UPPER MISSISSIPPI RIVER RESTORATION
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563 -573
JO DAVIESS COUNTY, ILLINOIS

FINAL

March 2013

US Army Corps
of Engineers ®
Rock Island District

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EXECUTIVE SUMMARY

The *Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project* (HREP) is located in Jo Daviess County, Illinois, upstream of Bellevue, Iowa, in Pool 12 between Upper Mississippi River, river miles 563 and 573. All Project lands are in Federal ownership and are managed by the U.S. Fish and Wildlife Service (USFWS) as part of the Upper Mississippi River National Wildlife and Fish Refuge.

The Project area is comprised primarily of a series of islands, backwater channels, and backwater lakes modified or created following construction of Lock and Dam 12 in 1939. This construction contributed to an abundance of deep, lentic, backwater habitat within Pool 12 which is particularly ideal overwintering habitat for certain fish species such as bluegill, largemouth bass, and white and black crappie. Following lock and dam construction, river sediments have been slowly accumulating in backwater areas and have reduced the depth and area of quality backwater habitats and blocked entryways to backwater areas. Construction of Lock and Dam 12 also resulted in changes to the floodplain forest communities of Pool 12. Areas of this pool are currently dominated by similar-aged species of cottonwood and silver maple. This lack of species diversity results in reduced habitat value.

The goals of the proposed Project are to restore and protect off-channel aquatic habitat and restore floodplain forest habitat. The objectives identified to meet these goals are:

1. increase the amount of deep water habitat in the backwater lakes complex of Pool 12 as measured by acres to provide pool-wide overwintering habitat for fish. (Target depth is 6 to 8 feet);
2. increase depth diversity in the backwater lakes complex of Pool 12 as measured by acres to provide year round habitat for fish;
3. increase sustainability of aquatic habitat in the backwater lakes complex of Pool 12 as measured by acres by decreasing the sedimentation in the complex; and
4. increase areal coverage in acres of forest stands with hard mast-producing trees as a dominant or component species in floodplain forest areas surrounding the backwater lakes of Pool 12.

The following enhancement features were considered to achieve the project goals and objectives: excavate channels in backwater areas; construct land and aquatic deflections berms; and establish native mast-producing trees on land berms. The following four backwater sites and their features were chosen for evaluation: Sunfish Lake, Kehough Slough, Stone Lake, and Tippy Lake.

Cost and habitat benefits were estimated for each site. Habitat benefits were estimated using Habitat Evaluation Procedures. Cost-effectiveness and incremental analyses were conducted to identify cost-effective plans and reveal changes in cost for increasing levels of environmental outputs.

The recommended plan, shown on figure ES-1, would restore backwater habitat at four lakes by excavating approximately 63 acres of deep backwater channels to a depth of 8 feet below flat pool, providing overwintering and year-round habitat for fish in the surrounding 6,942 acres. The plan provides 88 Average Annual Habitat Units of fish habitat. Excavated material would be used to construct land and aquatic berms to enhance topographic diversity. Rock closure structures will be constructed to reduce overwintering water velocities while maintaining necessary levels of dissolved oxygen. The recommended plan would also establish mast-producing trees on approximately 40 acres of land berms.

Constructing land and aquatic berms from dredged material would restore and protect aquatic habitat by reducing sedimentation and improving topographic diversity within the floodplain. Planting the land berms with mast-producing trees would improve the associated vegetative assemblages within the floodplain. Dredging channels in the backwater areas would restore overwintering and year-round habitat for fish and increase aquatic diversity, while also providing material to construct the berms. Restoration at the four backwater lakes will be implemented in a sequential order beginning with Sunfish Lake, which will take two years to construct. It is anticipated that the remaining three lakes will take one year each to construct. See Table 6-3 for additional information on the sequence of construction.

Implementation of the recommended plan would increase the quality and quantity of preferred habitat at this location. The Project outputs meet site management goals and objectives and support the overall goals and objectives of the UMRS-Environmental Management Program, and the UMR National Wildlife and Fish Refuge.

Section 906(e) of the 1986 Water Resources Development Act (WRDA) specifies that first cost funding for enhancement features “located on lands managed as a national wildlife refuge” will be 100 percent Federal. All project features would be located on federally owned lands managed through a cooperative agreement with the USFWS, the Federal participant in the project. Per Section 107(b) of the 1992 WRDA, the USFWS will accomplish project maintenance at an estimated average annual cost of $11,262. The Illinois Department of Natural Resources and the Iowa Department of Natural Resources are project proponents.

The Corps, Rock Island District, District Engineer has reviewed the project outputs, a gain of 88 average annual habitat units, and determined that implementation of the recommended plan is in the Federal interest. Therefore, the District Engineer recommends construction approval for the Pool 12 Overwintering HREP at an estimated construction expense of $17.5 million. The estimated Total Project Cost, including; planning, engineering and design; adaptive management measures; and construction management is $20.7 million.

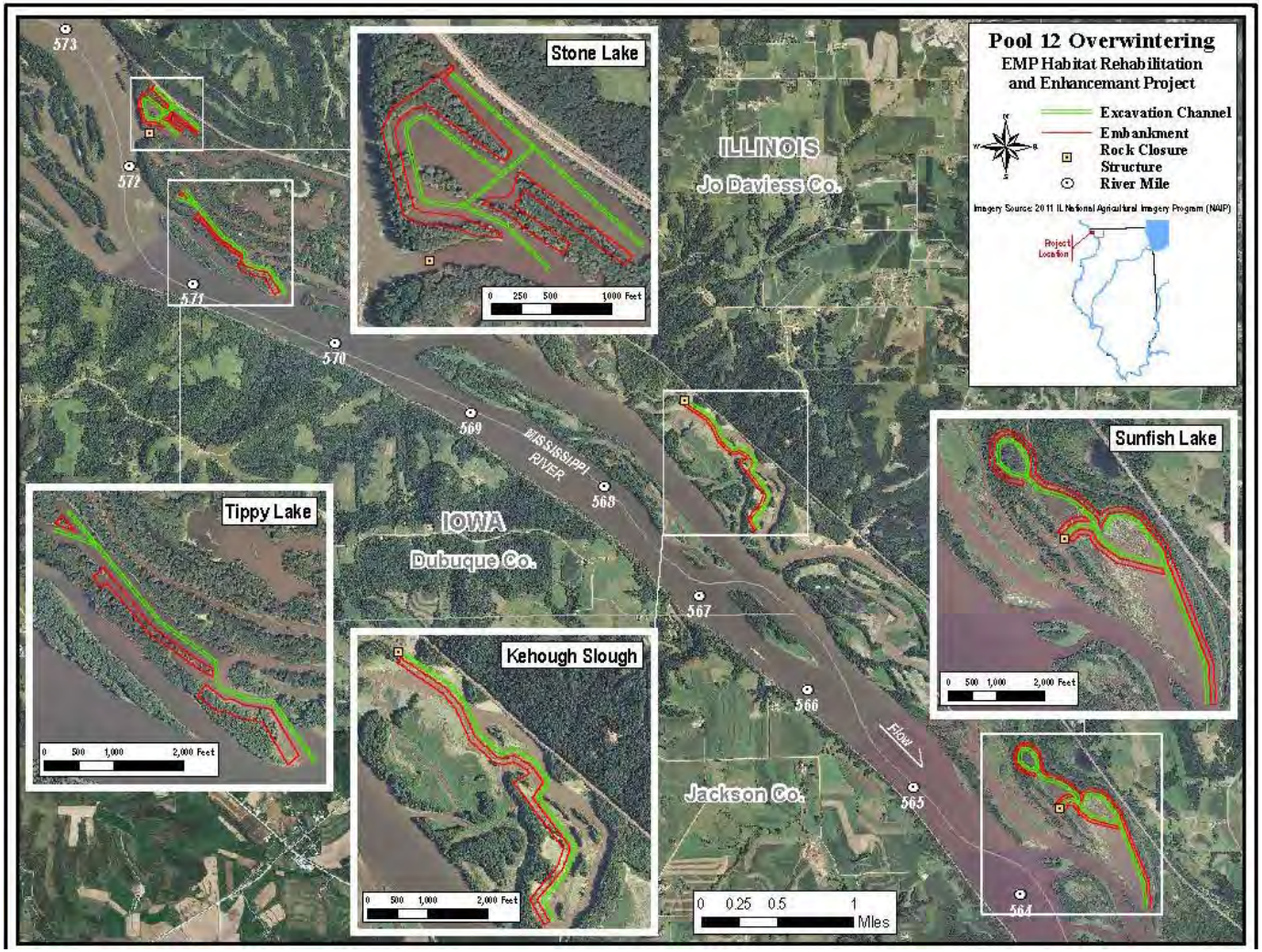

Figure ES-1. Location of the Recommended Plan

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APPENDICES

FIGURES

TABLES

PLATES

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I. INTRODUCTION

A. Location. The *Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project* (HREP) area is located in the middle to lower half of Pool 12, upstream of Bellevue, Iowa, in Jo Daviess County, Illinois, between river miles (RM) 563 and 573. All project lands are in Federal ownership. Plate 1 provides the location and vicinity maps for the Pool 12 Overwintering HREP. Plates 15 thru 18 show site-specific plans. The Pool 12 Project area is part of the U.S. Fish and Wildlife Service's (USFWS) UMR National Wildlife and Fish Refuge, Savanna District. The Project area is comprised primarily of a series of islands, backwater channels and backwater lakes modified or created following construction of Lock and Dam 12 in 1939 (Plate 1). This construction contributed to an abundance of deep, lentic, backwater habitat and created a less diverse floodplain forest within Pool 12. These backwater areas provide habitat for multiple life-stages of various fishes, but are particularly ideal overwintering habitat for certain fish species, including sunfish species such as bluegill, largemouth bass, and white and black crappie.

B. Purpose. The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of the Upper Mississippi River (UMR) backwater habitat areas of Pool 12. This report provides planning, engineering, and sufficient construction details of the recommended plan to allow final design and construction to proceed subsequent to approval of this document.

C. Resource Problems and Opportunities. Following lock and dam construction, river sediments have continued to accumulate in backwater areas of Pool 12. This sedimentation has reduced the depth and area of historic backwater sites used by fisheries resources for various life-stage needs, including overwinter survival. It also has blocked entrances to backwater fishery overwintering areas, which reduces the overall value of otherwise useable fish habitat. Ultimately, sedimentation has resulted in a reduction in both the quantity and quality of backwater fishery habitat, particularly overwintering habitat, utilized by several native fish species.

Construction of Lock and Dam 12 also changed the floodplain forest communities of Pool 12. Areas of this pool are currently dominated by similar-aged species of cottonwood and silver maple. This lack of both species and age diversity is undesirable for the floodplain forest habitat.

This report evaluates opportunities to restore deep off-channel habitat and floodplain forest for fish and wildlife in existing backwaters of Pool 12.

D. Project Selection. Initially this Project was called Molo Slough, referring to a 100-acre side channel in the Nine Mile island complex on the Iowa side of the Mississippi River navigation channel, at RMs 574.4 - 571.5. The Project involved constructing a closing dike across the upper end of the slough to reduce sedimentation and provide an overwintering area for fish. During project planning, the Iowa Department of Natural Resources (IADNR) executed a commercial contract to mechanically dredge sand from Molo Slough. The dredge built a shallow sand bar at the slough's upper end to simulate the proposed closing structure and dredged additional scattered holes to diversify water depths. This created conditions similar to what the original project hoped to produce. The Project proponents were pleased with the new site conditions at Molo Slough and proposed modifying the project by addressing overwintering habitat needs in other backwater lakes along the Illinois side of the Mississippi River. This evolved into the Pool 12 HREP proposed in this report.

The IADNR and Illinois Department of Natural Resources (ILDNR), with support from the USFWS, nominated the Pool 12 Overwintering HREP. The FWIC then ranked the project habitat benefits based on critical habitat needs along the Mississippi and Illinois Rivers. After considering resource needs and deficiencies pool by pool, the Project was recommended and supported by the FWIC and the River Resources Coordinating Team (RRCT) as providing significant aquatic and floodplain benefits with opportunities for habitat enhancement. Enhancement of habitat for fish and wildlife would be achieved by implementing the proposed Project features.

E. Scope of Study. The HREP Project area is located in the middle to lower half of Pool 12, upstream of Bellevue, Iowa, in Jo Daviess County, Illinois, between RM 563 –573. All project lands are in Federal ownership. Plate 1 provides the location and vicinity maps for the Project. Plates 15-18 show site-specific plans.

The scope of this study focuses on proposed Project features that would improve both aquatic backwater overwintering habitat and floodplain forest habitat. The Project is consistent with agency management goals and was planned for the benefit of resident fish and floodplain forest communities.

Field surveys and habitat quantification procedures were completed to support the planning and assessment of proposed Project alternatives. Soil borings were taken to determine sediment types and properties. Baseline water quality monitoring was performed to define present water quality conditions/problems.

The USFWS, IADNR, and ILDNR have made resident wildlife and fish observations within the study area. These observations, along with future studies and monitoring, would assist in evaluating project performance.

F. Format of Report. The report is organized to follow a general problem-solving format. Existing conditions and anticipated future conditions are reviewed and project goals and objectives are identified. Restoration alternatives are formulated to address the goals and objectives. Costs and benefits of the restoration alternatives are identified and the alternative plans are compared on this basis resulting in recommendation of a single restoration plan for implementation. A detailed analysis of the recommended plan is presented and includes: design and construction considerations; operation, maintenance, and rehabilitation considerations; a detailed cost estimate; a plan for monitoring the performance of the restoration; real estate requirements; environmental effects; and a detailed schedule

for implementation. Conclusions and recommendations are presented. Drawings (plates) have been furnished to provide sufficient detail to allow review of the existing features and recommended plan.

G. Prior Report and Existing Projects. The Corps and others have prepared numerous reports on the UMR Basin and the Pool 12 area. The following reports contain the most relevant information for the current effort:

A River That Works and a Working River: A Strategy for the Natural Resources of the Upper Mississippi River System. UMRCC, Rock Island, IL, 2000. This report describes the critical elements of a strategy for the operation and maintenance of the natural resources of the Upper Mississippi River System (UMRS) and its tributaries including the setting of restoration goals and objectives.

Upper Mississippi River Environmental Design Handbook. U.S. Army Corps of Engineers (USACE), Rock Island District, Rock Island, IL, August 2006. This Design Handbook of the Environmental Management Program (EMP) evaluates project features and incorporates lessons learned throughout the lifetime of the program.

2010 Report to Congress, Upper Mississippi River System Environmental Management Program. U.S. Army Corps of Engineers (USACE), Rock Island District, Rock Island, IL This Report to Congress is the most recent formal evaluation of the (EMP) that evaluates the EMP; describes its accomplishments, including development of a systemic habitat needs assessment; and identifies certain program adjustments.

Environmental Science Panel Report: Establishing System-wide Goals and Objectives for the Upper Mississippi River System. D. Galat, J. Barko, S. Bartell, M. Davis, B. Johnson, K. Lubinski, J. Nestler, and D. Wilcox, UMRS Navigation and Ecosystem Sustainability Program, NESP ENV Report 6, Rock Island, IL 2007. The report presents suggested refinements to system-wide ecosystem goals and objectives and proposed steps to take in the further development of objectives for the system.

UMR National Wildlife and Fish Refuge Comprehensive Conservation Plan. U.S. Fish and Wildlife Service. This plan will guide the administration and management of the UMR National Wildlife and Fish Refuge and contains 43 measurable objectives and associated strategies that will be carried out over the next 15 years.

Upper Mississippi River Fisheries Plan 2010 – UMRCC. The Upper Mississippi River Conservation Committee. The report establishes the fisheries plan goals and priority strategies for a sustainable UMR fishery.

Upper Mississippi River System-Environmental Management Program, Pool 11 Bertom/McCartney Lakes Habitat Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, June 1989. This EMP HREP is located near Cassville, Wisconsin, located 26 river miles upstream of the Pool 12 Overwintering Project area. The report's proposed project included dredging of deepwater channels with connections to spring-fed sloughs, building a barrier island from dredged material, constructing a rock partial closing structure, and installing rock substrate and protective cover structures.

Upper Mississippi River System-Environmental Management Program, Pool 11 Islands Habitat Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, September 2001. This EMP HREP is located immediately upstream of Dubuque, Iowa, 10 river miles upstream of the Pool 12 Overwintering Project area. The report's proposed project included construction of sediment deflection embankments using mechanically/hydraulically dredged material from adjacent channels and notched rock weirs.

Upper Mississippi River System-Environmental Management Program, Pool 13 Pleasant Creek Habitat Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, November 2000. This EMP HREP is located south of Bellevue, Iowa, 13 river miles downstream of the Pool 12 Overwintering Project area. The report's proposed project included a moist soil management unit with a stoplog structure, a well with a pump, and shoreline stabilization.

Upper Mississippi River System-Environmental Management Program, Pool 13 Brown's Lake Habitat Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, November 1987. This EMP HREP is located south of Bellevue, Iowa, 17 river miles downstream of the Pool 12 Overwintering Project area. The report's proposed project included construction of a deflection levee, a water control structure, tree plantings, and hydraulically dredged channels.

Upper Mississippi River System-Environmental Management Program, Pool 13 Potters Marsh Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, April 1992. This EMP HREP is located south of Bellevue, Iowa, 37 river miles downstream of the Pool 12 Overwintering Project area. The report's proposed project included excavation of a deep hole sediment trap, hydraulically dredged channels, potholes and a managed marshland on the confined placement site.

Upper Mississippi River System-Environmental Management Program, Pool 13 Spring Lake Rehabilitation and Enhancement Project, U.S. Army Corps of Engineers, Rock Island District, May 1993. This EMP HREP is located south of Savanna, Illinois, 28 river miles downstream of the Pool 12 Overwintering Project area. The report's proposed project included perimeter levee restoration, 3 cell moist soil management unit, pump station, stoplog and inlet structures, and a hemi-marsh with a well.

Upper Mississippi River System Habitat Needs Assessment: Summary Report 2000, U.S. Army Corps of Engineers, St. Louis District, 2000. The Habitat Needs Assessment (HNA) consists of an evaluation of existing habitat conditions throughout the UMRS, a forecast of future habitat conditions, and quantification of ecologically sustaining and a desired future habitat conditions. The HNA will address habitat needs at the system-wide, river reach, and pool levels of spatial scale. The primary purpose of a HNA will be to guide planning, design, and evaluation of future EMP habitat protection and restoration efforts. The HNA will be periodically updated, with refinements based on new information, changing condition of UMRS habitats, and new understanding of river ecology.

Integrated Feasibility Report and Programmatic Environmental Impact Statement for the UMR-IWW System Navigation Feasibility Study. U.S. Army Corps of Engineers, Mississippi Valley Division, September, 2004. This Navigation and Ecosystem Sustainability Program (NESP) project encompasses the Mississippi River from Minneapolis-St. Paul downstream to the confluence of the

Ohio River and the Illinois Waterway from Grafton, Illinois, upstream through the Thomas J. O-Brien Lock in Chicago. The report proposed Projects to reduce navigation congestion including; mooring facilities, switchboats, congestion fees, deck winches and excess lockage time charges, lock extension, and new locks. Ecosystem restoration measures included island building, island and shoreline protection, fish passage, floodplain restoration, water level management for pools and backwaters, backwater restoration (dredging), side channel restoration, wing dam/dike alteration, topographic diversity and dam point control. The Project goals were to reduce or eliminate commercial traffic delays and improve the national and regional economic conditions while restoring, protecting, and enhancing the environment.

H. Authority. The UMRS – EMP's original authorizing legislation was the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662), Section 1103. The text of the authorization follows on page 6.

The EMP was originally comprised of five elements:

- Habitat Rehabilitation and Enhancement Projects (HREPs)
- Long-Term Resource Monitoring Program (LTRMP)
- Recreation Projects
- Economic Impacts of Recreation
- Navigation Monitoring

Currently, the EMP is comprised of two elements: 1) plan, construct, and evaluate measures for fish and wildlife habitat improvement through HREPs; and 2) monitor the natural resources of the river system through the LTRMP. The other EMP elements have either been successfully completed or are now carried out under other authorities.

The original authorizing legislation has been amended three times since its enactment. The 1990 WRDA, Section 405, extended the original EMP authorization an additional five years to fiscal year 2002, which allowed for ramping up of the program. The 1992 WRDA, Section 107, amended the original authorization by allowing limited flexibility in how funds are allocated between the habitat Projects program and the long-term resource monitoring program. The 1992 WRDA also assigned sole responsibility for Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) of habitat projects to the agency that manages the lands on which the Project is located. The 1999 WRDA, Section 509, reauthorized the EMP as a continuing authority with reports to Congress every six years and changed the cost sharing percentage from 25 percent to 35 percent.

Environmental Management Program Authorization

Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) as amended by Section 405 of the Water Resources Development Act of 1990 (P.L. 101-640), Section 107 of the Water Resources Development Act of 1992 (P.L. 102-580), Section 509 of the Water Resources Development Act of 1999 (P.L. 106-53), and Section 2 of the Water Resources Development Technical Corrections of 1999 (P.L. 106-109).

WATER RESOURCES DEVELOPMENT ACT OF 1986
P.L. 99-662

SEC. 1103. UPPER MISSISSIPPI RIVER PLAN.

(a)(1) This section may be cited as the "Upper Mississippi River Management Act of 1986".

(2) To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that the system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes.

