007	1.000	1.012	1.007	1.000	0.500	0.520
HB-04	Bridge		1.000	1.042	1.087	1.000	1.042	1.087	1.000	0.960	0.920
-		catfish spp									
HB-05	Bridge	11	1.000	0.929	0.929	1.000	0.929	0.929	1.000	1.000	1.000
		catfish spp									
HB-06	Bridge		1.000	0.960	0.960	1.000	0.960	0.960	1.000	1.000	1.000
HWU10-0	Holtwood	American shad	0.875	0.764	0.600	0.894	0.780	0.613	0.926	0.758	0.526
HWU3-01	Holtwood	American shad	0.768	0.629	0.550	0.835	0.683	0.598	0.938	0.875	0.800
	Lower	chinook salmon									
LG-01	Granite		0.946		0.940	0.957		0.951	0.983		0.966
		chinook salmon									
LG-02	Granite		0.952			0.949			0.994		
		chinook salmon									
LG-03	Granite		0.956			0.953			0.994		
	Lower	chinook salmon	0.050			0.050			0.004		
LG-04	Granite	1' 1 1	0.978			0.978			0.994		
I C 05	Lower Granite	chinook salmon	0.004			0.075			0.004		
LG-05		chinook salmon	0.984			0.975			0.994		
LG-06	Granite	CHIHOOK Sailiion	0.968			0.972			0.996		
LG-00		chinook salmon	0.908			0.912			0.990		
LG-07	Granite	enniook sannon	0.946			0.946			1.000		
MNU3-01		bluegill	0.720		0.680	0.881		0.832	1.000		0.789
MNU3-02		largemouth bass	0.864		0.802	0.988		0.918			0.988
MNU3-03		largemouth bass	1.035		0.909	0.965		0.847			0.889
MNU3-04	Minetto	yellow perch	1.076		0.809	0.944		0.710	1.000		0.821
MNU3-05	Minetto	white sucker	1.857		2.217	1.029		1.229	0.900		0.467
MNU3-06		white sucker	0.539		0.590	0.906		0.991	1.000		0.800
MNU3-07		white sucker	1.107		0.913	0.988		0.815			0.767
MNU3-08		rainbow trout	0.857		0.840	0.944		0.926			1.000
MNU3-09		rainbow trout	0.868		0.893	0.989		1.018			0.931
MNU3-10		rainbow trout	1.004		0.671	0.895		0.598			0.323
MNU3-11		alewife	0.722		0.402	0.871		0.485			0.679
MNU3-12		alewife	0.634		0.135	0.728		0.155			0.293
MNU3-13		alewife	0.813		0.498	0.750		0.459			0.118
MNU3-14		alewife	0.809		0.736			0.775			0.478
MNU3-15 MNU4-01		alewife bluegill	1.022 0.623		0.860 0.267	0.972 0.974		0.818 0.417			0.617 0.758
MNU4-01 MNU4-02		largemouth bass	0.623		0.267	0.974		0.417			0.738
MNU4-02		largemouth bass	0.783		0.653	1.000		0.737			0.985
MNU4-04		yellow perch	0.783		0.668	0.957		0.894			0.383
MNU4-05		walleye	0.620		0.631	1.000		1.018			0.778
MNU4-06		walleye	1.087		1.030	1.000		0.948			0.851
		white sucker	0.638		0.620	0.933		0.907			0.857

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	n number i	eleased	Based or	n number re	ecovered	Based or	n number re	covered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
N D W 14 00	3.61		0.072		0.002	0.000		0.740	1.000		1.000
MNU4-08	1	white sucker	0.953		0.802	0.880		0.740			1.000
MNU4-09		white sucker	0.816		0.758	0.961		0.893	0.970		0.924
MNU4-10 MNU4-11		white sucker rainbow trout	0.856 0.582		0.844 0.527	0.885 1.000		0.874 0.906	1.000		1.000
MNU4-11 MNU4-12		rainbow trout	0.382		0.327	0.957		0.906	1.000		1.000
MNU4-12 MNU4-13		rainbow trout	0.898		0.780	0.937		0.871	1.000		0.966
MNU4-13 MNU4-14		rainbow trout	1.025		0.873	0.943		0.917	0.980		0.980
MNU4-14 MNU4-15		American eel	0.662		0.620	1.000		0.917			1.000
WINU4-13	Ninety-	bluegill	0.002		0.020	1.000		0.930	1.000		1.000
	Nine Nine	bluegiii									
NNI-01	Islands		1.000	0.916	0.759	1.000	0.916	0.759	1.000	0.840	0.760
ININI-U1	Ninety-	bluegill	1.000	0.910	0.739	1.000	0.910	0.739	1.000	0.640	0.700
	Nine Nine	bluegili									
NNI-02	Islands		1.000	0.964	0.929	1.000	0.964	0.929	1.000	1.000	1.000
1111-02	Ninety-	catfish spp	1.000	0.704	0.727	1.000	0.704	0.727	1.000	1.000	1.000
	Nine	санты эрр									
NNI-03	Islands		1.000	0.889	0.889	1.000	0.889	0.889	1.000	1.000	1.000
1111-03	Ninety-	catfish spp	1.000	0.009	0.009	1.000	0.009	0.009	1.000	1.000	1.000
	Nine	санты эрр									
NNI-04	Islands		0.962	0.923	0.885	0.962	0.923	0.885	1.000	1.000	1.000
1111 04	Ninety-	bluegill	0.702	0.723	0.003	0.702	0.723	0.003	1.000	1.000	1.000
	Nine	bidegiii									
NNI-05	Islands		1.000	0.962	1.183	1.000	0.962	1.183	1.000	0.680	0.520
1111 03	Ninety-	bluegill	1.000	0.702	1.103	1.000	0.702	1.103	1.000	0.000	0.320
	Nine										
NNI-06	Islands		0.893	0.714	0.643	0.893	0.714	0.643	1.000	1.000	1.000
	Ninety-	catfish spp		****		0.070	****				
	Nine	11									
NNI-07	Islands		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Ninety-	catfish spp									
	Nine	**									
NNI-08	Islands		1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Peshtigo	bluegill, bluegill x									
PTG-01		green sunfish hybrid	0.962	0.962	0.974	0.957	0.957	0.970	1.000	1.000	0.966
	Peshtigo	bluegill, bluegill x									
PTG-02		green sunfish hybrid	0.979	0.979	0.979	1.048	1.048	1.048	0.955	0.955	0.955
	Peshtigo	bluegill, bluegill x									
PTG-03		green sunfish hybrid	0.930	0.930	0.930	1.000	1.000	1.000	1.000	1.000	1.000
	Peshtigo	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-04			0.767	0.767	0.715	0.862	0.862	0.803	0.897	0.897	0.846
	Peshtigo	fathead minnow, creek		·							
		chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-05			1.001	1.001	1.009	1.036	1.036	1.044	0.944	0.944	0.917

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			Based of	on number r	eleased	Based of	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Со	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PTG-06	D 1.1	1.1 '11 1.1 '11	0.762	0.770	0.779	0.971	0.982	0.994	1.000	0.960	0.920
PTG-07	Peshtigo	bluegill, bluegill x green sunfish hybrid bluegill, bluegill x	1.122	1.122	1.122	1.000	1.000	1.000	1.000	1.000	1.000
PTG-08	Peshtigo	green sunfish hybrid	0.991	1.027	0.978	0.977	1.013	0.965	1.000	0.964	0.964
110-00	Peshtigo	bluegill, bluegill x	0.771	1.027	0.776	0.777	1.013	0.703	1.000	0.704	0.704
PTG-09	Ü	green sunfish hybrid	0.811	0.811	0.811	1.000	1.000	1.000	1.000	1.000	1.000
PTG-10	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse	0.848	0.848	0.789	0.915	0.915	0.852	0.939	0.939	0.939
F1G-10	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse	0.646	0.646	0.789	0.913	0.913	0.832	0.939	0.939	0.939
PTG-11			0.964	0.924	1.094	0.920	0.881	1.043	0.969	0.938	0.750
	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PTG-12	5 1 1		0.672	0.672	0.672	0.962	0.962	0.962	1.000	1.000	1.000
PTG-13	Peshtigo	bluegill, bluegill x green sunfish hybrid	1.070	1.044	1.044	1.000	0.976	0.976	1.000	1.000	1.000
PTG-14		bluegill, bluegill x green sunfish hybrid	0.840	0.907	0.993	0.909	0.982	1.075	1.000	0.895	0.789
PTG-15	Peshtigo	bluegill, bluegill x green sunfish hybrid	1.123	1.123	1.123	1.000	1.000	1.000	1.000	1.000	1.000
	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PTG-16			0.940	0.926	0.851	0.940	0.926	0.851	1.000	0.972	0.917
	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse		2.244							
PTG-17	Dochtics	fothood minnous and 1-	0.990	0.941	0.933	1.009	0.959	0.951	0.972	0.944	0.833
DTC 19	Peshtigo	fathead minnow, creek chub, white sucker, golden/shorthead redhorse	0 000	A 000	1 102	0.002	0.002	1 100	0.067	0.067	0.027
PTG-18	Peshtigo	fathead minnow, creek	0.988	0.988	1.102	0.993	0.993	1.108	0.967	0.967	0.867
	i esungo	chub, white sucker, golden/shorthead redhorse	,								
PTG-19			1.138	1.138	1.129	1.012	1.012	1.004	0.968	0.968	0.935

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Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Peshtigo	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-20			0.981	0.962	0.967	0.981	0.962	0.967	1.000	1.000	0.957
	Peshtigo	fathead minnow, creek									
		chub, white sucker, golden/shorthead									
		redhorse									
PTG-21		rediforse	0.864	0.864	0.864	0.896	0.896	0.896	1.000	1.000	1.000
110-21	Peshtigo	fathead minnow, creek	0.004	0.004	0.004	0.890	0.830	0.090	1.000	1.000	1.000
	1 comingo	chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-22			0.684	0.703	0.684	0.765	0.785	0.765	0.974	0.949	0.949
	Peshtigo	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead redhorse									
DTG 22		rednorse	0.004	0.070	4.045	0.004	0.050	0.055	1 000	1.000	0.010
PTG-23	Peshtigo	fathead minnow, creek	0.996	0.972	1.065	0.894	0.872	0.955	1.000	1.000	0.913
	Peshigo	chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-24			0.938	0.938	0.938	0.864	0.864	0.864	1.000	1.000	1.000
	Peshtigo	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-25	D 1.1	6.1 1 1	0.700	0.700	0.700	0.708	0.708	0.708	1.000	1.000	1.000
	Peshtigo	fathead minnow, creek chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-26			1.211	1.339	1.413	0.825	0.912	0.962	0.955	0.864	0.818
	Peshtigo	fathead minnow, creek									
		chub, white sucker,									
		golden/shorthead									
		redhorse									
PTG-27			0.604	0.604	0.604	0.806	0.806	0.806	1.000	1.000	1.000
DD111 01	Potato	bluegill, bluegill x	1 210	1 477	1.204	1 222	1 400	1.206	0.545	0.424	0.424
PRU1-01	Rapids	green sunfish hybrid	1.319	1.477	1.204	1.322	1.480	1.206	0.545	0.424	0.424
PRU1-02	Potato Rapids	bluegill, bluegill x green sunfish hybrid	0.947	0.929	0.924	0.842	0.826	0.821	0.625	0.542	0.417
1 KU 1-02	Potato	bluegill, bluegill x	0.747	0.949	0.724	0.042	0.020	0.621	0.023	0.342	0.41/
PRU1-03	Rapids	green sunfish hybrid	1.031	1.031	1.071	1.123	1.123	1.166	0.871	0.871	0.839
	Potato	fathead minnow, creek						,,,,,,			
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-04			0.632	0.615	0.631	0.860	0.837	0.859	1.000	1.000	0.975

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Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-05			1.098	1.025	1.001	1.023	0.955	0.932	0.880	0.880	0.880
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker, golden/shorthead									
		redhorse									
PRU1-06		reditorse	1.150	1.145	1.049	1.048	1.044	0.957	0.742	0.710	0.677
	Potato	bluegill, bluegill x	1.130	1.143	1.017	1.040	1.011	0.557	0.742	0.710	0.077
	Rapids	green sunfish hybrid	0.727	0.706	0.876	0.728	0.707	0.877	0.865	0.838	0.676
	Potato	bluegill, bluegill x									
	Rapids	green sunfish hybrid	0.432	0.432	0.425	0.800	0.800	0.788	1.000	1.000	0.964
	Potato	bluegill, bluegill x									
PRU1-09	Rapids	green sunfish hybrid	0.694	0.723	0.680	0.919	0.957	0.901	1.000	0.960	0.960
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapius	golden/shorthead									
		redhorse									
PRU1-10			0.598	0.598	0.567	0.676	0.676	0.640	0.938	0.938	0.938
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-11	D	C 4 1 ' 1	0.713	0.618	0.738	0.713	0.618	0.738	0.957	0.957	0.739
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapias	golden/shorthead									
		redhorse									
PRU1-12			0.800	0.776	0.822	0.818	0.793	0.841	0.897	0.897	0.793
	Potato	bluegill, bluegill x									
	Rapids	green sunfish hybrid	0.475	0.475	0.459	0.853	0.853	0.824	1.000	1.000	1.000
		bluegill, bluegill x									
PRU1-14	Rapids	green sunfish hybrid	0.371	0.371	0.361	0.857	0.857	0.835	1.000	1.000	0.970
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapius	golden/shorthead									
		redhorse									
PRU1-15			0.621	0.669	0.669	0.611	0.658	0.658	0.966	0.897	0.897
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
DD444.4.5		redhorse	0.7.50	0.70-	0.55:	0.550	0.541	0.500	4.000	4 000	0.000
PRU1-16	Dotata	fothood minary1	0.569	0.525	0.554	0.553	0.511	0.538	1.000	1.000	0.909
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Lupius	golden/shorthead									
		redhorse									
	Ī		0.543	0.598	0.642	0.747	0.822	0.883	0.971	0.882	0.765

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Со	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	D ()	C d 1									
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapius	golden/shorthead									
		redhorse									
PRU1-18			0.498	0.498	0.496	0.591	0.591	0.588	1.000	1.000	0.966
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-19			0.606	0.586	0.587	0.588	0.569	0.569	1.000	1.000	0.964
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead redhorse									
DD111 20		reunorse	0.670	0.742	0.650	0.600	0.757	0.671	1 000	0.000	0.000
PRU1-20	Potato	fathead minnow, creek	0.679	0.743	0.658	0.692	0.757	0.671	1.000	0.889	0.889
	Rapids	chub, white sucker,									
	Rapids	golden/shorthead									
		redhorse									
PRU1-21			0.563	0.343	0.314	0.788	0.480	0.440	0.889	0.833	0.833
1 KO1 21	Potato	fathead minnow, creek	0.505	0.545	0.514	0.700	0.100	0.110	0.007	0.033	0.033
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-22			0.545	0.545	0.583	0.558	0.558	0.597	1.000	1.000	0.897
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse	0.700	0. = 0.0				0.70			
PRU1-23	D	C.1. 1	0.500	0.500	0.514	0.521	0.521	0.536	1.000	1.000	0.972
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapius	golden/shorthead									
		redhorse									
PRU1-24			0.383	0.342	0.350	0.362	0.324	0.331	0.902	0.882	0.863
TROT 21	Potato	fathead minnow, creek	0.505	0.542	0.550	0.302	0.321	0.551	0.702	0.002	0.005
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU1-25			0.394	0.375	0.357	0.389	0.370	0.352	1.000	1.000	1.000
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
DD111 25		redhorse	0.224	0.25	0.225	0.222	0.264	0.222	1.000	0.015	0.015
PRU1-26	Dotata	bluggill bluggill -	0.234	0.256	0.227	0.333	0.364	0.323	1.000	0.917	0.917
DD 112 01	Potato Rapids	bluegill, bluegill x green sunfish hybrid	0.964	0.064	0.046	0.002	0.002	0.064	1 000	1 000	1 000
PRU2-01	Potato	bluegill, bluegill x	0.964	0.964	0.946	0.982	0.982	0.964	1.000	1.000	1.000
PRU2-02	Rapids	green sunfish hybrid	0.845	0.854	0.808	0.986	0.997	0.943	0.906	0.875	0.813
1102-02	Potato	bluegill, bluegill x	0.043	0.054	0.000	0.300	0.331	0.743	0.500	0.073	0.013
PRU2-03	Rapids	green sunfish hybrid	0.871	0.812	0.812	0.947	0.882	0.882	0.941	0.912	0.912
2 03	I I	,	3.071	0.012	5.012	V.7 17	0.002	0.002	J 0.7 11	0.712	0.712

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number i	eleased	Based of	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker, golden/shorthead									
		redhorse									
PRU2-04		reamorse	0.840	0.779	0.553	0.915	0.848	0.603	0.974	0.974	0.974
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU2-05	D	C .1 1	1.455	1.499	1.548	0.930	0.958	0.990	0.947	0.895	0.842
	Potato Rapids	fathead minnow, creek chub, white sucker,									
	Kapius	golden/shorthead									
		redhorse									
PRU2-06			0.999	0.999	0.999	1.000	1.000	1.000	1.000	1.000	1.000
	Potato	bluegill, bluegill x									
PRU2-07	Rapids	green sunfish hybrid	0.901	0.901	0.735	0.925	0.925	0.755	1.000	1.000	1.000
DD112 00	Potato	bluegill, bluegill x	0.205	0.270	0.270	1.020	0.002	0.002	0.071	0.071	0.071
PRU2-08	Rapids Potato	green sunfish hybrid bluegill, bluegill x	0.395	0.378	0.378	1.030	0.983	0.983	0.971	0.971	0.971
PRU2-09	Rapids	green sunfish hybrid	0.881	0.857	0.857	0.881	0.857	0.857	1.000	1.000	1.000
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU2-10			0.590	0.629	0.297	0.697	0.744	0.352	1.000	0.897	0.690
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker, golden/shorthead									
		redhorse									
PRU2-11			0.614	0.592	0.310	0.741	0.714	0.374	0.900	0.833	0.700
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU2-12	D	1.1 '11 1.1 '11	0.904	0.888	0.986	0.904	0.888	0.986	0.914	0.857	0.771
PRU2-13	Potato Rapids	bluegill, bluegill x green sunfish hybrid	1.019	0.983	0.948	0.983	0.948	0.914	1.000	1.000	1.000
PKU2-13	Potato	fathead minnow, creek	1.019	0.983	0.946	0.983	0.948	0.914	1.000	1.000	1.000
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
PRU2-14			0.855	0.912	0.805	0.855	0.912	0.805	0.970	0.909	0.727
	Potato	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead redhorse									
PRU2-15			0.734	0.537	0.496	0.780	0.571	0.527	0.885	0.846	0.654
1102-13	ı		0.734	0.557	0.470	0.760	0.571	0.341	0.003	0.040	0.054

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number i	eleased	Based o	n number re	ecovered	Based o	n number r	ecovered
Test		Species	Immediate		48 Hour	Immediate	24 Hour	48 Hour		ontrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
		fathead minnow, creek									
	•	chub, white sucker, golden/shorthead redhorse									
PRU2-16			0.778	0.738	0.747	0.778	0.738	0.747	0.969	0.938	0.906
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-17			0.730	0.730	0.496	0.730	0.730	0.496	0.971	0.971	0.882
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-18			0.640	0.620	0.500	0.769	0.745	0.602	0.929	0.821	0.679
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-19			0.804	0.760	0.738	0.820	0.776	0.753	0.914	0.886	0.857
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-20			0.435	0.435	0.435	0.513	0.513	0.513	1.000	1.000	0.800
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-21			0.681	0.709	0.689	0.762	0.794	0.771	1.000	0.900	0.833
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-22			0.617	0.467	0.466	0.627	0.475	0.474	1.000	1.000	0.966
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-23			0.287	0.287	0.280	0.280	0.280	0.273	0.893	0.893	0.500
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-24	Divi	6.1 1 .	0.575	0.521	0.461	0.542	0.492	0.435	1.000	1.000	0.935
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
PRU2-25			0.714						4		
PK-01 PK-02		bluegill bluegill	0.889 0.935	0.919 0.818	1.063 1.686	0.976 0.925	1.010 0.809	1.168 1.667			

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
		bluegill	0.947	0.529	0.545	0.857	0.479	0.494	1.000	0.895	0.579
		white sucker	0.707	0.653	0.617	0.699	0.645	0.610	0.969	0.917	0.490
		white sucker	0.476	0.267	0.222	0.357	0.200	0.167	1.000	0.714	0.429
		golden shiner	1.471	1.369	1.538	0.929	0.865	0.972	0.867	0.867	0.600
RRU3-01	Rocky Reach	chinook salmon	0.939		0.927	0.939		0.927	0.989		0.977
	Rocky Reach	chinook salmon	0.947		0.951	0.947		0.951	0.988		0.984
	Rocky Reach	chinook salmon	0.973		0.973	0.973		0.973	1.000		1.000
	Rocky Reach	chinook salmon	0.982		0.977	0.986		0.982	1.000		0.991
	,	chinook salmon	0.005		1.000	0.056		0.000	0.000		0.055
	Reach Rocky	chinook salmon	0.987		1.009	0.976		0.998	0.989		0.955
RRU5-04	Reach		0.915		0.931	0.899		0.913	1.000		0.984
RRU5-05	Reach	chinook salmon	0.978		0.978	0.976		0.976	0.987		0.987
	Rocky Reach	chinook salmon	0.941		0.929	0.952		0.940	1.000		1.000
	Rocky Reach	chinook salmon	0.912		0.888	0.912		0.888	1.000		1.000
	Rocky Reach	chinook salmon	0.984		0.981	0.976		0.972	1.000		0.991
	Rocky Reach	chinook salmon	0.983		1.010	0.962		0.988	1.000		0.966
		chinook salmon	0.965		0.980			0.948			0.984
		chinook salmon	0.903		0.980			0.948			0.984
		chinook salmon	0.960		0.960			0.973			1.000
	Rocky	chinook salmon									
	Reach	1.1	0.962	0.065	0.953		0.065	0.924	0.933	0.067	0.933
	_	bluegill	0.906	0.865	1.031	0.906	0.865	1.031	1.000	0.867	0.667
	_	bluegill	0.870	0.932	0.932	0.932	0.999	0.999	1.034	0.966	0.966
	υ	rainbow trout				0.800		0.720	1.000		1.000
	Ŭ	rainbow trout				0.967		0.900	1.000		1.000
-	Rogers	spottail shiner	_			0.806		1.262	1.000		0.563
H	Ŭ	yellow perch bluegill	0.000	0.047	0.021	0.933	0.000	0.929	1.000 0.983	0.002	0.969 0.983
-	Ŭ	bluegill	0.898 1.343	0.847 1.377	0.831 1.278	0.962 0.989	0.908 1.014	0.890 0.941	0.983	0.983 0.952	0.983
-	Rogers	golden shiner	0.583	0.583	0.549		0.984	0.941		0.932	0.932
	Rogers	golden shiner	1.118	0.383	0.549	0.984	0.984	0.926		0.980	0.980
-	Rogers	largemouth bass	0.813	0.795	0.043	0.932	0.830	0.330		1.000	0.960
	Ŭ	northern pike	1.049	1.049	0.780	0.800	0.782	0.774	1.000	1.000	1.000
		walleye	1.049	1.047	0.742	0.929	0.727	0.862	1.000	1.000	0.946
		white sucker				0.940		0.860	1.000		1.000
-	Ŭ	white sucker				0.875		0.812	1.000		0.955
-	Ŭ	yellow perch				0.929		0.812	1.000		1.000
-		yellow perch				0.956		0.911	1.000		1.000

TEST ID INFO SURVIVAL ESTIMATES Based on number released Based on number recovered Based on number recovered											
			Based o	on number i	eleased	Based or	n number re	ecovered	Based of	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Safe	American shad									
SHU7-01	Harbor Safe	Amaniaan ahad	0.980	0.980	1.024	0.980	0.980	1.024	1.000	1.000	0.838
SHU9-01	Harbor	American shad	0.978	1.000	1.106	0.978	1.000	1.106	1.000	0.685	0.511
SHU9-02	Safe Harbor	American shad	0.948	0.967	0.667	0.958	0.978	0.674	1.000	0.724	0.541
	Sandstone	bluegill, bluegill x									
SS-01	Rapids	green sunfish hybrid	0.759	0.689	0.668	0.886	0.804	0.779	1.000	0.960	0.880
		bluegill, bluegill x									
SS-02	Rapids	green sunfish hybrid	0.895	0.895	0.930	0.962	0.962	1.001	1.000	1.000	0.943
SS-03	Rapids Rapids	bluegill, bluegill x green sunfish hybrid	1.044	1.044	1.044	1.044	1.044	1.044	0.941	0.941	0.941
	_	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
SS-04	0 1.	C .1 1	0.676	0.676	0.417	0.818	0.818	0.504	1.000	1.000	0.767
	Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
SS-05			0.481	0.401	0.342	0.777	0.647	0.552	0.966	0.966	0.793
	Sandstone Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
SS-06			0.535	0.535	0.515	0.994	0.994	0.958	0.971	0.971	0.971
		bluegill, bluegill x									
SS-07	Rapids	green sunfish hybrid	0.877	0.704	0.580	0.896	0.719	0.593	0.808	0.769	0.538
SS-08	Rapids	bluegill, bluegill x green sunfish hybrid	0.885	0.885	0.879	0.920	0.920	0.914	1.000	1.000	0.941
33-00	_	bluegill, bluegill x	0.883	0.883	0.079	0.920	0.920	0.914	1.000	1.000	0.541
SS-09	Rapids	green sunfish hybrid	0.706	0.706	0.706	0.878	0.878	0.878	1.000	1.000	1.000