(b) For purposes of this section --

(1) the terms "Upper Mississippi River system" and "system" mean those river reaches having commercial navigation channels on the Mississippi River main stem north of Cairo, Illinois; the Minnesota River, Minnesota; Black River, Wisconsin; Saint Croix River, Minnesota and Wisconsin; Illinois River and Waterway, Illinois; and Kaskaskia River, Illinois;

(2) the term "Master Plan" means the comprehensive master plan for the management of the Upper Mississippi River system, dated January 1, 1982, prepared by the Upper Mississippi River Basin Commission and submitted to Congress pursuant to Public Law 95-502;

(3) the term "GREAT I, GREAT II, and GRRM studies" means the studies entitled "GREAT Environmental Action Team--GREAT I--A Study of the Upper Mississippi River", dated September 1980, "GREAT River Environmental Action Team--GREAT II--A Study of the Upper Mississippi River", dated December 1980, and "GREAT River Resource Management Study", dated September 1982; and

(4) the term "Upper Mississippi River Basin Association" means an association of the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, formed for the purposes of cooperative effort and united assistance in the comprehensive planning for the use, protection, growth, and development of the Upper Mississippi River System.

(c)(1) Congress hereby approves the Master Plan as a guide for future water policy on the Upper Mississippi River system. Such approval shall not constitute authorization of any recommendation contained in the Master Plan.

(2) Section 101 of Public Law 95-502 is amended by striking out the last two sentences of subsection (b), striking out subsection (i), striking out the final sentence of subsection (j), and redesignating subsection "(j)" as subsection "(i)".

(d)(1) The consent of the Congress is hereby given to the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, or any two or more of such States, to enter into negotiations for agreements, not in conflict with any law of the United States, for cooperative effort and mutual assistance in the comprehensive planning for the use, protection, growth, and development of the Upper Mississippi River system, and to establish such agencies, joint or otherwise, or designate an existing multi-State entity, as they may deem desirable for making effective such agreements. To the extent required by Article I, section 10 of the Constitution, such agreements shall become final only after ratification by an Act of Congress.

(2) The Secretary is authorized to enter into cooperative agreements with the Upper Mississippi River Basin Association or any other agency established under paragraph (1) of this subsection to promote and facilitate active State government participation in the river system management, development, and protection.

(3) For the purpose of ensuring the coordinated planning and implementation of programs authorized in subsections (e) and (h)(2) of this section, the Secretary shall enter into an interagency agreement with the Secretary of the Interior to provide for the direct participation of, and transfer of funds to, the Fish and Wildlife Service and any other agency or bureau of the Department of the Interior for the planning, design, implementation, and evaluation of such programs.

(4) The Upper Mississippi River Basin Association or any other agency established under paragraph (1) of this subsection is hereby designated by Congress as the caretaker of the master plan. Any changes to the master plan recommended by the Secretary shall be submitted to such association or agency for review. Such association or agency may make such comments with respect to such recommendations and offer other recommended changes to the master plan as such association or agency deems appropriate and shall transmit such comments and other recommended changes to the Secretary. The Secretary shall transmit such recommendations along with the comments and other recommended changes of such association or agency to the Congress for approval within 90 days of the receipt of such comments or recommended changes.

(e) Program Authority

(1) Authority

(A) In general. The Secretary, in consultation with the Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, may undertake, as identified in the master plan

(i) a program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement; and

(ii) implementation of a long-term resource monitoring, computerized data inventory and analysis, and applied research program.

(B) Advisory committee. In carrying out subparagraph (A)(i), the Secretary shall establish an independent technical advisory committee to review projects, monitoring plans, and habitat and natural resource needs assessments.

(2) REPORTS. — Not later than December 31, 2004, and not later than December 31 of every sixth year thereafter, the Secretary, in consultation with the

Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, shall submit to Congress a report that —

(A) contains an evaluation of the programs described in paragraph (1);

(B) describes the accomplishments of each of the programs;

(C) provides updates of a systemic habitat needs assessment; and

(D) identifies any needed adjustments in the authorization of the programs.

(3) For purposes of carrying out paragraph (1)(A)(i) of this subsection, there is authorized to be appropriated to the Secretary $22,750,000 for fiscal year 1999 and each fiscal year thereafter.

(4) For purposes of carrying out paragraph (1)(A)(ii) of this subsection, there is authorized to be appropriated to the Secretary $10,420,000 for fiscal year 1999 and each fiscal year thereafter.

(5) Authorization of appropriations.—There is authorized to be appropriated to carry out paragraph (1)(B) $350,000 for each of fiscal years 1999 through 2009.

(6) Transfer of amounts.—For fiscal year 1999 and each fiscal year thereafter, the Secretary, in consultation with the Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, may transfer not to exceed 20 percent of the amounts appropriated to carry out clause (i) or (ii) of paragraph (1)(A) to the amounts appropriated to carry out the other of those clauses.

(7)(A) Notwithstanding the provisions of subsection (a)(2) of this section, the costs of each project carried out pursuant to paragraph (1)(A)(i) of this subsection shall be allocated between the Secretary and the appropriate non-Federal sponsor in accordance with the provisions of section 906(e) of this Act; except that the costs of operation and maintenance of projects located on Federal lands or lands owned or operated by a State or local government shall be borne by the Federal, State, or local agency that is responsible for management activities for fish and wildlife on such lands and, in the case of any project requiring non-Federal cost sharing, the non-Federal share of the cost of the project shall be 35 percent.

(B) Notwithstanding the provisions of subsection (a)(2) of this section, the cost of implementing the activities authorized by paragraph (1)(A)(ii) of this subsection shall be allocated in accordance with the provisions of section 906 of this Act, as if such activity was required to mitigate losses to fish and wildlife.

(8) None of the funds appropriated pursuant to any authorization contained in this subsection shall be considered to be chargeable to navigation.

(f) (1) The Secretary, in consultation with any agency established under subsection (d)(1) of this section, is authorized to implement a program of recreational projects for the system substantially in accordance with the recommendations of the GREAT I, GREAT II, and GRRM studies and the master plan reports. In addition, the Secretary, in consultation with any such agency, shall, at Federal expense, conduct an assessment of the economic benefits generated by recreational activities in the system. The cost of each such project shall be allocated between the Secretary and the appropriate non-Federal sponsor in accordance with title I of this Act.

(2) For purposes of carrying out the program of recreational projects authorized in paragraph (1) of this subsection, there is authorized to be appropriated to the Secretary not to exceed $500,000 per fiscal year for each of the first 15 fiscal years beginning after the effective date of this section.

(g) The Secretary shall, in his budget request, identify those measures developed by the Secretary, in consultation with the Secretary of Transportation and any agency established under subsection (d)(1) of this section, to be undertaken to increase the capacity of specific locks throughout the system by employing nonstructural measures and making minor structural improvements.

(h)(1) The Secretary, in consultation with any agency established under subsection (d)(1) of this section, shall monitor traffic movements on the system for the purpose of verifying lock capacity, updating traffic projections, and refining the economic evaluation so as to verify the need for future capacity expansion of the system.

(2) Determination.

(A) In general. The Secretary in consultation with the Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, shall determine the need for river rehabilitation and environmental enhancement and protection based on the condition of the environment, project developments, and projected environmental impacts from implementing any proposals resulting from recommendations made under subsection (g) and paragraph (1) of this subsection.

(B) Requirements. The Secretary shall

(i) complete the ongoing habitat needs assessment conducted under this paragraph not later than September 30, 2000; and

(ii) include in each report under subsection (e)(2) the most recent habitat needs assessment conducted under this paragraph.

(3) There is authorized to be appropriated to the Secretary such sums as may be necessary to carry out this subsection.

(i) (1) The Secretary shall, as he determines feasible, dispose of dredged material from the system pursuant to the recommendations of the GREAT I, GREAT II, and GRRM studies.

(2) The Secretary shall establish and request appropriate Federal funding for a program to facilitate productive uses of dredged material. The Secretary shall work with the States which have, within their boundaries, any part of the system to identify potential users of dredged material.

(j) The Secretary is authorized to provide for the engineering, design, and construction of a second lock at locks and dam 26, Mississippi River, Alton, Illinois and Missouri, at a total cost of $220,000,000, with a first Federal cost of $220,000,000. Such second lock shall be constructed at or in the vicinity of the location of the replacement lock authorized by section 102 of Public Law 95-502. Section 102 of this Act shall apply to the project authorized by this subsection.

II. ASSESSMENT OF EXISTING RESOURCES AND CONDITIONS

Pool 12 flows from the tailwaters of Lock and Dam 11 (UMR RM 583) at Dubuque, Iowa, south 26.3 river miles to Bellevue, Iowa. Pool 12 was impounded in 1939 following construction of Lock and Dam 12 at UMR RM 556.8. The entire Pool 12 area contains several types of aquatic and floodplain habitats. All of these areas have been affected to varying degrees by sedimentation and altered hydrology throughout the operating life of the navigation pool. There are 3 major rivers (Little Menominee, Sinsinawa and Galena) rivers and four minor creeks (Spruce, Smallpox, Yeager and Tete Des Morts)flow into Pool 12, transporting sediment into the Project area. Of these rivers and creeks, the Galena and Sinsinawa Rivers are the tributary streams that contribute most to sedimentation of side channel and backwater areas of Pool 12. Backwaters are off-channel aquatic areas such as contiguous impoundments, floodplain lakes, and shallow aquatic areas, as well as secondary, tertiary, and tributary channels.

A. Resource History. Prior to constructing the lock and dam, this reach of river featured multiple channels, sloughs, shallow lakes, bottomland forests, and islands. Numerous wing dams, closing dams, and bank revetment in the channel borders and side channels were already present in the pool as a result of construction of the 4- and 6-Foot Channel Navigation Projects decades earlier. Construction of Lock and Dam 12 inundated additional low-lying areas and increased the depth of existing aquatic areas in the middle and lower portions of the pool. While these changes reduced habitat for wildlife, they expanded the habitat available for fish and other aquatic organisms. Today, more than 50 percent of the Pool 12 floodplain is covered by permanent water (USACE, 2000a).

In the decades following impoundment, sedimentation, erosion, and altered hydrology have affected many types of aquatic habitat in Pool 12. Off-channel, backwater areas have become shallower and it is likely that these areas will continue to slowly transform from deep (>4 feet) aquatic habitat to shallow aquatic or even terrestrial habitat. Some pockets of deeper water remain in off-channel areas and are typically associated with flowing channels. Although shallow and/or flowing-water areas are used by many aquatic species, they do not perform some of the important habitat functions provided by deeper areas located in backwater habitats (USACE, 2000b).

B. Habitat Types and Distribution. The navigation channel runs along the bluff on the Iowa side of the river for its entire length within the Pool 12 Overwintering Project area (figure 2-1). As a result, essentially all off-channel land and water areas are located on the Illinois side of the main channel. A variety of geomorphic areas and cover types are represented in Pool 12 (see Appendix D, figure D-1). Geomorphic areas and land cover acreages were compiled for the UMRS based on aerial photography and GIS analysis compiled in 1989 and compiled in the HNA prepared for the EMP (West Consultants Inc. 2000; USACE 2000)

Backwater areas investigated as part of this study include Molo Slough, Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Hires Lake, Tippy Lake, and Stone Lake, as well as other off-channel areas (figure 2-1). The Galena and Sinsinawa Rivers enter the Project area on the Illinois side. These rivers likely serve as corridors for certain migratory fish species. In addition to aquatic habitat, Pool 12 includes large tracts of floodplain and numerous islands. Additional information on existing habitat (vegetation) types is included in Section II.G. A more detailed account of geomorphic areas is provided in Appendix D, table D-2).

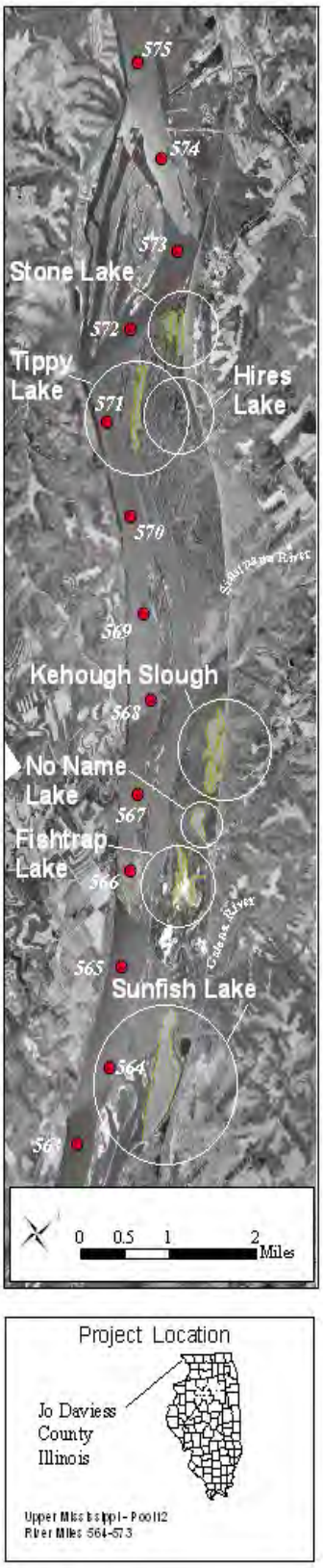

Figure 2-1. General Project Area

Backwater areas provide year-round benefits to fisheries resources, but are particularly important for the overwintering of many fish species. Local resource managers and biologists believe that availability and quality of these areas are one of the primary limiting factors for certain fish populations. The HNA (USACE 2000) projected the continued loss of habitat value of the Pool 12 backwaters due to sedimentation. Backwaters in the study area would not completely fill in, but sedimentation would reduce their value as overwintering habitat for centrarchids.

Impoundment of Pool 12 directly converted some previously floodplain habitat to aquatic habitat. Additionally, alteration of hydrology within the middle to lower reaches of the pool has degraded existing habitat by reducing the ability of these areas to support desirable native plant communities, particularly floodplain forest.

C. Water Resources and Flooding History. Lock and Dam 12 provides navigable channel depths by maintaining a water surface elevation of 592 feet (flat pool) or higher. The water levels are highly variable. The Rivers and Harbors Act of July 3, 1930, authorized the existing navigation project on the Mississippi River between the Missouri River and Minneapolis, Minnesota. The Project provides for a 9-foot channel of adequate width between the mouth of the Missouri River and Minneapolis by constructing a system of locks and dams, supplemented by dredging. The proposed Project features are adjacent and contiguous to the Mississippi River 9-foot channel. The proposed Project and features as described in this report would not affect navigation. Table 2-1 details flood flows and elevations at Lock and Dam 12. Note that Pool 12 does slope; Appendix H is the flow frequency profile can be seen in Appendix H.

Table 2-1. Flood Flows and Elevations at Lock and Dam 12 (Approximate RM 556.8)
Based on 2004 Flow Frequency Study

Event	Elevation (ft)	Flow (cfs)
flat pool	592.0	
2-year	594.3	127,000
5-year	597.2	169,000
10-year	598.9	196,000
25-year	600.9	228,000
50-year	602.1	252,000
100-year	603.2	275,000
200-year	604.1	298,000

[1] Elevations are based on 1912 MSL Datum

High water events at Lock and Dam 12 have occurred in 1965, 2001, 1993, 1997, 1969, 1975, 1973 and 1967 (listed in order of decreasing magnitude). The highest flood on record occurred on April 26, 1965, at a river elevation of 603.71 feet MSL 1912. The 1965 event was higher than the 100-year flood event. Flood stage is 17 feet (597.20 feet MSL 1912).

D. Water Quality. Water quality in backwater areas is strongly influenced by depth. Reduced depths result in wider fluctuations in water temperature and low dissolved oxygen which limits the usefulness of these areas as deep-water, off-channel habitat for fish. Previous HREP projects have suggested that ideal overwintering habitat for sunfishes would include areas that provide and maintain dissolved oxygen (DO) levels of 5 mg/L, water temperatures near 4ºC, little to no current velocity, and at least 4 feet of depth (Palesh and Anderson 1990).

Baseline water quality data has been collected during the winter period for several backwater locations in Pool 12 (Appendix F, *Water Quality*). The Corps has utilized *in situ* data loggers to continuously monitor temperature, DO, pH and turbidity in Kehough Slough (Dec-Mar 2000, 2001,2002, 2003,and 2004); Tippy Lake (Dec-March 2001 to 2002, 2004 to 2006, and 2010 to 2012); Fishtrap Lake (Dec-Mar 2001 to 2005, 2007-2009); Stone Lake (Dec-Mar 2004 to 2006, and 2010-2012); and Sunfish Lake (Dec-Mar 2002 to 2003).

The IADNR has also collected water quality information (water temperature, DO and ice thickness, as well as other parameters) from Sunfish Lake since 1993 as part of the LTRM program. This data is limited to individual point measurements and is not as complete as that collected for Kehough Slough and Tippy Lake. Additional point measurements have been collected in Pool 12 by IADNR in association with winter habitat-use fisheries surveys.

Monitoring of habitat conditions has shown that on occasion DO concentrations fall well below 5 mg/l during the winter months. DO levels below 2 mg/L have been observed during winter months in Fishtrap Lake (1.78 mg/L on January 21, 2009) and Sunfish Lake (1.0 mg/L on January 14, 2010). Monitoring by the Corps during 2001 and 2002 within areas of Sunfish, Fish Trap and Kehough has not documented DO levels below 5 mg/L, suggesting that critically low DO may not occur every year. Low DO concentrations can have adverse impacts on species that rely on backwater habitats for overwintering. Shallow backwater areas are particularly susceptible to winterkills during periods with extended cold temperatures and heavy snow cover. With continued sedimentation in backwater areas, the frequency of winterkills would likely increase.

Although variable, monitoring by the Corps identified that water temperatures often were 1° C or less within backwater areas. During the winter of 2002, weather conditions were so extreme that some backwater areas (Sunfish and No Name) were frozen from the water surface to the bottom.

E. Sedimentation. Pool 12 has experienced continual sedimentation from the time the lock and dams went into operation. Approximate historical sediment deposition rates were determined for each backwater site Project area by using recent survey data and comparing it to the Brown's Map data from the 1930s. Historical sedimentation rates varied from negative 1.3 to 3.7 cm/year. See Appendix H for sediment deposition rates.

F. Subsurface Soil Characterization. The Corps conducted an extensive subsurface exploration to characterize the composition and engineering properties of soils present at each backwater area in Pool 12. Borings were taken at locations shown on Plate 4. On each boring, samples were taken at sufficient intervals to classify all the strata encountered. Representative samples were taken for visual classification, moisture content on enough samples to verify classifications.

Three soil boring operations were performed in March, July, and September of 2001 using hollow stem augers and hand augers. Most of the borings were approximately 10 feet deep. The encountered materials can generally be classified as a 10-foot thickness of slightly organic clay overlying a 15-foot thickness of stiffer clay. Sand is generally encountered at 25 feet below ground surface.

G. Vegetation. Previous observations of aquatic vegetation by the IADNR at Sunfish Lake as a part of the Long Term Resource Monitoring (LTRM) have noted both submergent and emergent vegetation. Vegetation abundance has been identified as "sparse" to "dense." Plants potentially found

in shallow areas include sago pondweed (*Potamogeton pectinatus*); coontail (*Certophyllum demersum*); elodea (*Elodea canadensis*); curly pondweed (*Potamogeton crispus*); floating-leaf pondweed (*Potamogeton natans*); lotus (*Nelumbo lutea*); water milfoil (*Myriophyllum verticillatum*); duckweed (*Lemna* sp.); and arrowhead (*Sagittaria latifolia*). In addition to aquatic vegetation, trees and woody debris supply additional cover in backwater areas.

Large areas of Pool 12 are wet floodplain forest lacking species and age diversity. The UMR floodplain forest is dominated by flood tolerant species such as silver maple (*Acer saccharinum*), and cottonwood (*Populus deltoides*). Other woody plants may include green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), elm (*Ulmus americana*), and willow (*Salix* sp.). Understory tree species include willow, silver maple, green ash, box elder, mulberry (*Morus* sp.) and hackberry (*Celtis occidentalis*).

Species diversity is limited by the availability of tree species capable of surviving UMR floods. Less flood tolerant species such as bur oak (*Quercus macrocarpa*); pin oak (*Quercus palustris*); swamp white oak (*Quercus bicolor*); shellbark hickory (*Carya laciniosa*); and pecan (*Carya illinoensis*) provide natural diversity on the floodplain. These species produce acorns and nuts (hard mast) that are important food sources for some wildlife. As is typical of Mississippi River floodplain forests, mast trees are found in Pool 12 on higher elevations or ridges within the floodplain. Floodplain forest conditions changed considerably with impoundment of the navigation pools. Artificially higher and stable water levels have increased inundation or saturation of the root zone reducing areas suitable for mast trees. Corps forest inventory data shows that of the 4,370 acres of forest in Pool 12, mast trees are dominant in stands totaling 122 acres and notable in stands totaling 1,374 acres. Many of the mast trees found in the floodplain today were alive and growing prior to impoundment of the navigation pool. There is virtually no natural regeneration of hard mast trees in the floodplain.

Forest stands with even–aged, mature trees and little or no understory or seedling regeneration are a result of land use conditions prior to impoundment, clearing during construction of the Nine-Foot Navigation Channel, and the characteristics of the dominant species. (Urich et al. 2002). These floodplain areas were naturally re-vegetated, in a narrow time frame, by shade intolerant species, which often grow in even-aged, single-canopied stands. Such an even-aged community could collapse as the result of disease, causing substantial adverse effects to the UMRS ecosystem.

H. Fish and Wildlife. Fisheries sampling in Pool 12 backwater areas (Summer 2000) collected 56 different species. Species collected in Pool 12 include numerous minnow species (Cyprinidae), gizzard shad (*Dorosoma cepedianum*); brook silverside (*Labidesthes sicculus*); black crappie (*Pomoxis nigromaculatus*); white crappie (*Pomoxis annularis*); bluegill (*Lepomis macrochirus*); and largemouth bass (*Micropterus salmoides*) (Mike Steuck, IADNR, personal communication).