	Sandstone Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse									
SS-10			0.936	0.887	0.455	0.959	0.908	0.466	0.967	0.967	0.733
SS-11	Sandstone Rapids	fathead minnow, creek chub, white sucker, golden/shorthead redhorse	0.369	0.403	0.422	0.600	0.655	0.686	0.867	0.733	0.467
აა-11	Sandstone	fathead minnow, creek	0.309	0.403	0.422	0.000	0.033	0.000	0.807	0.733	0.407
	Rapids	chub, white sucker, golden/shorthead redhorse									
SS-12			0.901	0.879	0.879	0.901	0.879	0.879	0.971	0.971	0.971

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number r	eleased	Based or	n number re	covered	Based of	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour		ntrol Survi	
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Sandstone	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
SS-13			0.833	0.817	0.755	0.833	0.817	0.755	1.000	0.952	0.810
		fathead minnow, creek									
	Rapids	chub, white sucker, golden/shorthead									
		redhorse									
SS-14			0.840	0.840	0.816	0.814	0.814	0.791	1.000	1.000	1.000
55 11	Sandstone	fathead minnow, creek	0.010	0.040	0.010	0.014	0.014	0.771	1.000	1.000	1.000
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
SS-15			0.745	0.686	0.504	0.745	0.686	0.504	1.000	1.000	0.778
		fathead minnow, creek									
	Rapids	chub, white sucker, golden/shorthead									
		redhorse									
SS-16		rediforse	0.753	0.816	0.906	0.842	0.912	1.013	0.839	0.710	0.581
33-10	Sandstone	fathead minnow, creek	0.733	0.810	0.900	0.042	0.912	1.013	0.639	0.710	0.361
	Rapids	chub, white sucker,									
	•	golden/shorthead									
		redhorse									
SS-17			0.839	0.843	0.828	0.839	0.843	0.828	1.000	0.974	0.949
		fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead redhorse									
CC 10		reunorse	0.602	0.580	0.520	0.610	0.505	0.550	1 000	1 000	0.062
SS-18	Sandstone	fathead minnow, creek	0.603	0.580	0.538	0.619	0.595	0.552	1.000	1.000	0.862
	Rapids	chub, white sucker,									
	rapids	golden/shorthead									
		redhorse									
SS-19			0.864	0.818	0.832	0.905	0.857	0.872	1.000	1.000	0.929
		fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
gg 20		redhorse	0.742	0.740	0.750	0.717	0.717	0.521	1.000	1.000	0.020
SS-20	Condotan	fathead minnow, creek	0.743	0.743	0.758	0.717	0.717	0.731	1.000	1.000	0.929
	Rapids Rapids	chub, white sucker,									
	rupius	golden/shorthead									
		redhorse									
SS-21			0.292	0.243	0.233	0.273	0.227	0.218	1.000	1.000	0.833
	Sandstone	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
aa		redhorse			<u> </u>	0 =-	a =-	a = -			
SS-22			0.659	0.659	0.659	0.794	0.794	0.794	1.000	1.000	1.000

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Со	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	9 1										
		fathead minnow, creek chub, white sucker,									
	Rapids	golden/shorthead									
		redhorse									
SS-23		rediforse	0.519	0.519	0.534	0.583	0.583	0.601	1.000	1.000	0.971
33-23	Sandstone	fathead minnow, creek	0.519	0.319	0.554	0.363	0.363	0.001	1.000	1.000	0.971
	Rapids	chub, white sucker,									
	F	golden/shorthead									
		redhorse									
SS-24			0.579	0.521	0.516	0.545	0.491	0.486	1.000	1.000	0.973
	Sandstone	fathead minnow, creek		****		3.0	*****				0.57.0
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
SS-25			0.405	0.381	0.357	0.424	0.399	0.374	0.955	0.955	0.955
	Sandstone	fathead minnow, creek									
	Rapids	chub, white sucker,									
		golden/shorthead									
		redhorse									
SS-26			0.584	0.584	0.611	0.537	0.537	0.562	0.957	0.957	0.913
	U	brook trout									
STC-01	oke		0.228		0.245	0.170		0.182	0.983		0.914
~~~	_	brook trout									
STC-02	oke		0.000		0.000	0.000		0.000	0.905		0.703
OTTO 02	Schaghtic oke	largemouth bass	0.410		0.415	0.214		0.211	0.017		0.002
STC-03		brook trout	0.418		0.415	0.314		0.311	0.917		0.883
STC-04	Schaghtic oke	Drook trout	0.506		0.486	0.433		0.416	0.966		0.862
31C-04		golden shiner	0.500		0.460	0.433		0.410	0.900		0.802
STC-05	oke	golden sinner	0.531		0.483	0.617		0.561	0.985		0.923
510-03		white sucker	0.551		0.403	0.017		0.501	0.703		0.723
STC-06	oke	Winter Sucker	0.503		0.405	0.516		0.415	0.928		0.594
210 00		white sucker	0.000		01.00	0.010		01.12	0.720		0.00
STC-07	oke		0.471		0.492	0.615		0.643	1.000		0.897
	Schaghtic	bluegill									
STC-08	oke		0.382		0.294	0.414		0.318	0.984		0.852
	Schaghtic	largemouth bass									
STC-09	oke		0.268		0.250	0.254		0.238	0.982		0.912
	Schaghtic	yellow perch									
STC-10	oke		0.508		0.540	0.501		0.532	0.913		0.725
	_	brook trout									
STC-11	oke		0.061		0.063	0.045		0.047	0.846		0.821
	_	white sucker									
STC-12	oke		0.328		0.309	0.349		0.330	0.906		0.859
ama 12	_	white sucker	0.11-		0 11-	0.15-		0.1.1-	0.00		0.01-
STC-13	oke	1 .1 1	0.115		0.118	0.137		0.140	0.936		0.915
CTC 14	_	largemouth bass	0.151		0.100	0.100		0.122	0.743		0.530
STC-14	oke Sahaahtia	longamouth bas-	0.154		0.108	0.189		0.133	0.743		0.529
STC 15	oke	largemouth bass	0.000		0.000	0.000		0.000	0.924		0.600
STC-15		brook trout	0.000		0.000	0.000		0.000	0.824		0.608
STC-16	oke	DIOOK HOUL	0.209		0.197	0.224		0.211	0.882		0.868
210-10	JAC	l	0.209		0.197	0.224		0.211	0.002	l l	0.008

Schaghtic   Scha		TEST	ID INFO				SURVI	VAL ESTI	MATES		Control Survival		
D. No.   Site Name   Tested   Survival   S				Based of	on number r	eleased	Based or	n number re	ecovered	Based o	n number re	ecovered	
Schaghtic   Scha	Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Co	ntrol Survi	val	
STC-17   Oke	ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour	
STC-17   Oke													
STC-17   Oke		Schaghtic	white sucker										
Schaghtic   Schaghtic   Schaghtic   StrC-19   Schaghtic   Schaghtic   StrC-19   Schaghtic   Walleye   StrC-20   Schaghtic   Walleye   StrC-20   Schaghtic   Scha	STC-17	_		0.319		0.175	0.295		0.161	0.945		0.863	
Schaghtic   Scha		Schaghtic	white sucker										
STC-19   oke	STC-18			0.265		0.223	0.296		0.249	0.756		0.686	
Schaghtic   Schaghtic   Frook trout   STC-20   oke		_	largemouth bass										
STC-20   Oke   O	STC-19			0.692		0.900	0.666		0.865	0.520		0.400	
Schaghtic   Schaghtic   STC-21   oke   0.806   0.700   0.737   0.704   0.969   0.953	CTC 20	_	walleye	0.426		0.444	0.292		0.290	0.796		0.257	
STC-22   Oke   O	S1C-20		brook trout	0.436		0.444	0.382		0.389	0.780		0.237	
STC-22   Oke	STC-21	_	brook trout	0.806		0.770	0.737		0.704	0.969		0.953	
STC-22   Oke	~	Schaghtic	brook trout	0.000								0.700	
STC-23   Oke	STC-22	oke		0.500		0.397	0.427		0.338	0.969		0.906	
STC-24   oke		Schaghtic	bluegill										
STC-24	STC-23			0.420		0.233	0.491		0.272	0.908		0.566	
STC-25   Oke   O		_	yellow perch										
STC-25	STC-24		11 1	0.758		0.751	0.791		0.784	0.900		0.800	
Stevens   Stevens   Stevens   Stevens   Sc-01   Creek   Stevens	STC 25	_	yellow perch	O 505		0.540	0.764		0.717	0.000		0.707	
Secondary   Seco	31C-23		hlueback herring	0.363		0.349	0.704		0.717	0.828		0.797	
Stevens   Stev	SC-01		ordeodek nerring	1.019	1.010	0.993	0.967	0.959	0.943	1.000	1.000	1.000	
SC-02   Creek   Stevens   SC-03   Creek   Stevens   SC-04   Creek   Stevens   Stevens   SC-04   Creek   Stevens   Stevens   SC-04   Creek   Stevens	~ ~ ~ ~		sunfish spp	21022		*****		0.707					
Sc-03   Creek   Stevens	SC-02	Creek		0.974	1.053	1.057	0.974	1.053	1.057	0.981	0.907	0.778	
Stevens   Stevens   Stevens   Sc-04   Creek   Sucker   Stevens		Stevens	sunfish spp										
SC-04   Creek   Sucker   0.983   0.966   0.972   0.983   0.966   0.972   0.983   0.975   0.883     Townsend   Iargemouth bass   1.000   1.000   1.000   1.000   1.000   1.000   0.980   0.980   0.980     TS-01   Townsend   Iargemouth bass   0.860   0.860   0.860   0.860   0.860   0.860   0.860   1.000   1.000   1.000     TS-02   Townsend   rainbow trout   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944   0.944	SC-03	Creek		0.938	0.909	0.976	0.938	0.909	0.976	1.000	0.964	0.804	
Townsend   largemouth bass   1.000   1.000   1.000   1.000   1.000   1.000   1.000   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.980   0.994   0.000   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900   0.900													
TS-01   Townsend   Largemouth bass   TS-02   Townsend   Largemouth bass   TS-02   Townsend   Largemouth bass   TS-02   Townsend   Largemouth bass   TS-03   Townsend   Largemouth bass   TS-03   Townsend   Largemouth bass   TS-04   Townsend   Largemouth bass   TS-05   Largemouth bass   Largemouth ba	SC-04			0.983	0.966	0.972	0.983	0.966	0.972	0.983	0.975	0.883	
Townsend   largemouth bass   0.860   0.860   0.860   0.860   0.860   0.860   0.860   0.860   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000	TS 01	Townsend	largemouth bass	1 000	1 000	1 000	1 000	1 000	1 000	0.080	0.080	0.080	
TS-02   Townsend rainbow trout   TS-03   Townsend rainbow trout   TS-04   Townsend rainbow trout   TS-05   Townsend rainbow rainbow   TS-05   Townsend rainbow	13-01	Townsend	largemouth bass	1.000	1.000	1.000	1.000	1.000	1.000	0.960	0.960	0.960	
Townsend rainbow trout	TS-02	Townsena	largemouth ouss	0.860	0.860	0.860	0.860	0.860	0.860	1.000	1.000	1.000	
Townsend rainbow trout  TS-04  Twin  Bluegill  TBU1-01  Branch  Twin  Thin  Chinook/channel catfish  TBU5-01  Branch  Twin  TBU5-02  Branch  Twin  Thin  Thin  Thin  Chinook/channel catfish  TBU5-02  Twin  Twin  Thin		Townsend	rainbow trout										
TS-04	TS-03			0.944			0.944			1.000			
Twin   Branch   1.231   1.202   0.973   0.950   1.000   0.971		Townsend	rainbow trout										
TBU1-01   Branch	TS-04			0.919	0.919	0.919	1.000	1.000	1.000	1.000	1.000	1.000	
Twin   Chinook/channel catfish   0.986   0.963   1.000   0.976   1.000   1.000	TTD 111 01		bluegill	4 224		1.000	0.070		0.050	1.000		0.054	
TBU5-01         Branch         0.986         0.963         1.000         0.976         1.000         1.000           TWin DBranch         Chinook/channel catfish         0.970         0.815         0.986         0.829         1.000         0.903           TWin Steelhead/channel         Twin Catfish         0.703         0.656         0.862         0.804         1.000         0.950           VNU10-01 Vernon Vernon Atlantic salmon         0.959         0.949         1.000         0.989         1.000         1.000           VNU4-02 Vernon Atlantic salmon         1.013         1.013         1.000         1.000         1.000         1.000           VNU4-01 Vernon Atlantic salmon         0.851         0.851         0.840         0.840         1.000         1.000           WNP-01 Wanapum coho salmon         0.897         0.897         0.897         0.897         0.988         0.981           WNP-02 Wanapum coho salmon         0.949         0.955         0.949         0.955         0.949         0.955         0.988         0.981	TBU1-01		ahina alv/ahannal aatfiah	1.231		1.202	0.973		0.950	1.000		0.971	
Twin   Chinook/channel catfish   0.970   0.815   0.986   0.829   1.000   0.903     Twin   Steelhead/channel	TRU5 01		ciimook/channel catrish	0 086		0.063	1 000		0 076	1 000		1 000	
TBU5-02         Branch         0.970         0.815         0.986         0.829         1.000         0.903           Twin         steelhead/channel         0.703         0.656         0.862         0.804         1.000         0.950           VNU10-01 Vernon         Atlantic salmon         0.959         0.949         1.000         0.989         1.000         1.000           VNU10-02 Vernon         Atlantic salmon         1.013         1.013         1.000         1.000         1.000         1.000           VNU4-01 Vernon         Atlantic salmon         0.851         0.851         0.840         0.840         1.000         1.000           Wanapum         coho salmon         0.897         0.897         0.897         0.897         0.988         0.981           WNP-02         Wanapum         coho salmon         0.949         0.955         0.949         0.955         0.949         0.955         0.988         0.981	1503-01		chinook/channel catfish	0.300		0.703	1.000		0.970	1.000		1.000	
Twin steelhead/channel catfish 0.703 0.656 0.862 0.804 1.000 0.950   VNU10-01 Vernon Atlantic salmon 0.959 0.949 1.000 0.989 1.000 1.000   VNU10-02 Vernon Atlantic salmon 1.013 1.013 1.000 1.000 1.000 1.000   VNU4-01 Vernon Atlantic salmon 0.851 0.851 0.840 0.840 1.000 1.000   Wanapum coho salmon 0.897 0.897 0.897 0.897 0.988 0.981   Wanapum coho salmon 0.949 0.955 0.949 0.955 0.988 0.981   Wanapum coho salmon 0.949 0.955 0.949 0.955 0.988 0.981	TBU5-02			0.970		0.815	0.986		0.829	1.000		0.903	
VNU10-01   Vernon   Atlantic salmon   0.959   0.949   1.000   0.989   1.000   1.000		Twin											
VNU10-02         Vernon         Atlantic salmon         1.013         1.013         1.000         1.000         1.000         1.000           VNU4-01         Vernon         Atlantic salmon         0.851         0.851         0.840         0.840         1.000         1.000           Wanapum         coho salmon         0.897         0.897         0.897         0.897         0.988         0.981           WNP-02         Wanapum         coho salmon         0.949         0.955         0.949         0.955         0.949         0.955         0.988         0.981												0.950	
VNU4-01         Vernon         Atlantic salmon         0.851         0.851         0.840         0.840         1.000         1.000           Wanapum         coho salmon         0.897         0.897         0.897         0.897         0.988         0.981           WNP-02         Wanapum         coho salmon         0.949         0.955         0.949         0.955         0.949         0.955         0.988         0.981           Wanapum         coho salmon         0.949         0.955         0.949         0.955         0.988         0.981												1.000	
Wanapum   Coho salmon													
WNP-01         0.897         0.897         0.897         0.897         0.988         0.981           Wanapum coho salmon         0.949         0.955         0.949         0.955         0.949         0.955         0.988         0.981           Wanapum coho salmon         0.949         0.955         0.949         0.955         0.988         0.981	VNU4-01			0.851		0.851	0.840		0.840	1.000		1.000	
Wanapum   Coho salmon	WNP_01	vv anapum	COHO SAIMON	0 807		0 807	0 807		0 807	U 088		U 081	
WNP-02         0.949         0.955         0.949         0.955         0.988         0.981           Wanapum coho salmon         0.955         0.949         0.955         0.988         0.981	**111-01	Wanapum	coho salmon	0.037		0.037	0.077		0.097	0.300		0.301	
Wanapum coho salmon	WNP-02			0.949		0.955	0.949		0.955	0.988		0.981	
WNP-03 0.935 0.942 0.924 0.930 0.994 0.987		Wanapum	coho salmon										
	WNP-03			0.935		0.942	0.924		0.930	0.994		0.987	

	TEST	ID INFO				SURVI	VAL ESTI	MATES			
			Based o	on number i	eleased	Based or	n number re	ecovered	Based or	number r	ecovered
Test		Species	Immediate	24 Hour	48 Hour	Immediate	24 Hour	48 Hour	Cor	ntrol Survi	val
ID No.	Site Name	Tested	Survival	Survival	Survival	Survival	Survival	Survival	Immediate	24 hour	48 hour
	Wanapum	coho salmon									
WNP-04			0.981		0.987	0.968		0.975	0.994		0.987
WNP-05	Wanapum	coho salmon	0.942		0.942	0.948		0.948	0.987		0.987
WNP-06	Wanapum	coho salmon	1.006		1.006			1.000			0.987
WNP-07	Wanapum	coho salmon	0.868		0.873	0.885		0.890	1.000		0.994
WNP-08	Wanapum	coho salmon	0.962		0.962	0.968		0.968	1.000		0.994
WR-01	White Rapids	bluegill	0.944		1.022	0.945		1.024	1.000		0.852
WR-02	White Rapids	bluegill	0.957		0.967	1.000		1.011	1.000		0.676
WR-03	White Rapids	white sucker	1.018		1.000	1.009		0.992	0.941		0.882
WR-04	White Rapids	white sucker	0.991		1.023	0.930		0.960	1.000		0.932
WD-01	Wilder	Atlantic salmon	0.960	0.943	0.943	0.960	0.943	0.943	1.000	0.984	0.984

# APPENDIX C SPECIES COMPOSITION AND LENGTH FREQUENCY DATA

Table C-1: Species Composition Data Derived from the Twin Branch Hydroelectric Field Entrainment Study

**Twin Branch Species Composition** 

Species	Family	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Channel catfish	Ictaluridae	47	38	41	1654	2149	1484	1077	6686	6840	4319	1800	54	26189
Bluegill	Sunfish	144	163	113	43	57	24	445	228	598	2860	2991	167	7833
Spottail shiner	Cyprinidae	148	163	118	266	344	522	309	664	642	1650	386	172	5384
White sucker	Catostomidae	66	65	55	111	146	42	3786	122	24	12	0	76	4505
White Crappie	Sunfish	154	124	134	152	195	167	122	312	460	271	196	176	2463
Logperch	Percidae	31	25	27	558	721	887	270	202	16	31	83	36	2887
Walleye	Percidae	571	720	435	40	51	103	193	251	91	31	227	674	3387
Pumpkinseed	Sunfish	0	0	0	553	713	714	255	309	144	17	22	0	2727
Morone sp	Percichthyidae	0	0	0	0	0	0	0	0	0	673	1289	0	1962
shorthead redhorse	Catostomidae	0	0	0	376	484	718	31	37	22	173	83	0	1924
stonecat	Ictaluridae	16	13	14	178	231	101	275	42	23	46	173	18	1130
mimic shiner	Cyprinidae	0	0	0	0	0	0	0	12	0	558	0	0	570
tadpole madtom	Ictaluridae	0	0	0	0	0	13	259	12	46	31	0	0	361
smallmouth bass	Bass	0	0	0	85	109	123	116	89	107	16	0	0	645
brown bullhead	Ictaluridae	0	0	0	43	56	24	242	74	86	0	0	0	525
northern pike	Esocidae	0	0	0	0	0	0	321	41	11	0	0	0	373
rock bass	Bass	0	0	0	100	128	121	111	51	34	20	0	0	565
common shiner	Cyprinidae	0	0	0	126	164	0	12	13	0	0	0	0	315
green sunfish	Sunfish	0	0	0	15	19	10	137	29	0	16	32	0	258
black bullhead	Ictaluridae	0	0	0	7	10	0	98	86	16	0	0	0	217
largemouth bass	Bass	0	0	0	0	0	0	0	73	35	13	0	0	121
Golden shiner	Cyprinidae	0	0	0	35	45	42	45	12	0	0	22	0	201
Creek chub	Cyprinidae	0	0	0	15	20	43	87	0	0	0	0	0	165
yellow bullhead	Ictaluridae	0	0	0	0	0	13	79	12	17	10	11	0	142
Golden redhorse	Catostomidae	0	0	0	84	108	138	92	0	0	0	0	0	422
silver redhorse	Catostomidae	0	0	0	0	0	0	38	60	0	0	0	0	98
Black Crappie	Sunfish	0	0	0	0	0	20	0	26	39	0	0	0	85
Johnny Darter	Percidae	13	10	11	29	38	0	9	0	8	0	11	14	143
Spotted sucker	Catostomidae	0	0	0	0	0	0	0	0	0	0	11	0	11
Black redhorse	Catostomidae	0	0	0	0	0	0	14	0	0	0	67	0	81
common carp	Cyprinidae	0	0	0	0	0	0	0	0	0	0	90	0	90
spotfin shiner	Cyprinidae	0	0	0	0	0	0	9	36	0	0	11	0	56
fathead minnow	Cyprinidae	18	26	14	15	19	10	0	0	0	0	0	22	124
central mudminnow	Umbridae	0	0	0	7	10	0	9	12	0	0	11	0	49
carps and minnows	Cyprinidae	0	0	0	, 48	0	0	58	0	0	0	11	0	117
yellow perch	Percidae	18	26	14	23	62	57	0	0	0	0	0	22	222
rainbow darter	Percidae	0	0	0	0	30	0	0	0	0	0	0	0	30
blackside darter	Percidae	12	10	11	0	0	0	34	0	0	15	0	14	96
longnose dace	Cyprinidae	18	26	14	7	0	0	0	0	0	0	0	22	87
bullhead catfishes	Ictaluridae	0	0	0	0	10	0	0	12	0	0	0	0	22
sand shiner	Cyprinidae	0	0	0	0	0	0	0	0	17	0	0	0	17
Brook silverside	Atherinidae	31	36	25	0	0	0	0	0	0	0	0	37	129
Longnose gar	Lepisosteidae	0	0	0	20	26	0	0	0	19	0	0	0	65
Muskellunge	Esocidae	0	0	0	0	0	0	0	0	0	18	0	0	18
Suckers	Catostomidae	0	0	0	0	0	0	9	0	0	0	0	0	9
Quillback	Catostomidae	0	0	0	0	0	10	0	0	0	0	0	0	10
~	Catostomidae	0	0	0	0	0	0	0	0	0	0	17	0	17
Northern hogsucker	Catostomidae	0	0	0	20	26	24	0	0	0	0	0	0	70
Moxostoma sp														
	1 otal	1287	1443	1026	4010	5971	3410	0042	9003	<b>3</b> 233	10/00	7 344	1304	66917

Table C-2: Length Frequency Data Derived from the Long Term Illinois River Fish Population Monitoring Program 1996 Annual Report (CE, 1996)

		Catostomia	lae	
Season		1-149mm (small)	150-419 mm (large)	Total
Spring		1	0	1
	%	100	0	100
Summer		3	4	7
	%	43	57	100
Fall		0	4	4
	%	0	100	100
		Ictalurida	e	
Season		1-149mm (small)	150-610+ mm (large)	Total
Spring		1	46	47
	%	2	98	100
Summer		0	83	83
	%	0	100	100
Fall		1	58	59
	%	2	98	100
		Sunfish		
Season		1-149mm (small)	150-209 mm (large)	Total
Spring		46	5	51
	%	90	10	100
Summer		46	2	48
	%	96	4	100
Fall		16	0	16
	%	100	0	100
		Bass		
Season		1-149mm (small)	150-469 mm (large)	Total
Spring		2	17	19
	%	11	89	100
Summer		52	33	85
	%	61	39	100
Fall		10	17	27
	%	59	63	122

# APPENDIX D DESKTOP STUDY PLAN

# BRANDON ROAD HYDROPOWER PROJECT (FERC NO. 12717)

# DRESDEN ISLAND HYDROPOWER PROJECT (FERC NO. 12626)

#### FISH ENTRAINMENT DESKTOP STUDY PLAN

#### **JANUARY 8, 2009**

#### **DRAFT**

#### STUDY OBJECTIVE

The study objective is to characterize and provide an order-of-magnitude estimate of potential fish entrainment and subsequent turbine mortality using existing literature and site-specific information for the Brandon Road and Dresden Island Hydropower projects (FERC Nos. 12717 & 12626, respectively).

#### PROJECT DESCRIPTIONS AND PROPOSED OPERATIONS

# Brandon Road

The Brandon Road Lock and Dam is operated by the US Army Corps of Engineers (ACOE). The facility lies on the Des Plaines River at the southwest edge of Joliet, Illinois, 13.3 miles upstream from the confluence with the Kankakee River. There are no existing hydropower facilities within the proposed Project boundary.

The existing Brandon Road Lock and Dam was constructed as part of the Illinois Waterway System to create a navigational pool for the original 9-ft deep channel. The reservoir, with a water surface elevation held constant at 539.0 ft NGVD, extends upstream just over 5 miles to the Lockport Dam. Water is released from the facility at the same rate as it enters the Project.