Off-channel deep-water overwintering habitat in Pool 12 is limited and continues to degrade due to sedimentation. Backwater areas provide spawning and nursery habitat and are particularly important for the overwintering of many fish species. Pitlo (1992) suggested that the decline of deep backwater habitats might limit populations in the sunfish (Centrarchid) family. Species in this family include bluegill, largemouth bass, smallmouth bass, and white and black crappie. Decline of backwater habitat suitability can result in winter fish kills and negatively affect fish populations.

Pool 12 is an integral part of the Mississippi Flyway, a major migratory corridor for waterfowl, neotropical birds and many other avian species in the central United States. The area provides migration requirements in the fall and spring for species that spend the summer and winter in other parts of the continent. It has been estimated that 20 percent of all ducks in North America utilize the UMR. More than 20 species of native freshwater mussel have been found in past surveys at various locations in Pool 12; however, no surveys have been conducted in the backwater areas. Substrates within the backwaters of the Project area are largely soft clay sediments. Backwater habitats with soft substrates and low current velocities do not generally provide suitable habitat to support a diverse mussel community.

I. Endangered and Threatened Species. Four federally listed threatened or endangered species are listed for Dubuque and Jackson Counties, Iowa, and Jo Daviess County, Illinois. The bald eagle (*Haliaeetus leucocephalus*) is recorded for both counties. Migrating bald eagles perch in trees throughout Pool 12. While no longer listed as endangered or threatened, the bald eagle is a federally-protected species that utilizes large trees for roosting in Pool 12 during the winter months.

Pool 12 on the Mississippi River is within the historic range of three federally-endangered mussel species. However, two of these species – the spectaclecase (*Cumberlandia monodonta*) and the sheepnose (*Plethobasus cyphyus*) are not listed for Jo Daviess County, and suitable habitat for these species does not occur in the immediate Project area. The Higgins' eye pearly mussel (*Lampsilis higginsii*) has been collected during surveys of main channel border habitats several miles downstream of the Project area (Stanley 1987). However, this species is typically not found in backwater habitats dominated by fine sediments and reduced flows, and would unlikely be found within the Project area. The Iowa Pleistocene snail (*Discus macclintockii*) and northern wild monkshood (*Aconitum noveborasence*) also are listed for the counties that border Pool 12. However, suitable habitat for these species (algific talus slopes and areas with cool soil conditions, respectively) is not found within the Project area. The Indiana bat (*Myotis sodalis*) is listed as potentially occurring in Jo Daviess County, Illinois and suitable habitat exists in the floodplain forests of the study area.

Numerous State of Illinois threatened and endangered species may occur in the vicinity of the proposed Project. The State-endangered ornate box turtle may utilize areas adjacent to the project site; however, it is unlikely that project area will provide suitable habitat for the ornate box turtle. The State-threatened Blanding's turtle may also utilize the area. The western hognose snake is a State-threatened species which may be found in the Project area. State threatened and endangered mussels potentially occurring within this river reach include the Higgins' eye, spectacle case and butterfly mussels. The lake sturgeon, western sand darter, pallid shiner, bobcat, river otter, yellow-headed blackbird, and red-shouldered hawk are also listed for the county. State of Iowa threatened and endangered species that may occur in the vicinity of the project include the river otter and Higgins' eye pearly mussel.

J. Land Use and Management. The Corps has primary administrative responsibility for approximately 4,900 acres of Federal land in Pool 12. Management of the majority of this area (approximately 4,425 acres) was subsequently outgranted to the Department of Interior, USFWS for fish and wildlife purposes under a Cooperative Agreement between the Department of the Interior, the USFWS, and the Corps, dated February 14, 1963, as amended on July 31, 2001. The USFWS fee title and Cooperative Agreement lands within Pool 12 are managed collectively as part of the Savanna District of the UMR National Wildlife and Fish Refuge.

A number of recreational facilities exist in Pool 12. Approximately 1 mile above the Lock and Dam 12 berm on the Illinois shoreline is the Blanding Landing Public Use Area which includes a boat ramp. Two boat ramps are located on the Iowa shore below the Project area, including one located at RM 559, and another at the Spruce Creek Public Use Area 1/2 mile upstream. The Galena Boat Club is located adjacent to No Name Lake off Harris Slough near RM 567. Massey Marina is located along the Iowa shore above the Project area between RM 573 and 574. Additional facilities can be found further upstream near Dubuque, Iowa.

Although the Project area does not contain large industry, such facilities can be found upstream near Dubuque between RM 578 and 581.

K. Hazardous, Toxic, and Radioactive Waste (HTRW). An HTRW Documentation Report (HDR) for the Project was completed in accordance with ER 1165-2-132, HTRW Guidance for Civil Works Projects, and ER 405-1-12, Real Estate Handbook. As a part of the HDR, a Phase I Environmental Site Assessment was performed in conformance with the scope and limitations of ASTM Standards E 1527-05 and E 1528-06. Information was obtained through site reconnaissance, informal interviews, a review of maps and aerial photographs, Corps records, and a search of Federal and state environmental databases. These screening methods have been selected based on the particular nature of the ecosystem habitat project.

The current HDR was completed in July 2012. A previous HDR for Pool 12 was completed in July 2002. In addition to the investigation done for the 2002 report, the Corps initiated various studies and sampling events in an effort to gather more information about the Project area. Sediment sampling was performed by Foth Infrastructure and Environment, LLC (Foth), from July 18-22, 2011. The analysis of the samples showed that none of the bulk sediment samples exceeded the IL EPA TACO Tier 1 objectives. Environmental Data Resources, Inc. performed an Area Study Report in December 2011. The report showed no concerns in the immediate study area. A team comprised of Corps personnel and project sponsors visited the site on April 9, 2012. No HTRW concerns were identified by the team at that time.

The assessment has revealed no evidence of HTRW in connection with the Project sites at the Pool 12 Overwintering HREP. However, samples tested for the presence of metals exceeded the IL acute general water quality standards for copper, lead, mercury, nickel and zinc. See Appendix E for a complete copy of the HDR.

No HDR can wholly eliminate uncertainty regarding the existence of recognized environmental conditions concerning a property. This assessment is intended to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property with reasonable limits of time and cost. Continuing the Environmental Due Diligence Audit process beyond this HDR would not reduce uncertainty, nor reveal any unidentified environmental liabilities. If any previously un-addressed recognized environmental condition should arise, this HDR will be revisited.

L. Historic Properties. The Pool 12 project has no historic properties listed on or eligible for inclusion in the National Register of Historic Places. Appendix A includes Corps letters dated March 19, 2004, and April 20, 2004, to the Illinois State Historic Preservation Offices (SHPO). The Illinois SHPO's reply of April 9, 2004, [Illinois Historic Preservation Agency (IHPA) Log #: 064032204]

indicates concurrence with the findings of the archeological survey and the Corps determination of "no historic properties affected" by the Pool 12 undertaking. If the scope of the project should change, the Corps will coordinate any changes with the Illinois SHPO. In addition, if the execution of the project should uncover any item of archaeological, historical, or architectural interest, the Corps will ensure that reasonable efforts are taken to avoid or minimize harm to the property until its significance can be determined (36 CFR 800.11); the Corps will also comply with appropriate Federal and State laws should human remains be discovered.

M. Invasive Species. Invasive Species – Common invasive species known to be present in Pool 12 include: purple loosestrife (*Lythrum salicaria*), curly-leaf pondweed (*Potamogeton crispus*), Eurasian water milfoil (*Myriophyllum spicatum*), Asian clam (*Corbicula fluminea*), zebra mussel (*Dreissena polymorpha)* and common carp (*Cyprinus carpio*). Though not abundant, silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) have been captured both upstream and downstream of Pool 12 and are likely to be present in Pool 12.

III. PROJECT GOALS AND OBJECTIVES

A. Habitat Problems and Opportunities. The backwaters and floodplain forests of Pool 12 have been negatively affected by impoundment and continued sedimentation. Sedimentation has reduced backwater depths thus reducing the suitability of these areas as year-round and overwintering habitat for fish. The floodplain forests consist of even-aged stands dominated by silver maple and cottonwood with little species diversity. Mast-producing trees, which provide an important food source for wildlife, are limited and there is no natural regeneration. The lack of age and species diversity would continue to negatively impact birds and other wildlife.

Significant opportunities are available to restore deep off-channel habitat by excavating backwater areas. Excavated material can be used to raise existing islands to establish areas suitable for mast-producing trees. This would restore diversity to the floodplain forests. Restoration of backwaters and floodplain forests would restore important fish and wildlife habitat.

B. Future Conditions Without Project. Without implementation of the Project, the overwintering habitat suitability of backwater areas and overall floodplain forest health are anticipated to decline. Continued sedimentation of backwaters is anticipated, which could limit deep-water, off-channel habitat in favor of backwaters with shallow open water and emergent vegetation. The future without project conditions were modeled using the overwintering module for the Habitat Suitability Index (HSI) for bluegill. See Appendix D for details on Habitat Evaluation.

Reduced depths would limit the suitability of backwaters as overwintering and year round habitat for fish in Pool 12. During cold winters with greater than average snowfall, DO conditions in the backwaters may drop below suitable levels. As sedimentation continues, low DO conditions are anticipated to occur more frequently. As DO drops, some fish may leave backwaters for the less suitable conditions of the main channel and side channels, which stresses the fish and likely reduces their overall fitness. Fish kills may occur as fish become trapped in the backwaters due to a combination of ice thickness and reduced depth of entrance/exit channels.

The UMR Conservation Committee (UMRCC) Wildlife Technical Section (Urich et al. 2002) outlined future conditions without active forest management. Forested areas may be converted to herbaceous vegetation as trees die-off if regeneration conditions are not ideal. Higher water levels in the lower and mid-pool areas may result in a gradual replacement of forest species with more flood tolerant herbaceous vegetation such as reed canary grass. Shade intolerant species such as cottonwood and willow may decline and shade tolerant species such as box elder and mulberry may increase. A continued reduction of mast-producing trees is also anticipated. Mast-producing trees and other tree species with a high habitat value may be replaced with less desirable floodplain trees and herbaceous vegetation.

A reduction in the floodplain forest would likely impact wildlife that depends on this habitat. Bald eagles, great blue herons, and cerulean warblers, which favor taller trees such as cottonwood and swamp white oak would be negatively impacted if tall tree habitat continues to diminish (Urich et al. 2002). Resident and migratory songbirds that utilize the closed canopy forest would also be impacted.

C. Resource Significance. The Water Resources Council's Principles and Guidelines (1983) define significance in terms of institutional, public, and technical recognition.

1. Institutional Recognition. Backwater habitats on the UMR are a significant resource. In 1986, U.S. Congress designated the UMRS as both a "…nationally significant ecosystem and a nationally significant navigation system..." in Section 1103 of the WRDA of 1986. The National Research Council's Committee on Restoration of Aquatic Ecosystems targeted the UMR and the Illinois River for restoration as two of only three large river-floodplain ecosystems so designated. The UMR Basin Association is an advocate for restoration of habitat on the UMR. In addition, the UMRCC, made up of UMR resource professionals, is also a strong advocate for habitat restoration on the river. The UMRCC recognized the importance of the floodplain forest to the fish and wildlife of the UMR in the report "Upper Mississippi and Illinois River Floodplain Forests" (Urich et al., 2002). The report describes the habitat significance of the forest, describes the changes in the floodplain forests, and recommends management actions to restore the species, age, and structural diversity of the forest. Knutson et al. (1996) described the importance of floodplain forest in the conservation and management of neotropical migratory birds. The UMR floodplain forest is dominated by flood tolerant species such as silver maple, cottonwood, and green ash.

Pool 12 is part of the UMR National Wildlife and Fish Refuge. Refuge objectives include maintaining and enhancing the habitat of fish and other aquatic life on the UMR (USFWS 2006).

2. Public Recognition. The public recognizes the UMR, including Pool 12, as a nationally, regionally, and locally significant resource. Some of the public services the Mississippi River provides include aesthetics, recreation, science, education, spiritual, historic, food, raw materials, water supply, biological regulation, flood regulation, nutrient regulation, soil retention, and waste regulation. In general, the services identified show the wide range of uses from the river, which extend beyond the ecological health of the UMR, and directly relate to public welfare and long term economic health of the region.

American Rivers, a non-governmental organization dedicated to protecting and restoring healthy, natural rivers, listed the Mississippi River in America's Top Ten Endangered Rivers for 2004 and added the Mississippi River as a "special mention" on the 2011 list. Regional groups also recognize

the importance of backwater habitats and floodplain forests. The public recognizes the backwaters and side channels of Pool 12 as a locally and regionally important recreational fishery.

This Project is consistent with and fully supports the overall goals and objectives of the UMRS-EMP, the USFWS Comprehensive Conservation Plan (CCP), the North American Waterfowl Management Plan, and the Partners in Flight Program.

3. Technical Recognition. The FWIC, a committee of state and Federal natural resource specialists that work on Pools 11-22, has developed Environmental Pool Plans to address navigation and restoration needs. The FWIC has identified numerous backwater complexes in Pool 12, including the Project area, as priority areas in need of habitat restoration. These areas were identified as priority areas for restoration as part of the *Upper Mississippi River-Illinois Waterway System Navigation Study* (DeHaan et al. 2003). Within the Pool 12 area, the FWIC identified the following restoration priorities; six objectives related to backwater depth, four objectives related to topographic diversity, and one objective related to connectivity of the floodplain.

Fisheries biologists recognize the importance of off-channel deepwater habitat to overwintering and year-round habitat for fish. Fisheries biologist have identified overwintering habitat as a limiting factor for centrarchid populations (Bodensteiner and Lewis, 1992 and 1994, Gent et al. 1995, Sheehan et al. 2000a and 2000b) and are continuing research on winter habitat selection of centrarchid fishes (Pitlo, personal communication).

D. Systemic Habitat Goals (HNA). The HNA prepared for the EMP in October 2000 summarized habitat needs for the Upper Impounded Reach of the UMRS (Pools 1-13) to create or restore as follows:

- 3,500 acres of main channel (i.e., main channel, channel border, and tailwater) habitat
- 9,300 acres of secondary channel habitat
- 24,000 acres of contiguous backwater or impounded backwater habitat
- 5,800 acres of isolated backwater habitat
- 1,000 acres of island habitat

E. Land Use Management Goals. The USFWS manages lands in Pool 12 in accordance with the UMR National Wildlife and Fish Refuge CCP (USFWS 2006). The CCP will guide the administration and management of the UMR National Wildlife and Fish Refuge and contains 43 measurable objectives and many associated strategies that will be carried out over the next 15 years. The CCP also identifies and supports the construction of the Pool 12 Overwintering HREP project. A few of the major objectives in the CCP relate closely to the problems described above and include; “Improve water quality and reduce and/or address sedimentation, increase wildlife monitoring and research efforts to guide management, and increase emphasis on fishery and mussel management in cooperation with the states and Corps of Engineers.” The Corps maintains forest management responsibilities for land in the Project area. Corps forest management goals are described in Mississippi River Project Operational Management Plan (USACE 1990). The basic goal is to manage project lands to provide natural resource benefits to the public by perpetuating a diversity of ecological communities that are suitable for a variety of public purposes. Additional goals include “sustain the integrity of the Mississippi River forested riverine ecosystem” and “manage forested habitat to protect and enhance biodiversity.”

F. Upper Mississippi River System Ecosystem Restoration Objectives. Formal planning for the UMRS ecosystem management and restoration has been an ongoing process that was institutionalized in the 1970s with a Comprehensive Master Plan completed by the UMR Basin Commission in 1982. The Master Plan proposed an outline for the EMP which was authorized in WRDA 1986. The EMP has been a National leader in ecosystem restoration planning and implementation for 25 years. EMP partners have participated in several project planning cycles to develop regional ecosystem restoration needs and priorities. Their prior experience and strong interagency relationships provided the foundation to develop the ecosystem restoration component of the Navigation and Ecosystem Sustainability Program (NESP) which was authorized in WRDA 2007. Program partners understand the interrelated information needs of multiple navigation and ecosystem restoration programs, so Reach Planning was conducted to identify ecosystem objectives and subareas where they can be achieved in a program-neutral fashion. Reach Planning relied on participants from River Management Team workgroups including the Fish and Wildlife Work Group in the Upper Impounded Floodplain Reach; the Fish and Wildlife Interagency Committee (FWIC) in the Lower Impounded Floodplain Reach; the Illinois River Work Group in the Illinois River; and the RRCT in the Unimpounded Floodplain Reach (also the Lower Impounded Floodplain Reach and the Illinois River).

The *Upper Mississippi River System – Ecosystem Restoration Objectives 2009* report is the final product of a planning process initiated in 2008 for the purpose of identifying areas for new restoration projects and identifying knowledge gaps at a system scale. The report serves as a technical basis for investment decisions through 2013 and as a backdrop for the formulation of specific restoration projects and their adaptive management components.

The reach planning process leads to the identification of high priority areas for restoration of natural river processes (as required by Section 8004 of WRDA 2007). The reach planning process also provides context for formulating project features, defining performance measures, and designing monitoring plans.

The Reach Planning framework emphasized system-wide environmental goals, implementation guidance to achieve objectives, considerations of scale and connectivity, and then identified a stepwise process for setting ecosystem restoration objectives that included: identifying unique characteristics, historic, existing, and future conditions, stressors, objectives, performance criteria, and indicators. Goals and objectives for condition of the river ecosystem are central to river management, and are linked to other elements of the framework.

1. Upper Impounded Floodplain Reach. The UMRS ecosystem restoration objectives are broken down into four geomorphic reaches of the UMRS. The Pool 12 Project area is within the Upper Impounded Floodplain reach. Objectives for the reach include:

- a more natural stage hydrograph
- restored hydraulic connectivity
- improved water clarity
- reduced nutrient loading
- reduced sediment loading from tributaries, sediment resuspension, and sediment loading to backwaters

- reduced contaminants loading and remobilization of in-place pollutants
- restore rapids
- restore a sediment transport regime so that transport, deposition, erosion rates, and geomorphic patterns are within acceptable limits
- restored habitat connectivity
- restored riparian habitat
- restored aquatic off-channel areas
- restored terrestrial floodplain areas
- restored channel areas
- diverse and abundant native aquatic vegetation communities
- diverse and abundant native fish community

2. EMP Goals and Objectives

- Manage for a more natural hydrologic regime (hydrology and hydraulics)
- Manage for processes that shape a physically diverse and dynamic river-floodplain system
- Manage for processes that input, transport, assimilate, and output material within the UMR basin river-floodplains: e.g. water quality, sediments, and nutrients
- Manage for a diverse and dynamic pattern of habitats to support native biota
- Manage for viable populations of native species within diverse plant and animal communities

G. Project Goals, Objectives, and Potential Project Features. Based on the identified problems affecting the significant natural resources and considering the fish and wildlife management goals of the cooperating agencies, the goals, objectives, and potential project features are shown in table 3-1.

These potential project features are described in Section III.I. Channels would be excavated in the backwater areas to provide deep-water and year-round habitat for fish. Berms would be constructed with the dredged material to deflect sediment from depositing in the excavated channels. Berms built to sufficient elevation would be inundated less frequently. Mast-producing trees which are less tolerant of flooding would be established on the berms. Some berms would be high enough to support natural regeneration of mast-producing trees thus establishing a sustainable mast component to the floodplain forest.

Table 3-1. Project Goals, Objectives, and Potential Project Features

Goal	Objectives	Potential Project Features
Restore and Protect Off-Channel Aquatic Habitat	Increase the amount of deep water habitat in the backwater lakes complex of Pool 12 as measured by acres to provide pool-wide overwintering habitat for fish. Target depth is 6 to 8 feet. Increase depth diversity in the backwater lakes complex of Pool 12 as measured by acres to provide year round habitat for fish. Increase sustainability of aquatic habitat in the backwater lakes complex of Pool 12 as measured by acres by decreasing the sedimentation in the complex.	Excavate channels in backwater areas Construct deflection berms, higher-level terraces, and/or islands from dredged material
Restore Floodplain Forest Habitat	Increase areal coverage in acres of forest stands with hard mast-producing trees as a dominant or component species in floodplain forest areas surrounding the backwater lakes of Pool 12.	Establish native mast-producing trees on high elevation areas. Construct areas with elevations above the 2-year flood recurrence

H. Planning Constraints. The following constraints were considered in plan formulation:

- **Environmental Laws and Regulations.** Construct features consistent with Federal, state and local laws.
- **Flood Heights.** Restoration features should not increase flood heights or adversely affect private property or infrastructure.
- **Operation and Maintenance.** Restoration features shall be designed to facilitate operations and maintenance (O&M) and minimize operation and maintenance requirements.
- **Aesthetics.** Features should be designed to minimize negative impacts to aesthetics.

I. Criteria for Potential Enhancement Features. Following are specific criteria for some of the potential enhancement features.

- **Excavate Channels in Backwaters.** Channels should be excavated to a depth of 8 feet below flat pool elevations to accommodate settling following construction and sedimentation over the 50-year project life. General characteristics of suitable overwintering sites include off-channel areas that do not freeze to the bottom, have suitable DO levels, slightly warmer waters, and protection from the current (Bodensteiner and Lewis, 1992 and 1994; Sheehan et al., 2000a and 2000b). As stated previously, ideal overwintering areas maintain DO levels of 5 parts per million, have water temperatures near 4° C, and have little to no current velocity (Palesh and Anderson, 1990). Backwater depths of 4 feet or greater should help attain suitable water quality conditions.
- **Construct Deflection Berms/Areas With Higher Elevation.** To support regeneration of hard mast-producing trees, land berms should be constructed to higher elevations with reduced

flooding frequency. Land berms should be constructed to equal or exceed the target elevations shown in table 3-2 which are approximately the 2-year flood recurrence. Target elevations increase upstream with the water profile of the navigation pool. Elevations 1 to 2 feet lower than those shown in table 3-2 would likely support mast-producing trees, but would be less likely to support natural regeneration of mast-producing trees.