Northern Illinois Hydropower, LLC (NIH) currently proposes to install an intake structure, powerhouse, discharge works, and transmission line at the Brandon Road Project. The Project (land and water within the Project boundary) will include a 10.2 MW capacity, 75-ft by 125-ft power plant between headgate sections 1 through 6 immediately below the existing dam.

The powerhouse will contain two 3.76 meter diameter S-type turbines with an estimated hydraulic capacity of 4,500 cfs. NIH proposes to install a powerhouse at the Brandon Road Lock and Dam with an average anticipated annual energy production of 59,100 MWh. A 50-ft by 50-ft switchyard will be adjacent to and to the west of the powerhouse building. An automated system will automatically start up, run, and shut down the turbines.

The ACOE currently operates the lock and dam to maintain a navigation pool at a constant 539.0 ft NGVD. Because of the established navigation use of the canal system, reservoir storage cannot be assigned to power generation specifically. NIH proposes to operate the plant on a strict run-of-river mode in compliance with the ACOE's reservoir regulation and navigation guidelines.

NIH will control the Project with an automated system that will automatically start up, run, and shut down the turbines. The automated control package will have overload, fault, and runaway speed protection. The system will allow the ACOE to modify hydroelectric operations in response to emergencies related to the Lock operation or flood control instantaneously. NIH will purchase new turbines and generators for this hydropower Project. The proposed plan is similar to the Recommended Plan contained within the November 1981 Draft Feasibility Report for Hydropower, Brandon Road Lock and Dam, Illinois Waterway, Main Report with an environmental assessment (EA) prepared by the ACOE, Rock Island District.

#### Dresden Island

The existing Dresden Island Lock and Dam is operated by the ACOE. The facility is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River near the town of Morris. The lock and dam is located 271.5 miles above its confluence with the Mississippi River, and about 15 miles southwest of Joliet, Illinois. There are no existing hydropower facilities within the proposed Project boundary.

The Dresden Island Lock and Dam was constructed as part of the Illinois Waterway System to create a navigational pool for the original 9-ft deep channel. The ACOE holds the upper pool water surface elevation relatively constant at elevation 504.5 NGVD.

NIH currently proposes to install a 10.2 MW capacity powerhouse on the spillway side of the Dresden Island Lock and Dam, with an estimated annual energy production of 59,300 MWh pending final design and economic analysis. This plant would have three 3.35-m runner diameter Bulb-type Kaplan turbines with a total estimated hydraulic capacity of 7,500 cfs.

The ACOE currently operates the lock and dam to maintain a navigation pool at a constant 539.0 ft NGVD. Because of the established navigation use of the canal system, reservoir storage cannot be assigned to power generation specifically. NIH proposes to operate the plant on a strict run-of-river mode in compliance with the ACOE's reservoir regulation and navigation guidelines.

NIH will control the project with an automated system that will automatically start up, run, and shut down the turbines. The automated control package will have overload, fault, and runaway speed protection. The system will allow the ACOE to modify hydroelectric operations in response to emergencies related to the Lock operation or flood control instantaneously. NIH will purchase new turbines and generators for this hydropower project. The proposed plan is similar to the Recommended Plan contained within the November 1981 Draft Feasibility Report for Hydropower, Dresden Island Lock and Dam, Illinois Waterway, Main Report with an environmental assessment prepared by the ACOE, Rock Island District.

# Study Justification

NIH submitted Pre-Application Documents (PADs) for the Brandon Road and Dresden Island Projects (Projects) in July of 2006, and identified potential fish entrainment and subsequent turbine mortality as an issue for both Projects. The Illinois Department of Natural Resources and US Fish and Wildlife Service indicated that an analysis of potential fish entrainment at the projects would be necessary for them to determine the potential impact of the project operations on the fishery resource. NIH proposed to develop an order-of-magnitude entrainment estimate for the projects based on both site-specific biological and engineering data and the extensive database of entrainment and mortality information that currently exists from previous hydroelectric relicensing studies.

#### *METHODOLOGY*

Fish entrainment for each Project will be assessed through a desktop study. The goal of this study is to characterize and provide an order-of-magnitude estimate of fish entrainment using existing literature and site-specific information. The primary goals for this analysis will be to:

- Define the most applicable data that will populate the fish entrainment database that could be applied to the both Projects;
- Calculate a potential estimated fish entrainment rate(s) (eq: fish/hour) (with seasonal rates if possible);
- Characterize the species composition of potential fish entrainment;
- Estimate the potential total annual fish entrainment for the Projects; and
- Estimate potential turbine mortality for fish entrainment based on turbine mortality estimates sourced from studies conducted at other similar project.

These inputs will be developed as described in more detail in the following sections.

#### Development of Entrainment Database

Over sixty site-specific empirical studies of resident fish entrainment at hydroelectric sites in the United States have been reported to date. These provide order-of-magnitude estimates of annual fish entrainment (FERC, 1995). Most such studies were conducted over a twelve month period using tailrace netting, hydroacoustics or other methods to estimate the abundance of fish passing through turbines. Descriptive information will be gathered from each entrainment study and will likely include:

- 1) Location: geographic proximity (preference given to same river basin and/or ecoregion);
- 2) Project size: discharge capacity and power production;
- 3) Mode of operation e.g., peaking, run-of-river, etc.;
- 4) Biological factors: fish species composition;
- 5) Impoundment characteristics: general water quality, impoundment size, flow

regime; and

6) Physical project characteristics: trash rack spacing, intake velocity, etc.

This information will be assembled into a "matrix" database for both the Brandon Road and Dresden Island entrainment desktop studies. The matrix will be used to screen for specific studies that are most applicable to the projects for use as source studies to estimate entrainment abundance. Several key criteria to be used in acceptance of candidate studies include:

- Similar geographic location, with preference given to projects located in the same river basin and/or ecoregion;
- 2) Similar station hydraulic configuration and capacity;
- 3) Similar station operation (peaking, pulsing, run-of-river, etc.);
- 4) Biological similarities: fish species, assemblage and water quality; and
- 5) Availability of entrainment netting data.

# Fish Entrainment Rate

Fish entrainment density and composition can vary throughout the year depending on seasonal changes in fish behavior, water quality, station operation and/or flow rate (EPRI, 1992). Therefore, entrainment rate information from the pool of accepted studies will be statistically analyzed to provide an estimated fish entrainment rate as a time series (monthly basis when available). Entrainment rates will be presented in units of fish entrained per hour of operation and/or fish per volume of water passed through project turbines (fish/million cubic feet). To the extent that source data allow, the data will be grouped by season, where appropriate, to estimate an entrainment density for each season of the year. The seasonal data from each entrainment study will be averaged to develop a seasonal mean fish entrainment estimate for both the Brandon Road and Dresden Island Projects. Entrainment abundance for Brandon Road and Dresden Island will then be calculated by adjusting the estimated entrainment rate based on the site-specific operational volume of each of the projects at the monthly level. Monthly flow rates will be based on flow duration data for each site relative to station capacity. Annual entrainment will be the sum of estimated monthly or seasonal entrainment abundance estimates.

#### **Species Composition Analysis**

Species composition data from the accepted similar entrainment source studies will be analyzed and compiled to characterize the fish species typically entrained at other hydroelectric projects. In addition, site-specific fish sampling data from the project area will be obtained and used to classify fish species potentially exposed to entrainment. This information will be grouped to yield predicted seasonal estimates of species-specific data for entrained fish to determine:

- 1) A list of potentially entrained fish species;
- Expected relative abundance of each species identified as potentially entrained;
   and
- 3) Prediction of seasonal presence and absence of potentially entrained fish species and lifestages.

# **Estimation of Annual Fish Entrainment**

Total fish entrainment for each Project will be estimated on an annual basis to provide an order of-magnitude fish entrainment estimate. Total fish entrainment will be estimated for a typical water and operating year.

# **Turbine Mortality**

A percentage of fish that move through hydroelectric turbines are killed due to turbine mortality (i.e. blade strikes, shear forces, and pressure changes, etc.). Extensive turbine passage survival studies performed at numerous hydroelectric projects throughout the country have shown that there is a relationship between turbine design characteristics and mortality rates (Franke, et al., 1997). Characteristics of project turbines from these source studies will be compared to the characteristics of the Brandon Road and Dresden Island turbines and the most suitable studies will be selected for the transfer of turbine mortality data. Selected turbine survival rate data will be obtained from the literature and used to estimate the number of fish potentially killed due to turbine mortality. The following turbine characteristics are recommended as general criteria in accepting turbine mortality studies for use in this analysis:

# 1) design type;

- 2) operating head;
- 3) runner speed;
- 4) runner diameter, and
- 5) peripheral runner velocity.

These characteristics are commonly attributed to turbine passage mortality (Eicher, 1987; EPRI, 1992; Franke, et al., 1997).

Turbine mortality is also a function of fish size, skeletal structure and body form; therefore, to the extent possible, turbine mortality study source data will be related at the Family level of fish species (i.e. Clupeidae, Percidae, Centrarchidae, etc.) based on the species groups predicted to be entrained at each Project. To the extent data area available, fish survival test results within each family group will be classified into "small" (*e.g.* fish smaller than12 inches) and "large" (fish greater than 12 inches) Where multiple tests are available for a given Family, a mean survival rate will be computed. For Families with no applicable data available, the survival rate reported for a fish Family with similar morphology will be substituted.

Family-specific turbine mortality rates will be applied to each species group component of the fish entrainment estimates for Brandon Road and Dresden Island to compute annual fish entrainment loss. This will be accomplished by multiplying the total fish entrainment estimate by the mortality rates for each Family/size category (where applicable).

#### **Entrainment Refinements**

It may be necessary to adjust fish entrainment estimates due to certain site-specific characteristics of the projects,. For example, factors potentially affecting entrainment rates that may warrant adjustment of estimates include:

- 1) Intake configuration and/or velocities;
- 2) Trashrack openings
- 3) Fish habitat available in the vicinity of intakes,
- 4) Turbine characteristics: and/or
- 5) Other site specific factors.

#### SCHEDULE AND REQUIRED CONDITIONS

A draft report will be prepared and distributed to state and federal resource agencies for review and comment. The draft report will detail methods, summarize the study results, contain appropriate tables and figures depicting estimated fish entrainment, and will contain all supporting correspondence among relicensing participants. After receipt of all comments, the draft report will be revised to address final comments by licensing participants and will be resubmitted as the Final Report.

#### **USE OF STUDY RESULTS**

Study results will be used as an information resource during discussion of licensing issues with agencies and other licensing stakeholders.

#### REFERENCES

- Eicher Associates, Inc. 1987. Turbine-related fish mortality: review and evaluation of studies.

  Research Project 2694-4. Prepared for Electric Power Research Institute, Palo Alto, CA.
- EPRI. 1992. Final Report. Fish Entrainment and Turbine Mortality Review and Guidelines.

  Project 2694-01. Prepared for Stone & Webster Environmental Services, Boston, MA.
- Federal Energy Regulatory Commission (FERC). 1995. Preliminary assessment of fish entrainment at hydropower projects volume 1 (Paper No. DPR-10). Office of Hydropower Licensing, FERC, Washington, DC.
- Franke, G.F., D.R. Webb, R.K. Fisher, D. Mathur, P.N. Hopping, P.A. March, M.R. Headrick, I.T. Laczo, Y. Ventikos, F. Sotiropoulus. 1997. *Development of environmentally advanced hydropower turbine system design concepts*. U.S. Dept. of Energy and Hydropower Research Foundation. July 1997.

## APPENDIX B CONSULTATION RECORD

#### NORTHERN ILLINOIS HYDROPOWER, LLC. DRESDEN ISLAND HYDROELECTRIC PROJECT (FERC NO. 12626)

#### APPENDIX B

#### CONSULTATION RECORD

#### **SUMMARY**

Listed below are key milestones that were achieved in the consultation process. All pertinent major documents emanating from the consultation process conducted in the preparation of the draft license application distributed for review on December 19, 2008 have been filed and are included on the FERC docket pertaining to this project. Items denoted with an asterisk (*) are already included on the FERC docket and therefore may not be included in this Consultation Appendix. Items denoted with a double asterisk (**) have not been previously submitted to FERC by the Applicant. These consultation documents are included in the correspondence section of this Consultation Appendix as described further below.

- *July 17, 2008: NIH issued its Notice of Intent (NOI), Pre-Application Document (PAD) and request to use the TLP.
- *August 14, 2008: NIH submitted its Request for Designation as the Commission's Non-Federal Representative for Informal Consultation under Section 106 of the National Historic Preservation Act.
- *August 20, 2008: FERC issued a letter order authorizing NIH to use the Traditional Licensing Process. NIH henceforth conducted the pre-filing consultation process in compliance with the Commission's regulations at 18 CFR §4.38.
- *August 21, 2008: FERC issued public notice of NIH's NOI to license the Dresden Island Project and initiated informal consultation with: (a) the U.S. Fish and Wildlife Service under section 7 of the Endangered Species Act; and (b) the Illinois State Historic Preservation Officer, as required by section 106, National Historical Preservation Act, and the implementing regulations of the Advisory Council on Historic Preservation at 36 CFR 800.2 to use the Traditional Licensing Process.
- *October 13-14, 2008: NIH conducted the initial consultation joint agency/public meetings and site visit.
- *December 19, 2008: NIH completed its draft license application responding to comments resulting from the initial consultation meetings and distributed the draft application to resource agencies and consultation participants.
- **March 17, 2009: NIH held a meeting to review the Draft Application and comments with the consulting agencies.
- **March 18, 2009: NIH held a meeting with the Army Corps of Engineers (ACOE) to review the draft license application and the proposed design of the project and to review ACOE process in relation to FERC process.
- **March 31, 2009: NIH concluded the 90 day draft application review period, modified its draft application to address comments received and completed its final license application enclosed herewith.

- **March 31, 2009: NIH sent letters to the consulted agencies and Tribes distributing notice of the filing of the application with FERC and electronic file copies of the application.
- **March 31, 2009: NIH sent letters to the consulted public stakeholders distributing notice of the filing of the application with FERC and instructions for availability of the application for review.

#### RECORD OF STAKEHOLDER COMMENTS

Attachment 1 is NIH's record of Stakeholder Comments summarizing the comment source, the comment and NIH's response to each respective comment noted.

#### **CORRESPONDENCE**

Attachment 2 is a compilation of all pertinent consultation correspondence listed in reverse chronological order.

DATE	FROM	COMMENT	RESPONSE
7/30/08	Peoria Tribe of Indians of Oklahoma (comments on Pre-Application Document and application to use Traditional Licensing Process (TLP) licensing process)	Peoria Tribe is unaware of any documentation directly linking Indian Religious Sites to the proposed Project construction. In the even any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Peoria Tribe requests notification and further consultation.  Peoria Tribe has no objections to the proposed construction; however, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, all construction should stop immediately and the appropriate persons, including state and tribal NAGPRA representatives contacted.	The Applicant acknowledges its responsibilities regarding NAGPRA and will, if necessary, abide by these guidelines and protocols
8/7/08	Illinois Historic Preservation Agency (comments on Pre-Application Document)	Project is located within the Dresden Island Lock and Dam Historic District (listed 3/10/04). IHPA cannot adequately review the project until it undertakes a site inspection and has the opportunity to review and approve plans and specifications to ensure the Project meets the Secretary of Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings".	
9/5/08	Department of the Army – Rock Island District Engineering and Construction Division (comments on Pre-Application Document and Design Considerations)	NIH has to prepare and coordinate National Environmental Policy Act (NEPA) documentation during the licensing process. NEPA documentation will also demonstrate project compliance with any other environmental regulation such as the National Historic Preservation Act and Endangered Species Act.	The Applicant understands its requirements to fulfill NEPA requirements and will do so, both through the FERC process, and through other state and federal permitting/certification processes

DATE	FROM	COMMENT	RESPONSE
		NIH will need to show that the proposed projects will not have an impact on navigation, which includes outdraft, river regulation, the restricted area, operation of the Corps site, and recreation.	The Applicant, in consultation with Corps, is in the process of modeling flows to determine any potential effect on navigation. Exhibit B, and Exhibit E Sect. 2.0 of the license application address Project operation; Exhibit E, Sect. 7.0 addresses recreational use.
		Dresden Island Lock and Dam site been determined as historic district and listed on the National Register of Historic Places. A determination of effect has to be made in compliance with the National Historic Preservation Act, as amended and its implementing regulation 36CFR Part 800: "Protection of Historic Properties, "If a determination of Adverse Effect is made, mitigation measures shall be completed and documented	
		PAD references mussel species not common in Illinois; recommendation for coordination with Bob Schanzle of Illinois Department of Natural Resources (IDNR)	The Applicant has accomplished a mussel survey, as directed and approved by IDNR. Exhibit E, Sect. 3.0 discusses the findings; Exhibit E, Appendix A includes the mussel survey study report.
		PAD references potential Indiana Bat use in the area. NIH will have to comply with the Indian Bat Recovery Plan (USFWS, 2007) including an Indiana Bat survey and avoidance measures if, in fact, Indiana Bats are utilizing the area. The Indiana Bat Recovery Plan, 2007 should be added to licensing documentation	The Applicant proposes to conduct pre-construction surveys within the Project area; See Exhibit E, Section 4.0.
11/10/08	Illinois Environmental Protection Agency (comments on Pre-Application Document)	Informs NIH of the need for a Water Quality Certification from the State of Illinois.	The Applicant acknowledges this regulatory requirement.

DATE	FROM	COMMENT	RESPONSE
		Recommendation that NIH undertake investigation detailing in-stream water quality effects from generating unit operation.	The Applicant has not yet selected generating equipment. When this occurs, it will be possible to assess the effect of operation. The Applicant anticipates consulting and coordinating with IEPA staff throughout the licensing, permitting, and construction process.
		Request more information on the need for dredging and excavation necessary for construction or maintenance of the Project. Advises that dredging activities are jurisdictional under Section 404 (administered by the Army Corps of Engineers).	Exhibit B contains information regarding proposed dredging activities. As the Applicant finalizes engineering design, it will provide additional/more refined information regarding the scope of proposed dredging. The Applicant acknowledges Section 404 jurisdiction and anticipates coordination with the Army Corps of Engineers to obtain construction permit approval.
		Presents Illinois water standards and advises NIH that the Project is subject to an anti-degradation review in accordance with Section 302.105.	The Applicant acknowledges state water standards.

DATE	FROM	COMMENT	RESPONSE
		Recommends NIH initiate consultation for state endangered species through Eco-CAT.	The Applicant initiated consultation with IEPA and has identified state endangered species which may occur within the Project boundary. Exhibit E, Sect. 4.0 discusses these resources.
		Discharges of wastewater that may occur at the site such as equipment cooling waters should be described. These discharges must be authorized by IEPA.	Hydroelectric generation generally involves a deminimus level of cooling water discharge; When the Applicant finalizes its engineering design, it will provide this information to IEPA in relevant permit applications.
12/5/08	Illinois Department of Natural Resources	Concerns and study recommendation previously stated in August 6, 2008. These include potential negative effects of the hydropower facility on fish and other aquatic life in the Upper Illinois River. Species of concern include: greater redhorse, river redhorse and pallid shiner and a developing mussel population downstream of Dresden Island Lock & Dam	Exhibit E, Sect. 4.0 discusses species of special significance and the Project's potential effect on these species.

DATE	FROM	COMMENT	RESPONSE
		Modeling should be performed to determine the Project's effects, if any, on dissolved oxygen (DO) levels downstream from the lock and dam. Any reduction in DO levels resulting from water being passed through turbines rather than the dam gates should be identified.	The Applicant initiated water quality monitoring above and below the Dresden Island Lock and Dam in 2008. It intends to continue gathering data throughout 2009 to assess the Project's potential effect on water quality. Exhibit E, Sect. 2.0, describes the efforts and findings to date.
		The Project's effects, if any, on flow parameters, erosion and sediment redistribution should be evaluated in terms of aquatic habitat impacts as well as water quality	The Applicant, in consultation with Corps, is in the process of modeling flows to determine any potential effect on navigation, as part of this effort, the Applicant will also use this information to assess the potential effects of flow redistribution on habitat as well as water quality.
		IDNR recommends 1.5" trashrack spacing and intake velocities not exceeding 1.5 ft./sec. A desktop entrainment/impingement study to address a majority of these concerns is acceptable.	

DATE	FROM	COMMENT	RESPONSE
		The mussel bed identified just downstream from the Project is highly significant – indicating re-colonization of the Upper Illinois River. IDNR request a survey employing crowfoot brailing and diving/hand picking downstream of the lock and dam to identify any areas that support mussels and ensure they are protected from disturbance	In consultation with IDNR, the Applicant undertook a mussel survey downstream of the Dresden Island Lock & Dam. Exhibit E, Sect. 3.0 discusses the study finding. Exhibit E, Appendix A contains the study report.
		Downstream dredging at the Project is likely to affect flow patterns and aquatic habitat conditions. Analysis of this potential should address sediment deposition and flow, as well as potential effects to mussel populations	The Applicant, in consultation with Corps, is in the process of modeling flows. The Applicant will also use this information to assess the potential effects of flow redistribution sediment transport.
		Request for a summary of unavoidable tree clearing in order to assess potential effect of wooded habitat.	The Applicant does not anticipate extensive tree clearing, but will determine construction methods and access prior to construction. When this information is available the Applicant will provide it to IDNR for review.

DATE	FROM	COMMENT	RESPONSE
1/12/09	U.S. Department of Interior Fish and Wildlife Service – Rock Island Field Office	Recommend the applicant provide information on daily and seasonal dissolved oxygen profiles between river miles 271 and 273.5 to determine how alternatives hydropower operations will affect dissolved oxygen in the upper Marseilles navigation pool Recommend hydraulic analysis to determine the percent of the seasonal flows estimate to pass through the turbine units, and effects on the power plant mixing zone under alternative hydropower operations.  Recommend the applicant provide information on daily and seasonal temperature profiles between river miles 271 and 273.5 to determine how alternative hydropower operations will affect daily and seasonal temperatures in the Upper Marseilles navigation pool.  "Capturing all flow and reducing aeration to upper Marseilles Pool by over 50% of an average year appears to be a	The Applicant initiated water quality monitoring above and below the Dresden Island Lock and Dam in 2008. It intends to continue gathering data throughout 2009 to assess the Project's potential effect on water quality. Exhibit E, Sect. 2.0, describes the efforts and findings to date.
		potentially significant change in aquatic habitat quality."	

#### Northern Illinois Hydropower, LLC 801 Oakland Avenue Joliet, IL 60435

March 31, 2009

#### VIA FIRST CLASS MAIL

To: Agency and Tribe Distribution List

Northern Illinois Hydropower, LLC Notice of Filing – Final License Application for Initial License Dresden Island Hydroelectric Project (FERC No. 12626)

To Agency and Tribe Distribution List:

Northern Illinois Hydropower, LLC (NIH) herein provides notice that it has filed with the Federal Energy Regulatory Commission (FERC or Commission) its Final License Application for Initial License for proposed Dresden Island Hydroelectric Project (FERC No. 12626). NIH prepared the license application in accordance with 18 CFR §4.51 (Major Project Existing Dam) with the exception of Exhibit E where NIH elected to use the more expansive Environmental Report format in accordance with 18 CFR §4.41 (Major Unconstructed Project) regulations. NIH is sending this notice to the Dresden Island Hydroelectric Project mailing list (see attached).

The Dresden Island Project is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River near the town of Morris. The Project is located at the existing U.S. Army Corps of Engineers Dresden Island Lock and Dam.

NIH filed the document electronically with FERC on March 31, 2009. Electronic copies of the filing are available on the Project licensing website (<a href="http://www.nihydropower.com">http://www.nihydropower.com</a>). NIH is providing you with a copy of the final license application on CD. Upon receipt and acceptance of the final license application, FERC will issue a notice that the license application is available for public comment. The notice will include contact information to relevant FERC offices and staff. NIH can provide a hard copy upon request. Please contact Damon Zdunich at 801 Oakland Avenue, Joliet, IL 60435, at (815) 723-6314 or by emailing info@nihydropower.com.

If there are any questions or comments regarding this notice or any of the documents, please contact me at the above address.

Sincerely,

Northern Illinois Hydropower, LLC

Damon Zdunich

President

Attachment (Agency and Tribe Distribution List) Dresden Island License Application on CD cc: Jeremiah L. Maher, Kleinschmidt Associates

#### Northern Illinois Hydropower, LLC 801 Oakland Avenue Joliet, IL 60435

March 31, 2009

VIA U.S. MAIL

Northern Illinois Hydropower, LLC Notice of Filing – Final License Application for Initial License Dresden Island Hydroelectric Project (FERC No. 12626)

To Stakeholder Distribution List:

Northern Illinois Hydropower, LLC (NIH) herein provides notice that it has filed with the Federal Energy Regulatory Commission (Commission) its Final License Application for Initial License for proposed Dresden Island Hydroelectric Project (FERC No. 12626). NIH prepared the license application in accordance with 18 CFR §4.51 (Major Project Existing Dam) with the exception of Exhibit E where NIH elected to use the more expansive Environmental Report format in accordance with 18 CFR §4.41 (Major Unconstructed Project) regulations. NIH is sending this notice to the Dresden Island Hydroelectric Project mailing list (see attached).

The Dresden Island Project is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River near the town of Morris. The Project is located at the existing U.S. Army Corps of Engineers Dresden Island Lock and Dam.