Table 3-2. Target Minimum Elevation for Land Berms by River Mile (2-year Recurrence Interval from Flow Frequency Study) [1]

River Mile	Target Elevation (1912 MSL Datum)
RM 564	596.3 ft
RM 566	596.8 ft
RM 568	597.4 ft
RM 570	598.0 ft
RM 572	598.5 ft

[1] USACE. *Upper Mississippi River System Flow Frequency Study: Final Report*. Prepared by the Rock Island, St. Louis, St. Paul, Omaha, and Kansas City Districts, USACE. Jan 2004

- **Establish Hard Mast-Producing Tree.** Native hard mast-producing trees that would have historically been found in the bottomland forest should be planted, including Kentucky Coffee Tree, American Sycamore, Pin Oak, Northern Pecan, Swamp White Oak, Bur Oak, and Green Ash.

IV. POTENTIAL PROJECT FEATURES AND PROJECT SITES

This section describes and assesses a preliminary number of potential enhancement features and sites that meet the goals and objectives described in Section III. For planning purposes, the project life was established as 50 years. Potential project features were determined based on their contribution to the project goals and objectives, engineering considerations, and local restrictions or constraints. Features that were not recommended were not subject to further evaluation. A variety of backwater sites were then considered for implementing each of the feasible project features. Feasible features at selected backwater sites were developed into project alternatives in Section V. Feasible features are shown on Plate 12. The backwater areas and their features that were not considered feasible are shown on Plate 13.

A. Potential Project Features. An array of potential features commonly used in the restoration of overwintering fish-habitat was compiled and evaluated for implementation at this Project site. The *Upper Mississippi River System Environmental Design Handbook* (Design Handbook) was the primary resource used during the selection of potential features for evaluation which would address the goals and objectives of the Pool 12 HREP project. The Design Handbook describes the project features commonly used in HREP design as well as the goals and objectives that those features address. The Design Handbook also discusses general methodology, case studies, lessons learned, and references for both the individual features and overall HREP success. Therefore, recommendations from the Design Handbook were utilized as the starting point for alternative development in the Pool 12 Overwintering HREP. However, not all potential features can be implemented at each backwater site. Therefore feasible project features from the list below will be combined into a single restoration measure for each potential backwater site under consideration (Section IV.B).

1. Channel Dredging. Shallow water depths are found throughout the Project area. Dredging a system of channels can restore backwater habitat to desired depths, thus restoring habitat conditions. This feature also would provide material for construction of other potential features such as deflection berms and elevated areas for planting mast-producing trees.

Channel depth and bottom width is based on reasonable assumptions concerning constructability, environmental need, and longevity. The target depth for this Project is 6 feet below flat pool. This depth would provide enough water under the winter ice-cover for overwintering fish. The channel shall be excavated to 8 feet below flat pool to maintain suitable depths through the 50-year project. Channels could be excavated deeper than 8 feet below flat pool; however, there is a limit to cost effectiveness. Over-dredging eventually becomes less effective with added depth because the deeper excavations tend to silt in faster than the more shallow excavations. It is difficult to quantitatively predict how sediment deposition rates vary with channel depths, and therefore it was assumed that 2 feet of excavation below the target depth of 6 feet is a cost-effective alternative and is consistent with other projects. A channel bottom width of 60 feet was selected to provide adequate fish habitat and accommodate the necessary barge-mounted dredging equipment. Channel side slopes are a geotechnical design consideration in terms of channel stability. For this Project, it was estimated at 3 horizontal:1 vertical.

The encountered materials can generally be classified as a 10-foot thickness of slightly organic clay overlying a 15-foot thickness of stiffer clay. Sand is generally encountered at 25 feet below ground surface.

Channel location and orientation are based on the existing underwater topography, backwater flow patterns, and the reach capabilities of the dredge if the material is being mechanically placed. Most of the mechanically placed dredged material is placed to direct flows and reduce channel sedimentation. In some areas, the material placement would concentrate the flow so that the current water velocities increase and maintain the channel depth. In other areas, the material placement is designed to protect the channels from flood flows that carry large sediment loads or to protect the channels from wave-wash induced sediments that can scour from the shallow river bottom and move across the lakebed into the channels. Channels were located within reach of the banks or deflection berms to minimize handling costs.

a. Hydraulic Dredging. Dredging could be accomplished using hydraulic and/or mechanical techniques. Hydraulic dredging would be required in areas where adjacent placement is not desirable and would necessitate finding a suitable containment area for the hydraulically dredged material. Relative to hydraulic dredging, mechanical dredging results in less mixing, significantly higher dredged material solids concentrations, and a considerably smaller volume of return water. After review of the pre-project water quality data, this measure will not be considered further due to potential negative water quality impacts For more information see Appendices E, *HTRW*, and F, *Water Quality*.

b. Mechanical Dredging. Mechanical dredging involves a crane-loaded barge excavating lake-bed material and placing it adjacent to the dredged channel or double handling the material, which involves barge loading the dredged material to be hauled to a suitable placement site. The adjacent placement of the dredged material would facilitate the building of deflection berms to protect the dredged channels and enhance topographic diversity.

2. Containment Areas. To the extent possible, dredged material would be utilized to the benefit of the project. This would include the berms and raised topography discussed above. In some instances, however, construction of these types of structures is not desirable. Due to construction issues, cost issues, and sensitive habitat areas that should be avoided, some areas do not lend themselves to these beneficial uses. In preparation of this study, various containment alternatives were studied and include upland placement alternatives, hydraulic containment within the floodplain, and low-level containment on existing islands as discussed below. The mechanical dredging with both adjacent placement and double handling is addressed in the berms discussion.

a. Upland Placement. Placing dredged material in an upland location out of the floodplain could be accomplished using hydraulic dredging equipment. This would require installing a discharge line through culverts under the railroad, up the steep bluffs and onto privately owned farm fields. It would be costly to pump the material up to the bluff and difficult to find a suitable return water route. The farm fields near the top of the bluff are relatively small and may not provide sufficient space for the material. This alternative would require a cost-share sponsor for land acquisition and site preparation. The ILDNR was not willing to cost-share this alternative. Due to the increased costs, lack of a cost-share sponsor, time requirements, water quality impacts, and beneficial use of the material in the floodplain for berm construction, upland placement was not further pursued.

b. Hydraulic Containment within the floodplain. Constructing relatively large containment areas within the backwaters of Pool 12 would avoid the costs of pumping material to the top of the bluff on private property. The containment areas could be converted to "perched" wetlands. A containment ring could be constructed using mechanical dredging and utilizing existing natural features as much as possible. These alternatives were considered and are shown near the lower part of Sunfish Lake, near Tippy Lake, and at two different areas within the Kehough Slough area (Plate 13). Once containment areas are constructed, hydraulic dredging is a cost-effective alternative to constructing the fish channels. The disadvantage to these alternatives is that the containment areas replace open water areas or emergent wetland areas. The multi-agency study team determined that replacing the open water or existing wetland with the large containment areas was not desirable and should not be pursued. These areas were dropped from further consideration.

c. Low-level Containment Areas. Dredged material could be placed in a low-level containment area. The containment area would consist of a ring of straw bales staked into the ground to contain a relatively small amount of hydraulically dredged material – varying in depth from 6 inches to 2 feet. The straw bales could be reinforced with silt fence or geotextile fabric. The remaining dredged material would raise the existing ground level by a small amount. The higher elevation could potentially allow more diverse plant species, including mast-producing trees, to populate the area. Some of the existing trees could die as a result of the material placement; however, many trees may also survive the shallow material placement. The dead trees would help diversify the existing monotypic stand of trees and provide a different type of habitat. The straw bales would not adversely affect the environment and may be left in place.

Low-level containment areas were considered at Fishtrap Lake and north of No Name Lake. The Fishtrap Lake containment area was initially reduced in size due to the presence of existing oak seedlings starting to emerge. During a subsequent site visit, the containment area at Fishtrap Lake was eliminated due to the continued presence of oak seedlings. In the course of correspondence with the IL EPA, it was learned that straw bales are not recognized by the State of Illinois as appropriate means

of containing sediment. Therefore, the low-level containment areas are not in the recommended plan.

Higher levels of containment were also considered in these areas but not recommended. While stacking material higher would reduce the footprint of the containment area, all existing vegetation would likely be killed. The higher containment would be constructed with an earth berm or potentially staking straw bales in a pyramid or by using the very large, heavy bales. Constructing earth berms was ruled out to avoid the required clearing and grubbing associated with this alternative. The heavy straw bales or pyramid shaped smaller bales were ruled out due to the expense of placing them and unknown strength characteristics of designing and working with straw bales. This measure was not considered further because it requires hydraulic dredging, which was screened out as a potential measure.

3. Berms. Berms would provide a means to beneficially utilize dredged materials removed from backwater areas to enhance topographic diversity. The berms were positioned to direct flood flows and to deflect sediment away from the excavated channels. Two types of berms utilized within Pool 12 are land or aquatic.

a. Land Berms. Land berms would have a minimum top elevation, shown in table 3-2, in order to support desirable mast tree species. This would assist in increasing bottomland forest diversity and value to wildlife habitat. These berms will also help direct flood flow away from the excavated channels.

b. Aquatic Berms. Berms constructed in aquatic areas would not be high enough to support mast-producing trees. However, such berms would help to divert flow and sediments away from backwater habitats, extending the project life of dredged areas.

4. Mast Tree Establishment. Placement of dredged material to an elevation such that, after material consolidation, the elevation is high enough to mimic pre-impoundment ridges, which would provide an opportunity to add tree diversity to Pool 12. Candidate species for planting include; Kentucky Coffee Tree, American Sycamore, Pin Oak, Northern Pecan, Swamp White Oak, Bur Oak, and Green Ash. Common methods of planting are direct seeding, seedling planting, and container stock planting.

a. Container Stock. This measure involves planting trees that are 4 to 6 feet (#3 Root Production Method™ (RPM)) in height with 3-foot spiral, plastic wrap on the trunk. There would be approximately 50 trees planted per acre. A 4-foot perimeter would be sprayed around each tree to deter weed growth. Approximately 5 percent of the total trees planted (2 or 3 trees per acre) would have fencing placed around them. The fencing would be 3-foot tall plastic fencing zip-tied to wood stakes 1 foot in diameter. Individual fencing of various trees would help to determine if it is effective in preventing beaver damage. The amount of fencing in this measure is limited because large scale implementation of fencing can become problematic in the floodplain due to high water events causing debris to get caught up in the fence, possibly causing the fencing to fail and knocking the tree plantings down. Fencing can also be expensive which can limit the cost effectiveness of large scale implementation.

b. Container Stock with Advanced Natural Regeneration. This measure would allow natural regeneration for two years after construction completion. There would be no intervention,

including no mowing. After the 2years of natural regeneration, container stock trees would be hand planted in the same number, size and species as in Measure 4.a. *Container Stock*.

c. Container Stock with Button Bush Cover Crop. This measure involves collecting button bush seeds in the fall or early winter and planting those seeds in spring after berm construction. Planting would require disking as site prep and harrowing after spreading the seed. Those seeds would then be allowed to grow for one season before hand planting of the container stock trees. The button bush would provide a good cover crop, a nurse crop for the trees, and help prevent beaver damage to the trees. The container stock trees would be the same number, species, and size as Measure 4.a. *Container Stock*.

d. Direct Seeding. This measure involves a broadcast seeding of desirable tree species in the approximate amount of 10,000 seeds per acre immediately after construction. This measure would require the ground to be disked prior to seeding and harrowed after distribution of the seeds. Direct seeding has been implemented at other places with varied levels of success. Some instances have had high mortality rates. This measure also requires mobilization of equipment to the berm sites, which would likely involve barging the equipment. Included in this measure is spraying herbicide at least once in the May timeframe, and again in the July timeframe if needed.

5. Rock Closure Structure. A rock closure structure would be constructed to decrease sediment entering the dredge channel and to make sure the dissolved oxygen is adequate for the fish. Routine monitoring of dissolved oxygen would be required to ensure that the fish are not impacted negatively. If a decrease in dissolved oxygen is noted, the closure structure would be notched to allow additional oxygen.

B. Potential Project Sites to Implement Feasible Project Features. Feasible project features from above were combined into a single restoration measure for each backwater site under consideration. Numerous meetings with the project team were conducted to find the most desired location and magnitude of project features for each individual site. Considerations during this process included existing habitat conditions at and near each backwater site; location, magnitude and expense of various dredging options; optimal area for each backwater site; volume, beneficial use and remaining dredged material placement; location of the berms and raised topography; and location of other sites for dredged material placement. The Project team ultimately reached a consensus for each site and its features. The potential sites considered were; Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Hires Lake, Tippy Lake and Stone Lake. The individual sites and project features are discussed below, with the various combinations of proposed sites discussed thereafter.

In addition, each formulated measure carried forward for consideration as the recommended plan must uphold the four evaluation criteria of the Economic and Environmental Principles and Guidelines (P&G) for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council 1983), which are acceptability, completeness, effectiveness, and efficiency.

1. Sunfish Lake (RM 564). Backwater restoration at Sunfish Lake would involve dredging and constructing a series of aquatic and land berms (Plate 12). Various configurations of dredging were considered. Construction of a containment area with an emergent wetland was considered, but was not further pursued because of existing fish use in the proposed containment area. Therefore, all dredged material would be utilized to construct berms at Sunfish Lake. The top of the land-based

berms would be planted with mast-producing trees.

2. Fishtrap Lake (RM 566). Backwater restoration at Fishtrap Lake would involve dredging and constructing a series of aquatic and land berms (Plate 13). Various configurations of dredging were considered. In addition to the berms, it was considered to place some material within a containment facility on the wooded area along the northwest edge of the lake. However, this facility was dropped from further consideration because it was discovered that the site has existing areas of raised topography with desirable trees such as pin oak, swamp white oak, hickory, and locust. Therefore, the dredged material would be sidecast onto both sides of the peninsula in order to raise the topography and widen this area. The land berms would be planted with mast-producing trees. Elutriate and bulk sediment sampling determined that there were high levels of copper, lead, mercury, nickel and zinc in the sediment in the area. Negative water quality impacts could occur when dredging by re-suspending contaminated sediments. This feature does not meet the acceptability criteria set forth by the P&G. Backwater restoration at Fishtrap Lake was not considered further.

3. No Name Lake (RM 566.5). Backwater restoration at No Name Lake would involve dredging (Plate 13). Various configurations of dredging were considered. Extending the channel to the north end of No Name Lake was first considered. The material would have been hydraulically dredged and placed in a portion of the lake or mechanically dredged and used for island construction to diversify the habitat and topography. Excavation of a shorter channel to the northwest was also considered. Excavated dredged material would be double-handled and placed mechanically at an alternate location, such as along the islands at Kehough Slough. During plan formulation, further assessment of the existing conditions demonstrated that No Name Lake is more valuable functioning in its current state of open marsh habitat than it would be as overwintering habitat. This feature does not meet the efficiency criteria set forth by the P&G. Backwater restoration at No Name Lake was not considered further.

4. Kehough Slough (RM 567.5). Backwater restoration at Kehough Slough would involve mechanical dredging and construction of a series of aquatic and land berms (Plate 12). Various configurations of dredging were considered. The land berms would be planted with mast-producing trees. Access to Kehough Slough would require dredging in Harris Slough. Currently, a small area along the left descending bank of the entrance channel at Harris Slough is rimmed with rocks in order to protect the entrance and prevent siltation. However, the rock area is fairly low, allowing frequent sediment-laden water to flow over the top and cause silt to drop out into the entrance channel at Harris Slough. The access dredged material from the entrance channel should be used to fill an elevated area within the rimmed rock area. The material would be reinforced with stone to prevent erosion.

Instead of building the berms, creating a relatively large low level hydraulic placement facility in the open water of Kehough Slough was considered as shown on Plate 13. The containment area could be built with a mechanical excavator. The interior of the containment would be filled with dredged material, creating a “perched” wetland. This containment alternative and hydraulic dredging was not selected because it covers up open backwater area. The mechanical dredging and adjacent placement option will be evaluated further.

5. Hires Lake (RM 571). Backwater restoration at Hires Lake would involve hydraulically dredging channels throughout the lake (Plate 13). Dredged material would be confined by existing banklines and islands. Material could then be pumped into the lake to build low-level islands. The resulting emergent wetland would be suitable habitat for migrating waterfowl and other wildlife. Placement of dredged material in this location was not further pursued due to concerns regarding loss of existing open water. No other suitable placement sites were identified.

Access channels to Hires Lake are very narrow, making it difficult to access with dredging equipment. While the site could be accessed by cutting through existing islands, this was not recommended. This feature does not meet the acceptability and efficiency criteria set forth by the P&G. Backwater restoration of Hires Lake was not considered further due to access concerns and lack of an acceptable placement site.

6. Tippy Lake (RM 571). Backwater restoration at Tippy Lake would involve mechanical dredging and construction of a series of land and aquatic berms (Plate 12). Various configurations of dredging were considered. The land berms would be planted with mast-producing trees. A feature considered would be to construct a containment area for hydraulic dredging. One side of the placement site could utilize the flow deflection berm as a barrier. The material could be re-shaped to allow for increased elevations within areas of placement for planting of desirable mast-producing trees. This containment alternative and hydraulic dredging was not selected because it covers up open backwater area. The mechanical dredging and adjacent placement option will be evaluated further. Two wingdams exist across the entrance channel to Tippy Lake, which would be removed to allow the dredge access to the backwater area.

7. Stone Lake (RM 572). Backwater restoration at Stone Lake would involve dredging and constructing a series of berms (Plate 12). Various configurations of dredging were considered. Dredged material would be utilized to construct berms on existing land. The top of these land-based berms would be planted with mast-producing trees. A rock deflection berm and a rock closure structure were considered to divert sediment away from the upstream end of Stone Lake. However, the cost and required coordination to obtain right-of-way from the railroad was compared to the potential benefit of constructing the structure. The study team decided not to pursue this further. Another flow diversion structure near the entrance was considered and further evaluated.

V. FORMULATION AND EVALUATION OF FEASIBLE PROJECT ALTERNATIVES

This section describes the sites and the features chosen that meet the goals and objectives of this Project. Each feature was evaluated to determine its potential for environmental restoration and enhancement. Costs also were derived for all feasible project sites.

A. Feasible Project Sites and Their Features. Plates 15 thru 28 show the locations of all feasible project sites, which include Sunfish Lake, Kehough Slough, Stone Lake, and Tippy Lake, as well as their features as described below. Table 5-1 summarizes the outputs and costs associated with each backwater site. The final dredging configuration for each site that was chosen by the project team was evaluated.

Table 5-1. Environmental Outputs and Cost of Project Alternatives

Alternatives	No. Sites	Combined Net Increase AAHUs [1]	Total Cost [2]	Average Annual Cost [3]
0 - No Action Plan	0	0	$0	$0
1 - Stone Lake	1	14	$4,576,592	$213,041
2 - Tippy Lake	1	13	$3,715,340	$172,950
3 - Kehough Slough	1	19	$4,773,495	$222,207
4 - Sunfish Lake	1	42	$6,907,400	$321,540
5 - Stone, Tippy	2	27	$7,321,931	$340,837
6 - Stone, Kehough	2	33	$8,380,086	$390,094
7 - Stone, Sunfish	2	56	$10,513,992	$489,428
8 - Tippy, Kehough	2	32	$7,518,834	$350,003
9 - Tippy, Sunfish	3	55	$9,652,740	$449,337
10 - Kehough, Sunfish	3	61	$10,710,895	$498,594
11 - Stone, Tippy, Kehough	3	46	$11,125,426	$517,891
12 - Stone, Kehough, Sunfish	3	75	$14,317,487	$666,482
13 - Sunfish, Kehough, Tippy	3	74	$13,456,234	$626,390
14 - Sunfish, Stone, Tippy	3	69	$13,259,331	$617,225
15 - Stone, Tippy, Kehough, Sunfish	4	88	$17,062,826	$794,278

[1] Average Annual Habitat Units
[2] Current Working Estimate is based on August 2012 price levels
[3] Annualized based on FY2012 discount rate of 4.0% and a 50-year project life

1. Sunfish Lake. Backwater restoration at Sunfish Lake involves dredging and constructing a series of berms to deflect external sediments from entering the site (Plate 15). Sunfish Lake would include 12,140 linear feet of channel excavation. The channel would have a bottom width of 60 feet, with dredging performed to a depth of 584 feet MSL, 8 feet below flat pool elevation. All dredged material would be utilized to construct berms on land as well as within water. The berms within the water would be constructed to an elevation near flat pool elevation (592 feet MSL). Berms on land would be made to a minimum elevation of 596.3 feet MSL. The top of these land-based berms would be planted with mast-producing trees. In addition, a rock closure structure is proposed to reduce water velocity and divert sediment away from the upstream entrance to the Sunfish Lake backwater area. The rock closure structure would extend the project life at Sunfish Lake.

2. Kehough Slough. Backwater restoration at Kehough Slough involves dredging and constructing a series of berms to deflect external sediments from entering the site (Plate 16). Kehough Slough would include 6,520 linear feet of channel excavation. The channel would have a bottom width of 60 feet, with dredging performed to a depth of 584 feet MSL. All dredged material would be utilized to construct berms on both land and within water. The berms within the water would be constructed to an elevation near flat pool elevation (592 feet MSL). The berms on land would be made to an elevation of 597 feet MSL. The land berms would be planted with mast-producing trees. In addition, a rock closure structure is proposed to reduce water velocity and divert sediment away from the upstream entrance to the Kehough Slough backwater area. The rock closure structure would extend the project life at Kehough Slough.

3. Tippy Lake. Backwater restoration at Tippy Lake involves dredging and constructing a series of berms to deflect external sediments from entering the site (Plate 17). Tippy Lake would include 5,975 linear feet of channel excavation. The channel would have a bottom width of 60 feet, with dredging performed to a depth of 584 feet MSL. All dredged material would be utilized to construct berms on both land and within water. The berms within the water would be constructed to an elevation near flat pool elevation (592 feet MSL). The berms on land would be made to an elevation of 598.3 feet MSL. The land berms would be planted with mast-producing trees.

4. Stone Lake. Backwater restoration at Stone Lake involves dredging and constructing a series of berms to deflect external sediments from entering the site (Plate 18). Stone Lake would include 5,790 linear feet of channel excavation. The channel would have a bottom width of 60 feet, with dredging performed to a depth of 584 feet MSL. All dredged material would be utilized to construct berms. The berms on land would be made to an elevation of 598.5 feet MSL. The top of these land-based berms would be planted with mast-producing trees. In addition, a rock closure structure is proposed to divert sediment away from the entrance to the Stone Lake backwater area. The rock closure structure would extend the project life at Stone Lake.

B. Formulation of Project Alternatives. Restoration activities at the identified project sites would benefit not only the individual footprint areas, but also would have a systemic benefit within Pool 12. Because of the range of potential benefits and project costs that may be associated with various combinations of backwater sites, a range of combinations to compare project costs with potential resulting ecological benefits were evaluated. A total of 16 project alternatives were developed from all possible combinations of the four sites (table 5-1), including the No Action alternative. It was assumed that all four sites were combinable with each other, with no dependencies of one site upon another.

Evaluation of alternatives was accomplished through comparison of environmental benefits and associated costs. The evaluation is a three-step procedure: 1) calculate the environmental outputs of each alternative; 2) estimate costs for each alternative; and 3) compare the alternatives to evaluate the best overall project alternative based on habitat benefits and associated cost. While cost and environmental outputs must be considered, other factors such as the ability to construct, schedule, likelihood to achieve projected results, incalculable environmental benefits, professional opinion, local support, and ancillary benefits are very important in deciding the preferred alternative.

C. Environmental Output Evaluation. This Project would produce environmental benefits in three main areas: site-specific overwintering benefits for each backwater lake, mast tree planting benefits at each backwater site, and systemic overwintering benefits for Pool 12 based on the area of influence for implemented features. Site-specific overwintering benefits were quantified using a certified model and these output units were used to compare project alternatives. A detailed discussion of these environmental analyses, including discussion on methodology and results, can be found in Appendix D. Mast tree planting benefits and systemic overwintering benefits were estimated using a variety of methods and are discussed in the sensitivity analysis below, as well as in Appendix D and K..

1. Site-Specific Overwintering Benefits. The Project would improve aquatic habitats at each individual backwater site. Increasing backwater depths and improving water quality would promote and improve the aquatic environment and associated fisheries communities.

Since a complete description of the methodology used to quantify site-specific benefits is included as Appendix D, it will be discussed only briefly here. Habitat Evaluation Procedures (HEP) were utilized to evaluate potential site-specific benefits of project alternatives. Participants for this analysis included biologists from the Corps, the USFWS, the IADNR, and the ILDNR. The HEP can be used to evaluate the quality and quantity of particular habitats for certain species. The qualitative component is known as the HSI for key indicator species and is rated on a scale of 0.0 to 1.0. The quantitative component is the measure of acres of habitat that is available for the selected species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU), is calculated using the formula: HSI x Acres = HUs.

The proposed Project alternatives would affect the value of backwater habitats within the Project area. Changes in HUs would occur as habitat matures and is influenced over time by river conditions. These changes influence the values derived over the life of the project. To help identify general habitat changes over time HUs are averaged over the life of the project (50 years). This determines what is known as the Average Annual Habitat Units (AAHUs). AAHUs are used to estimate site-specific changes of all alternatives, including the No Action alternative.

HSI models were reviewed to identify appropriate models that could quantify habitat changes as a result of project alternatives. Following this review, it was decided that a general HSI model of Centrarchid Overwintering would be utilized. This model was based on the bluegill overwintering model by Palesh and Anderson (1990). Dredged channel features have been successfully implemented at multiple EMP HREPs. Based on these previous experiences, there is a high likelihood of success in achieving the projected site-specific overwintering benefits. In addition to these overwintering benefits, other year-round aquatic benefits would be realized at these sites. These benefits are discussed qualitatively below.

2. Year-round Aquatic Benefits. In addition to the overwintering benefits discussed above, the proposed Project also would provide year-round benefits to aquatic backwater habitat. These benefits, while valuable, are not included in the detailed cost/benefit evaluation, discussed below. The reason for not quantifying the year-round benefits is that the suitable habitat typically utilized during spring, summer and fall is probably more abundant than wintering habitat in the Project area. Therefore, the overwintering habitat is considered to be the limiting factor for fish communities and the most critical element for restoration. Discussing year-round benefits qualitatively allows for a more simplified analysis while still discussing important habitat values resulting from the project. A detailed discussion of resulting improvements in year-round aquatic habitat is included in Appendix D.

3. Additional Habitat Changes. In addition to the benefits discussed above, the proposed Project also would result in other changed habitat conditions within the Project area. The berms would include a footprint area of about 40 acres of floodplain habitat, and 61 acres of aquatic habitat. Berms placed in aquatic habitat would generally remain below the water surface, and thus the area would remain aquatic. The aquatic berms would likely become vegetated with emergent and submergent vegetation due to the increased shallowness of the area. Conversely, berms placed on floodplain habitat would include almost 40 acres planted with mast-producing trees. The remaining area would include a graded elevation from near flatpool elevation up to the top of the berm. Such graded areas would provide the topographical diversity sought by resource managers. Following initial disturbance during placement, these areas would become re-vegetated within a few years. Discussion of these changes is also included in Appendix D.

D. Cost Estimates for Habitat Improvement Measures. Table 5-1 shows an estimated cost of project alternatives. A more detailed breakdown of costs is outlined in Section VIII, *Cost Estimates.* The cost estimates were prepared to August 2012 price levels and include construction; planning, engineering and design; construction management; OMRR&R; adaptive management; and monitoring. Project features are on Federal land. Consequently, there are no lands and damages and relocations costs. Total project costs were annualized based on the Fiscal Year 2012 discount rate of 4.0 percent and a 50-year project life.

E. Comparison of Alternative Plans. For environmental planning, traditional benefit-cost analysis is not possible because costs and benefits are expressed in different units. However, cost-effectiveness and incremental cost analyses can provide decision-makers with relative benefit-cost relationships of the various enhancement or restoration solutions. While these analyses are not intended to lead to a single best solution, they do improve the quality of decision making by ensuring that a rational, supportable, focused, and traceable approach is used for considering and selecting alternative methods to produce environmental outputs (Appendix D).

1. Methodology. Corps guidance requires cost-effectiveness and incremental cost analyses for recommended ecosystem restoration plans. Two analytical processes are conducted to meet these requirements. First, a Cost-Effectiveness Analysis (CEA) is conducted to ensure that the least-cost solution is identified for each possible level of environmental output (Orth, 1994). Cost effectiveness means that no plan can provide the same benefits for less cost or more benefits for the same cost (Appendix D).

Second, an Incremental Cost Analysis (ICA) of the least-cost solutions is conducted to reveal changes in costs for increasing levels of environmental outputs. Plans that provide the greatest increase in benefits for the least increase in costs are identified as “Best Buy” plans. In the absence of a common measurement unit for comparing the non-monetary benefits with the monetary costs of environmental plans, cost-effectiveness and incremental cost analyses are valuable tools to assist in decision-making. Appendix D presents the detailed cost-effectiveness and incremental cost analyses for the project.

2. Results. The results of the cost-effectiveness and incremental cost analyses are presented below. Figure 5-1 shows the cost-effectiveness results for all alternatives as it relates to site-specific benefits. Each point within the figure represents an alternative. The “best buy” plans are identified by a cube symbol and labeled with the alternative name. In total, 15 project alternatives and the No Action alternative were evaluated within the CEA and ICA (table 5-1).

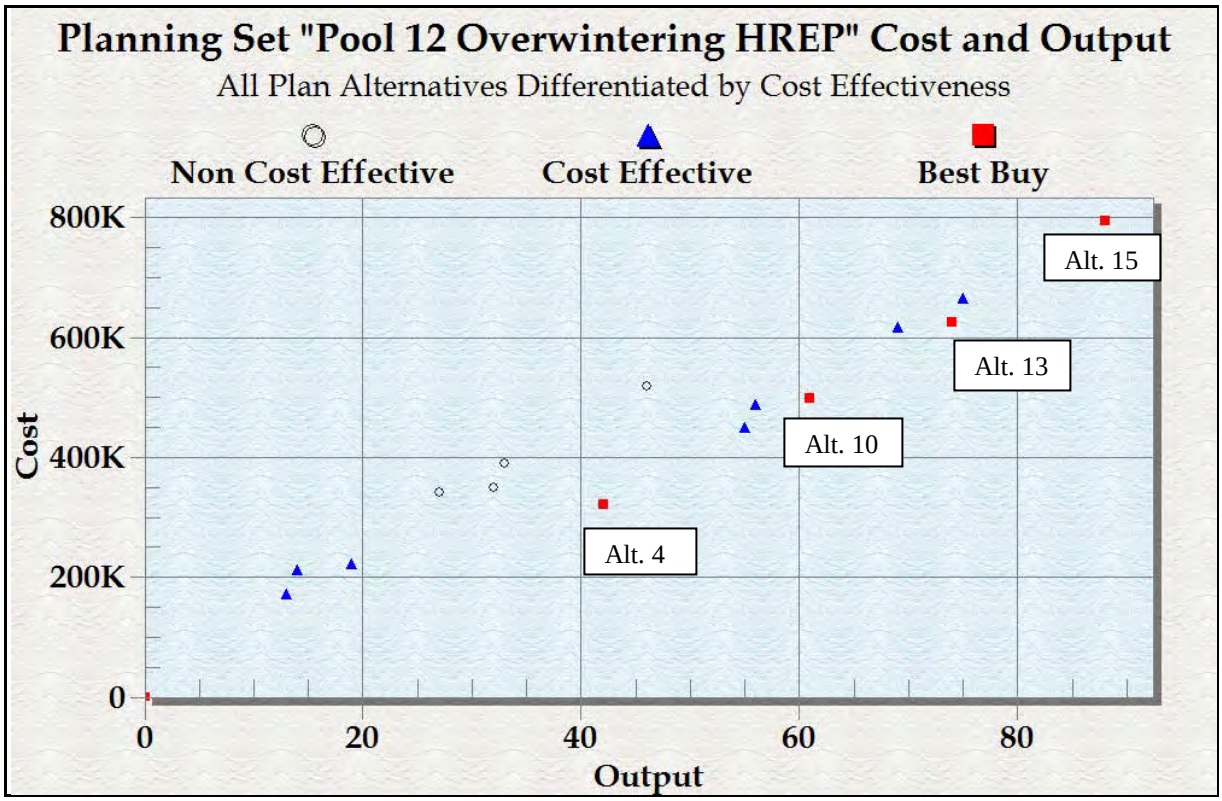

Figure 5-1. Cost-effectiveness Analysis – Site-Specific Benefits

For the site-specific analysis, besides the No Action alternative, four best buys were identified out of the seven cost-effective alternatives. All 16 alternatives were relatively close, with a strong linear relationship among alternatives for cost and resulting benefits (figure 5-1 and Appendix D). This general trend is not surprising, as this analysis would support the conclusion that the more area improved, the greater the anticipated site-specific benefits. Of all the alternatives evaluated, Alternatives 4, 10, 13, and 15 have been identified as "best buy" alternatives, meaning they provide the greatest increase in environmental benefits for least incremental cost (table 5-2 and figure 5-2). There is a cost efficiency gained through constructing more than one lake due to savings in line items such as mobilization & de-mobilization and fish monitoring. In comparing the project alternatives, the greater the number of lakes constructed, the more cost efficient the alternative becomes. Simply stated, constructing four backwater lakes as one project is less expensive than constructing four individual backwater lake projects.

Table 5-2 and figure 5-2 show the alternatives that were identified as "best buy" plans for the site-specific benefits. These alternatives may be considered to be the most cost-effective and incrementally justified plans to accomplish restoration at the project site, given the parameters of the analysis (Appendix D).

Table 5-2. Incremental Costs of Best Buy Plans for Site-Specific Benefits

Alternative	Total Cost	Average Annual Cost	Incremental Increase	Combined Net Increase AAHUs	Incremental Increase	Incremental Cost/Benefit
4 Sunfish	$6,907,400	$321,540	$321,540	42	42	$7,656
10 Sunfish, Kehough	$10,710,895	$498,594	$177,054	61	19	$9,319
13 Sunfish, Kehough, Tippy	$13,456,234	$626,390	$127,796	74	13	$9,830
15 Sunfish, Kehough, Tippy, Stone	$17,062,826	$794,278	$167,888	88	14	$11,992

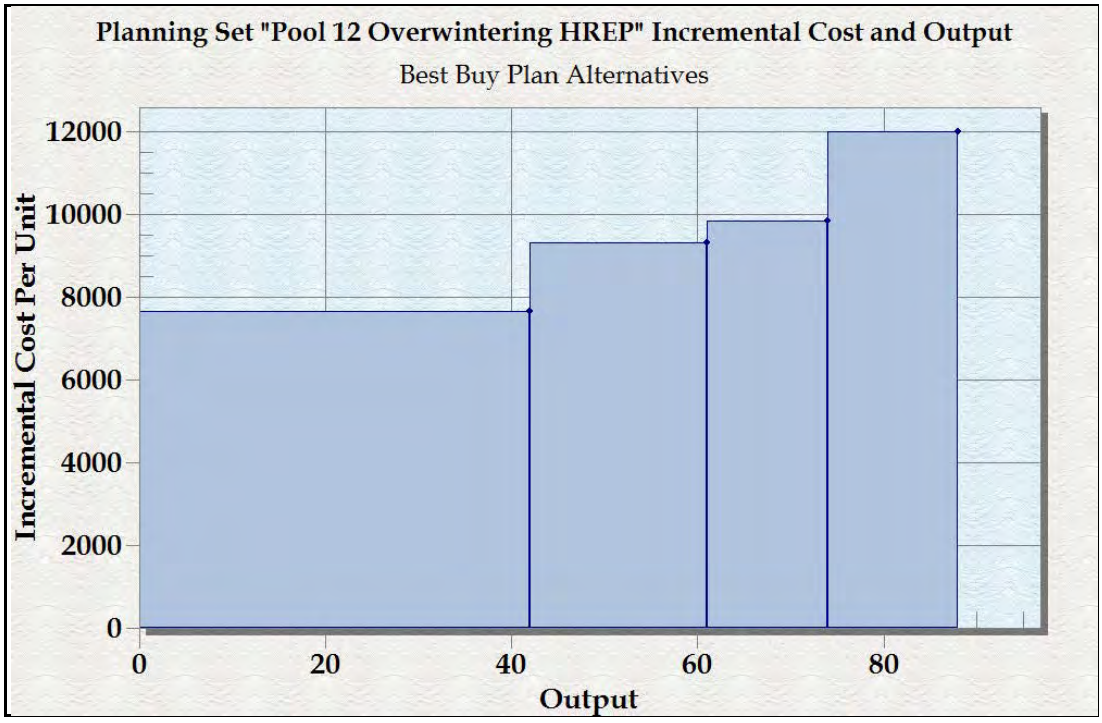

Figure 5-2. Incremental Cost Analysis "Best Buy" Plans – Site Specific Benefits

F. Sensitivity Analysis. In addition to the site-specific aquatic habitat benefits that were evaluated in the analysis above, there are additional and equally important benefit categories to consider. Implementation of this project would provide mast tree benefits and systemic overwintering benefits as well. However, it is difficult to accurately quantify these benefits using only the data and tools currently available. For example, the PDT is required to use only certified models for benefit quantification, which eliminates the use of some models historically used for quantification purposes. Additionally, the data that is collected as part of the monitoring portion of this project will inform the development of certified models to quantify systemic benefits.

Although the ability to quantify these benefits is somewhat restricted, it is important to recognize the additional benefits that this project will provide. Therefore, an effort has been made to estimate and analyze the additional benefit categories using the best available tools and data as a sensitivity analysis to ensure that the best alternative is chosen as the recommended plan.

1. Mast Tree Planting Benefits. In order to estimate the benefits derived from mast tree plantings, the PDT utilized the two most recently approved DPRs with mast tree planting components: Rice Lake HREP and Lake Odessa HREP. Both HREPs utilized WHAG to quantify benefits from mast tree plantings. Although WHAG is not yet a certified model, historically it has been the tool used on EMP HREPs for quantifying mast tree benefits, and no other quantification tool of this nature has been approved for use to date.

In the example of Rice Lake, 409 acres of mast trees will be planted resulting in 629 Annual Average Habitat Benefits (AAHUs). In the example of Lake Odessa, 53 acres were planted with mast trees resulting in 120 AAHUs. The PDT recognizes that both of these examples vary from the Pool 12 Overwintering HREP in that the mast trees were planted on former crop lands while Pool 12 will be converting wet floodplain forest to mast tree forest. Although converting the homogenous wet floodplain forest consisting of similar-aged, similar-species, flood-tolerant trees to mast trees will greatly benefit the habitat quality; the impacts will not be as great as those realized at Rice Lake and Lake Odessa. The existing habitat quality was considered during the estimation of habitat benefits for Pool 12's mast tree plantings.

A proportionate conversion factor was calculated for both Rice Lake and Lake Odessa to be applied to Pool 12. For example, at Rice Lake the acreage of mast tree plantings was divided by the total AAHUs, resulting in a conversion factor of 1.54 AAHUs per acre. At Lake Odessa, the resulting conversion factor is 2.26 AAHUs per acre. These factors were then averaged with a result of 1.90 and applied to the acreages of mast trees planted for each of the Pool 12 alternatives. In order to account for the difference in pre-project habitat conditions (Rice Lake and Lake Odessa being crop land vs. Pool 12's wet floodplain forest), the mast tree benefits at Pool 12 were then reduced by a factor of 0.5. The resulting estimate applied to Pool 12's mast tree plantings is a factor of 0.95 per acre of tree planting as represented in the equation below:

$$(1.90 \times \text{acres of mast tree plantings}) \times 0.5 = \text{AAHU per acre}$$

The benefits generated by the mast tree plantings at all four backwater lakes are estimated at 39 AAHUs (Table 5-3). The Mast Tree Planting benefits were also combined with the Site Specific benefits for purposes of alternative comparison. The resulting AAHUs and construction costs for each alternative were compared using IWR Planning Suite, Cost Effective/Incremental Cost Analysis. The cost effective plans are displayed in Figure 5-3. The Incremental Cost Analysis resulted in four "best buy" plans as denoted in Table 5-3 with gray boxes. The Incremental Cost Analysis is also displayed in graphic form in Figure 5-4. Total Site Specific benefits and Mast Tree Planting benefits for Alternative 15 is estimated at 127 AAHUs and is a best buy plan.