NIH filed the document electronically with FERC on March 31, 2009. Electronic copies of the filing are available on the Project licensing website (http://www.nihydropower.com), as well as on the Commission's eLibrary (http://www.ferc.gov). A hard copy of the final license application is available for public review at the Morris and Joliet Public Libraries. Additionally, NIH can provide a hard copy upon request. Please contact Damon Zdunich at 801 Oakland Avenue, Joliet, IL 60435, at (815) 723-6314 or by emailing info@nihydropower.com.

If there are any questions or comments regarding this notice or any of the documents, please contact me at the above address.

Sincerely,

Northern Illinois Hydropower, LLC

Varin Salundh Damon Zounich

President

Attachment (Stakeholder Distribution List) cc: Jeremiah L. Maher, Kleinschmidt Associates

### BRANDON ROAD DRESDEN ISLAND DRAFT LICENSE APPLICATION

#### **AGENCY MEETING**

#### 3/17/09, 1PM to 4PM CDT Illinois Department of Natural Resources office, Springfield, IL

#### **MEETING NOTES**

The following notes are not intended to represent a complete record of the details of the meeting held March 17, 2009; instead they represent a listing and, as necessary, a brief discussion of the major topics discussed. The notes, after review by the attendees, will be attached to the License Applications for both Projects as part of the record of consultation.

#### **ATTENDEES**

Damon Zdunich – Northern Illinois Hydropower
Jay Maher – Kleinschmidt
Laura Shirey Cowan – Kleinschmidt
Bob Schanzle – IDNR
Anne Haaker – Illinois SHPO
Ron Deiss – ACOE
Amber Andress – USFWS Rock Island District (by phone)
Shawn Cirton – USFWS Chicago District (by phone)

#### **INTRODUCTION**

The purpose of the meeting was to continue communication between Northern Illinois Hydropower (NIH) and the agencies regarding the progress with the Dresden Island and Brandon Road Hydroelectric Projects. Specifically the meeting was to review the draft license applications and determine any remaining issues existing to address in the final application and if possible to discuss and resolve these issues. The meeting also served to review the recent draft of Kleinschmidt's desktop analysis of fish entrainment at the two projects.

The meeting opened with a brief introduction of each of the participants and a quick review of others contacted not in attendance. Kleinschmidt gave a brief overview of the FERC licensing process and the specific project activities to date.

#### **OVERVIEW OF SCHEDULE**

- NIH is using the Traditional Licensing Process (TLP) for both proposed Projects. The Integrated Licensing Process (ILP), the default licensing process, has a strict schedule that is longer than the timeline that is available with the preliminary permits at the Brandon Road and Dresden Island projects.
- Agencies are provided 90 days to comment on the draft license application; for Dresden Island the 90 days ends March 19. Several agencies have already provided written

- comments. FERC will also request comments from agencies when they notice acceptance of the License Application.
- Kleinschmidt will distribute a general timeline of the FERC application process to agencies.
  - Pending approval, FERC will grant a license at some point after the FERC license application; under good circumstances FERC would issue a license within 9 -12 months.
  - FERC will request comments and recommended Terms and Conditions in their notice of the application. The timing of the Notice of the application may vary but may be between several weeks and several months after NIH files the application.

#### ISSUES DISCUSSED AT MEETING

- Water Quality
  - o major improvements in baseline water quality since previous license applications
- Dissolved oxygen
  - NIH's understanding is that our requirement is for 'non-degradation'. To that end NIH plans to install venting turbines and is monitoring D.O. at both sites. If we have any information or modeling to indicate what DO will be after construction, NIH will include it in the license application
- 404 Permits
  - o NIH needs to confirm timeline for submitting the 404 permit application to ACOE
- 401 Permit
  - NIH has begun drafting the water quality certification materials for Illinois and hopes to file them soon
- Land ownership
  - o NIH needs to check ownership of lands and is contracting to have legal surveys of the proposed projects and adjacent areas
  - o State likely owns bed and banks
  - o ACOE owns lock, dam, and small gated area on land directly adjacent to lock and dam
- Disposal of dredged materials
  - Bob Schanzle will determine who within IDNR would need to be contacted regarding a lease or permit if any material is to be placed on state property
  - Currently, NIH plans to use much of the dredge and removal materials in the construction process and to haul excess materials off-site. Areas such as the planned dredging downstream at Dresden will use the excavated rock material to build 'training' walls to direct hydro discharge to protect mussel beds and to avoid sedimentation downstream near the maintained channel
- Historic/Archaeological
  - o Ron Deiss will provide NIH/Kleinschmidt with a copy of a CD of the National Register information
  - O Using towpath for construction access IDNR manages the tow path and will need to be contacted for a right of entry; NIH will need to look into who owns portions of the roads and bridges that would be used
  - o Construction should be complimentary to the existing resource

#### • Fish

- o The Invasive Asian carp has been found in the reach between Dresden and Brandon
- O The American eel has been collected in recent years upstream from the projects; Bob Schanzle expressed concern about potential turbine-induced mortality to adults migrating downstream to spawn

#### • Draft Entrainment Report

- o The draft entrainment report was a desktop analysis that relied upon a comparative analysis of other, similar projects
  - Overall, fish mortality is low for the types of turbines proposed for these projects
- O The agencies had a few questions regarding the draft report, but had not had sufficient time for a complete review
- O Kleinschmidt will address the questions raised at the meeting in the final report (as well as provide them by email earlier); the final report will be issued shortly

#### Mussels

- An area with 10 or more mussel species may be designated an Illinois Natural Areas Inventory (INAI) site by IDNR. Mussel beds downstream of Dresden may qualify. (Subsequent communication with Bob Schanzle indicates this designation is not automatic, rather subject to a committee ruling.)
- o Kleinschmidt will send a separate copy of the mussel report to Bob Schanzle, Shawn Cirton, and Amber Andress

#### Systemic effects

Ron Deiss noted that he would like FERC to address cumulative effects in the EA. Kleinschmidt indicated that is normal procedure for FERC analyses

#### • Tree removal

- o If the I&M Canal Towpath is to be used for construction access, some tree trimming may be needed for construction vehicles
- O Any tree removal/trimming activity will be coordinated with the IDNR, and permits may be needed
- o If tree removal is conducted, NIH needs to consider potential effects to Indiana bat
- NIH needs to address loss of wooded habitat in the license application

#### Floodway impacts

Any effect to the floodway would need to go through IDNR Office of Water Resources

#### Birds

- O USFWS requested that NIH/Kleinschmidt address using diverters for migratory birds on the transmission lines
- O NIH has proposed transmission routes in the draft applications, but has not finalized transmission lines, as those may be dependent on the power purchasers. Where possible the plans call for use of existing right-of-way corridors with minimal environmental disturbance



# IN REPLY REFER TO: FWS/RIFO

#### United States Department of the Interior

# FISH AND WILDLIFE SERVICE Rock Island Field Office 1511 47th Avenue Moline, Illinois 61265 Phone: (309) 757-5800 Fax: (309) 757-5807



January 12, 2009

Ms. Allison Murray Kleinschmidt Associates P.O. Box 650 141 Main Street Pittsfield, Maine 04967

RE: FERC Project Number: P-12626

Dear Ms. Murray:

We have reviewed the information provided for the project described in the Notice of Availability – Draft Application for License for the Dresden Island Hydroelectric Project, FERC No. 12626, dated December 19, 2008. We offer the following comments.

The project is proposed to be constructed in a section of the existing Dresden Lock and Dam on the Illinois River at approximate river mile 271.5. This site is just below the confluence of the Kankakee and Des Plaines Rivers. The Dresden Nuclear Power Station is located immediately upstream of the lock approach.

Our previous comments provided January 2006 in response to the Notice of Preliminary Permit Application noted the concern for potential cumulative effects on water quality resulting from nuclear power plant cooling water discharge combined with altered flow patterns in the discharge mixing zone resulting from proposed hydropower operations. We recommended that should the project proceed, the applicant provide:

- Information on daily and seasonal dissolved oxygen profiles between river miles 271 and 273.5 to determine how alternative hydropower operations will affect dissolved oxygen in the upper Marseilles navigation pool.
- Hydraulic analyses to determine the percent of seasonal flows estimated to pass through the turbine units, and effects on the power plant mixing zone under alternative hydropower operations.

• Information on daily and seasonal temperature profiles between river miles 271 and 273.5 to determine how alternative hydropower operations will affect daily and seasonal temperatures in the upper Marseilles navigation pool.

Review of Attachment E, Appendix B does not reflect any record of this correspondence; however, Attachment E, Section 2.2.2 addresses these concerns in part. Capturing all flow and reducing aeration to upper Marseilles Pool by over 50% of an average year appears to be a potentially significant change in aquatic habitat quality. In addition to supporting the recommendations provided by the Illinois DNR in their December 5, 2008 letter, we reiterate our request for the applicant to develop dissolved oxygen and temperature profiles to understand the effects of alternative project operations on the aquatic environment, and to develop mitigation through projects, per page E-12.

This letter provides comments under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and the Endangered Species Act of 1973, as amended. Questions regarding this letter may be directed to Mr. Bob Clevenstine at 309/757-5800, extension 205.

Sincerely,

Richard C. Nelson Field Supervisor

cc: FWS R3 (Gosse)
FWS CIFO (Cirton)
IIDNR (Schanzle, Diedrichsen)
IEPA (Heacock)
NPS (Tornes)
FERC (Bose)

S:\Office General\FERC\IL River Projects\Dresden09.doc

2009-01-08 Kleinschmidt distribution of entrainment study.txt

From: Jay Maher

Sent: Thursday, January 08, 2009 4:53 PM

To: 'bob. schanzle@illinois.gov'; 'shawn_cirton@fws.gov'; 'RockIsland@fws.gov' Cc: 'Damon Zdunich'; Allison Murray

Cc: Damon Zdunich; Allison Murra Subject: Draft Entrainment Study

Gentlemen,

Attached is a DRAFT entrainment study proposal we developed in response to comments we received regarding the potential impacts of the projects. So we all keep on the same page, I would appreciate it if you could review this and feel free to make comments or suggestions. There is no sense in us doing studies that won't produce the information that you need to make informed decisions. If you have technical questions that might require an oral explanation, I'll be happy to set up a conference call with our fish biologists who will do the work.

Thanks in advance for reviewing this... as for timing, the sooner the better.

J

Jeremiah (Jay) L. Maher

Senior Regulatory Advisor

KI ei nschmi dt

Energy & Water Resource Consultants

307 McKee Crossing

New Castle, PA 16105

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

```
2009-01-06 DOI request for removal from contact list.txt
From: Mi chael _Chezi k@i os. doi . gov
Sent: Tuesday, January 06, 2009 10:25 AM
To: Allison Murray
Subject: Re: FW: Northern Illinois Hydro Dresden Island (FERC No. 12626) - Notice of
Availability -Draft License Application
Allison,
Please remove my name from the mailing list and continue corresponding with the FWS.
 Thanks.
Mi chael T. Chezi k
Regional Environmental Officer
U.S. Department of the Interior
Office of Environmental Policy and Compliance
RM 244, U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106
Phone:
                    215-597-5378
Fax: 215-597-9845
Cell (emergencies): 215-266-5155
E-Mail: mi chael _chezi k@i os. doi. gov
        From: "Allison Murray" <Allison. Murray@KleinschmidtUSA.com>
To: Michael Chezik/PEP/OS/DOI@DOI
         Date: 12/30/2008 05:31 PM
        Subject: FW: Northern Illinois Hydro Dresden Island (FERC No. 12626) -
Notice of Availability -Draft License Application
I'm not sure if you wish to remain on this mailing list. Should I continue to send
you this information or just to the regional guys?
Regards,
Allison
 ----Original Message----
          Allison Murray
From:
           Friday, December 19, 2008 5:23 PM
Sent:
To: 'Lee. Traeger@fema. gov'; 'vince. yearick@ferc. gov'; 'bob. schanzle@illinois. gov'; 'mike. diedrichsen@illinois. gov'; 'Anne. Haaker@Illinois. gov'; 'JAMES. W. BARTEK@usace. army. mil'; 'Michael. D. Cox@usace. army. mil'; 'guenther. julia@epa. gov'; 'Jeff_Gosse@fws. gov'; 'RockIsland@fws. gov'; 'shawn_cirton@fws. gov'; 'bradner@willcountylanduse. com'; 'fhalpin@grundy. co. org'; 'tthanas@jolietcity.org'; 'Jcook@channahon. org'; 'peggy.harding@ferc. gov'; 'Tom. dean@ferc. gov'; 'Mike. Spencer@ferc. gov'; 'ifergen@poorietrike.com'
 i froman@peori atri be. com'
           'Damon Zdunich'; Jay Maher; Laura Shirey
RE: Northern Illinois Hydro Dresden Island (FERC No. 12626) -
Notice of Availability -Draft License Application
Good Afternoon,
This afternoon (December 19, 2008) NIH posted the draft license application for the
Dresden Island Project on its licensing website www.nihydropower.com
```

Page 1

2009-01-06 DOI request for removal from contact list.txt document is now available for you to download and review. Written comments for the Dresden Draft License Application are due to NIH by March 19, 2009. The attached letter (which has also been mailed to you via U.S. mail) includes contact information for submittal of comments. We expect to post the Brandon draft application in the near future and will advise you when it is available.

As we have not, to date, received any requests for paper or cd copies of the applications we are assuming you are able to download and print the documents. Please, of course, contact me if you would prefer NIH send you hard copies.

We will be contacting you shortly after the holidays to schedule a meeting to discuss the Dresden Application.

On behalf of Kleinschmidt and NIH, I wish you a Happy Holiday Season.

Regards, Allison Murray

<<DLA Dresden cover letter 12-19-08. doc>>

----Original Message---From: Allison Murray
Sent: Tuesday, December 16, 2008 2:21 PM
To: 'Lee.Traeger@fema.gov'; 'vince.yearick@ferc.gov';
'bob.schanzle@illinois.gov'; 'mike.diedrichsen@illinois.gov';
'Anne.Haaker@lllinois.gov'; 'JAMES.W.BARTEK@usace.army.mil';
'Michael.D.Cox@usace.army.mil'; 'guenther.julia@epa.gov'; 'Jeff_Gosse@fws.gov';
'Rocklsland@fws.gov'; 'shawn_citron@fws.gov'; 'bradner@willcountylanduse.com';
'fhalpin@grundy.co.org'; 'tthanas@jolietcity.org'; 'Jcook@channahon.org';
'peggy.harding@ferc.gov'

Cc: 'Damon Zdunich'; Jay Maher; Laura Shirey
Subject: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden
Island (FERC No. 12626) - Upcoming submittal of Draft License Applications

Good Afternoon,

This email is to advise you that Northern Illinois Hydroelectric LLC (NIH) is preparing to provide draft license applications for the Brandon Road and Dresden Island projects to you for your review and comment. Pursuant to the FERC regulations, once NIH provides the applications, you will have 90 days to respond with written comments to NIH. We anticipate the draft applications will be available before Christmas.

To limit our use of paper and avoid unnecessary mailings, our intent is to post the draft license applications to NIH's licensing website www.nihydropower.com or a ftp site. We will alert you via email when we accomplish this. You should subsequently be able to download the draft applications to your files. If you are unable to access the site, or wish to receive either electronic (CD) or paper copies instead of using the website, I would very much appreciate knowing what format you prefer and the number of copies you require this week.

As always, if you note I have missed anyone in this mailing please contact me.

Regards, Allison

Allison Murray Project Regulatory Coordinator

KI ei nschmi dt

2009-01-06 DOI request for removal from contact list.txt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell) [attachment "DLA Dresden cover letter 12-19-08.doc" deleted by Michael Chezik/PEP/OS/DOI]

2008-12-22 Peoria Tribe cmts on Dresden DLA. txt

RE: Northern Illinois Hydro Dresden Island (FERC No. 12626) - Notice of Availability -Draft License ApplicationFrom: Mandie Ferguson [mferguson@peoriatribe.com]

Sent: Monday, December 22, 2008 9:34 AM

To: Allison Murray

Subject: Fw: Northern Illinois Hydro Dresden Island (FERC No. 12626) - Notice of Availability -Draft License Application

Thank you for notice of the referenced project. The Peoria Tribe of Indians of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Peoria Tribe request notification and further consultation.

The Peoria Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

John P. Froman

Chi ef

Bud Ellis, Repatriation/NAGPRA Committee Chairman XC:

---- Original Message -----

From: John Froman To: mandi e ferguson

Sent: Sunday, December 21, 2008 8:16 AM Subject: Fw: Northern Illinois Hydro Dresden Island (FERC No. 12626) - Notice of

Availability -Draft License Application

---- Original Message -----From: Allison Murray

To: Lee. Traeger@fema.gov; vince. yearick@ferc.gov; bob. schanzle@illinois.gov; mike. diedrichsen@illinois.gov; Anne. Haaker@Illinois.gov; JAMES. W. BARTEK@usace.army.mil; Michael. D. Cox@usace.army.mil;

guenther.julia@epa.gov; Jeff_Gosse@fws.gov; RockIsland@fws.gov; shawn_cirton@fws.gov; bradner@willcountylanduse.com; fhalpin@grundy.co.org;

tthanas@jolietcity.org; Jcook@channahon.org; peggy.harding@ferc.gov; Tom.dean@ferc.gov; Mike.Spencer@ferc.gov; jfroman@peoriatribe.com Cc: Damon Zdunich; Jay Maher; Laura Shirey Sent: Friday, December 19, 2008 4:23 PM

Subject: RE: Northern Illinois Hydro Dresden Island (FERC No. 12626) - Notice of Availability -Draft License Application

Good Afternoon, This afternoon (December 19, 2008) NIH posted the draft license application for the Dresden Island Project on its licensing website www.nihydropower.com . This Page 1

2008-12-22 Peoria Tribe cmts on Dresden DLA.txt document is now available for you to download and review. Written comments for the Dresden Draft License Application are due to NIH by March 19, 2009. The attached letter (which has also been mailed to you via U.S. mail) includes contact information for submittal of comments. We expect to post the Brandon draft application in the near future and will advise you when it is available.

As we have not, to date, received any requests for paper or cd copies of the applications we are assuming you are able to download and print the documents. Please, of course, contact me if you would prefer NIH send you hard copies.

We will be contacting you shortly after the holidays to schedule a meeting to discuss the Dresden Application.

On behalf of Kleinschmidt and NIH, I wish you a Happy Holiday Season.

Regards, Allison Murray

<<DLA Dresden cover Letter 12-19-08. doc>>

----Original Message---From: Allison Murray
Sent: Tuesday, December 16, 2008 2:21 PM
To: 'Lee.Traeger@fema.gov'; 'vince.yearick@ferc.gov';
'bob.schanzle@illinois.gov'; 'mike.diedrichsen@illinois.gov';
'Anne.Haaker@lllinois.gov'; 'JAMES.W.BARTEK@usace.army.mil';
'Michael.D.Cox@usace.army.mil'; 'guenther.julia@epa.gov'; 'Jeff_Gosse@fws.gov';
'Rocklsland@fws.gov'; 'shawn_citron@fws.gov'; 'bradner@willcountylanduse.com';
'fhalpin@grundy.co.org'; 'tthanas@jolietcity.org'; 'Jcook@channahon.org';
'peggy.harding@ferc.gov'

Cc: 'Damon Zdunich'; Jay Maher; Laura Shirey
Subject: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden
Island (FERC No. 12626) - Upcoming submittal of Draft License Applications

Good Afternoon,

This email is to advise you that Northern Illinois Hydroelectric LLC (NIH) is preparing to provide draft license applications for the Brandon Road and Dresden Island projects to you for your review and comment. Pursuant to the FERC regulations, once NIH provides the applications, you will have 90 days to respond with written comments to NIH. We anticipate the draft applications will be available before Christmas.

To limit our use of paper and avoid unnecessary mailings, our intent is to post the draft license applications to NIH's licensing website www.nihydropower.com or a ftp site. We will alert you via email when we accomplish this. You should subsequently be able to download the draft applications to your files. If you are unable to access the site, or wish to receive either electronic (CD) or paper copies instead of using the website, I would very much appreciate knowing what format you prefer and the number of copies you require this week.

As always, if you note I have missed anyone in this mailing please contact me.

Regards, Allison

Allison Murray Project Regulatory Coordinator

KI ei nschmi dt

## \$2008-12-22\$ Peoria Tribe cmts on Dresden DLA.txt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell)

#### TELEPHONE DISCUSSION NOTES

DATE:12-19-08 PROJECT: 1538-003

TIME: 3:00 PM TALKED WITH: Fay Woods

PLACED: X RECEIVED: FROM: Peoria Tribe

BY: AML

Called the Peoria Tribe to verify an e-mail address to send updates on the licensing process. I spoke with Fay Woods who recommended sending e-mails to Chief John P, Froman at <a href="mailto:JFroman@Peoriatribe.com">JFroman@Peoriatribe.com</a>. She mentioned there is another man involved in the research, however all e-mails should be sent to the Chief who can decide to forward on any information to the researcher involved.

DISTRIBUTION:

2008-12-16 City of Joliet verification of contact info.txt MessageFrom: Eggen, James E [jeggen@jolietcity.org]
Sent: Tuesday, December 16, 2008 3:57 PM

To: Allison Murray
Cc: Thanas, Thomas A
Subject: RE: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden Island
(FERC No. 12626) - Upcoming submittal of Draft License Applications

Allison,

My address is:

921 E. Washington Street

Joliet, Illinois 60433

Keep Mr. Thanas on the list unless you hear otherwise from him.

Thanks,

Jim Eggen

Ph: 815-724-4230

From: Allison Murray [mailto: Allison. Murray@KleinschmidtUSA.com] Sent: Tuesday, December 16, 2008 2:51 PM To: Eggen, James E Subject: RE: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden Island

(FERC No. 12626) - Upcoming submittal of Draft License Applications

Hi Jim,

I'll be happy to add you. May I also please have your physical address for my contact database?

Shall I keep Mr. Thanas on the list or will you be the primary contact for the City?

Regards,

Allison

----Original Message----From: Eggen, James E [mailto:jeggen@jolietcity.org] Page 1

2008-12-16 City of Joliet verification of contact info.txt

Sent: Tuesday, December 16, 2008 3:49 PM

To: Allison Murray

Subject: RE: Northern Illinois Hydro Brandon Road (FERC No.12717) & Dresden Island (FERC No. 12626) - Upcoming submittal of Draft License Applications

Hello Allison,

My name is Jim Eggen. I am Director of Public Utilities for the City of Joliet. Please add my name to the e-mail distribution list for this project as we are the land owner on the east side of the river at this point.

We are planning to do work on the east side in 2009 to relocate our outfall from the water plant. I will need to track your project and can subsequently send you our plans so we are aware of what each other is doing. If you have any questions, feel free to give me a call.

James E. Eggen, P.E.

Director of Public Utilities

City of Joliet

Ph: 815-724-4230

------

From: Thanas, Thomas A

Sent: Tuesday, December 16, 2008 1:56 PM
To: 'MISSB825@aol.com'; 'TMB777@aol.com'; 'Warren C. Dorris'; tom@tg4joliet.com; janquillman@att.net'; 'jrshetina@sbcglobal.net'; 'miket@sowic.org'; 'Uremovic, Anthony'; Franchi, Nancy E

Cc: Trizna, James R; Eggen, James E; Plyman, Jeffrey S; Mihelich, Kenneth R Subject: FW: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden Island (FERC No. 12626) - Upcoming submittal of Draft License Applications

FYI . . . on the hydroelectric projects being pursued in our area.

Tom

______

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Tuesday, December 16, 2008 1:21 PM

To: Lee. Traeger@fema.gov; vince. yearick@ferc.gov; bob. schanzle@illinois.gov; mike. diedrichsen@illinois.gov; Anne. Haaker@Illinois.gov; JAMES. W. BARTEK@usace.army.mil; Michael.D. Cox@usace.army.mil; guenther.julia@epa.gov;

Jeff_Gosse@fws.gov; Rockisland@fws.gov; shawn_citron@fws.gov;

bradner@willcountylanduse.com; fhalpin@grundy.co.org; Thanas, Thomas A; Jcook@channahon.org; peggy.harding@ferc.gov

2008-12-16 City of Joliet verification of contact info.txt Cc: Damon Zdunich; Jay Maher; Laura Shirey Subject: Northern Illinois Hydro Brandon Road (FERC No. 12717) & Dresden Island (FERC No. 12626) - Upcoming submittal of Draft License Applications

Good Afternoon,

This email is to advise you that Northern Illinois Hydroelectric LLC (NIH) is preparing to provide draft license applications for the Brandon Road and Dresden Island projects to you for your review and comment. Pursuant to the FERC regulations, once NIH provides the applications, you will have 90 days to respond with written comments to NIH. We anticipate the draft applications will be available before Christmas.

To limit our use of paper and avoid unnecessary mailings, our intent is to post the draft license applications to NIH's licensing website www.nihydropower.com or a ftp site. We will alert you via email when we accomplish this. You should subsequently be able to download the draft applications to your files. If you are unable to access the site, or wish to receive either electronic (CD) or paper copies instead of using the website, I would very much appreciate knowing what format you prefer and the number of copies you require this week.