Table 5-3. Estimated Benefits for Pool 12 Overwintering HREP [1]

Alternative	Site Specific Benefits (AAHUs	Est. Mast Tree Planting Benefits (AAHUs)	Site Specific and Est. Mast Tree Planting Benefits Combined (AAHUs)	Contiguous Floodplain Shallow Aquatic Area Benefits w/in a 1-mile Buffer (acres)	Contiguous Floodplain Shallow Aquatic Area Benefits w/n a 3-mile Buffer (acres)	Channel Dredging Benefits, Estimated Using the Navigation Study (acres)
No Action Plan	0	0	0	**0**	0	0
1 - Stone Lake	14	12	26	140	413	399
2 - Tippy Lake	13	9	22	244	420	390
3 - Kehough Slough	19	4	23	235	791	288
4 - Sunfish Lake	42	13	55	279	778	798
5 - Stone, Tippy	27	21	48	232	413	789
6 - Stone, Kehough	33	17	50	372	986	687
7 - Stone, Sunfish	56	26	82	418	1191	1197
8 - Tippy, Kehough	32	13	45	463	986	678
9 - Tippy, Sunfish	55	22	77	509	1191	1188
10 - Kehough, Sunfish	61	18	79	511	1152	1086
11 - Stone, Tippy, Kehough	46	25	71	465	986	1077
12 - Stone, Kehough, Sunfish	75	30	105	650	1346	1485
13 - Sunfish, Kehough, Tippy	74	26	100	742	1346	1476
14 - Sunfish, Stone, Tippy	69	34	103	511	1191	1587
15 - Stone, Tippy, Kehough, Sunfish	88	39	127	743	1346	1875

[1] Gray Boxes denote “best buy” plans using IWR Planning Suite, Incremental Cost Analysis

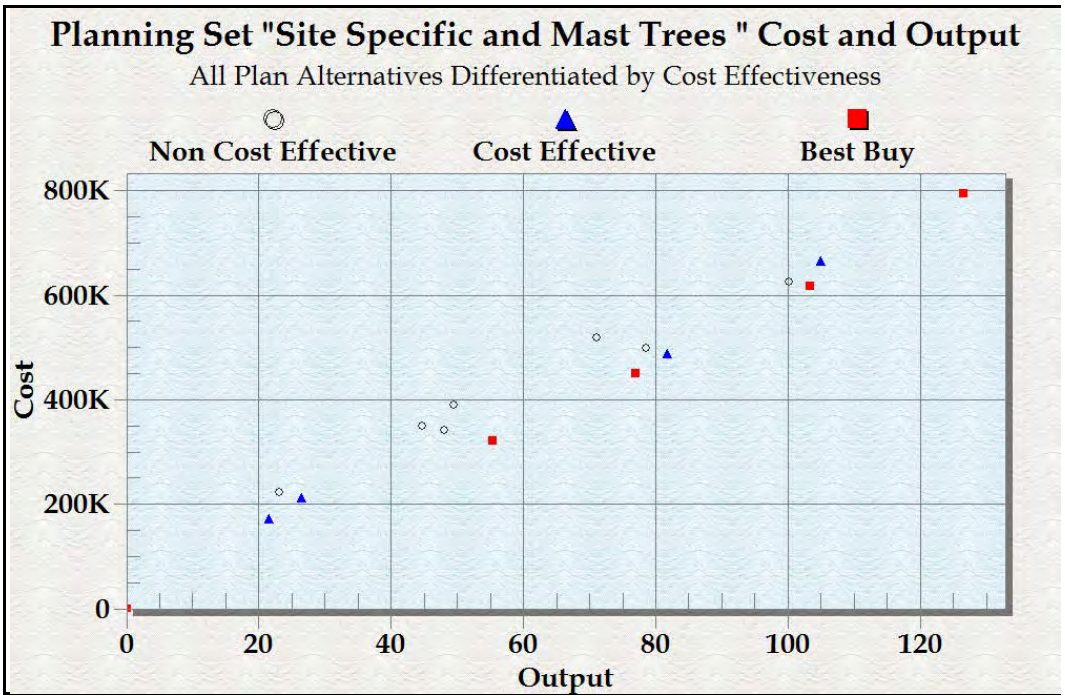

Figure 5-3. Cost-effectiveness Analysis – Site-Specific and Mast Tree Benefits

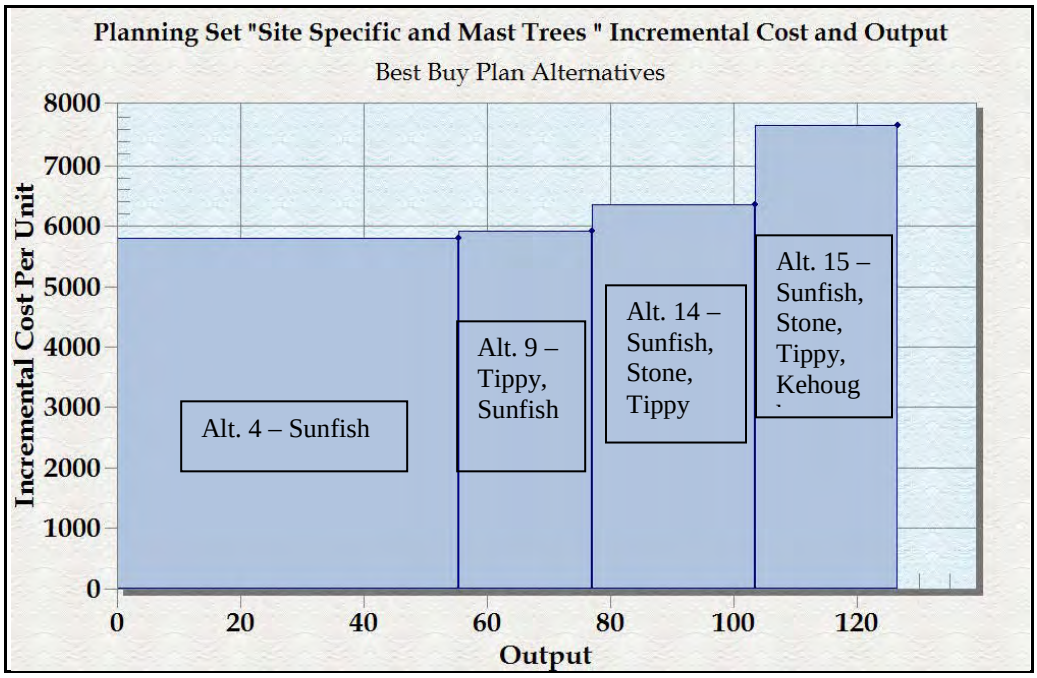

Figure 5-4. Incremental Cost Analysis "Best Buy" Plans – Site Specific and Mast Tree Planting Benefits

2. Systemic Overwintering Benefits. The project alternatives would benefit fish populations not only within individual sites, but systemically within Pool 12 as well. Centrarchid species, as well as other fishes, rely on off-channel backwater habitat for use during winter conditions. Radio telemetry studies performed by IADNR in Pool 12 and other adjacent pools have documented that centrarchids migrate varying distances to overwinter at known sites, and that sites have been utilized year after year by individual fish. Migration distances vary, but previous studies by IADNR (Pitlo 1992) found that largemouth bass might typically migrate 5 miles to reach overwintering sites. Additional radio telemetry work supported by the Corps during the winter of 2002 identified that bluegills, black crappies and white crappies typically migrated distances of 3 miles to reach overwintering habitat in Pool 12 (Iowa DNR 2002 and 2003, Pitlo 2004). Inferences from these data sets indicate that suitable backwater overwintering areas need to be spaced within a pool relatively close to one another to be effective.

Pre-project monitoring in the Pool 12 area was initiated to monitor fish movement out of overwinter sites, as compared to prior studies tracking their movement into overwintering sites. Home range analysis identified the area that fish used 80% of the time for each backwater lake (Table 5-4). The influence of landscape features such as the proximity to the main channel, position in the pool or side channel complex, or proximity to other overwintering backwaters were observed, but not tested. Changes in home range through the winter season or in response to other environmental factors (dissolved oxygen sags, changes in temperature, water level fluctuations, etc.) were also explored. Pre-project results indicate that fish communities are relatively stable and do not range far (<1 mile) from overwintering sites. Consistent with prior findings, however, was the timing of movements and apparent relationships to environmental conditions like oxygen and flow.

Two scenarios were used to quantify potential systemic benefits and address the uncertainty regarding local fish movements. The first scenario utilizes information from previous studies indicating a bluegill migration distance of 3 miles. The second scenario utilizes information from pre-project monitoring data that indicates a migration distance of 1 mile. Buffer areas of 1-mile and 3-miles were established around each backwater lake in the project area using GIS. These buffer areas were then used to calculate the amount of backwaters (e.g., shallow contiguous aquatic habitat) that may be used by fish overwintering at a specific backwater. Overlapping areas from multiple backwaters were not "double counted" (Figures 5-5 and 5-6).

This approach quantifies the amount of backwater aquatic habitat that could benefit from a potential project at a given backwater. However, the systemic analysis does not answer the ultimate question of "how much" backwater overwintering habitat is "needed" within a given area. Unfortunately, the understanding of cause-effect relationships between habitat and UMR fish populations is not yet strong enough to identify how much overwintering habitat is necessary to support an identified centrarchid population level. However, this project is designed to provide insight into how much of a fish's non-winter life history, such as spawning, may benefit from an alternative that improves fish overwintering condition and spring fitness. The lake selection and post-project monitoring will help evaluate how backwater sites may need to be spaced to maximize potential benefits.

Table 5-4. Bluegill Home Range (ha), by Period and Mean Size During Ice Cover, as Determined by Telemetry and Kernel Methods at Fishtrap, Frentress, Greens, and Stone Lakes

Shaded areas denote periods with ice cover.

	Lake			
Period	**Fishtrap Lake**	**Frentress Lake**	**Greens Lake**	**Stone Lake**
1	19.76	9.60	8.65	5.04
2	0.21	7.17	3.22	1.23
3	0.54	3.53	6.29	1.40
4	0.27	3.59	4.45	0.52
5	0.25	3.30	9.39	2.24
6	0.65	4.52	6.08	0.46
7	-	3.48	9.06	0.98
8	-	7.30	4.04	2.01
9	-	13.42	23.18	21.39
10	-	-	14.07	20.71
11	-	-	12.86	34.03
12	-	-	11.94	41.29
13	-	-	13.57	20.73
14	-	-	9.06	6.55
15	-	-	7.02	-
16	-	-	9.88	-
17	-	-	7.54	-
18	-	-	8.03	-
19	-	-	8.55	-
Mean Ice	**0.32**	**4.70**	**6.07**	**1.26**

Benefits were quantified for every alternative at both the 1-mile and 3-mile buffer area, resulting in acreage of contiguous aquatic habitat and compared with the construction cost for each alternative. The alternatives were compared using IWR Planning Suite to determine the best buy alternatives (table 5-3). Using the scenario in which fish migrate a distance of 1-mile, the resulting alternative comparison determined that there were four best buy alternatives; Alt. 2 (Tippy Lake), Alt. 8 (Tippy, Kehough), Alt. 13 (Sunfish, Kehough, Tippy) and Alt. 15 (Stone, Tippy, Kehough, Sunfish).

Using the scenario in which fish migrate a distance of 3-miles, the resulting alternative comparison determined that there were three best buy alternatives; Alt.3 (Kehough), Alt. 9 (Tippy, Sunfish), and Alt. 13 (Sunfish, Kehough, Tippy). Alt. 15 was not identified as a best buy plan because the 3-mile areas around Tippy Lake and Stone Lake overlap extensively due to their close proximity and did not show additional benefits (figure 5-6).

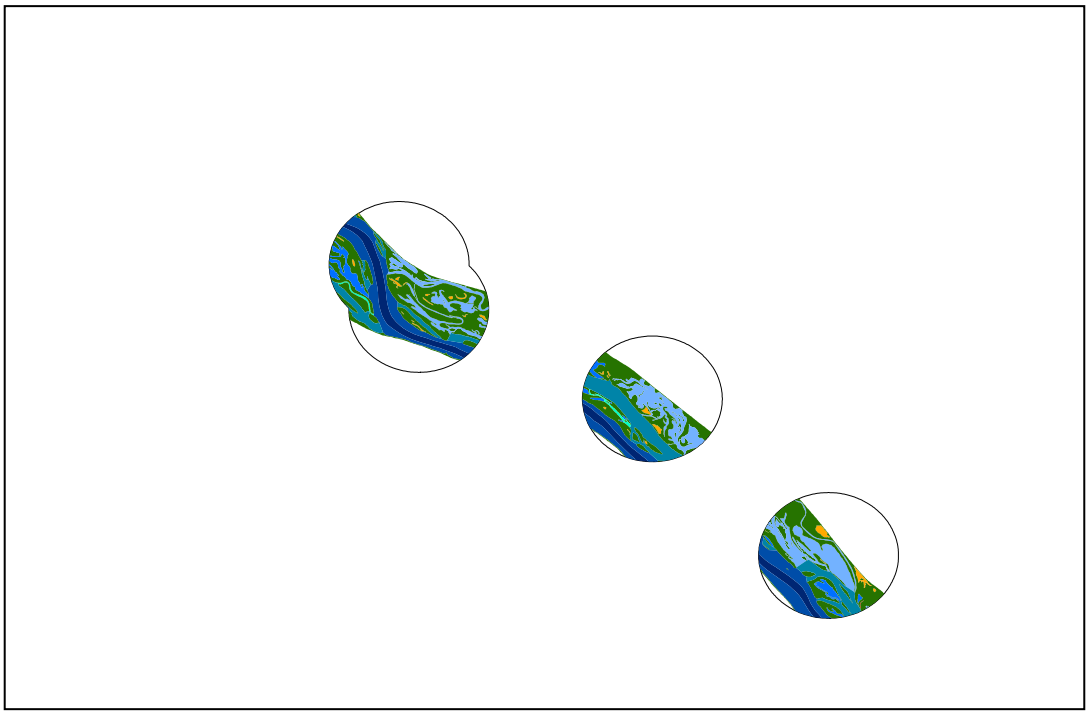

Figure 5-5. Alternative 15 With 1-mile Buffer Areas

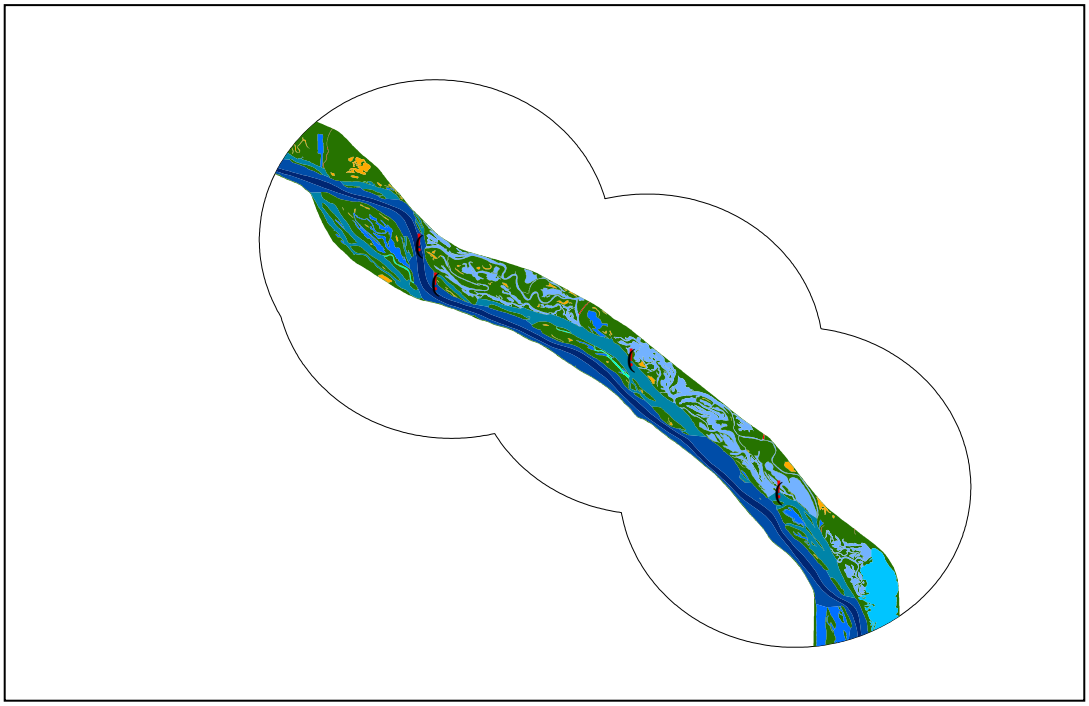

Figure 5-6. Alternative 15 With 3-mile Buffer Areas

3. Navigation Study. As an additional way for the PDT to cross-check the estimated Systemic Benefits, information from the Navigation Study was used as a sensitivity analysis. As part of the Navigation Study, work groups, the science panel, coordinating committees, States, and other stakeholders formulated and refined ecosystem restoration alternatives to better and more efficiently meet the identified range of ecosystem protection and restoration opportunities. This included establishing and evaluating potential ecosystem measure performance (e.g., area of influence, cost per acre, etc.). The resulting information was compiled into Table 5-5, as part of the Navigation Study.

The Navigation Study quantified the area of influence for a variety of restoration measures, including backwater restoration (channel dredging). This multi-District effort examined how habitat areas were influenced by anticipated or ongoing UMRS management and restoration activities. By reviewing existing restoration efforts, the average area of influence was identified for a given project footprint. Using this methodology, the areas of influence were estimated for the management and restoration measures displayed in Table 5-5.

Areas of influence identified for the restoration projects reflected only the direct habitat impacts of the measures. Overall, this may be considered a conservative estimate when one takes into account the restoration effort's more far-reaching effects on migratory species.

The Navigation Study stated,

> *"Backwater dredging is conducted primarily to improve water quality conditions for backwater fish. The activity typically includes dredging channels and holes in distinct backwater areas that have experienced high rates of sedimentation over time. It is known that fish make seasonal movements to these habitats, so that they may be attracted from many miles during certain critical time periods. The area of influence for this measure, however, was restricted to the area of the backwater lake in which dredging was conducted. Based on a range of experience with other projects, it was estimated that the average project would dredge 20 acres in a 600-acre lake for a 1:30 footprint to influence ratio."*

Using this information, the PDT applied the 1:30 ratio to the dredging acreage in each of Pool 12's alternatives. For every acre of dredged channel, there are 30 acres influenced for ecosystem restoration. The area of influence was determined for each alternative and compared in IWR Planning Suite using construction costs of each alternative. The result was three best buy plans as shown in Table 5-3. The benefiting acreage for Alternative 15 is estimated at 1,875. This estimate is greater than the systemic benefits estimates using either the 1-mile or 3-mile buffer areas.

Table 5-5. UMRS Ecosystem Measures (costs and benefits in 2003 dollars)

Ecosystem Measures	Project Footprint	Project Costs (50 years)		Benefits	Cost per Acre
		Measure	O&M	Acres of Influence	of Influence
Island Building	30 Acres	$3,459,000	$247,500	1,000	$3,500
Fish Passage[a]	1 Site	$23,500,000	$1,500,000	-	-
Floodplain Restoration (Pools 1-13)	500 Acres	$1,000,000	$375,000	500	$2,000
Floodplain Restoration (Rest of UMR-IWW)[b]	5,000 Acres	$25,000,000	$3,750,000	5,000	$5,000
Water Level Management - Pool[a]	1 Site	$4,504,000	$0	-	-
Water Level Management - Backwater	1,000 Acres	$3,400,000	$1,000,000	1,000	$3,400
Backwater Restoration (Dredging)	20 Acres	$2,326,000	$0	600	$3,900
Side Channel Restoration	100 Acres	$1,450,000	$575,000	100	$14,500
Wing Dam/Dike Alteration	5 Structures	$785,000	$68,750	10	$78,500
Island Protection	3000 Feet	$528,900	$82,500	240	$2,200
Shoreline Protection	3000 Feet	$528,900	$82,500	3	$176,300
Topographic Diversity	5 Acres	$767,500	$60,000	8	$96,000
Dam Point Control	1 Site	$10,750,000	$2,250,000	3,000	$3,600
Floodplain Restoration-Immediate Opportunities	5,000 Acres	$25,000,000	$3,750,000	5,000	$5,000

[a] Fish Passage and pool-scale Water Level Management benefits were assessed separately.
[b] Floodplain Restoration (Rest of UMR-IWW) includes an additional $3,000/acre real estate cost.

4. Total Estimated Benefits. For the recommended plan (Alt. 15), the estimated benefits are 127 Annual Average Habitat Units and up to 1,875 acres of benefits. The Site Specific Benefits are 88 AAHUs. The Mast Tree Planting Benefits are an additional 39 AAHUs. The acreages benefited by this project conservatively range from 743 to 1,875 acres of backwater lake area. Tools previously used to value these acres in terms of AAHUs are no longer available for use, but are significant nonetheless.

5. Is it Worth It? The purpose of the above sensitivity analysis is to ensure that the selection of Alt. 15 is reasonable by demonstrating it is consistent with past experiences with HREP projects and answers the fundamental question posed when doing cost effectiveness/incremental cost analysis; is a particular alternative and increment of benefit worth the additional cost over the next best buy plan or cost effective plan? The recommended plan is a best buy in five of the six analyses that were conducted using IWR Planning Suite, Incremental Cost Analysis.

Alt. 13 is the closest comparable alternative as it is a best buy in three of six categories including the original sites specific AAHU benefits. However, it is neither a best buy in the Mast Tree analysis or the Navigation Study methodology analysis. Of particular note is that it is not a Best Buy in the Mast Tree analysis or when combined with Site Specific benefits. This significant and scarce habitat type is fundamental to having a healthy Upper Mississippi River System as recognized in numerous studies and publications both within and without USACE. This significance is reflected in Program and Project objectives and manifest in many previous HREP projects.

The potential benefits for Alt. 13 range from 100 AAHUs (Mast Trees + Site Specific) to 1,476 Acres (Navigation Study Channel Benefits), while Alt. 15 range from 127 AAHUs (Mast trees + Site Specific) to 1,875 Acres (Nav Study Channel Benefits). The incremental analysis shown in Table 5-6 compares those two alternatives against each other with the low end of benefits being represented by the Mast Tree and Site Specific category and the upper end by the Nav Study Channel Benefits. Alternative 15, when taking into consideration the potential for additional mast tree and systemic benefits, shows a lower incremental cost per benefit unit over Alt. 13. This demonstrates that Alt. 15 is consistent with other best buys in the original site specific analysis and that the large jump displayed in Figure 5-2 between Alt, 13 and Alt. 15 would be similar to the incremental jumps between Alternatives 4, 10 and 13.

An additional qualitative factor that provides additional justification for Alt. 15 over other best buy plans is its contribution to greater understanding of e*cosystem process, structure and function.* This project area was identified by the interagency partnership as being the most suitable location on the Upper Mississippi River System to answer several critical questions related to spatial distribution and size of overwintering habitats in backwater lakes and its impacts on fish migration, life cycle requirements. Selection of Alt. 15 is “worth it” to the State of Iowa in so much as it will leverage approximately $800,000 in State funds for targeted monitoring and research into the above questions which will benefit future ecosystem restoration on the Upper Mississippi. The information gained and lessons learned will be transferable to other large floodplain rivers in the nation. Information gained will result in refinements to future HREP and similar ecosystem projects on the UMRS that will reduce formulation and construction costs while improving the quantity, quality and sustainability of benefits. Finally, the information gained can be used to develop tools and models to more adequately assess ecosystem benefits of those projects.

Table 5-6. Direct Incremental Analysis of Alt. 13 & Alt. 15 Utilizing a Range of Benefits

Alternative	Average Annual Cost for AAHU Benefits *(Mast Tree + Site Specific)*	Incremental Benefit [1]	Incremental Cost	Incremental Cost Per AAHU	Total First Cost for Acres Benefits (Navigation Study)	Incremental Benefit*	Incremental Cost	Incremental Cost Per Acre
Alt. 13 - Sunfish, Kehough, Tippy	$626,390	23	$177,053	$7,698	$13,456,234	288	$3,803,494	$13,207
Alt. 15 - Stone, Tippy, Kehough, Sunfish	$794,278	27	$167,888	$6,218	$17,062,826	399	$3,606,592	$9,039

[1] Alt. 9 was selected as the baseline to determine the incremental benefits of Alt. 13 and 15, because Alt. 9 is a Best Buy Plan in both the Mast Tree + Site Specific and Navigation Study benefit categories (see table 5-3).

G. Recommended Plan. Federal planning for water resources development is conducted in accordance with the requirements of the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G). The P&G provide a decision rule for selecting a recommended plan where both outputs and costs are measured in dollars. Under this rule, "The alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (National Economic Development Plan, NED Plan) is to be selected..." (paragraph 1.10.2). There is no similar rule for plan selection where outputs are not measured in dollars, as is the case in planning for environmental restoration and rehabilitation projects such as this HREP.

For ecosystem restoration projects, neither cost effectiveness analysis nor incremental cost analysis includes a plan selection rule similar to the NED rule. In the absence of such a decision-making rule, neither analysis will indicate what choice to make. The information developed by CE/ICA will assist in making informed decisions and, once a decision is made, will help in better understanding its consequences in relation to other choices. However, this procedure should not be the sole source of information on which to base a decision. Other factors considered in this analysis were landscape of the overall Project area (including physical and spatial dynamics associated with the large river-floodplain ecosystem), management objectives of the resource agencies, critical needs of the region, and ecosystem needs of the UMRS.

The question posed to the interagency team involved in this analysis was, "Is the cost of the added increment in output worth the added costs?" The Project team concluded that the alternative plan that best meets the goals and objectives of each agency and the EMP program is Alternative 15, which includes restoration at four backwater lake sites. This alternative is cost-effective and justified as a "Best Buy" plan. While the other cost-effective alternatives evaluated for this Project would partially address the goals and objectives of the project, the consensus of the interagency team was that this alternative would reasonably maximize ecosystem restoration benefits with the greatest spatial extent and distribution of benefits to resident and migratory aquatic and floodplain species (lower, middle, and upper reaches of Pool 12), and that other cost-effective alternatives would be less effective in meeting project objectives. For these reasons, Alternate 15 is considered to be the NER plan and is the recommended plan.

The recommended plan includes overwintering fish-habitat restoration at the four backwater sites of Sunfish Lake, Kehough Slough, Stone Lake, and Tippy Lake. Increasing backwater depths, while maintaining dissolved oxygen and appropriate water velocities for fish overwintering habitat, would promote and improve the aquatic environment and associated fisheries communities. The recommended plan would restore backwater habitat at four lakes by excavating approximately 64 acres of deep backwater channels providing overwintering and year-round habitat for fish in the surrounding 6,942 acres. The recommended plan would also establish mast-producing trees on approximately 40 acres of raised berms. The Project also would improve the floodplain forest community within areas of enhanced topographic diversity. Raised areas would be planted with hard mast-producing trees. The plan provides 88 AAHUs of fish.

From the programmatic perspective, restoration projects should have a high likelihood for success, help achieve one or more of the reach objectives, and add to a cumulative body of knowledge. WRDA 2007 authorizes almost 20 percent of ecosystem restoration funding for monitoring and adaptive ecosystem management. Continued commitment to adaptive management in the future will build

upon the monitoring and learning from experience that was established by EMP. The recommended plan would benefit fish populations not only within individual sites, but systemically within Pool 12 as well. Centrarchid species, as well as other fish taxons, rely on off-channel backwater habitat for use during winter conditions. Inferences from field data sets indicate that suitable backwater overwintering areas need to be spaced within a pool relatively close to one another to be effective. The question remains of how much backwater overwintering habitat is required within a given area to support the pool-wide fish population. Unfortunately, the understanding of cause-effect relationships between habitat and UMR fish populations is not yet strong enough to identify how much overwintering habitat is necessary to support an identified centrarchid population level. However, monitoring data collected as part of the recommended plan would provide some insight into how much of the Pool 12 area may benefit from the project; and how backwater sites may need to be spaced to maximize potential benefits. To make future analyses more informative, the Corps would work with fisheries experts to develop habitat suitability models that address overwintering habitat needs on a pool-wide basis.

In addition to the benefits discussed above, the proposed Project also would provide additional year-round benefits to aquatic backwater habitat, as well as providing benefits to the floodplain forest community. These benefits, while valuable, are not included in the detailed incremental cost analysis for multiple reasons. First, suitable habitat typically utilized during spring, summer and fall is probably more abundant than wintering habitat in the Project area, and may be less critical to fish populations. In addition, for floodplain forest enhancement, the realized benefits would be small in terms of acreage, relative to backwater lake habitat. Discussing these two benefits qualitatively allows for a more simplified analysis while still discussing important habitat values resulting from the project. The detailed discussion of resulting improvements in year-round aquatic and floodplain forest habitat is included in Appendix D.

The four evaluation criteria of the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council 1983) are acceptability, completeness, effectiveness, and efficiency; the recommended plan meets these criteria. The recommended plan is acceptable. The plan is feasible from technical, environmental, economical, financial, political, legal, institutional, and social perspectives. It is fully supported by the USFWS, the ILDNR, and the IADNR. The plan is complete. Realization of the plan benefits does not depend on implementation of actions outside the plan. The plan effectively addresses the project objectives. The dredged channels would effectively provide off-channel deep-water habitat for year-round and overwintering fish. Berms would deflect flow to minimize sedimentation in channels and would provide sufficient elevation for establishment and regeneration of hard mast-producing trees. The plan is efficient. The recommended plan was among the best-buy plans for the incremental analysis.

VI. RECOMMENDED PLAN: DESCRIPTION WITH DESIGN, CONSTRUCTION, OPERATION, AND MAINTENANCE CONSIDERATIONS

A. General Description. The Pool 12 Overwintering HREP recommended plan includes dredging backwater channels at four sites— Sunfish Lake (RM 564), Kehough Slough (RM 567.5), Tippy Lake (RM 571), and Stone Lake (RM 572)—in the backwater area of the Mississippi River in Pool 12 (see Plate 14). The channels have various lengths and configurations as shown on Plates 15 to 18 and described below. Plates 19 thru 28 show the channel plan and profiles, and Plates 29 and 30 show the

cross sections. Channels would be dredged to elevation 584.0 feet, 8 feet below flat pool with a 60-foot bottom width and 3 horizontal: 1 vertical side slopes. Flat-pool elevation is the lowest elevation that the pool would experience under very low flow conditions. Channel bottom width is 60 feet with 3 horizontal: 1 vertical side slopes.

The dredging would be accomplished with mechanical dredging with the dredged material placed adjacent to the excavated channel. Mechanical dredging would most likely be accomplished with a clamshell bucket attached to a barge-mounted crane capable of moving a full bucket of dredged material to construct the berms.

Tree clearing would be required on land placement. However the tree clearing in the water placement will depend on if the trees are in the way of the dredge's swinging bucket. Land placement site preparation includes removal of trees and shrubs within the placement area. The Corps forester would evaluate the sites to determine if there is merchantable timber. If a timber sale is warranted, the Corps forester would coordinate the timber sale, as appropriate. Incidental tree clearing would be required if timber sale does not occur.

The dredged material berms are placed in close proximity to the channels so that material can be easily placed. The berms are also positioned to direct flood flows and deflect sediment away from the excavated channels, minimizing the amount of sediment entering the channels. Berms constructed on the existing islands shall be high enough to support mast-producing trees. A mix of mast-producing trees and tree seeding would be established on the berms as described below. Berms that are placed in aquatic areas would diversify the bottom elevations in the backwater area and, when exposed in low water periods, would support wetland vegetation.

B. Recommended Plan for Each Backwater Site. Table 6-1 shows project feature details such as channel dredging: length, volume, area, aquatic berm and land berm area by site.

Table 6-1. Project Feature Details

	Channel Dredging			Berm		
	Length (ft)	**Vol. (cy)**	**Area (acres)**	**Aquatic Footprint Area (acres)**	**Land Footprint Area (acres)**	**Tree Clearing (acres)**
Sunfish Lake	12,140	240,000	26.6	15.0	14.1	14.1
Kehough Slough	6,520	165,000	9.6	11.3	4.3	4.3
Tippy Lake	5,975	120,000	13.0	5.2	9.0	9.0
Stone Lake	5,790	146,000	13.3	0	13.0	13.25[1]
Project Total	**30,425**	**671,000**	**62.5**	**31.5**	**40.4**	**40.65**

[1]The rock structure area will have to be cleared; therefore, 0.25 acres were added.

The aquatic berms would be constructed using mechanically placed dredged material in the water on the lakebed, while the land berms would be constructed using mechanically placed dredged material on the existing shoreline. The resulting elevation of the land berms would be much higher than the aquatic berms. The footprint width would vary depending on the height of the finished berms (height will not exceed elevation 602), operator skill, number of passes by the dredge, and amount and cohesiveness of the dredged material.

The aquatic berms would not be high enough to support mast-producing trees. However, most of

these berms would likely break the water surface and may support wetland vegetation during periods of low water when the tops of the berms are exposed to sunlight. The side slopes of the aquatic berm would be gently sloping (6H:1V) and the berm would be more spread out as dredged material placed in water tends to retain high moisture content and have a lower strength. These slopes would not be susceptible to erosion.

The land berms would be constructed high enough to support the planting of mast-producing trees. Trees would be planted on the top of the land berms. The top width would vary, but a minimum top width of 50 feet is desirable to ensure adequate space for tree planting. The minimum target elevation that would support mast producing trees is approximately the 2-year flood recurrence interval and is shown for each site in table 6-2. Also in table 6-2 is the minimum target elevation for aquatic berms.

Table 6-2. Aquatic and Land Berms Target Elevations

	Aquatic Berm	**Land Berm**
Recommended Plan	Min Target Elevation	Min Target Elevation
Sunfish Lake	592	596.3
Kehough Slough	592	597.4
Tippy Lake	592	598.0
Stone Lake	592	598.5

*Bottom Elevation $\leq$ 584 ft

1. Construction

a. Sunfish Lake. The recommended layout for the overwintering fish channels for Sunfish Lake is shown on Plate 15. Approximately 12,140 linear feet of channel would be mechanically dredged with material placed adjacent to the dredge cut. There is an estimated 240,000 CY of dredging. Typical cross sections for this work are shown on Plates 29 and 30.

The adjacent placement of dredged material in this area helps protect the channels by blocking out floodwaters that can carry higher amounts of sediment. Water flows into Sunfish Lake in the middle of the lake where the proposed rock closure structure is shown on Plate 15. The purpose of the flow deflection berm is to direct the flow around the bend and prevent it from dropping sediment in the channels to the north.

To access Sunfish Lake, the dredge would likely enter from the lower end via Stone Slough shown on Plate 15. During preparation of plans and specifications, a new hydrographic survey is recommended to verify contract quantities. Access dredging is not anticipated.

A rock closure structure at flat pool with a 20-foot notch in the middle is proposed (Plates 15 and 30). The purpose of this structure is to keep sediment from accumulating in the entry channel to Sunfish Lake and to minimize flow rates to enhance overwintering benefits for fish (low to no flow). If the channel silts in, the fish could be blocked from entering or leaving the site during a hard freeze. Entry channels to the backwater areas tend to silt in faster than other areas because water in the deeper channel moves fast enough during a flood to hold or maintain the sediment load. These sediment-laden waters slow down at the entry to the backwater areas where the velocities are very low and the sediment drops out of the water.

The adjacent placement of dredged material would be used to construct approximately 15.0 acres of aquatic berms and 14.1 acres of land berms for a total of 29.1 acres of placement. The aquatic berms will only have minor tree clearing (if the dredge bucket cannot swing the material into the placement area). The land berms will be cleared of most trees (14.1 acres). The existing valuable mature trees to avoid clearing will be marked prior to construction by the Corps. All cleared trees will be stockpiled on site.

Minimum land berm height for Sunfish Lake is 596.3 feet. Sunfish Lake will utilize four (4) tree planting methods. Plate 32 shows the placement area planting schedule and species. The first planting method is container stock trees (#3 Root Production MethodTM (RPM)), which consist of planting trees that are 4' to 6' in height with 3' spiral, plastic wrap on the trunk. There would be approximately 50 trees planted per acre. The tree species consist of Kentucky coffeetree, American sycamore, Pin Oak, Northern Pecan, and Swamp White Oak. A 4-foot perimeter would be sprayed around each tree to deter weed growth. Approximately 5 percent of the total trees planted (2 or 3 trees per acre) would have fencing placed around them. The fencing would be 3-foot tall plastic fencing zip-tied to wood stakes one foot in diameter. Individual fencing of various trees would help to determine if it is effective in preventing beaver damage. Fencing can become problematic in the floodplain due to high water events causing debris to get caught up in the fence, possibly causing the fencing to fail and knocking the tree plantings down.

The next planting method is planting a cover crop of buttonbush and then following up with container stock tree planting. This method involves collecting button bush seeds in the fall or early winter and planting those seeds in spring after berm construction. Planting would require disking as site preparation and harrowing after spreading the seed. Those seeds would then be allowed to grow for one season before the hand planting of the container stock trees. The button bush would provide a good cover crop or nurse crop for the trees, and is intended to help prevent beaver damage to the trees. The container stock would be the same number, species, and size as above method.

The third planting method is Container Stock with Advanced Natural Regeneration. This method would allow natural regeneration for two years after construction completion. There would be no intervention, including no mowing. After 2 years of natural regeneration, the same number and species of container stock trees would be planted.

The last planting method is direct seeding. This measure involves a broadcast seeding of desirable tree species (Kentucky coffeetree, American Sycamore, Pin Oak, Northern Pecan, Swamp White Oak, Bur Oak and Green Ash) in the approximate amount of 10,000 seeds per acre. This measure would require the ground to be disked prior to seeding and harrowed after distribution of the seeds. This method also requires mobilization of equipment to the berm sites, which would involve barging the equipment. Included in this method is spraying herbicide at least once in the May timeframe and again in the July timeframe if needed.

b. Kehough Slough. The layout for the proposed overwintering fish channels for Kehough Slough is shown on Plate 16. Approximately 6,520 linear feet of channel would be mechanically dredged with material placed adjacent to the dredge cut. There is an estimated 165,000 CY of dredging. The adjacent placement of dredged material in these areas helps protect the channels from silt laden flood flows and provide higher elevations for vegetation. Water flows into Kehough Slough from Deadman's Slough, near the proposed rock closure structure as shown on Plate 16.

One rock closure structure at flat pool with a 20-foot notch in the middle is proposed (Plates 16 and 31). The purpose of this structure is to reduce sedimentation rates and to minimize flow rates to enhance overwintering benefits for fish (low to no flow).

The adjacent placement of dredged material would be used to construct approximately 11.3 acres of aquatic berms and 4.3 acres of land berms. The aquatic berms will only have minor tree clearing (if the dredge bucket cannot swing the material into the placement area). The land berms will be cleared of most trees (4.3 acres). The existing valuable mature trees to avoid clearing will be marked prior to construction by the Corps. All cleared trees will be stockpiled on site.

Minimum land berm height for Kehough Slough is 597.4 feet. Kehough Slough will utilize the best producing mast tree planting method from Sunfish Lake. For the purpose of cost estimating the most expensive tree planting method was used for the estimate, which is planting a cover crop of buttonbush and then following up with container stock trees. Access to Kehough Slough is from the main channel through Harris Slough. During preparation of plans and specifications, a new hydrographic survey is recommended to verify contract quantities. Access dredging with adjacent placement is anticipated (12,000 CY).

c. Tippy Lake. The layout for the proposed overwintering fish channels for Tippy Lake is shown on Plate 17. Approximately 5,975 linear feet of channel would be excavated. The estimated 120,000 CY of dredging would be accomplished mechanically. The lower portions of the channel would be excavated and the dredged material placed adjacent to the channel. The design team did not want to place material on the existing islands in the upper portion of the channel due to the quality of the existing floodplain habitat. Therefore, the material will be place along the bankline and any excess material will be double handled to the placement area near Tippy Lake's downstream end.

The dredged material would be used to construct approximately 5.2 acres of aquatic berm and 9.0 acres of land berm. The aquatic berms will only have minor tree clearing (if the dredge bucket cannot swing the material into the placement area). The land berms will be cleared of most trees (9.0 acres). The existing valuable mature trees to avoid clearing will be marked prior to construction by the Corps. All cleared trees will be stockpiled on site.

Minimum land berm height for Tippy Lake is 598.0 feet MSL 1912. Tippy Lake will utilize the best producing mast tree planting method from Sunfish Lake. For the purpose of cost estimating the most expensive tree planting method was used for the estimate, which is planting a cover crop of buttonbush and then following up with container stock trees.

Construction equipment would access Tippy Lake from the south end. Portions of two existing wingdams would be removed in the adjacent slough to provide access for construction equipment. The riprap from the wingdams will be placed on the nearest bankline. The removal of portions of the existing wingdams was coordinated with Corps staff responsible for channel maintenance. Depths along the expected access route should be included in the hydrographic survey required for preparation of plans and specifications.

d. Stone Lake. The layout for the proposed overwintering fish channels for Stone Lake is shown on Plate 18. Approximately 5,790 linear feet of channel would be mechanically dredged with

material placed adjacent to the dredge cut. There is an estimated 146,000 CY of dredging. The land berms provide higher ground elevations than existing. This allows for the establishment of better quality hardwood trees, to diversify the topography, and diversify the habitat.

One rock closure structure at three feet below flat pool is proposed as shown on Plates 18 and 31. The purpose of this structure is to keep sediment from accumulating in the entry channel to Stone Lake. If the channel silts in, the fish could be blocked from entering or leaving the site during a hard freeze. Entry channels to the backwater areas tend to silt in faster than other areas because water in the deeper channel moves fast enough during a flood to hold or maintain the sediment load. These sediment-laden waters slow down at the entry to the backwater areas where the velocities are very low and the sediment drops out of the water.

Dredged material would be used to construct approximately 13.0 acres of land berms. The land berms areas will be cleared of most trees along with the rock closure structure area (13.25 acres). The existing valuable mature trees to avoid clearing will be marked prior to construction by the Corps. All cleared trees will be stockpiled on site.

Minimum land berm height for Stone Lake is 598.5 feet MSL 1912. Stone Lake will utilize the best producing mast tree planting method from Sunfish Lake. For the purpose of cost estimating the most expensive tree planting method was used for the estimate, which is planting a cover crop of buttonbush and then following up with container stock trees. Access to Stone Lake is from the main channel to Menominee Slough. Access dredging with adjacent placement is anticipated (6,000 CY).

C. Design Considerations The Project has been developed to a feasibility level of design. Design details are included in the technical appendices. As with all feasibility level studies, these details will be refined in the Plans and Specifications (P&S) Stage.

1. Survey Data. It is recommended that data of areas proposing dredging be resurveyed prior to construction in order to obtain accurate quantities for the Construction Contracts.

2. Site Access. In order to access the dredge cuts, an access channel 50 feet wide and to a depth of 587 (5 feet below flat pool) would need to be constructed to get equipment to Stone Lake and Kehough Slough.

3. Hazardous, Toxic, and Radioactive Waste. As required for all earth working projects in the Rock Island District, it is also recommended that the Environmental Protection specification section include requirements for HTRW testing of any material to be brought onto the site or removed from the site to ensure the material is not contaminated. If contaminated material is identified, the Corps would stop work and follow the steps outlined in ER 1165-2-132.

4. Public Access and Security. Safety and security are important parameters which would be detailed during the P&S Phase. Of specific concern will be the coordination of regional hunting seasons with the construction season.

5. Hydraulic Considerations. Appendix H presents the hydraulic development and evaluation of proposed improvements that, if constructed, would provide greater water depths, reduce the rate of sediment deposition, and improve water quality in the Project areas. A description of the

general climatic conditions, hydrology, flood profiles, stage hydrographs, and duration profiles and curves is included in Appendix H.

An analysis of expected sedimentation rates within the Pool 12 backwater area for both the with- and without- project conditions was completed. Every effort was made to design the proposed fish channels and the earth berms to minimize sedimentation. Various hydraulic models and methods were developed to estimate future performance. This included a study of historical deposition rates. The lake areas were divided into separate areas for evaluation. Historical sedimentation rates varied from negative 1.3 to 3.7 cm/year and are specified in Appendix H.

Results of the sedimentation analysis are shown in the Hydraulic Appendix by backwater area and channel section. The estimated theoretical computed sedimentation rates vary from no expected sedimentation to up to 5 feet of sedimentation over a 50-year project life. The only channel length with sedimentation rates high enough to degrade the project benefits occurs at Sunfish Lake and is accounted for with a dredging event in the O&M requirements at year 40 (table 6-4). Tractive force plots were developed to identify areas that would experience greater flows and velocities and may experience scour.

Two dimensional modeling was used for the sedimentation analysis. The RMA2 model performed the computations and the Surface Water Modeling System displayed the results graphically. The Surface System was used to compute bed shear stresses in order to predict whether cohesive sediments would remain in suspension or deposit.

A HEC-RAS model was developed for the middle to lower portion of Pool 12 to determine floodplain impacts as a result of this Project. The results indicate that, according to State of Illinois Floodplain Regulations, the project does not adversely impact the floodplain. These results are currently being coordinated through the ILDNR, Office of Water Resources.