As always, if you note I have missed anyone in this mailing please contact me.

Regards, Allison

Allison Murray Project Regulatory Coordinator

Kleinschmidt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207. 487. 3328 207. 487. 3124 (fax) 207. 249. 9048 (cell) From: Schanzle, Bob [Bob.Schanzle@Illinois.gov]

Sent: Friday, December 05, 2008 9:39 AM

**To:** Nicholas Morgan **Cc:** Heacock, Dan

Subject: RE: EcoCAT for Brandon and Dresden Island Hydro Projects

Thanks Nick. I found the two files in EcoCat this morning and reassigned them to myself for handling. Thus, I'll

be your IDNR/OREP contact for both the FERC review and the IEPA consultation.

Robert W. Schanzle
Permit Program Manager
IDNR, Office of Realty and Environmental Planning

Ph: 217-785-4863 bob.schanzle@illinois.gov

From: Nicholas Morgan [mailto:Nicholas.Morgan@KleinschmidtUSA.com]

Sent: Friday, December 05, 2008 7:35 AM

To: Schanzle, Bob

Subject: EcoCAT for Brandon and Dresden Island Hydro Projects

#### Bob,

I just wanted to let you know that I submitted the two projects on EcoCAT. Thank you for your help. Let me know if you need anything else to move this process along.

Thank you,

Nicholas Morgan, Biologist
Kleinschmidt
Energy and Water Resources Consultants
2 East Main Street
Strasburg, Pa. 17579

Phone: (717) 687-7211 Fax: (717) 687-7266 www.kleinschmidtusa.com http://dnr.state.il.us

Rod R. Blagojevich, Governor

71 Sam Flood, Acting Director

December 5, 2008

Ms. Allison Murray Kleinschmidt Associates 141 Main Street, P.O. Box 650 Pittsfield, Maine 04967

Re: Dresden Island Hydroelectric Project, FERC No. 12626

Dear Ms. Murray:

Reference is made to your September 26, 2008 message announcing Northern Illinois Hydropower's plans to host a Joint Agency Meeting (JAM) for licensing of the Dresden Island and Brandon Road hydroelectric projects. The message states that "pursuant to 18 CFR §16.8 (b)(5), any agency comments and requests for studies are due to NIH within 60 days of the JAM (i.e. by December 12, 2008)."

The Dresden Island Hydroelectric project will be located at the existing lock & dam in Section 26, Township 34 North, Range 8 East, Grundy County, Illinois. The plans call for construction of a 75 X 125-foot powerhouse and a 50 X 50-foot switchyard, and utilization of an existing transmission line from the switchyard approximately 0.75 miles to an existing Commonwealth Edison substation. The proposed facility is anticipated to have an authorized installed capacity of approximately 10.2 MW.

Although no Department representatives were present at the Joint Agency Meeting, our concerns and study recommendations were previously stated at an August 6, 2008 meeting with Kleinschmidt here in Springfield. To summarize, the Department has concerns about the potential negative effects of the hydropower facility on fish and other aquatic life in the upper Illinois River. The river supports many sport and/or commercial fishes as well as numerous non-game species that may be affected by the development. These include at least three fish species, the greater redhorse (Moxostoma valenciennesi), river redhorse (Moxostoma carinatum) and pallid shiner (Hybopsis amnis), that are listed as threatened or endangered in the State of Illinois. In addition, a developing freshwater mussel population was identified just downstream from the Dresden Island Lock & Dam as recently as 1997.

The studies we have recommended to evaluate aquatic resources and potential impacts are summarized in the minutes of the August 6 meeting and include the following:

1. Dissolved Oxygen effects: modeling should be performed to determine the hydropower facility's effects, if any, on dissolved oxygen levels downstream from the lock & dam. It is our understanding that significant aeration currently results from water cascading through the dam gates. A portion of this flow will in the future be passed through the hydropower facility instead. Any reduction in dissolved oxygen levels resulting from the water being passed through turbines rather than the dam gates should be identified.

Ms. Allison Murray December 5, 2008 Page Two

- Sediment deposition and flow: the facility's effects, if any, on flow parameters, erosion and sediment redistribution should be evaluated in terms of aquatic habitat impacts as well as water quality.
- 3. Fish entrainment/impingement: the Department has recommended 1.5" trashrack spacing and also that intake velocities not exceed 1.5 ft./sec. The minutes of the August 6 meeting indicate that NIH and Kleinschmidt can "run a desktop entrainment/impingement study to address a majority of concerns related to this issue."
- 4. Mussel surveys: the mussel bed identified just downstream from the lock & dam is highly significant in that it appears to indicate re-colonization of the upper Illinois River, from which virtually all freshwater mussels were extirpated by pollution in the early 1900s. Given the documented presence of this resource in the project area, we have requested that a survey employing crowfoot brailing and diving/hand picking be conducted downstream from the lock & dam to identify any areas that support mussels and ensure they are protected from disturbance.
- 5. Excavation downstream of the powerhouse: one potential feature of the Dresden hydropower project proposal the excavation of a deep channel below the powerhouse to increase head and generating capacity is likely to affect flow patterns and aquatic habitat conditions. The proposed channel should be specifically addressed in the studies and surveys requested by sections 2 and 4 above.
- 6. An additional concern is the potential loss of wooded habitat resulting from construction of the proposed switchyard and other project elements. In addition to the immediate impacts associated with tree clearing, ongoing disturbances associated with future maintenance activities are possible. We would appreciate a summary of any unavoidable tree clearing and where it will take place.

The Department looks forward to further coordination with NIH and Kleinschmidt as this hydropower proposal goes forward. Please contact me at 217-785-4863 if we can be of further assistance.

Sincerely,

Robert W. Schanzle Permit Program Manager

Robbert Sharp

Office of Realty and Environmental Planning

RWS:rs

cc: Northern Illinois Hydropower, LLC

Federal Energy Regulatory Commission (Bose)

U.S. Fish and Wildlife Service (Clevenstine)

U.S. Army Corps of Engineers (Bartek)

Illinois Environmental Protection Agency (Yurdin)

Illinois Department of Natural Resources (Diedrichsen, Mick, Kirk, Bell)





0904298 12/05/2008

IDNR Project #:

Date:

Applicant: Northern Illinois Hydropower, LLC

Contact: Jay Maher

Address: 801 Oakland Avenue

Joliet, IL 60435

Project: Dresden Island
Address: 7521 Lock rd., Morris

Description: Northern Illinois Hydropower (NIH) is preparing to license two new hydroelectric facilities with the Federal Energy Regulatory Commission (FERC). The proposed Dresden Island Project (FERC No. 12626) would be located on the Illinois River, in Grundy County, Illinois. The proposed project would use the U.S. Army Corps of Engineers' (ACOE) Dresden Island Dam and consist of: (1) a proposed powerhouse containing several generating units with a total installed capacity of approximately 11 megawatts, (2) a short transmission line, and (3) appurtenant facilities. The project would have a total installed capacity of approximately 10 megawatts. The ACOE will continue to manage and decide all matters associated with water discharge from the dam and all hydroelectric operations will be consistent with and dictated by the ACOE operations plan.

#### **Natural Resource Review Results**

#### Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)

The Illinois Natural Heritage Database shows the following protected resources may be in the vicinity of the project location:

Illinois River - Dresden INAI Site Greater Redhorse (Moxostoma valenciennesi) Henslow'S Sparrow (Ammodramus henslowii) Pallid Shiner (Hybopsis amnis) River Redhorse (Moxostoma carinatum)

An IDNR staff member will evaluate this information and contact you within 30 days to request additional information or to terminate consultation if adverse effects are unlikely.

#### Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Grundy

Township, Range, Section:

34N, 8E, 26



IL Department of Natural Resources Contact
Pat Giordano
217-785-5500
Division of Ecosystems & Environment

Local or State Government Jurisdiction
Illinois Enviromental Protection Agency
Daniel Heacock
1021 North Grand Avenue East
PO Box 19276
Springfield, Illinois 62794-9276

#### **Disclaimer**

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

#### **Terms of Use**

By using this website, you acknowledge that you have read and agree to these terms. These terms may be revised by IDNR as necessary. If you continue to use the EcoCAT application after we post changes to these terms, it will mean that you accept such changes. If at any time you do not accept the Terms of Use, you may not continue to use the website.

- 1. The IDNR EcoCAT website was developed so that units of local government, state agencies and the public could request information or begin natural resource consultations on-line for the Illinois Endangered Species Protection Act, Illinois Natural Areas Preservation Act, and Illinois Interagency Wetland Policy Act. EcoCAT uses databases, Geographic Information System mapping, and a set of programmed decision rules to determine if proposed actions are in the vicinity of protected natural resources. By indicating your agreement to the Terms of Use for this application, you warrant that you will not use this web site for any other purpose.
- 2. Unauthorized attempts to upload, download, or change information on this website are strictly prohibited and may be punishable under the Computer Fraud and Abuse Act of 1986 and/or the National Information Infrastructure Protection Act.
- 3. IDNR reserves the right to enhance, modify, alter, or suspend the website at any time without notice, or to terminate or restrict access.

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#### **Privacy**

EcoCAT generates a public record subject to disclosure under the Freedom of Information Act. Otherwise, IDNR uses the information submitted to EcoCAT solely for internal tracking purposes.



# ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397 IAMES R. THOMPSON CENTER, 100 WEST RANDOLPH, SUITE 11-300, CHICAGO, IL 60601 – (312) 814-6026

ROD R. BLAGOJEVICH, GOVERNOR

DOUGLAS P. SCOTT, DIRECTOR

217/782-3362

NOV 1 0 2008

Mr. Damon Zdunich Northern Illinois Hydropower, LLC 801 Oakland Avenue Joliet, IL 60435

Re: Northern Illinois Hydropower, LLC (LaSalle County)
Hydroelectric power generation – Illinois River, Dresden L&D
Log No. C-0405-08
FERC No. 12626

Dear Mr. Zdunich:

We received the documentation regarding application for a Federal Energy Regulatory Commission License and possible Section 401 water quality certification concerning the above referenced project on July 21, 2008. The documents, as submitted, have been reviewed by the Watershed Management Section staff, and based on that review, the following items are offered for your consideration and appropriate action.

Pursuant to Section 401 of the Clean Water Act (PL-95-217), a water quality certification must be granted by this Agency to the applicant of the Federal Energy Regulatory Commission license for the construction and operation of these facilities. Such certification, if issued, would provide the Agency's judgment that the resultant discharges from the proposed facilities would comply with the applicable water quality standards under 35 II. Adm. Code Subtitle C and the provisions of the Illinois Environmental Protection Act. A copy of the Subtitle C is available over the Internet at the Illinois Pollution Control Board homepage: www.ipcb.state.il.us. A copy of the water quality standards may also be obtained by contacting our office.

As part of the FERC application process, a series of feasibility studies should be undertaken by the applicant to evaluate environmental and economic considerations. It is recommended that an investigation be made during these studies that would detail the in-stream water quality effects from the generating unit operations. Particular interest should be given to potential increases in unnatural turbidity and decreases in dissolved oxygen. This office would also be interested in any associated dredge and fill activity that may be necessary for the construction or maintenance of the proposed facilities.

Please be advised that the Illinois River at Dresden Island is subject to the recently revised dissolved oxygen standard adopted at Section 302.206 by the Illinois Pollution Control Board. The standard is as follows:

The dissolved oxygen concentration in all sectors within the main body of the stream must not be less than:

- 1) During the period of March through July,
  - A) 5.0 mg/L at any time; and
  - B) 6.25 mg/L as a daily mean averaged over 7 days.
- 2) During the Period of August through February,
  - A) 4.0 mg/L at any time;
  - B) 4.5 mg/L as a daily minimum averaged over 7 days; and
  - C) 6.0 mg/L as a daily mean averaged over 30 days.

Page No. 2 Log No. C-0405-08 FERC No. 12626

This project will be subject to an anti-degradation review in accordance with Section 302.105. You should review the subject regulation and provide any additional documentation that fulfills the information required at 35 Ill. Adm. Code 302.105 for completion of the antidegradation assessment. As a precursory review the Agency notes that the Illinois River at this location is an Illinois Natural Area Inventory (INAI) site – Illinois River-Dresden Island and there is a potential for the following state endangered species: Pallid Shiner (fish), Greater Redhorse (fish), American Bitten (bird), King Rail (bird), Northern Harrier (bird), Common Moorhen (bird), Henslow's Sparrow (bird), and River Redhorse (fish) to be present in the project area and the following to be present in adjacent areas: Grass Pink Orchid (flora), Narrow-leaved Sundew (flora), False Mallow (flora), Redveined Prairie Leafhopper (invertebrate), Regal Fritillary (invertebrate), Eryngium Stem Borer (invertebrate), Pallid Shiner (fish), Greater Redhorse (fish), American Bitten (bird), King Rail (bird), Northern Harrier (bird), Common Moorhen (bird), and Henslow's Sparrow (bird). The protection of these species and their habitat should be addressed in further documentation. Provide all correspondence submitted and received as part of a threatened and endangered species consultation with the Illinois Department of Natural Resources. Consultation may be initiated using the EcoCAT web tool found at <a href="http://dnrecocat.state.il.us/ecopublic/">http://dnrecocat.state.il.us/ecopublic/</a>. When using this tool, please indicate the Illinois Environmental Protection Agency as the government unit (state agency).

Discharges of wastewater that may occur at the site such as equipment cooling waters should be described in full in the applicant's future reports. These discharges must be authorized under the Agency's National Pollutant Discharge Elimination System (NPDES) program and comply with the Subtitle C effluent and water quality standards.

Any dredge or fill activities to the waters of the State associated with the project may require a Section 404 permit and a separate Section 401 water quality certification. Please contact the U.S. Army Corps of Engineers, Rock Island District for further details at (309) 794-5373 or Clocktower Building, P.O. Box 2004, Rock Island, IL 61204-2004.

Containment or settling basins for hydraulic dredged material will require a state construction and operation permit from the Agency under 35 II. Adm. Code Section 309.202 and 309.203.

Please be advised that applicants for a Section 401 water quality certification, a NPDES permit and a state construction permit from the Illinois EPA must submit a fee prior to issuance under the Illinois Environmental Protection Act, Section 12 (415 ILCS 5/12).

If you have any questions on these matters, please contact James Allison of my staff.

Sincerely,

Daniel L. Heacock, P.E.

Manger, Facility Evaluation Unit

Bureau of Water

DLH:JRA

cc: CoE, Rock Island District

Federal Energy Regulatory Commission, Division of Project Review, Room 1027

Kleinschmidt Associates

#### 2008-11-05 NPS PAD cmts.txt

From: Angie_Tornes@nps.gov Sent: Wednesday, November 05, 2008 1:35 PM To: Allison Murray Subject: Re: Brandon Road and Dresden Island Projects - Final Meeting Minutes and Public Meeting invitation Hi Allison - I've reviewed the PAD; please remove NPS from your list serve. Thanks. - Angie ***************** Angie Tornes National Park Service Hydropower Assistance Program Rivers & Trails Program Wisconsin Field Office 626 E. Wisconsin Ave., St. 100 Milwaukee, WI 53202 Voi ce 414. 297. 3605/ FAX: 414. 944. 3660 www.nps.gov/rtca http://www.nps.gov/ncrc/programs/hydro "Allison Murray" <Allison. Murray@Kleinschm idtUSA.com> 09/26/2008 07:10 PM AST <angle-tornes@nps.gov> | cc: "Damon Zduni ch" <dzduni ch@gel bergroup. com>, "Jay Maher" <Jay. Maher@Kl ei nschmi dtUSA. com>, "Laura Shi rey" | <Laura. Shi rey@Kl ei nschmi dtUSA. com> Subject: Brandon Road and Dresden Island Projects - Final Meeting Minutes and Public Meeting invitation

#### 2008-11-05 NPS PAD cmts. txt

Good Afternoon, I received only a couple editorial comments on the 8-14-08 meeting minutes. I have addressed those. I attach the final meeting summary for your files.

<<8-14-08 mtg summary final.doc>>

On another note, In accordance with 18 CFR §16.8 (b)(4), NIH will host Joint Agency Meetings (JAM) for the licensing of the Dresden Island and the Brandon Road Hydroelectric Projects on Monday, October 13, 2008. The purpose of the meeting is primarily what we accomplished at our August meeting. We welcome your participation but understand that the topics may be redundant to our previous discussions. Perhaps of more interest, NIH intends to host site visits at the Project on October 14th. The attached letter, filed with FERC today, provides details regarding the meetings and site visits. Once we have an idea of the number of participants for the site visit, we will coordinate with Corps staff in a timely manner to gain access to the sites.

It is important for you to note, that pursuant to 18 CFR §16.8 (b)(5), any agency comments and requests for studies are due to NIH within 60 days of the JAM (i.e. by December 12, 2008).

We hope you can join us and look forward to seeing you again.

Regards, Allison

<<001-FERC Filing Letter - JAM 092608.pdf>>

----Original Message---From: Allison Murray
Sent: Thursday, August 14, 2008 5:28 PM
To: 'Schanzle, Bob'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov';
'JAMES. W. BARTEK@usace. army. mil'; 'Diedrichsen, Mike'
Cc: 'Brian Radner'; 'Rocklsland@fws.gov';
'dan. heacock@illinois.gov'; 'angie_tornes@nps.gov';
'Michael.D. Cox@usace. army. mil'; 'robert_clevenstine@fws.gov'; 'Mauer, Paul'; 'Damon Zdunich'; Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura Shirey; Matt Dunlap

Subject: Draft mtg summary 8-6-08 NIH

<< File: Draft 8-14-08 mtg summary final draft.doc >>

Greetings Folks,
Attached is a draft meeting summary based on Kleinschmidt's notes
from our August 6 PAD review meeting. Please feel free to edit if I
have missed anything or mistypified your respective agencies
positions or comments. I would appreciate some response so I know
when to finalize the document. Once finalized I will resend for your
records.

I have included some folks who could not attend, and others who have Page 2

2008-11-05 NPS PAD cmts.txt expressed interest in being kept "in the loop". If you do not wish to receive further correspondence regarding the project, please let me know. Also, as always, if I have missed someone who should be contacted please let me know. Jim, I know you mentioned keeping Andy Tomlinson advised of our progress, but I do not have an email address for him. I'd appreciate it if you could forward his contact info.

Thanks to those who attended and provided feedback. We're Looking forward to moving through the licensing process with you.

Regards,

Allison (See attached file: 8-14-08 mtg summary final.doc)(See attached file: 001-FERC Filing Letter - JAM 092608.pdf)

2008-10-17 Kleinschmidt sediment report to IEPA. txt

From: Jesse Wechsler

Sent: Friday, October 17, 2008 10:25 AM

'Allison, James' To:

Subject: Sediment Report_Dresden Island & Brandon Roads

James -

Attached is a copy of the results of sediment testing completed in 2008 at the Dresden & Brandon Roads Lock and Dam facilities. At both sites, concentrations of arsenic, chromium, lead, and mercury were detected above the State of Illinois's Tier 1 standards. In addition, at Brandon Roads, one PCB (Aroclor 1242) was reported above detection limits. The parameters sampled were chosen based on specific input from staff in the water quality division of IEPA.

I'd like to discuss with you these findings and what measures might be appropriate for contending with these sediments during construction and dredging activities at the two sites. It would be our goal to utilize the removed sediment to develop construction staging areas, if appropriate.

Please give me a call at your nearest convenience to discuss.

Many thanks! Jesse

Jesse Wechsler Fisheries & Aquatic Scientist KI ei nschmi dt Energy and Water Resource Consultants 141 Main St. PO Box 650 Pittsfield, Maine 04967 tel: (207) 487-3328 (Ext. 278) fax: (207) 487-3124

www. klei nschmi dtusa. com

From: Allison Murray

Sent: Friday, September 26, 2008 7:10 PM

To: 'Schanzle, Bob'; 'Brian Radner'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov';

'JAMES.W.BARTEK@usace.army.mil'; 'Diedrichsen, Mike'; 'Rocklsland@fws.gov'; 'Michael.D.Cox@usace.army.mil';

'robert_clevenstine@fws.gov'; 'Mauer, Paul'; 'dan.heacock@illinois.gov';

'angie_tornes@nps.gov'

Cc: 'Damon Zdunich'; Jay Maher; Laura Shirey

Subject: Brandon Road and Dresden Island Projects - Final Meeting Minutes and

Public Meeting invitation

Good Afternoon,

I received only a couple editorial comments on the 8-14-08 meeting minutes. I have addressed those. I attach the final meeting summary for your files.

9.14.09 m

8-14-08 mtg summary final.doc ...

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It is important for you to note, that pursuant to 18 CFR §16.8 (b)(5), any agency comments and requests for studies are due to NIH within 60 days of the JAM (i.e. by December 12, 2008).

We hope you can join us and look forward to seeing you again.

# Regards, Allison



-----Original Message-----**From:** Allison Murray

Sent: Thursday, August 14, 2008 5:28 PM

To: 'Schanzle, Bob'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov'; 'JAMES.W.BARTEK@usace.army.mil';

'Diedrichsen, Mike'

Cc: 'Brian Radner'; 'RockIsland@fws.gov'; 'dan.heacock@illinois.gov'; 'angie_tornes@nps.gov';

 $\label{thm:condition} \begin{tabular}{ll} \b$ 

Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura Shirey; Matt Dunlap

Subject: Draft mtg summary 8-6-08 NIH

<< File: Draft 8-14-08 mtg summary final draft.doc >>

# Greetings Folks,

Attached is a draft meeting summary based on Kleinschmidt's notes from our August 6 PAD review meeting. Please feel free to edit if I have missed anything or mistypified your respective agencies positions or comments. I would appreciate some response so I know when to finalize the document. Once finalized I will resend for your records.

I have included some folks who could not attend, and others who have expressed interest in being kept "in the loop". If you do not wish to receive further correspondence regarding the project, please let me know. Also, as always, if I have missed someone who should be contacted please let me know. Jim, I know you mentioned keeping Andy Tomlinson advised of our progress, but I do not have an email address for him. I'd appreciate it if you could forward his contact info.

Thanks to those who attended and provided feedback. We're looking forward to moving through the licensing process with you.

2008-09-10 Kleinschmidt DO monitoring sites for review.txt

FW: Draft mtg summary, 8-6-08, Northern Illinois Hydro, Brandon & Dresden

IslandFrom: Jesse Wechsler

Sent: Wednesday, September 10, 2008 9:45 PM

To: 'james. allison@illinois.gov'

Subject: RE: Draft mtg summary, 8-6-08, Northern Illinois Hydro, Brandon & Dresden

Isl and

James -

Here are the proposed locations for DO monitoring at Brandon & Dresden. Look OK to you?

Thanks. **Jesse** 

Jesse F. Wechsler Fisheries & Aquatic Scientist Kleinschmidt Associates Energy and Water Resources Consulting 141 Main Street PO Box 650 Pittsfield, Maine 04967 (207)487-3328 X 278 www. kl ei nschmi dtusa. com

From: Jesse Wechsler

Sent: Fri 8/15/2008 11:53 AM To: 'james.allison Cc: Allison Murray james. alli son@illi noi s. gov'

Subject: FW: Draft mtg summary, 8-6-08, Northern Illinois Hydro, Brandon & Dresden

I sl and

Hi James,

Wanted to make sure you got a copy of this. Please give me a call when you get a chance, as I'd like to talk dissolved oxygen monitoring with you. As outlined in the PAD, NIH plans to start collecting DO data this fall at 4 locations, one in each impoundment and one in each downstream reach. I've also attached the individual study plans that were included in the PAD, which outline our general study approach. The plans in the PAD identified a target start period of July 1, which has gone by so at this point we'd plan to sample September - October, and then again in June, July, August of 2009 to collect information pertaining to existing DO conditions.

Many thanks in advance for any thoughts or guidance you can offer on DO sampling.

Best. Jesse

<<BR WQ Study Plan.pdf>> <<WQ Study Plan.pdf>>

Jesse Wechsler Fisheries & Aquatic Scientist KI ei nschmi dt Energy and Water Resource Consultants 141 Main St. PO Box 650 Pittsfield, Maine 04967 (207) 487-3328 (Ext. 278) (207) 487-3124 fax: www. klei nschmi dtusa.com

----Original Message----

2008-09-10 Kleinschmidt DO monitoring sites for review.txt

From: Allison Murray

Thursday, August 14, 2008 5:28 PM Sent:

'Schanzle, Bob'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov'; To:

JAMES. W. BARTEK@usace. army. mil'; Diedrichsen, Mike Cc: 'Brian Radner'; 'RockIsland@fws.gov'; 'dan.heacock@illinois.gov'; angie_tornes@nps.gov'; 'Michael.D.Cox@usace.army.mil';

'robert_clevenstine@fws.gov'; 'Mauer, Paul'; 'Damon Zdunich'; Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura Shirey; Matt Dunlap

Subject: Draft mtg summary 8-6-08 NIH

<<Draft 8-14-08 mtg summary final draft.doc>>

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Thanks to those who attended and provided feedback. We're looking forward to moving through the licensing process with you.



REPLY TO

# DEPARTMENT OF THE ARMY ROCK ISLAND

DISTRICT, CORPS OF ENGINEERS CLOCK TOWER BUILDING - P.O. BOX 2004 ROCK ISLAND, ILLINOIS 61204-2004

http://www.mvr.usace.army.mil

September 5, 2008

Engineering and Construction Division

Mr. Jay Maher Kleinschmidt Energy & Water Resource Consultants 307 McKee Crossing New Castle, P A 16105

Dear Mr. Maher:

With regard to Dresden Island and Brandon Road Hydroelectric Projects (FERC projects No. 12626 and 12717), we offer the following comments for consideration on your concept design and some additional comments on the Preliminary Application Document (PAD).

- a. You will have to prepare and coordinate National Environmental Policy Act (NEP A) documentation during the licensing process. The NEP A documentation will also demonstrate project compliance with any other environmental regulation such as the National Historic Preservation Act and Endangered Species Act.
- b. You will need to show that the proposed projects will not have an impact on navigation, which includes outdraft, river regulation, the restricted area, operation of the Corps site, and recreation.
- c. The Brandon Road and Dresden Island Lock and Dam sites have been determined as historic districts and listed on the National Register of Historic Places. A determination of effect has to be made in compliance with the National Historic Preservation Act, as amended and its implementing regulation 36CFR Part 800: "Protection of Historic Properties, "If a determination of Adverse Effect is made, mitigation measures shall be completed and documented.
- d. In the PAD, Appendix D: the mussel survey study methodologies presented are not common in our river reaches. You should coordinate with Mr. Bob Schanzle, IL DNR mussel expert and he can make some suggestions to improve the Mussel Study Plan.
- e. In Section 6.4 of the PAD there is potential Indiana Bat use identified in the area. You will have to comply with the Indian Bat Recovery Plan (USFWS, 2007) including an Indiana Bat survey and avoidance measures if, in fact, Indiana Bats are utilizing the area. The Indiana Bat Recovery Plan, 2007 should be added to table 7.2 and the Indiana Bat Survey to Appendix D.

If you have any questions, please contact Jim Bartek at (309)794-5599. Email: <u>james.</u> w .bartek@usace.army.mil.

Denny A. Lundberg, P.E.

Chief, Engineering and Construction Division

From: Allison Murray

**Sent:** Tuesday, August 26, 2008 11:39 AM

To: 'Shawn_Cirton@fws.gov'
Cc: Jesse Wechsler; Jay Maher

Subject: Comments - Dresden Island, Brandon Road PADs

Hi there Shawn,

I know there isn't a deadline looming immediately in the future for your comments on the PADs, but we are trying to gear up and get DO meters in the water at the Projects asap. We'd very much appreciate your feedback on preferred locations and any other comments/suggestions you have on the monitoring effort so we can make sure to incorporate them into the study protocol. Any chance we could get something this week?

Thanks, Allison

Allison Murray Project Regulatory Coordinator

### **Kleinschmidt**

Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell) 2008-08-18 IDNR cmts on PAD review mtg. txt

Draft mtg summary 8-6-08 NIHFrom: Schanzle, Bob [Bob. Schanzle@Illinois.gov]

Sent: Monday, August 18, 2008 4:49 PM

To: Allison Murray

Subject: RE: Draft mtg summary 8-6-08 NIH

Hello Allison,

I've reviewed the draft meeting minutes and they appear accurate to the best of my recollection.

The mussel information isn't really a big deal, but perhaps the snuffbox and salamander mussel don't belong in a discussion of the DesPlaines/upper Illinois River. They're both extremely sensitive species that I wouldn't expect to find anywhere in the vicinity of either project. The snuffbox is mentioned on page 5-21 and 5-22, and the salamander mussel appears twice on page 5-22. Both species are also listed on page 5-28, page 5-30, and in Table 5.3.3-1. Another species I'd delete from the table is the hickorynut, which Seitman et al. didn't list in their 2001 report. It's also mentioned on page 5-21. Your treatment of the spectaclecase (page 5-30) is fine since it states that the species was "historically" found in the areă.

Thanks, Bob S.

From: Allison Murray [mailto: Allison. Murray@KleinschmidtUSA.com]

Sent: Thursday, August 14, 2008 4:28 PM
To: Schanzle, Bob; Haaker, Anne; Shawn_Cirton@fws.gov;
JAMES. W. BARTEK@usace.army.mil; Diedrichsen, Mike
Cc: Brian Radner; RockIsland@fws.gov; Heacock, Dan; angie_tornes@nps.gov; Mi chael . D. Cox@usace. army. mil; robert_clevenstine@fws. gov; Mauer, Paul; Damon Zdunich; Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura Shirey; Matt Dunlap Subject: Draft mtg summary 8-6-08 NIH

<<Draft 8-14-08 mtg summary final draft.doc>>

Greetings Folks,

Attached is a draft meeting summary based on Kleinschmidt's notes from our August 6 PAD review meeting. Please feel free to edit if I have missed anything or mistypified your respective agencies positions or comments. I would appreciate some response so I know when to finalize the document. Once finalized I will resend for your records.

I have included some folks who could not attend, and others who have expressed interest in being kept "in the loop". If you do not wish to receive further correspondence regarding the project, please let me know. Also, as always, if I have missed someone who should be contacted please let me know. Jim, I know you mentioned keeping Andy Tomlinson advised of our progress, but I do not have an email address for him. I'd appreciate it if you could forward his contact info.

Thanks to those who attended and provided feedback. We're looking forward to moving through the licensing process with you.

2008-08-15 Kleinschmidt draft PAD summary mins. txt

From: Allison Murray

Sent:

To:

Sent: Friday, August 15, 2008 3:15 PM

Fo: 'Schanzle, Bob'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov';

JAMES. W. BARTEK@usace.army.mil'; 'Diedrichsen, Mike'

Cc: 'Brian Radner'; 'RockIsland@fws.gov'; 'dan.heacock@illinois.gov';

angie_tornes@nps.gov'; 'Michael.D. Cox@usace.army.mil';

robert_clevenstine@fws.gov'; 'Mauer, Paul'; 'Damon Zdunich'; Jay Maher; Laura

Shi rey

Subject: RE: Draft mtg summary 8-6-08 NIH

#### Good Afternoon,

Attached is a synopsis of the FERC regulations related to the Traditional Licensing Process (TLP). We've included some highlighted sections that identify timeframes, consultation requirements. You may also access this information at http://www.access.gpo.gov/nara/cfr/waisidx_07/18cfrv1_07.html

Also, we discussed interest in "esubscribing" to FERC's website. This would result in you receiving an email notification from FERC when it issues orders, directives etc. or receives submittals for the Brandon Road and Dresden Island Projects. If This would result you need any assistance in setting up an esubscription, please feel free to give me a call (207)487-3328 and I'd be happy to walk you through the process.

Regards, Allison

----Original Message----

From: Allison Murray

Sent: Thursday, August 14, 2008 5:28 PM
To: 'Schanzle, Bob'; 'Haaker, Anne'; 'Shawn_Cirton@fws.gov'; 'JAMES.W.BARTEK@usace.army.mil'; Diedrichsen, Mike

Cc: 'Bri an Radner'; 'RockIsland@fws.gov'; 'dan.heacock@illinois.gov'; angie_tornes@nps.gov'; 'Michael.D.Cox@usace.army.mil';

'robert_clevenstine@fws.gov'; 'Mauer, Paul'; 'Damon Zdunich'; Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura Shirey; Matt Dunlap Subject: Draft mtg summary 8-6-08 NIH

<< File: Draft 8-14-08 mtg summary final draft.doc >>

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Thanks to those who attended and provided feedback. We're looking forward to moving through the licensing process with you.

From: Diedrichsen, Mike [Mike.Diedrichsen@Illinois.gov]

**Sent:** Friday, August 15, 2008 11:21 AM

**To:** Allison Murray

**Subject:** RE: Draft mtg summary 8-6-08 NIH

Hi Allison,

The first item in Section 4.0 should be revised to read: Any placement of spoil material within the floodway must not change the base flood elevation. Spoil material may not be deposited below the river's normal stage unless shown to comply with IDNR's Part 3704 Public Water Regulations.

Thanks for checking with us.

Mike Diedrichsen, P.E.
Acting Manager, Downstate Regulatory Programs IDNR, Office of Water Resources
One Natural Resources Way
Springfield, Illinois 62702-1271
Tel: 217/782-3863; Fax: 217/785-5014
mike.diedrichsen@illinois.gov

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Thursday, August 14, 2008 4:28 PM

**To:** Schanzle, Bob; Haaker, Anne; Shawn_Cirton@fws.gov; JAMES.W.BARTEK@usace.army.mil; Diedrichsen, Mike **Cc:** Brian Radner; RockIsland@fws.gov; Heacock, Dan; angie_tornes@nps.gov; Michael.D.Cox@usace.army.mil; robert_clevenstine@fws.gov; Mauer, Paul; Damon Zdunich; Jay Maher; Nicholas Morgan; Jesse Wechsler; Laura

Shirey; Matt Dunlap

Subject: Draft mtg summary 8-6-08 NIH

<< Draft 8-14-08 mtg summary final draft.doc>>

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Attached is a draft meeting summary based on Kleinschmidt's notes from our August 6 PAD review meeting. Please feel free to edit if I have missed anything or mistypified your respective agencies positions or comments. I would appreciate some response so I know when to finalize the document. Once finalized I will resend for your records.

I have included some folks who could not attend, and others who have expressed interest in being kept "in the loop". If you do not wish to receive further correspondence regarding the project, please let me know. Also, as always, if I have missed someone who should be contacted please let me know. Jim, I know you mentioned keeping Andy Tomlinson advised of our progress, but I do not have an email address for him. I'd appreciate it if you could forward his contact info.

Thanks to those who attended and provided feedback. We're looking forward to moving through the licensing process with you.

From: Shawn_Cirton@fws.gov

Sent: Thursday, August 14, 2008 10:29 AM

To: Jay Maher Cc: Allison Murray; Damon Zdunich Subject: RE: FW: Fish Species Table NIH

I was informed on the call that I had 30 days from the date we received the PAD (July 16th). My plan was to get comments out by this Friday (the reason I originally asked for the fax number because our comments wouldn't get to you via mail by this Friday).

Even though I have more time now I may stick with my original plan and get comments to you by tomorrow. If not, I would definitely get them out no later than the beginning of September .

#### Shawn

*******

Shawn Cirton Fish and Wildlife Biologist U.S. Fish and Wildlife Service Chicago Illinois Field Office 1250 South Grove Avenue, Suite 103 Barrington, IL 60010 (847) 381-2253 xt. 19 (847)381-2285 Fax shawn_cirton@fws.gov http://midwest.fws.gov/chicago

The mission of the U. S. Fish and Wildlife Service: Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

> "Jay Maher" <Jay. Maher@KI ei ns chmi dtUSA. com>

08/13/2008 04:14 PM

<Shawn_Ci rton@fws. gov>

To CC

"Allison Murray"

<Allison. Murray@KleinschmidtUSA.com

>, "Damon Zduní ch"

<dzduni ch@gel bergroup. com>

Subj ect

RE: FW: Fish Species Table NIH

Believe it or not....that is not such an easy question to answer! Here is the rough answer... Under the ILP (where all proceedings start) FERC issues a 'Notice of Commencement' within 60d of our filing (July 17) you have 60d after that to file comments on the PAD and on FERC's Scoping Document and make any additional study requests. FERC has yet to issue the notice, so the clock has yet to start (officially). is slightly complicated by the fact we requested to use the TLP. FERC should grant the TLP at the time of the notice. That will kick us into a different process where

we schedule an 'official' joint meeting of the public and agencies and after that meeting you have 60d to respond to information we have provided. (so, a little Ionger than the ILP)

We are trying to 'unofficially' keep the process moving (with FERC's knowledge) by having the meeting we had last week and by continuing to share all aspects of the design /development as we go and to carry out the necessary studies earlier than required. This is so that even if 'official' comments and process are delayed, we will have everyone's agreement ahead of time on what we are doing, so there are no surprises or delays at the other end of the process. So, Technically, either way, the clock has not started for you to comment. We would appreciate your official or unofficial comments as soon as possible so we can incorporate them now. We are looking at dates for a the joint meeting near the Projects (we have to provide a tour if public or agencies desire) now, so we can hold the meeting as soon as we have FERC's approval.

How is that for a long answer to a short question? You have time! J

----Original Message----

From: Shawn_Cirton@fws.gov [mailto: Shawn_Cirton@fws.gov]

Sent: Wednesday, August 13, 2008 4:53 PM

To: Jay Maher Cc: Allison Murray

Subject: RE: FW: Fish Species Table NIH

So, when did that clock start and how long do I have? Thanks Jay.

********

Shawn Cirton Fish and Wildlife Biologist U.S. Fish and Wildlife Service Chicago Illinois Field Office 1250 South Grove Avenue, Suite 103 Barrington, IL 60010 (847) 381-2253 xt. 19 (847) 381-2285 Fax shawn_cirton@fws.gov http://midwest.fws.gov/chicago

The mission of the U. S. Fish and Wildlife Service: Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

"Jay Maher"

<Jay. Maher@KI ei ns

chmi dtUSA. com>

To

<Shawn_Cirton@fws.gov>, "Allison

08/13/2008 03:46 Murray"

<Allison. Murray@KleinschmidtUSA.com

CC

Subj ect

RE: FW: Fish Species Table NIH

Shawn, we will be happy to have your comments now. After reviewing the regulations, I think you are well within the time frame as the clock really does not start till FERC notifies us/you of starting the proceeding. But, the earlier we get them, the earlier we get started on addressing them. Thanks. Feel Free to call either Allison or I if you have any questions. 1,11 try to get a copy of the regulations out to you tomorrow. Jeremiah (Jay) L. Maher Senior Regulatory Advisor Kleinschmidt Energy & Water Resource Consultants 307 McKee Crossing New Castle, PA 16105

P: 207. 416. 1239 Cell: 724.674.6145

www. kl ei nschmi dtusa. com

----Original Message----

From: Shawn_Cirton@fws.gov [mailto: Shawn_Cirton@fws.gov]

Sent: Wednesday, August 13, 2008 11:26 AM

To: Allison Murray

Cc: Jay Maher Subject: Re: FW: Fish Species Table NIH

Thanks Allison. Please provide me with your contact information (including fax number) so I can send our comments by the end of the week. The original will be sent in the mail and arrive next week.

Shawn

******

Shawn Cirton Fish and Wildlife Biologist U.S. Fish and Wildlife Service Chicago Illinois Field Office 1250 South Grove Avenue, Suite 103 Barrington, IL 60010 (847) 381-2253 xt. 19 (847)381-2285 Fax shawn_cirton@fws.gov

http://midwest.fws.gov/chicago

The mission of the U. S. Fish and Wildlife Service: Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

"Allison Murray"

<Allison. Murray@K

I ei nschmi dtUSA. co

То

<Shawn_Ci rton@fws. gov> m>

CC

08/13/2008 09:50 "Jay Maher"

AM<Jay. Maher@KI ei nschmi dtUSA. com>

Subject

FW: Fish Species Table NIH

Hi Shawn. My apologies for not including you on the first email.

As with Bob, it was a pleasure speaking with you in Springfield. I hope that one day we can actually meet in person.

Regards, Allison

----Original Message----

From:

Sent:

To:

Allison Murray Monday, August 11, 2008 1:48 PM 'Schanzle, Bob' Jay Maher; Nicholas Morgan Cc: FW: Fish Species Table Subject:

Hi There Bob, It was great to finally meet you last week. Attached is the Commonwealth Edison fish list we discussed.

We are gearing up internally to do the mussel surveys. Any chance you could send that list of local contractors who do this type of work? We'd like to contact them as soon as possible. Also, the invite remains open for you to come and visit, dive, watch the surveys when we get them scheduled!

Thanks, Allison

<<Tabl e 9.3-5.pdf>>

Cite: Commonwealth Edison, 1996. Final Report. Aquatic Ecological Study of the Upper Illinois Waterway Volume 2 of 2. Commonwealth Edison Company, Chicago, Illinois.

[attachment "Table 9.3-5.pdf" deleted by Shawn Cirton/R3/FWS/DOI]

---- Message from "Jay Maher" <Jay. Maher@KleinschmidtUSA.com> on Sun, 28 Aug 2005 18: 10: 45 -0400 ----

Subject: Jeremiah (Jay) L. Maher

#### **MEETING SUMMARY**

# Northern Illinois Hydropower, LLC Brandon Road (FERC No. 12717) & Dresden Island (FERC No. 12626) Projects

# **Pre-Application Document Review Meeting**

Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, Illinois

ATTENDEES: Jim Bartek, U.S. Army Corps of Engineers (by phone)

Shawn Citron, U.S. Fish and Wildlife Service (by phone)

Dennis Cohil, Northern Illinois Hydropower, LLC Anne Haaker, Illinois Historic Preservation Agency

Jay Maher, Kleinschmidt Allison Murray, Kleinschmidt

Bob Schanzle, Illinois Department of Natural Resources Damon Zdunich, Northern Illinois Hydropower, LLC

DATE: August 6, 2008

#### 1.0 PURPOSE OF MEETING

Northern Illinois Hydropower, LLC (NIH) is preparing to license the Brandon Road and Dresden Island Projects with the Federal Energy Regulatory Commission (FERC). NIH proposes to construct new powerhouses at the existing Brandon Road Dam and Dresden Island Dam to accommodate turbine

generating systems. NIH filed Pre-Application Documents (PADs) for the Projects on July 16, 2008. NIH also distributed the PADs to agencies who expressed interest in being included in the licensing process. NIH scheduled this meeting in an effort to proactively solicit comments on the PADs as well as facilitate further discussion on additional information needs as it begins to develop FERC license applications.

NIH subsequently met with Illinois Department of Natural Resources (IDNR) staff member Mike Diedrichson (who was unable to attend the morning meeting) in the afternoon of August 6, at the IDNR offices in Springfield. This summary includes a synopsis of the topics discussed.

#### 2.0 INTRODUCTION AND PROJECT OVERVIEW

After a brief round of introductions identifying NIH and Kleinschmidt staff who are involved in the licensing efforts, Kleinschmidt gave an overview of the Projects and the licensing process. The Dresden Island Project is located on the Illinois River near the town of Morris. The U.S. Army corps of Engineers (ACOE) currently operates the Dresden Island Lock and Dam. The Brandon Road Project is located on the Des Plaines River, immediately south of Joliet. The ACOE also operates a lock and dam system at Brandon Road. NIH submitted preliminary permit applications to FERC for the Dresden Road Project in November 2005 and the Brandon Road Project in July 2006. FERC issued three-year preliminary permits for the Project in April 2006 and November 2006, respectively.

NIH intends to file FERC license applications for the Dresden Island Project on or before April 12, 2009 and for the Brandon Road Project on or before November 23, 2009. Kleinschmidt also informed the group that NIH requested FERC allow it to use the Traditional Licensing Process (TLP) rather than FERC's default Integrated Licensing Process (ILP). NIH believes, given the relatively tight licensing timeline, existing development, and limited resource concerns at the Projects that the TLP is the most appropriate process. The group did not express concerns with this assumption.

# 3.0 GENERAL DISCUSSION

# 3.1 <u>Historic and Culturally Sensitive Resources</u>

Anne Haaker of the Illinois Historic Preservation Agency (IHPA) indicated that while the PADs acknowledge that the Dresden Island Lock and Dam is eligible for listing on the National Register of Historic Places, in fact both Army Corps Locks and Dams are actually listed on the Register. In general, IHPA did not have concerns with construction of the hydroelectric facilities; however, it is likely that IHPA will require NIH to do some form of historic documentation of the structures. IHPA will coordinate with the ACOE, before making that determination. IHPA will require further information regarding the location of transmission lines at both projects to determine the potential for adverse effect to culturally significant resources. It is likely that a

transmission corridor along Route 6 for Brandon Road will not require additional study; however, IHPA will reserve the right to require additional review and/or study at Dresden Island.

# 3.2 Agency Jurisdiction

Shawn Citron (USFWS Barrington Office) informed the group that his office's jurisdiction only covers the Brandon Road Project. USFWS staff from the Rock Island office will cover the Dresden Project. Kleinschmidt noted that it had contacted Rick Nelson and Bob Clevenstine of the Rock Island office, and neither could attend. Shawn indicated that the two offices do not always have the opportunity to communicate directly and stressed the need to keep the Rock Island USFWS in the process loop.

Jim Bartek (ACOE) suggested that NIH and Kleinschmidt add Andrew Tomlinson of the Vicksburg ACOE office to it contact list and include him in any further information distribution.

# 3.3 Mapping and Design Drawings

Kleinschmidt acknowledged that it needs to develop better project boundary maps for both Projects.

The group queried Kleinschmidt and NIH regarding the availability of design drawings for the Projects. Kleinschmidt indicated that the design is in progress and that it anticipates having the Dresden Island Project drawings available by the end of August, with Brandon Road to follow later. The ACOE also requested that the design incorporate modeling that showed any changes to flow patterns upstream of the proposed project that may have the potential to affect navigation. Kleinschmidt indicated that that analysis would be included in the design.

# 3.4 Water Quality

The group discussed the anticipated need for monitoring water quality, specifically dissolved oxygen (DO). Kleinschmidt indicated the PADs include a brief study plan to accomplish this. IDNR confirmed that the Projects potential effect on DO levels will be a concern to them. USFWS indicated it would also provide guidance regarding DO sampling in a comment letter it anticipates providing to NIH in the next few weeks.

NIH informed the group that it has already commissioned sediment surveys for both Projects. Kleinschmidt coordinated with Illinois EPA and the work is currently underway. NIH will provide the results of the studies to the agencies once the analyses are complete. The results of the analyses will be included in the license application as well and considered as NIH finalizes the powerhouse designs. The ACOE indicated it may require hydrologic/hydraulic modeling to assess how the Projects may affect sediment deposition and flow patterns. IDNR concurred as it is interested in the potential for dewatering of habitat areas.

### 3.5 Fisheries

USFWS inquired if NIH intends to do entrainment studies. The group further discussed whether the operation of the Projects will pose a mortality risk for fish species present at either Project. IDNR and USFWS concurred that adult mortality is the primary concern. In general, the IDNR recommends use of 1.5" trashrack spacing to avoid entrainment. NIH and Kleinschmidt suggested it could run a desktop entrainment/impingement study to address a majority of concerns related to this issue. INDR also requested NIH provide estimated velocities for the proposed designs at the Projects. In general, the state standard for acceptable intake velocities is 1.5 ft/sec. USFWS informed NIH that it will reserve its prescriptive Section 18 right to require fish passage in the future, but does not anticipate that it will require passage as a condition of the Project licenses.

### 3.6 Mussels

IDNR indicated the PADs do not correctly identify mussel species likely to occur within the Project areas. Specifically the PADs indicate the potential for snuffbox, spectaclecase, and salamander mussels. The incorrect information was derived from reports developed for other regional licensing efforts. NIH will research the issue based on references provided by IDNR and will correct the baseline information in the license application. IDNR anticipates that any mussel species present at either Project will occur downstream of the dams. It does not anticipate that there are significant (or any) mussel populations at the Brandon Road Project; however it requested NIH conduct a "foot search" in accessible areas to confirm this assumption. IDNR confirmed there are known mussel populations below the Dresden Island Project and agree with NIH's assumption that a site survey is necessary. IDNR's primary concern regarding potential effects to mussels relates to construction; however, there is some potential for long-term effects related to operation of the Project (see Section 3.4). IDNR advised NIH to revise the mussel sampling protocols included in the Dresden Island PAD to focus on brailing, diving, and hand picking. The study results will identify the location and species of mussels present and provide a basis for assessing the need for any mitigation (e.g. relocation prior to construction) that may become a condition of the Project license. Bob Schanzle offered to forward a list of contractors qualified for mussel investigations in Illinois.

### 3.7 Other State Permitting Needs

The group confirmed that the Illinois Environmental Protection Agency (IEPA) is the state department that issued 401 water quality certifications. IEPA staff did not attend the meeting. Additionally IDNR and IHPA indicated that use of state waters as well as the towpath at the Dresden Island Project will require some form of lease agreement and permitting between NIH and IDNR. Construction activities within the waterway such as dredging and filling will also trigger state permitting authority.

# 3.8 Potential Construction Issues at Dresden

NIH and Kleinschmidt explained that the current design plan under development for Dresden Island requires excavation downstream of the proposed powerhouse. The additional excavation will add additional head to the generating capacity but may affect both flow patterns and aquatic habitat currently established below the spillway gates at Dresden. There were no objections to the proposal at the meeting, though all agencies indicated that they would express their comments once they had the opportunity to review the design. IDNR suggested that NIH include the area below the spillway in the mussel survey and along with the ACOE requested a model showing the flow patterns after excavation. Kleinschmidt will modify the mussel survey accordingly and will develop a flow model as part of the plan design.

#### 4.0 FOLLOW-UP MEETING WITH IDNR

NIH and Kleinschmidt met with Mike Diedrichsen to discuss Mike's department's involvement with the licensing process. While Mike's office will have permitting authority over the Project and will require NIH to submit permit applications for IDNR approval prior to initiating any construction activities within the waterway. Key points of the meeting include:

- Any placement of spoil material within the waterway must not change the base flood elevation. Spoil material may not be deposited below the river's normal stage unless shown to comply with IDNR's Part 3704 Public Water Regulations.
- NIH will likely need to prepare and submit a Joint Application to INDR, ACOE, and IEPA.
- Because of the Project locations, there may be two separate jurisdictions for permitting. (Springfield and Northeastern Illinois).
- Mike's group at IDNR won't be involved in the licensing process.
- Paul Mauer is the contact for obtaining a lease for the use of waters.

# 5.0 ACTION ITEMS

- Kleinschmidt to revise Project Boundary Maps
- Kleinschmidt to provide USFWS/IDNR with Commonwealth Edison fish survey data
- NIH to undertake sediment sampling, DO sampling, and mussel surveys (as modified from comments received) to support license applications
- NIH/Kleinschmidt to undertake desktop entrainment and hydrologic modeling to support license applications
- NIH/Kleinschmidt to include flow modeling both upstream and downstream of the projects to show any effects to navigation or to habitat
- IDNR to forward list of contractor to accomplish mussel survey
- USFWS to issue comments on the PADs

 $J:\1538\003\Meetings\Draft 8-14-08 mtg summary final draft.doc$ 

2008-08-13 Kleinschmidt response to USFWS re comment period.txt

From: Jay Maher

Sent: Wednesday, August 13, 2008 5:15 PM To: 'Shawn_Cirton@fws.gov'

Cc: Allison Murray; 'Damon Zdunich' Subject: RE: FW: Fish Species Table NIH

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How is that for a long answer to a short question? You have time! J

----Original Message----

From: Shawn_Cirton@fws.gov [mailto: Shawn_Cirton@fws.gov]

Sent: Wednesday, August 13, 2008 4:53 PM

To: Jay Maher

Cc: Allison Murray

Subject: RE: FW: Fish Species Table NIH

Thanks Jay. So, when did that clock start and how long do I have?

Shawn

******

Shawn Cirton Fish and Wildlife Biologist U.S. Fish and Wildlife Service Chicago Illinois Field Office 1250 South Grove Avenue, Suite 103 Barri ngton, IL 60010 (847)381-2253 xt.19 (847)381-2285 Fax shawn_cirton@fws.gov http: //mi dwest. fws. gov/chi cago

The mission of the U. S. Fish and Wildlife Service: Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

> "Jay Maher" <Jay. Maher@KI ei ns chmi dtUSA. com>

To <Shawn_Cirton@fws.gov>, "Allison Page 1

2008-08-13 Kleinschmidt response to USFWS re comment period.txt 08/13/2008 03:46 Murray" PM<Allison. Murray@KleinschmidtUSA.com

CC

Subj ect

RE: FW: Fish Species Table NIH

Shawn, we will be happy to have your comments now. After reviewing the regulations, I think you are well within the time frame as the clock really does not start till FERC notifies us/you of starting the proceeding. But, the earlier we get them, the earlier we get started on addressing them. Thanks.
Feel Free to call either Allison or I if you have any questions.
try to get a copy of the regulations out to you tomorrow. Jeremiah (Jay) L. Maher Senior Regulatory Advisor Kleinschmidt Energy & Water Resource Consultants 307 McKee Crossing New Castle, PA 16105

P: 207. 416. 1239 Cell: 724.674.6145

www. kl ei nschmi dtusa. com

----Original Message----

From: Shawn_Cirton@fws.gov [mailto: Shawn_Cirton@fws.gov]

Sent: Wednesday, August 13, 2008 11:26 AM

To: Allison Murray Cc: Jay Maher Subject: Re: FW: Fish Species Table NIH

Please provide me with your contact information (including fax Thanks Allison. number) so I can send our comments by the end of the week. The original will be sent in the mail and arrive next week.

Shawn

*******

Shawn Cirton Fish and Wildlife Biologist U.S. Fish and Wildlife Service Chicago Illinois Field Office 1250 South Grove Avenue, Suite 103 Barrington, IL 60010 (847)381-2253 xt.19 (847)381-2285 Fax shawn_cirton@fws.gov http://midwest.fws.gov/chicago

The mission of the U. S. Fish and Wildlife Service: Working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Page 2

# 2008-08-13 Kleinschmidt response to USFWS re comment period.txt

"Allison Murray"

<Allison. Murray@K

I ei nschmi dtUSA. co

To

<Shawn_Ci rton@fws. gov> m>

CC

08/13/2008 09:50 "Jay Maher"

AM<Jay. Maher@KI ei nschmi dtUSA. com>

Subj ect

FW: Fish Species Table NIH

Hi Shawn, My apologies for not including you on the first email.

As with Bob, it was a pleasure speaking with you in Springfield. I hope that one day we can actually meet in person.

Regards, AlĬison

----Original Message----

From: Aĭlison Murrăy

Sent:

To:

Monday, August 11, 2008 1:48 PM 'Schanzle, Bob' Jay Maher; Nicholas Morgan FW: Fish Species Table Cc: Subject:

Hi There Bob,

It was great to finally meet you last week. Attached is the Commonwealth Edison fish list we discussed.

2008-08-13 Kleinschmidt response to USFWS re comment period.txt We are gearing up internally to do the mussel surveys. Any chance you could send that list of local contractors who do this type of work? We'd like to contact them as soon as possible. Also, the invite remains open for you to come and visit, dive, watch the surveys when we get them scheduled!

Thanks, Allison

<<Table 9.3-5.pdf>>

Cite: Commonwealth Edison, 1996. Final Report. Aquatic Ecological Study of the Upper Illinois Waterway Volume 2 of 2. Commonwealth Edison Company, Chicago, Illinois.

[attachment "Table 9.3-5.pdf" deleted by Shawn Cirton/R3/FWS/DOI]

---- Message from "Jay Maher" <Jay. Maher@KleinschmidtUSA.com> on Sun, 28 Aug 2005 18: 10: 45 -0400 ----

Subject: Jeremiah (Jay) L. Maher

2008-08-11 IDNR mussels.txt

FW: Fish Species TableFrom: Schanzle, Bob [Bob.Schanzle@Illinois.gov]

Sent: Monday, August 11, 2008 4:14 PM

To: Allison Murray Subject: RE: Fish Species Table

It was a pleasure meeting you, Allison.

Attached per your request is a listing of potential consultants who might perform the proposed mussel surveys. Unfortunately, none of them is really "local" in terms of proximity to the project sites. To expand on our discussions of August 6, since there is no evidence that freshwater mussels have re-colonized the Illinois Waterway upstream from Dresden, your survey efforts should be weighted towards the area below Dresden Lock & Dam, particularly where dredging or altered flow patterns are anticipated. Lacking any evidence of significant mussel resources in the vicinity of Brandon Road, I believe only a minimal survey effort is called for.

Please feel free to contact me if I can be of further assistance.

Robert W. Schanzle Permit Program Manager IDNR, Office of Realty and Environmental Planning

217-785-4863 bob. schanzl e@illinois. gov

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com] Sent: Monday, August 11, 2008 12:48 PM To: Schanzle, Bob Cc: Jay Maher; Nicholas Morgan Subject: FW: Fish Species Table

Hi There Bob,

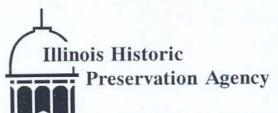
It was great to finally meet you last week. Attached is the Commonwealth Edison fish list we discussed.

We are gearing up internally to do the mussel surveys. Any chance you could send that list of local contractors who do this type of work? We'd like to contact them as soon as possible. Also, the invite remains open for you to come and visit, dive, watch the surveys when we get them scheduled!

Thanks. Allison

<<Table 9.3-5.pdf>>

Cite: Commonwealth Edison, 1996. Final Report. Aquatic Ecological Study of the Upper Illinois Waterway Volume 2 of 2. Commonwealth Edison Company, Chicago, III i noi s.



FAX (217) 782-8161

1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • www.illinois-history.gov

Grundy County Morris

> New Construction, Dresden Island Hydroelectric Project Illinois River Mile 271.5 FERC-12626 IHPA Log #002080608

August 7, 2008

Kimberly D. Bose Federal Energy Regulatory Commission 888 First Street NE, Room 1A Washington, DC 20426

Dear Ms. Bose:

Thank you for requesting comments from our office concerning the possible effects of your project on cultural resources. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Our staff has reviewed the specifications of the referenced project as submitted by your office. This property is located within the Dresden Island Lock and Dam Historic District, which was listed on the National Register of Historic Places on March 10, 2004. We cannot adequately review this proposed project until the following additional documentation has been submitted to our Agency:

- 1. On site inspection by Illinois Historic Preservation Agency staff.
- Our office is given an opportunity to review and approve plans and specifications as they are developed to ensure the project meets the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings".

In your reply, please refer to IHPA Log #002080608. If you have any further questions, please contact me at 217/785-5027.

Sincerely,

Anne E. Haaker

Deputy State Historic

Preservation Officer

c: Damon Zdunich, Northern Illinois Hydropower, LLC Jeremiah Maher, Kleinschmidt Associates 2008-08-05 ACOE PAD Mtg attendance.txt

From: Bartek, James W MVR [JAMES. W. BARTEK@usace.army.mil]

Sent: Tuesday, August 05, 2008 1:57 PM

To: Allison Murray Subject: RE: Brandon Road & Dresden Island Pre-Application Document

Review Meeting (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

Allison,

I had intended to attend tomorrow's meeting but given the situation with the recent flooding and recovery efforts, I will not be able to make it. I don't foresee any major questions on our part this early in the process but I would like to dial in if there is still time to do so.

Jim Bartek

----Original Message----

From: Allison Murray [mailto: Allison. Murray@KleinschmidtUSA.com]

Sent: Wednesday, July 30, 2008 3:41 PM
To: Schanzle, Bob MVS External Stakeholder; Haaker, Anne; akoval@canalcor.org; angie_tornes@nps.gov; Cox, Michael D MVR; michael_chezik@fws.gov; jeff_gosse@fws.gov; Shawn_Cirton@fws.gov; Brian Radner; Diedrichsen, Mike;

dan. heacock@illinois.gov; Bartek, James W MVR; RockIsland@fws.gov

Cc: Damon Zdunich; Jay Maher

Subject: Brandon Road & Dresden Island Pre-Application Document Review Meeting

#### Good Afternoon

We have attempted to contact everyone on this email list to advise you of Northern Illinois Hydropower, LLC's (NIH) scheduled Pre-Application Document (PAD) review meeting for the proposed Brandon Road and Dresden Island hydroelectric projects. While we understand that several of you are not available for the meeting, we are distributing the attached agenda to everyone for informational purposes.

As the agenda indicates, we anticipate spending approximately four hours discussing the FERC licensing process and the contents of the PADs distributed to you on July 17. We are hoping to solicit your agency's insight and positions on the document, any other resource information that may be available to NIH as it moves forward with the licensing process, and other information which you believe is needed to develop FERC license

As the agenda indicates, the Illinois Historic Preservation documents. Commission has been kind enough to host the meeting. Participants should enter the parking deck under the Old State Capitol on 6th Street and park on the upper level. The entrance to IHPC's office is on the south side of that floor. The conference room will be to the left as you come in. I will follow up with those who requested teleconferencing with the dial in information in a separate email.

If possible, we intend to conclude the meeting around 1:00pm. We are, however, available for the day if the group feels we need more time. In an effort to move through the topics as expediently as possible, we have not scheduled a lunch break. We can, as a group, decide if this is appropriate on Wednesday. If you have any questions or agenda items you wish to include, please feel free to contact me via email or at the numbers indicated below. I very much look forward to meeting with you.

Regards, Allison

<<Final PAD Review mtg agenda.doc>> Allison Murray Project Regulatory Coordinator

# 2008-08-05 ACOE PAD Mtg attendance.txt

KI ei nschmi dt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell)

Classification: UNCLASSIFIED Caveats: NONE

# PEORIA TRIBE OF INDIANS OF OKLAHOMA



118 S. Eight Tribes Trail (918) 540-2535 FAX (918) 540-2538 P.O. Box 1527 MIAMI, OKLAHOMA 74355

CHIEF John P. Froman

SECOND CHIEF Jason Dollarhide

July 30, 2008

Northern Illinois Hydropower, LLC Attn: Damon Zdunich President 801 Oakland Ave. Joliet, IL 60435

RE: Notice of intent, pre-application document and application to use the traditional licensing process

Brandon Road Hydropower Project (FERC No. 12717) and Dresden Island Hydropower Project (FERC No. 12626)

Thank you for notice of the referenced projects. The Peoria Tribe of Indians of Oklahoma is currently unaware of any documentation directly linking Indian Religious Sites to the proposed construction. In the event any items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered during construction, the Peoria Tribe request notification and further consultation.

The Peoria Tribe has no objection to the proposed construction. However, if any human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, the construction should stop immediately, and the appropriate persons, including state and tribal NAGPRA representatives contacted.

John P. Froman Chief

xc: Bud Ellis, Repatriation/NAGPRA Committee Chairman

2008-07-17 IEPA receipt of PAD. txt

Availability of Notice of Intent and PAD - Dresden Island and Brandon Roads

Hydroel ectric Projects (FERC Nos. 12626 & 12717) From: Heacock, Dan

[Dan. Heacock@Illinois. gov]
Sent: Thursday, July 17, 2008 3:05 PM
To: Jay Maher
Cc: Allison Murray

Subject: RE: Availability of Notice of Intent and PAD - Dresden Island and Brandon

Roads Hydroel ectric Projects (FERC Nos. 12626 & 12717)

That would be ok

Note: My new email address is Dan. Heacock@illinois.gov

Dani el L. Heacock, P. E.

Manager, Facility Evaluation Unit

Bureau of Water

Illinois Environmental Protection Agency

1021 N. Grand Ave. East

Springfield, IL 62794-9276

ph. no. 217/782-3362

fax no. 217/785-1225

email: Dan. Heacock@illinois.gov

From: Jay Maher [mailto: Jay. Maher@KleinschmidtUSA.com] Sent: Thursday, July 17, 2008 1:54 PM

To: Heacock, Dan Cc: Allison Murray

Subject: RE: Availability of Notice of Intent and PAD - Dresden Island and Brandon

Roads Hydroel ectric Projects (FERC Nos. 12626 & 12717)

Will one Hard copy and one CD suffice? Will do!

Thank you for responding.

J

----Original Message----

From: Heacock, Dan [mailto: Dan. Heacock@lllinois.gov]

Sent: Thursday, July 17, 2008 2:52 PM

To: Jay Maher

2008-07-17 IEPA receipt of PAD. txt

Subject: RE: Availability of Notice of Intent and PAD - Dresden Island and Brandon Roads Hydroel ectric Projects (FERC Nos. 12626 & 12717)

Please send us a hard copy.

Note: My new email address is Dan. Heacock@illinois.gov

Dani el L. Heacock, P. E.

Manager, Facility Evaluation Unit

Bureau of Water

Illinois Environmental Protection Agency

1021 N. Grand Ave. East

Springfield, IL 62794-9276

ph. no. 217/782-3362

fax no. 217/785-1225

email: Dan. Heacock@illinois.gov

From: Jay Maher [mailto: Jay. Maher@KleinschmidtUSA.com] Sent: Thursday, July 17, 2008 8:55 AM

To: michael.bryant@dhs.gov; Buhnerkempe, John; DNR, Parksadmin; Schanzle, Bob; Diedrichsen, Mike; Heacock, Dan; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; mi chael _chezi k@fws. gov; j ohn_rogner@fws. gov; j eff_gosse@fws. gov; RockI sl and@fws. gov; robert_cl evensti ne@fws. gov; dduffy@grundyco. org; bradner@wi l I countyl anduse. com Cc: peggy. hardi ng@ferc. gov; vi nce. yeari ck@ferc. gov; dzduni ch@ni hydropower. com; Jay Maher; Al I i son Murray; Damon Zduni ch

Subject: Availability of Notice of Intent and PAD - Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717)

<< Jeremi ah (Jay) L. Maher>>

Good Morning,

This email is a notice to you that Northern Illinois Hydropower has filed the NOI and PAD and a request to use the Traditional Licensing Process with FERC on July 16 for both of the referenced Projects. You will be receiving a similar notice by US Mail shortly, but I wanted you all to know as quickly as possible. The documents are all available as described below on either Northern Illinois Hydropower's website (By the COB July 17) or on FERC's elibrary. For those of you who have previously requested hard copies of the filings, they are on the way. If you have If you have Page 2

2008-07-17 IEPA receipt of PAD. txt

not requested a hard copy and you wish to receive one, please reply to this email or send an email to info@NIHydropower.com .

We are in the process of finalizing arrangements for an 'open' meeting for interested agency personnel on August 5 or 6 in Springfield, II. We will also, if there is interest, schedule a second meeting for agencies in the Joliet (Projects') area. These meetings will provide an opportunity to discuss the PAD, as well as the licensing process and for the licensee to answer questions and gather additional information from the agencies regarding potential issues in developing the sites.

If you have any questions regarding the documents or the licensing process, please feel free to contact me by email or phone.

J

"Northern Illinois Hydropower, LLC (NIH) herein provides notice that it has filed with the Federal Energy Regulatory Commission (Commission) its Notices of Intent (NOI) and Pre-Application Documents (PAD) for licensing of the proposed Brandon Road Hydropower Project (FERC No. 12717) and the proposed Dresden Island Hydroelectric Project (FERC No. 12626). The PADs were prepared in accordance with 18 CFR §5.6 (c) and (d).

The Brandon Road Project is located on the Des Plaines River in Will County, Illinois, immediately south of Joliet, Illinois. The Dresden Island Project is located immediately downstream of the confluence of the Des Plaines and Kankakee River on the Illinois River near the town of Morris. Both proposed Projects are located at existing US Army Corps of Engineers Lock and Dams. NIH has also filed an Application to use the Traditional Licensing Process (TLP).

The PAD was electronically filed with FERC on July 16, 2008. This notice was sent to the Brandon Road Hydropower Project and Dresden Island Hydroelectric Project mailing list (see attached). Electronic copies of the filing are available on the Project licensing website (http://www.nihydropower.com), as well as on the Commission's eLibrary (http://www.ferc.gov) (under documents and filings). A hard copy can be provided by request by contacting Damon Zdunich at 801 Oakland Avenue, Joliet, IL 60435, at (815) 723-6314 or by emailing info@nihydropower.com "

Jeremi ah (Jay) L. Maher
Seni or Regul atory Advi sor
Klei nschmi dt
Energy & Water Resource Consul tants
307 McKee Crossi ng
New Castle, PA 16105

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

2008-07-17 Kleinschmidt Availability of NOI PAD TLP.txt

From: Jay Maher
Sent: Thursday, July 17, 2008 9:55 AM
To: 'michael.bryant@dhs.gov'; 'john.buhnerkempe@illinois.gov';
'dnr.parksadmin@illinois.gov'; 'bob.schanzle@illinois.gov';
'mike.diedrichsen@illinois.gov'; 'dan.heacock@illinois.gov';
'anne.haaker@ihpa.state.il.us'; 'akoval@canalcor.org'; 'diane_banta@nps.gov';
'JAMES.W.BARTEK@usace.army.mil'; 'Michael.D.Cox@usace.army.mil';
'michael_chezik@fws.gov'; 'john_rogner@fws.gov'; 'jeff_gosse@fws.gov';
'RockIsland@fws.gov'; 'robert_clevenstine@fws.gov'; 'dduffy@grundyco.org';
'bradner@willcountylanduse.com'
Cc: 'peggy.harding@ferc.gov'; 'vince.yearick@ferc.gov';
'dzdunich@nihydropower.com'; Jay Maher; Allison Murray; 'Damon Zdunich'
Subject: Availability of Notice of Intent and PAD - Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717)

#### Good Morning,

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We are in the process of finalizing arrangements for an 'open' meeting for interested agency personnel on August 5 or 6 in Springfield, Il. We will also, if there is interest, schedule a second meeting for agencies in the Joliet (Projects') area. These meetings will provide an opportunity to discuss the PAD, as well as the licensing process and for the licensee to answer questions and gather additional information from the agencies regarding potential issues in developing the sites.

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The PAD was electronically filed with FERC on July 16, 2008. This notice was sent to the Brandon Road Hydropower Project and Dresden Island Hydroelectric Project mailing list (see attached). Electronic copies of the filing are available on the Project licensing website (http://www.nihydropower.com), as well as on the Commission's eLibrary (http://www.ferc.gov) (under documents and filings). A hard copy can be provided by request by contacting Damon Zdunich at 801 Oakland Avenue, Joliet, IL 60435, at (815) 723-6314 or by emailing info@nihydropower.com "

2008-07-17 Kleinschmidt Availability of NOI PAD TLP.txt Jeremiah (Jay) L. Maher Senior Regulatory Advisor Kleinschmidt Energy & Water Resource Consultants 307 McKee Crossing New Castle, PA 16105

P: 207.416.1239 Cell: 724.674.6145 www.kleinschmidtusa.com Message Page 1 of 3

From: Brian Radner [BRadner@willcountylanduse.com]

**Sent:** Thursday, July 10, 2008 1:58 PM

**To:** Allison Murray **Subject:** Questionnaire

Allison-

Attached is the form that is one year late. Sorry for the delay!

Brian Radner, AICP, Senior Planner

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Tuesday, July 08, 2008 2:22 PM

To: Brian Radner

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

Process Update and Meeting Planning

Thanks for the response Brian. We will make every effort to schedule the meeting on the 6th. You're the first person to express a preference. Hopefully it will work out for the majority.

## Regards, Allison

----Original Message----

From: Brian Radner [mailto:BRadner@willcountylanduse.com]

Sent: Tuesday, July 08, 2008 2:57 PM

**To:** Allison Murray

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

Process Update and Meeting Planning

Electronic submittals are fine.

Brian Radner, AICP, Senior Planner

From: Brian Radner

Sent: Tuesday, July 08, 2008 1:56 PM

To: 'Allison Murray'

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

Process Update and Meeting Planning

Allison-

The Land Use Department Staff typically has conflicts on every Tuesday and the 2nd & 3rd Thursday of each month. We would request a meeting outside of these times. However, we would make every attempt to attend any meeting.

Best regards,

Brian Radner, AICP, Senior Planner

**From:** Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Message Page 2 of 3

Sent: Monday, July 07, 2008 3:19 PM

**To:** michael.bryant@dhs.gov; john.buhnerkempe@illinois.gov; dnr.parksadmin@illinois.gov; bob.schanzle@illinois.gov; mike.diedrichsen@illinois.gov; dan.heacock@illinois.gov; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; michael_chezik@fws.gov; john_rogner@fws.gov; jeff_gosse@fws.gov; RockIsland@fws.gov; robert_clevenstine@fws.gov; dduffy@grundyco.org; Brian Radner

**Cc:** peggy.harding@ferc.gov; vince.yearick@ferc.gov; dzdunich@nihydropower.com; Jay Maher **Subject:** Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning

### Good Afternoon,

We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with FERC. In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August.

In an effort to more efficiently distribute information, NIH intends to use electronic mail where possible. If you wish to receive hard copies of this or future transmittals, please contact me with your preferred mailing instructions. If you do not intend to participate in the FERC licensing process or believe there is a more appropriate person in your organization who we should contact in the future, please also respond with that information.

I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards, Allison

<<001-Agency invite letter 7-7-08 final.pdf>>

Allison Murray Project Regulatory Coordinator

### Kleinschmidt

Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) Message Page 3 of 3

207.249.9048 (cell)

2008-07-10 IHPA FERC process update mtg. txt

FW: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting PlanningFrom: Haaker, Anne

[Anne. Haaker@lllinois.gov] Sent: Thursday, July 10, 2008 9:57 AM

To: Allison Murray

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning

Yes, thank you. I obviously got your e-mail. We would be happy to be available for a meeting in August.

From: Allison Murray [mailto: Allison. Murray@KleinschmidtUSA.com]

Sent: Thursday, July 10, 2008 7:37 AM

To: Haaker, Anne

Subject: FW: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning

Hi Anne,

I called your office to verify your email address, but perhaps the lady I spoke to didn't realize she gave me an old one.

Hoping you get this transmittal this time.

Regards, Allison

----Original Message----

Allison Murray From:

Monday, July 07, 2008 4:19 PM

To: 'michael.bryant@dhs.gov'; 'john.buhnerkempe@illinois.gov'; 'dnr.parksadmin@illinois.gov'; 'bob.schanzle@illinois.gov'; 'mike.diedrichsen@illinois.gov'; 'dan.heacock@illinois.gov'; 'anne.haaker@ihpa.state.il.us'; 'akoval@canalcor.org'; 'diane_banta@nps.go'JAMES.W.BARTEK@usace.army.mil'; 'Michael.D.Cox@usace.army.mil'; 'michael_chezik@fws.gov'; 'john_rogner@fws.gov'; 'jeff_gosse@fws.gov'; 'Rocklsland@fws.gov'; 'robert_clevenstine@fws.gov'; 'dduffy@grundyco.org'; 'bradnor@will.countylanduso.com' 'diane banta@nps.gov';

'bradner@willcountylanduse.com'

'peggy. hardi ng@ferc. gov'; 'vi nce. yeari ck@ferc. gov';

dzduni cheni hydropower. com'; Jay Maher

Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos.

12626 & 12717) FERC Process Update and Meeting Planning

Good Afternoon,

We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with FERC. In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August.

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 $2008\mbox{-}07\mbox{-}10$  I HPA FERC process update mtg. txt please also respond with that information.

I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards, Allison

<<001-Agency invite letter 7-7-08 final.pdf>>

Allison Murray Project Regulatory Coordinator

Kleinschmidt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell) Message Page 1 of 3

From: Schanzle, Bob [Bob.Schanzle@Illinois.gov]

**Sent:** Tuesday, July 08, 2008 10:23 AM

**To:** Allison Murray **Cc:** Diedrichsen, Mike

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717)

FERC Process Update and Meeting Planning

Allison, you will need to keep Mike Diedrichsen or his designee in the loop since the IDNR Office of Water Resources is responsible for the review and issuance of state permits for work in water. My office, Realty and Environmental Planning, coordinates the Department's review of federal permitting and licensing activities including FERC, Corps of Engineers Section 10 and 404 permits, mining, etc. As necessary, we will involve other IDNR disciplines in the review process, such as Wildlife Resources (John Buhnerkempe), Fisheries, Natural Heritage and Lands.

Bob S.

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Tuesday, July 08, 2008 8:47 AM

To: Schanzle, Bob

Cc: Damon Zdunich; Jay Maher

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

Process Update and Meeting Planning

Thanks for the timely response Bob. As you may have noted in the email, I have multiple DNR folks on the list. I certainly don't want to miss anyone who will participate but would like to avoid redundant distribution of material. Do you have any insight on the folks I have contacted to date?

Regards, Allison

-----Original Message-----

From: Schanzle, Bob [mailto:Bob.Schanzle@Illinois.gov]

Sent: Tuesday, July 08, 2008 9:32 AM

**To:** Allison Murray; michael.bryant@dhs.gov; Buhnerkempe, John; DNR, Parksadmin; Diedrichsen, Mike; Heacock, Dan; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; michael_chezik@fws.gov; john_rogner@fws.gov; jeff_gosse@fws.gov; RockIsland@fws.gov; robert_clevenstine@fws.gov; dduffy@grundyco.org; bradner@willcountylanduse.com

Cc: peggy.harding@ferc.gov; vince.yearick@ferc.gov; dzdunich@nihydropower.com; Jay Maher

Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

**Process Update and Meeting Planning** 

Allison,

The Illinois Department of Natural Resources will participate in the licensing process. I am currently available for a meeting any day from August 1 to August 15, but that's subject to change on short notice.

I would like to receive hard copies of any future transmittals. My mailing address follows.

Thank you,

Robert W. Schanzle IDNR, Office of Realty and Environmental Planning

Message Page 2 of 3

One Natural Resources Way Springfield, Illinois 62702-1271

Ph: 217-785-4863 bob.schanzle@illinois.gov

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Monday, July 07, 2008 3:19 PM

**To:** michael.bryant@dhs.gov; Buhnerkempe, John; DNR, Parksadmin; Schanzle, Bob; Diedrichsen, Mike; Heacock, Dan; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; michael_chezik@fws.gov;

john_rogner@fws.gov; jeff_gosse@fws.gov; RockIsland@fws.gov; robert_clevenstine@fws.gov;

dduffy@grundyco.org; bradner@willcountylanduse.com

**Cc:** peggy.harding@ferc.gov; vince.yearick@ferc.gov; dzdunich@nihydropower.com; Jay Maher **Subject:** Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC

**Process Update and Meeting Planning** 

#### Good Afternoon,

We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with FERC. In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August.

In an effort to more efficiently distribute information, NIH intends to use electronic mail where possible. If you wish to receive hard copies of this or future transmittals, please contact me with your preferred mailing instructions. If you do not intend to participate in the FERC licensing process or believe there is a more appropriate person in your organization who we should contact in the future, please also respond with that information.

I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards, Allison

<<001-Agency invite letter 7-7-08 final.pdf>>

Allison Murray Project Regulatory Coordinator

#### Kleinschmidt

Energy & Water Resource Consultants

Message Page 3 of 3

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell) 2009-07-08 USFWS point of contact info.txt

From: John_Rogner@fws.gov

Sent: Tuesday, July 08, 2008 3:17 PM

To: Allison Murray

Cc: Shawn_Cirton@fws.gov; Karla_Kramer@fws.gov Subject: Re: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning

Allison -

Shawn Cirton (copied on this e-mail) is our office's point of contact for this project.

John

John D. Rogner Supervisor, Chicago Ecological Services Field Office U.S. Fish and Wildlife Service 1250 S. Grove Ave., Suite 103 Barrington, IL 60010 847/381-2253 ext. 11 fax 847/381-2285 http://midwest.fws.gov/chicago

"Allison Murray" <Allison. Murray@KleinschmidtUSA.com> 07/07/2008 03:18 PM To <mi chael.bryant@dhs.gov>, <john.buhnerkempe@illinois.gov>, <dnr. parksadmi n@illi noi s. gov>, <bob. schanzl e@illi noi s. gov>, <mi ke. di edri chsen@illi noi š. gov>, <dan. heacock@illi noi s. gov>, <JAMES. W. BARTEK@usace. army. mil>, <Mi chael. D. Cox@usace. army. mil>,
<mi chael _chezi k@fws. gov>, <j ohn_rogner@fws. gov>, <j eff_gosse@fws. gov>,
<Rockl sl and@fws. gov>, <robert_cl evensti ne@fws. gov>, <dduffy@grundyco. org>, <bradner@willcountylanduse.com> cc <peggy. hardi ng@ferc. gov>, <vi nce. yeari ck@ferc. gov>, <dzduni ch@ni hydropower. com>, "Jay Maher" <Jay. Maher@KI ei nschmi dtUSA. com> Subject Dresden Island and Brandon Roads Hydroel ectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning

Good Afternoon, We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with FERC. In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August. In an effort to more efficiently distribute information, NIH intends to use electronic mail where possible. If you wish to receive hard copies of this or future transmittals, please contact me with your preferred mailing instructions. If you do not intend to participate in the FERC licensing process or believe there is a more appropriate person in your organization who we should contact in the future, please also respond with that information.

I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards,

### 2009-07-08 USFWS point of contact info.txt

### Allison

<<001-Agency invite letter 7-7-08 final.pdf>>

Allison Murray Project Regulatory Coordinator

KI ei nschmidt Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell) From: Schanzle, Bob [Bob.Schanzle@Illinois.gov]

**Sent:** Tuesday, July 08, 2008 9:32 AM

**To:** Allison Murray; michael.bryant@dhs.gov; Buhnerkempe, John; DNR, Parksadmin; Diedrichsen, Mike; Heacock, Dan; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; michael_chezik@fws.gov; john_rogner@fws.gov; jeff_gosse@fws.gov; RockIsland@fws.gov; robert_clevenstine@fws.gov; dduffy@grundyco.org; bradner@willcountylanduse.com

Cc: peggy.harding@ferc.gov; vince.yearick@ferc.gov; dzdunich@nihydropower.com; Jay Maher Subject: RE: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process Update and Meeting Planning Allison,

The Illinois Department of Natural Resources will participate in the licensing process. I am currently available for a meeting any day from August 1 to August 15, but that's subject to change on short notice.

I would like to receive hard copies of any future transmittals. My mailing address follows.

Thank you,

Robert W. Schanzle IDNR, Office of Realty and Environmental Planning One Natural Resources Way Springfield, Illinois 62702-1271

Ph: 217-785-4863 bob.schanzle@illinois.gov

From: Allison Murray [mailto:Allison.Murray@KleinschmidtUSA.com]

Sent: Monday, July 07, 2008 3:19 PM

To: michael.bryant@dhs.gov; Buhnerkempe, John; DNR, Parksadmin; Schanzle, Bob; Diedrichsen, Mike;

Heacock, Dan; anne.haaker@ihpa.state.il.us; akoval@canalcor.org; diane_banta@nps.gov; JAMES.W.BARTEK@usace.army.mil; Michael.D.Cox@usace.army.mil; michael_chezik@fws.gov; john_rogner@fws.gov; jeff_gosse@fws.gov; RockIsland@fws.gov; robert_clevenstine@fws.gov;

dduffy@grundyco.org; bradner@willcountylanduse.com

Cc: peggy.harding@ferc.gov; vince.yearick@ferc.gov; dzdunich@nihydropower.com; Jay Maher

Subject: Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos. 12626 & 12717) FERC Process

**Update and Meeting Planning** 

### Good Afternoon,

We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with FERC. In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August.

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I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards, Allison

<<001-Agency invite letter 7-7-08 final.pdf>>

Allison Murray Project Regulatory Coordinator

### Kleinschmidt

Energy & Water Resource Consultants

141 Main Street P.O. Box 576 Pittsfield, Maine 04965

207.487.3328 207.487.3124 (fax) 207.249.9048 (cell)

2008-07-07 Kleinschmidt process plan mtg invite. txt Allison Murray

Monday, July 07, 2008 4:19 PM Sent:

To: 'michael.bryant@dhs.gov'; 'john.buhnerkempe@illinois.gov'; 'dnr.parksadmin@illinois.gov'; 'bob.schanzle@illinois.gov'; 'mike.diedrichsen@illinois.gov'; 'dan.heacock@illinois.gov'; 'anne.haaker@ihpa.state.il.us'; 'akoval@canalcor.org'; 'diane_banta@nps.gov'; 'JAMES.W.BARTEK@usace.army.mil'; 'Michael.D.Cox@usace.army.mil'; 'michael_chezik@fws.gov'; 'john_rogner@fws.gov'; 'jeff_gosse@fws.gov'; 'RockIsland@fws.gov'; 'robert_clevenstine@fws.gov'; 'dduffy@grundyco.org';

'bradner@willcountylanduse.com'

peggy. hardi ng@ferc. gov'; 'vi nce. yeari ck@ferc. gov';

dzduni ch@ni hydropower. com'; Jay Maher

Dresden Island and Brandon Roads Hydroelectric Projects (FERC Nos.

12626 & 12717) FERC Process Update and Meeting Planning

Good Afternoon,

From:

We are contacting you on behalf of Northern Illinois Hydropower, LLC (NIH) regarding its proposed Federal Energy Regulatory Commission (FERC) licensing of the Dresden Island and Brandon Roads hydroelectric projects. The attached letter advises you of NIH's process to date and its intent to file Pre-Application Documents (PAD)s with In an effort to move forward collaboratively, NIH wishes to extend an invitation to you to meet to review and discuss the PADs in early August.

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I look forward to hearing from you regarding your preferred meeting times and dates as suggested in the attached letter.

Regards, Allison

Allison Murray Project Regulatory Coordinator

KI ei nschmi dt Energy & Water Resource Consultants

141 Main Street P. 0. Box 576 Pittsfield, Maine 04965

207. 487. 3328

207. 487. 3124 (fax)

207. 249. 9048 (cell)

2008-06-05 IDNR response to questionnaire and contact info.txt

MessageFrom: Mauer, Paul [Paul Mauer@Illinois.gov] Sent: Thursday, June 05, 2008 2:27 PM

To: Allison Murray

Subject: RE: Questionnaire for NIH

My office, Water Resources, will not participate in the process directly. Upon notice of the pre-application from FERC we simply reply that permits and possibly a lease will be required. The rest of our Department, will take a more active role in the licensing process relates to our ecological involvement. I just needed to clarify that those groups had received the information.

Paul

From: Allison Murray [mailto: Allison. Murray@KleinschmidtUSA.com]

Sent: Thursday, June 05, 2008 10:17 AM

To: Mauer, Paul Cc: Jay Maher

Subject: RE: Questionnaire for NIH

My apologies for not responding sooner. I was traveling when I received your email and have just now had the opportunity to address your question.

We sent the questionnaire to several office within DNR. They include:

Illinois Department of Natural Resources Illinois Natural History Survey Illinois Department of Natural Resources Office of Resource Consérvation John

Buhnerkempe

Illinois Department of Natural Resources Wildlife Resources Division

Illinois Department of Natural Resources Office of Land Management Illinois Department of Natural Resources Office of Realty and Environmental

Planning Bob Schanzle

IĬlinois Department of Natural Resources Office of Water Resources, Resource

Management Division Mike Diedrichsen, P.E.

Illinois Department of Natural Resources Office of Water Resources, Resource Management Division Paul Mauer, P.E.

Regards, Allison

----Original Message----

From: Mauer, Paul [mailto: Paul. Mauer@Illinois.gov]

Sent: Tuesday, May 27, 2008 3:20 PM

To: Allison Murray

Subject: Questionnaire for NIH

Our office is in receipt of your questionnaire. The envelope it came in is no longer with it. I need to know if this is the only one sent to the Illinois Department of Natural Resources, or if several offices received it.

Paul Mauer, Jr., P.E. IDNR - Office of Water Resources 2008-05-19 Kleinschmidt transmittal of non-disclosure doc.txt

From: Jay Maher
Sent: Monday, May 19, 2008 3:48 PM
To: 'Bartek, James W MVR'
Cc: Matt Dunlap; Allison Murray; 'Damon Zdunich'
Subject: RE: (UNCLASSIFIED)

A scan of the original is attached. I will mail the original today. Thank You! J

----Original Message----

From: Bartek, James W MVR [mailto: JAMES. W. BARTEK@usace.army.mil] Sent: Monday, May 19, 2008 3:39 PM

To: Jay Maher Subject: RE: (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

Good Afternoon Jay,

Attached is the non-disclosure letter for you or someone from Northern Illinois Hydro to sign & return. When I receive it, I'll drop a CD witht e drawings in the máil.

**Thanks** 

Jim B.

Classification: UNCLASSI FI ED

Caveats: NONE

2008-05-15 IEPA list of analytes.txt

Sediment Testing AnalysesFrom: Smogor, Roy [Roy. Smogor@Illinois.gov] Sent: Thursday, May 15, 2008 2:54 PM

To: Jesse Wechsler Cc: Allison Murray

Subject: RE: Sediment Testing Analyses

Jesse,

Attached is a list of the analytes in lake or stream sediments that have been monitored by Illinois EPA.

Roy

Roy Smogor

Illinois EPA

Bureau of Water/Surface Water Section

217/782-3362

From: Jesse Wechsler [mailto: Jesse. Wechsler@KleinschmidtUSA.com]

Sent: Wednesday, May 14, 2008 2:05 PM

To: Smogor, Roy Cc: Allison Murray

Subject: Sediment Testing Analyses

Hi Roy -

I stealthily tracked down your email address so I could pester you electronically. I have to go out of town for a few days, and am hoping that once you are able to put together a standard list of chemical constituents for sediment analysis, as we discussed, you could respond to this email so that a copy also gets through to Allison Murray. Allison will be covering for me while I am gone.

Any chance you'd be able to get that to us this week?

Please feel free to contact Allison at 207-487-3328 X 270, if you have any questi ons.

Many thanks again! Jesse

Jesse Wechsler Fisheries & Aquatic Scientist KI ei nschmi dt Energy and Water Resource Consultants 141 Main St. PO Box 650 Pittsfield, Maine 04967 tel: (207) 487-3328 (Ext. 278)

# 2008-05-15 IEPA list of analytes.txt

fax: (207) 487-3124 www. kl ei nschmi dtusa. com 2008-05-14 Kleinschmidt request for standard list for sed analysis.txt

From: Jesse Wechsler

Sent: Wednesday, May 14, 2008 3:05 PM

To: 'roy. smogor@illinois. gov'

Cc: Allison Murray

Subject: Sediment Testing Analyses

Subject: Hi Roy -

I stealthily tracked down your email address so I could pester you electronically. I have to go out of town for a few days, and am hoping that once you are able to put together a standard list of chemical constituents for sediment analysis, as we discussed, you could respond to this email so that a copy also gets through to Allison Murray. Allison will be covering for me while I am gone.

Any chance you'd be able to get that to us this week?

Please feel free to contact Allison at  $207-487-3328 \times 270$ , if you have any questions.

Many thanks again! Jesse

Jesse Wechsler
Fisheries & Aquatic Scientist
Kleinschmidt
Energy and Water Resource Consultants
141 Main St. PO Box 650
Pittsfield, Maine 04967
tel: (207) 487-3328 (Ext. 278)
fax: (207) 487-3124
www.kleinschmidtusa.com

2008-04-30 ACOE Jurisdiction Document.txt From: Bartek, James W MVR [JAMES.W.BARTEK@usace.army.mil] Sent: Wednesday, April 30, 2008 3:32 PM

To: Jay Maher Cc: Allison Murray; Cox, Michael D MVR Subject: (UNCLASSIFIED)

Classification: UNCLASSIFIED

Caveats: NONE

Jay & Allison

Attached is a document that clearly describes that we, the Federal Government have complete jurisdiction or own, maintain & operate the facilities.

Jim Bartek Rock Island District (309) 794 - 5599

Classification: UNCLASSIFIED

Caveats: NONE

2008-04-09 ACOE Sediment Survey cmts.txt

From: Bartek, James W MVR [JAMES. W. BARTEK@usace.army.mil]

Sent: Wednesday, April 09, 2008 2:18 PM

To: Jay Maher; Cox, Michael D MVR Cc: Allison Murray Subject: RE: Sediment Survey Proposal (UNCLASSIFIED)

Cl assi fi cati on: UNCLASSI FI ED

Caveats: NONE

Jay

The main concerns relate to issues probably best addressed by Mike - the need for the contractor to fully coordinate with the Project on activities in and around the lock approach and dam structure (and the need to not interfere with or interrupt barge traffic). Depending upon the flow conditions (and gate openings), there are some safety concerns about operating immediately upstream of the dam gates.

Another comment relating to the the drilling exploratory holes is that they should be backfilled with bentonite prior to pulling out drill casing.

Thanks for the opportunity to review,

Jim Bartek Rock Island District (309) 794-5599

----Original Message----

From: Jay Maher [mailto: Jay. Maher@KleinschmidtUSA.com] Sent: Thursday, April 03, 2008 2:44 PM

To: Bartek, James W MVR; Cox, Michael D MVR Cc: Allison Murray

Subject: Sediment Survey Proposal

Gentlemen,

Attached is a proposed Scope of Work for sediment surveys we would like to conduct at Brandon Road and Dresden Island.... (You can skip the contractual blather in the first half!) The gist of it is we want a solid survey of the quantity of sediment and the depth to bedrock, etc and then core samples for contaminant analysis. If you look at the maps we show a limited area for BR and a larger area for DI... We can expand or contract the scope of area for If the Corps has interest in the study and the survey as you may advise. would like us to include areas next to the navigation channels (DI Map) or other areas within the Corps interest - and might be interested in participating (think cost share ! :-)) we would be pleased to consider that or any other assistance you could provide.

If you could, right now, I am seeking any technical advice you might provide on the RFP, to insure we get the data that you feel is appropriate for our plan to develop the sites. Also, while I know the Corps can not endorse any particular contractor I would be interested in any suggestions you might have as to local firms that could do the work. ...unless, of course, the corps has the gear and the interest!

Anyway, my thanks for you taking the time to look this over. Please call or email, if you have questions or comments.

### 2008-04-09 ACOE Sediment Survey cmts.txt

Jeremi ah (Jay) L. Maher Senior Regulatory Advisor

KI ei nschmi dt Energy & Water Resource Consultants 307 McKee Crossing New Castle, PA 16105

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

Classification: UNCLASSIFIED Caveats: NONE

2008-04-03 Kleinschmidt Sediment Survey Proposal for ACOE review.txt

From: Jay Maher

Sent: Thursday, April 03, 2008 3:44 PM To: 'Bartek, James W MVR'; 'Cox, Michael D'Cc: Allison Murray

Subject: Sediment Survey Proposal

Gentlemen,

Attached is a proposed Scope of Work for sediment surveys we would like to conduct at Brandon Road and Dresden Island... (You can skip the contractual blather in the first half!) The gist of it is we want a solid survey of the quantity of sediment and the depth to bedrock, etc and then core samples for contaminant analysis. If you look at the maps we show a limited area for BR and a larger area for DI... We can expand or contract the scope of area for the survey as you may advise. If the Corps has interest in the study and would like us to include areas next to the navigation channels (DI Map) or other areas within the Corps interest – and might be interested in participating (think cost share! J) we would be pleased to consider that or any other assistance you could provide that or any other assistance you could provide.

If you could , right now, I am seeking any technical advice you might provide on the RFP, to insure we get the data that you feel is appropriate for our plan to develop the sites. Also, while I know the Corps can not endorse any particular contractor , I would be interested in any suggestions you might have as to local firms that could do the work. ...unless, of course, the corps has the gear and the interest!

Anyway, my thanks for you taking the time to look this over. Please call or email, if you have questions or comments.

J

Jeremiah (Jay) L. Maher Senior Regulatory Advisor

KI ei nschmi dt

Energy & Water Resource Consultants 307 McKee Crossing

New Castle, PA 16105

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

2008-03-31 Kleinschmidt request for contact information.txt

From: Jay Maher Sent: Monday, March 31, 2008 1:09 PM

To: Cox, Michael D Cc: Allison Murray

Subject: Contact information

Mi ke,

We are getting ready to send out our first 'official' communications regarding the development of Brandon Road and Dresden Island. Would you please send me (asap) your official contact info (name, title, address, phone, etc) along with any other Corps folks we should be contacting?

Much appreciated. Thanks,

J

Jeremiah (Jay) L. Maher Senior Regulatory Advisor

KI ei nschmi dt Energy & Water Resource Consultants 307 McKee Crossing New Castle, PA 16105

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

2008-03-31 ACOE ID of contact person. txt

From: Cox, Michael D MVR [Michael. D. Cox@usace.army.mil]

Sent: Monday, March 31, 2008 1:25 PM

To: Jay Maher
Cc: Allison Murray; Bartek, James W MVR
Subject: RE: Contact information (UNCLASSIFIED)

UNCLASSI FI ED Classi fi cati on:

Caveats: NONE

Jay,

Jim Bartek of our Engineering and Construction Division in Rock Island will be your main POC:

Jim Bartek - EC-DG U.S. Army Corps of Engineers, Rock Island District Clock Tower Building 205 P. O. Box 2004 Rock Island, Illinois 6i 204-2004

309-794-5599

Jim should verify his contact info before you use it.

Good Luck, Mi ke

----Original Message----

From: Jay Maher [mail to: Jay. Maher@KleinschmidtUSA.com]

Sent: Monday, March 31, 2008 12:09 PM

To: Cox, Michael D MVR Cc: Allison Murray Subject: Contact information

Mi ke,

We are getting ready to send out our first 'official' communications regarding the development of Brandon Road and Dresden Island. Would you please send me (asap) your official contact info (name, title, address, phone, etc) along with any other Corps folks we should be contacting?

Much appreciated. Thanks,

Jeremiah (Jay) L. Maher

Senior Regulatory Advisor

KI ei nschmi dt

Energy & Water Resource Consultants

307 McKee Crossing

New Castle, PA 16105

2008-03-31 ACOE ID of contact person. txt

P: 207. 416. 1239

Cell: 724.674.6145

www. kl ei nschmi dtusa. com

Classification: UNCLASSIFIED Caveats: NONE

2008-03-25 Kleinschmidt reg for MWRD reports.txt

MessageFrom: Ni chol as Morgan

Sent: Tuesday, March 25, 2008 4:28 PM
To: 'Staudacher, Ed'; 'O'Connor, Catherine'
Cc: Jay Maher; Allison Murray
Subject: RE: Lockport Hydroelectric Project

Catherine and Ed,

Thank you for your reply. I could use hard copies if you have them because we will need them on file. If you are familiar with the reports I only need information about the aquatic organisms, distribution, and habitat use in the Brandon Road, Dresden Island, and Marseilles pools. Let me know if you need any further detail. Thanks for your help.

Si ncerel y,

Ni ck

Sir,

I have copies of all of the MWRD reports that you request except Report No. 90-30. I am sure that I will be able to send you a copy of Report No. 90-30, I do not have it at my fingertips.

I do not have the Commonwealth Edison reports that you request.

However, I send this message to ask you if you would like hard copies of these reports or if you would like our staff to photocopy specific information. The reports that I have handy stand eight inches high. You are more than welcome You are more than welcome to the reports. I regret that they are not available electronically.

Please let me know what you would like. Thanks, Catherine O'Connor (708) 588-4116.

----Original Message----

From: Staudacher, Ed [mailto: Ed. Staudacher@mwrdgc.dst.il.us] Sent: Tuesday, March 25, 2008 4:17 PM

To: Ni chol as Morgan

Subject: Lockport Hydroelectric Project

Ni chol as,

I received your request for reports from Ms. Torres. I have the R&D reports and am working on the ComEd reports. I will contact you when I have all of the information.

Ed