D. Geotechnical Considerations. Several soil borings were obtained in each backwater site. The soil information developed from these soil borings should be sufficient to proceed to P&S development. In general, most of the expected dredging would be in clayey material. Most borings showed a soft clay layer underlain by stiffer clay. There were also layers of sandy clay. Sand seams were generally found at deeper depths. Sunfish Lake borings indicate softer clay at greater depths. This is significant because the softer clays would not have as much strength as the harder clays. This could result in additional dredging time, flatter slopes, and potentially higher sedimentation rates. At the entrance to Tippy Lake is a rocky area. This shows up on the Navigation Charts as wing dams that extend into the backwater. Initial coordination with the Rock Island District Channel Maintenance Section revealed that a fish channel could be excavated through the wing dams in this area. Additional information can be found in Appendix G.

After material is mechanically excavated and sidecast, it would take time to gain strength and remold. For this Project, the geotechnical analysis indicated that the material could likely be placed in two passes. The minimum distance between the excavated material berm and the excavated channel was determined to be 20 feet via stability analyses. The final distance between the excavated material berm and the excavated channel can be greater than 20 feet to provide additional reliability and to account for specific site considerations and layout. The height of the sidecast material is dependent on whether the material is placed adjacent to or on existing islands.

If the material is placed in an area where the land elevation is below flat pool, elevation 592.0 feet, it may initially stack up to a height of 6 or 7 feet above the existing lakebed with a couple of passes of a large clamshell dredge. According to settlement computations, it can be expected to settle or consolidate up to 2.5 feet. This would allow a new final island height of 595.0 feet or less. In some areas, the amount of excavated material would determine placement height. In other areas, it would be controlled by the strength of the material and the number of passes. A height of 595.0 feet is similar to the height of existing islands in the area.

If the material is placed on an existing island, it can be expected to stack up another 3 to 5 feet. A minimal amount of tree clearing is expected in order to swing the bucket to the placement area. This would provide a uniform base to support the dredged material. The resultant shape and height should provide a 6 horizontal to 1 vertical side slope (or flatter) toward the water and a higher elevation capable of supporting a higher quality stand of mast trees. For additional details and information concerning soil type, existing moisture content, estimated strength, and consolidation analysis. See Appendix G.

E. Construction Considerations

1. Mechanically Dredged Channels. Plates 29 and 30 show typical cross sections for a mechanically dredged channel with adjacent placement. A mechanically dredged channel is accomplished with a barge mounted clamshell-crane combination or a barge mounted excavator with a large bucket. The clamshell typically has a longer reach and is more suitable for the dimensions shown on the cross-section. Other EMP HREPs have utilized similar applications, crane and clamshell bucket systems, to move the excavated material the prescribed distance. Additional equipment may be needed to move materials to the final design grades. A large bucket assists in maintaining strength of the excavated material. The Project would likely be placed in two passes. Material in the first pass gains strength after it is placed. It gains strength when water is allowed to drain off the material and the material begins to consolidate or compress due to its own weight. If the contractor attempts to build too quickly, the material would slide or form failure planes and not stay within the dimensions shown. Equipment with a smaller bucket and shorter boom would usually take longer to build and would have more difficulty building the far side of the berm.

2. Overhead Power Lines. Overhead power lines are located near the Galena Boat Harbor. The approximate locations are shown on the drawings. During preparation of plans and specifications, a more thorough search and description of utilities in and around the area will be identified. The contractor will be made aware of utility locations so that any required costs associated with working around these utilities can be included in the contractor's bid. The identified power lines appear to be low voltage.

3. Indiana Bats. Prior to initiation of any tree clearing activities, the Corps will conduct a survey to determine the potential presence or absence of Indiana bats within or adjacent to the construction area. If suitable habitat is found, clearing activities may only be accomplished between October 1 of the year of the bat survey and March 31 of the year following the survey, to avoid potential impacts to the federally-protected species. If no suitable habitat is found as a result of this survey, clearing activity may proceed without seasonal restrictions. As part of a survey conducted in July 2012, no Indiana bats were found during mist netting, but suitable habitat was found in the clearing area for Sunfish Lake; therefore tree clearing for construction at this location will be restricted to the

aforementioned time period. No clearing activities are anticipated to be required at Kehough Slough. Habitat assessments, acoustic surveys, and mist netting will be completed at Tippy Lake and Stone Lake prior to initiation of construction at these locations, to determine if seasonal restrictions on clearing activities are necessary. If Indiana bats are found during future surveys of Tippy Lake and Stone Lake, the USFWS will be consulted to assist in determining the primary habitat and a suitable buffer (spatial and temporal) to avoid adverse impacts to the bat. Should adverse impacts be unavoidable, consultation will be reinitiated.

4. Timber Sale. Corps foresters should evaluate the dredged material placement sites to determine if there is merchantable timber and if a timber sale is warranted. If warranted, the Corps foresters will coordinate the timber sale, as appropriate. Incidental tree clearing would be required if timber sale does not occur.

5. Tree Clearing. No clearing of trees greater than 4 inches in diameter with loose peeling bark shall be allowed between April 1 and September 30 (Indiana Bat breeding and rearing season).

6. Tree Planting. The placement of dredged materials and final preparation of the placement area shall be completed before seeding and planting of trees will be allowed. Trees shall be planted between October 25 and December 10 when weather and soil conditions are suitable (air temperature between freezing and 80 degrees F.)

7. Best Management Practices. The results from elutriate analyses performed by the Corps early in the project planning phase when hydraulic dredging was considered as an alternative, suggest that localized, short-term elevated total suspended solids, volatile suspended solids, and zinc concentrations could occur if hydraulic dredging was utilized without best management practices (BMPs) in place to reduce return water sediment concentrations. Lab results indicate that several of the lakes exceeded IL EPA Acute Water Quality Standards for various metals (copper, lead, mercury, nickel and zinc). Bulk sediment sampling also occurred during this timeframe. None of the parameters tested exceeded the IL TACO Tier 1 Remediation Objectives. Relative to hydraulic dredging, mechanical dredging (especially with a large bucket) results in less mixing, significantly higher dredged material solids concentrations, and a considerably smaller volume of return water. Therefore, dredging mechanically would result in lower contaminant concentrations in the return water; thus, minimizing the impact to the receiving water body.

Upon review of these initial elutriate results and evaluation of additional elutriate and bulk sediment analyses performed by both Foth Infrastructure and Environment LLC and the Corps, it was determined that all dredging would be performed mechanically. Dredging mechanically would result in lower contaminant concentrations in the return water. Further reductions in return water contaminant concentrations could be realized with the incorporation of BMPs to lower the concentration of suspended solids entering the receiving water body. BMPs may include, but are not limited to, silt fences around land-based berms and turbidity curtains surrounding aquatic berms. For more information, see Appendices E, *Hazardous, Toxic and Radioactive Waste*, and F, *Water Quality*, for more information.

F. Construction Sequence. Table 6-3 summarizes the probable construction sequence for dredging. Each backwater area will have a separate construction contract for dredging.

Table 6-3. Probable Construction Sequence

Sequence	Backwater Area	Start Construction	End Construction
1	Sunfish Lake	May 2014	Dec 2016
2	Stone Lake	May 2016	Dec 2017
3	Kehough Slough	May 2017	Dec 2018
4	Tippy Lake	May 2018	Dec 2019

G. Operation. This Project has no anticipated operational requirements. There are requirements to monitor project performance and inspect project features. See the project-monitoring plan in Section X, *Project Performance Assessment*.

H. Maintenance. This Project is located within the USFWS Refuge at Savanna, Illinois, and would be maintained by the USFWS. The Project has been designed to minimize maintenance. Over time, the dredged fish channels are expected to degrade through the process of sedimentation. Care has been taken to place the channels where they would remain open for as long as possible. Maintenance activities and schedule are reported in table 6-4. Maintenance activities would be further defined in the O&M Manual, which would be prepared when project construction is complete.

Table 6-4. Maintenance Activities and Schedule

Description of Maintenance Item	Frequency
Inspect backwater channels and vegetation	Every year
Remove trees/ debris from rock closure structures	Every 5 years
Monitor and repair rock closure structures	As needed, every 25 years
Maintenance dredging event at Sunfish Lake	At year 40

Maintenance includes routine inspections of the fish channels and the mast-producing trees. These would be made by boat, preferably with a depth sounder to check channel depths. Areas that appear to be filling in with sediment should be identified for closer monitoring and identified for maintenance dredging. If debris such as fallen trees blocks portions of the channels or the entry channels, the debris could cause the water velocity to slow down and drop sediment. The debris should be removed if potential sedimentation could occur as a result.

Maintenance dredging would include a reach in Sunfish Lake and limited dredging if an entry channel to the backwater lakes silts in and blocks winter fish passage. Sunfish Lake has a reach after the rock closure structure that has a high sedimentation rate (see table H-10 in Appendix H for sedimentation rate), which may require the reach to be dredged once in the project life (year 40). This reach is approximately 2,500 feet long and may have four feet of sediment (31,300 CY) by year 40. The dredged material would be placed on the adjacent shoreline.

The entry channels into the backwater lakes are not expected to silt in. Material would be placed on the adjacent shoreline if needed.

Replacing riprap and repairing erosion could be a concern, but is not expected unless a critical area begins to erode. If a critical area begins to erode, it is often less expensive to repair it earlier rather than later.

I. Project Data Summary

Table 6-5. Pool 12 Overwintering Project Data Summary

Feature	Measurement	Unit of Measure
Dimensions Common to All Channels		
Bottom Width	60	feet
Depth Below Flat Pool (Flat pool is 592.0 ft)	8	feet
Side Slopes	3:1	horizontal:vertical
Total Channel Length	30,425	feet
Total Dredged Amount	671,000	cubic yards
Sunfish Lake, River Mile 564.0		
Channel Length	12,140	feet
Dredged Amount	240,000	cubic yards
Type of Dredging	Mechanical	
Recommended Placement Alternative	Adjacent	
Rock Closure Structure	4,200	tons
Minimum target elevation for tree planting sites	596.3	feet
Container Stock Trees	529	trees
Seed Planting (Buttonbush)	14.1	lbs
Direct Seeding Tree Planting	10.6	lbs
Kehough Slough, River Mile 567.5		
Channel Length	6,520	feet
Dredged Amount	165,000	cubic yards
Type of Dredging	Mechanical	
Recommended Placement Alternative	Adjacent	
Rock Closure Structure	4,200	ton
Minimum target elevation for tree planting sites	597.4	feet
Container Stock Trees	215	trees
Seed Planting (Buttonbush)	17.2	lbs
Tippy Lake, River Mile 571.0		
Channel Length	5,975	feet
Dredged Amount	120,000	cubic yards
Type of Dredging	Mechanical	
Recommended Placement Alternative	Adjacent with some barging	
Minimum target elevation for tree planting sites	598	feet
Container Stock Trees	450	trees
Seed Planting (Buttonbush)	36	lbs
Stone Lake, River Mile 572.0		
Channel Length	5,790	feet
Dredged Amount	146,000	cubic yards
Type of Dredging	Mechanical	
Recommended Placement Alternative	Adjacent	
Placement Area	10	acres
Rock Closure Structure	2,600	tons
Minimum target elevation for tree planting sites	598.5	feet
Container Stock Trees	650	trees
Seed Planting (Buttonbush)	52	lbs

J. Permits

Section 401/404. Construction in the floodplain requires compliance with Section 404 of the Clean Water Act. Section 404 requires mitigating for loss of wetland areas. For this Project, wetland mitigation is not required since the purpose of the project is to enhance the environment. Areas along placement berms create wetland areas and other naturally existing wetland areas are being protected. Section 404 requires compliance with Section 401 of the Clean Water Act. The Illinois Environmental Protection Agency (IL EPA) reviews the Section 401 portion of the joint application. The IL EPA will not issue a Section 401 permit until draft P&S are provided. Sometimes mechanical dredging requirements include installing silt curtains and downstream monitoring.

National Environmental Policy Act (NEPA). This report includes an integrated Environmental Assessment. This is required in order for the government to proceed with this Project. It includes potential positive and adverse effects to the environment both during and following construction. It includes compliance with the National Historic Preservation Act and other applicable Federal and State laws. If important cultural sites were identified, the sites would be protected during construction operations.

Floodplain Permit. The ILDNR issues a floodplain permit based on hydraulic modeling described in Appendix H. Flood heights cannot be adversely affected by new projects.

U.S. Fish and Wildlife Service Special Use Permit. A USFWS Special Use Permit from the UMR National Wildlife and Fish Refuge is required for construction activities within the refuge.

National Pollutant Discharge Elimination System (NPDES) Construction projects with a size of one acre or more are required to obtain coverage for activities under the Illinois General NPDES Permit for Storm Water Discharges from Construction Site Activities.

Other. The contractor may be required to comply with other local permit requirements and ordinances.

K. Value Engineering. A Value Engineering (VE) study was completed in March 2005 for this Project in accordance with ER 11-1-321, Army Programs, Value Engineering, dated 28 February 2005 (formerly EC 11-1-114, Army Programs, Value Management/Value Engineering, dated 28 February 2003). The findings of that study have been reviewed for technical acceptance and coordinated with the sponsor as appropriate. The Draft Definite Project Report (DPR), dated October 2004, included riprap at Sunfish Lake. It was determined that the velocities through this reach do not require that riprap be placed. Therefore, the 11,500 tons of riprap that had been included in the Draft DPR has been eliminated from the project and is not included in this report, however, it is recommended that the constructed berm and dredged channel area be monitored after construction, as there could be areas that are sensitive to erosion. If damaging erosion begins to occur, riprap would be designed and constructed. The riprap would be reduced in scope to target the specific erosion rather than include a large wide band as initially proposed in the Draft DPR.

There were several other recommendations that have a potential of cost savings, but have not been incorporated in the project for this report. There appears to be a potential for savings by modifying the embankment alignments to reduce side cast-distance. More detailed surveys are needed in order to

determine this proposal's applicability. These recommendations would require further coordination and review upon the receipt of more detailed information and would require coordination with the sponsor as appropriate.

Additional opportunities to provide added value to the project will be pursued during the development of the P&S and construction phases of the project.

VII. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 7-1. Project Implementation Schedule

Requirement	Scheduled Date
Distribute DPR for public and agency review	Sep 2005
Submit final and public reviewed DPR to MVD	Nov 2012
DPR approval	Jan 2013
Execute Memorandum of Agreement	Feb 2013
Initiate plans and specifications	Nov 2012
P&S – District Quality Control Report	Feb 2013
P&S – Agency Technical Review	Mar 2013
P&S Biddability, Constructability, Operability, and Environmental Review	May 2013
Advertise contract	Aug 2013
Award contract	Sep 2013
Complete construction	May 2020
Prepare operation and maintenance manual	Aug 2020

VIII. COST ESTIMATES

Project element and contingency costs are presented in Appendix I. An average 20.65 percent contingency was used for construction costs. Appendix I includes the fully funded estimate (FFE) and the current working estimate (CWE). Table 8-1 compares these costs. Unit costs were updated following selection of the recommended plan; therefore the costs below do not match exactly with those used in the incremental analysis. Table 8-2 summarizes the cost estimate by Project area and phase of construction.

Table 8-1. Project Design and Construction Cost Summary

Account [1]	Features (including contingency)	CWE[2]	FFE[2]
01	Lands and Damages	$0	$0
02	Relocations	$0	$0
06	Potential Adaptive Management Measures	$105,000	$111,000
09	Dredging	$16,302,000	$17,408,000
16	Bank Stabilization (Rock Closure Structures)	$1,121,000	$1,194,000
30	Planning, Engineering and Design[3]	$1,525,000	$2,576,000
31	Construction Management	$1,602,000	$1,834,000
	TOTAL PROJECT COST	**$20,656,000**	**$23,123,000**

[1] Project features are on Federal land; consequently, the lands and damages and relocations costs are zero and not listed.

[2] Current Working Estimate is based on August 2012 price levels. Construction scheduled is scheduled to begin in FY14. The Fully Funded Estimate (FFE) is based on midpoint of construction for each construction contract.

[3] The planning, engineering and design costs include the cost of the definite project report in the amount of $904,000.

Table 8-2. Detailed Cost Summary of Current Working Estimate

Acct Code	Item	Quantity	Unit	Amount	Contingency	Total Cost w/ Contingency CWE
	CONSTRUCTION COSTS					
	Sunfish Lake					
6	Adaptive Management	1	LS	$58,996	20.65	$71,179
9	Mob & Demob	1	LS	$179,886	20.65	$217,032
9	Site Prep/Fell Trees to Clear Site	1	LS	$30,320	20.65	$36,581
9	Mechanical Dredging	1	LS	$4,582,260	20.65	$5,528,497
9	Tree/Seed Planting	1	LS	$94,085	20.65	$113,514
16	Riprap Deflection Structure	1	LS	$352,459	20.65	$425,242
	Sunfish Lake Subtotal					**$6,392,045**
	Kehough Slough					
6	Adaptive Management	1	LS	$14,034	20.65	$16,932
9	Mob & Demob	1	LS	$90,965	20.65	$109,749
9	Site Prep/Fell Trees to Clear Site	1	LS	$9,247	20.65	$11,156
9	Mechanical Dredging	1	LS	$3,000,322	20.65	$3,619,888
9	Tree/Seed Planting	1	LS	$30,307	20.65	$36,566
16	Riprap Deflection Structure	1	LS	$348,019	20.65	$419,885
	Kehough Slough Subtotal					**$4,214,176**
	Tippy Lake					
9	Mob & Demob	1	LS	$92,133	20.65	$111,158
9	Site Prep/Fell Trees to Clear Site	1	LS	$19,353	20.65	$23,350
9	Mechanical Dredging	1	LS	$2,282,600	20.65	$2,753,957
9	Tree/Seed Planting	1	LS	$44,039	20.65	$53,133
16	Wingdam Removal	1	LS	$43,343	20.65	$52,294
	Tippy Lake Subtotal					**$2,993,892**
	Stone Lake					
6	Adaptive Management	1	LS	$14,034	20.65	$16,932
9	Mob & Demob	1	LS	$92,279	20.65	$111,334
9	Site Prep/Fell Trees to Clear Site	1	LS	$27,955	20.65	$33,728
9	Mechanical Dredging	1	LS	$2,879,898	20.65	$3,474,597
9	Tree/Seed Planting	1	LS	$56,552	20.65	$68,230
16	Riprap Deflection Structure	1	LS	$185,717	20.65	$224,068
	Stone Lake Subtotal					**$3,928,888**
					TOTAL CONSTRUCTION COSTS	**$17,529,001**
	PLANNING, ENGINEERING, & DESIGN (PED)					
30	P&S	1	LS	$1,162,304	16.59	$1,355,131
30	EDC	1	LS	$145,288	16.59	$169,391
					TOTAL PED COST	**$1,524,522**
	CONSTRUCTION MANAGEMENT					
31	Construction Management	1	LS	$1,452,880	10.29	$1,602,382
					TOTAL CONSTRUCTION MANAGEMENT	**$1,602,382**

TOTAL PROJECT COSTS $20,655,904

A. Operation and Maintenance Considerations. Operation and maintenance may include performing inspections, debris removal, sediment removal, and additional riprap. The estimated total annual operation and maintenance cost is $11,262 (table 8-3). These quantities and costs may change during final design. A complete list of operation and maintenance needs will be provided in an operation and maintenance manual following construction.

Table 8-3. Estimated Maintenance and Monitoring Costs [1]

Item	Quantity	Unit	Unit Price	Total Unit Cost	Remarks	Total Cost
MAINTENANCE						
Maintenance Dredging						
Sunfish w/ mob & demob	31,300	CY	$22	$688,600	year 40	$688,600
Additional Riprap for Rock Closure Structures						
Stone Lake	520	TN	$91	$47,320	replace 10% total rock every 30 years if needed	$47,320
Kehough Slough	840	TN	$82	$68,880		$68,880
Sunfish Lake	840	TN	$82	$68,880		$68,880
Remove Small Trees and Debris from Riprap	60	Hr	$50	$3,000	every 5 years	$30,000
Inspections (Total Project Area)	16	Hr	$50	$800	every year	$40,000
					TOTAL MAINTENANCE COST	**$943,680**
					TOTAL MAINTENANCE COST (At Present Day Value and Annualized)	**$11,262**
MONITORING PER LAKE						
Water Quality Monitoring	1	LS	$12,000	$12,000	first 10 years	$120,000
Sedimentation Transects/Bathymetry	4	LS	$ 5,000	$20,000	every 5 years	$200,000
Fish Telemetry	1	LS	$60,000	$60,000	years 1 thru 5	$300,000
Fish Sampling	1	LS	$40,000	$40,000	years 2 thru 12	$400,000
Tree Survival/Regen Survey	4	LS	$16,000	$64,000	years 5, 10 & 20	$192,000
					TOTAL MONITORING COST	**$1,212,000**

[1] Price level is based on August 2012 prices. Costs are developed to inform alternative evaluation and sponsor responsibilities, but are not included in the total project costs.

B. Repair, Rehabilitation, and Replacement Considerations. For analysis purposes, the costs presented for operation and maintenance used the 50-year period of analysis. Table 8-4 lists the major Project components and their associated frequencies of repair, rehabilitation, and replacement. Estimates of these costs will be included in the operation and maintenance manual.

Table 8-4. Repair, Rehabilitation, and Replacement Considerations

Component	Frequency
Repair Rock Closure Structures	As needed, every 25 years
Maintenance dredging at Sunfish Lake	At year 40
Rehab backwater areas	Every 60 years

IX. ENVIRONMENTAL EFFECTS

A. Summary of Effects. The recommended plan would improve natural resource conditions within the Project area, including improvements in backwater lake and floodplain habitat conditions. No species listed or proposed for listing under the Federal Endangered Species Act would be affected. The proposed Project would result in short-term decreases in water quality due to localized increases in turbidity resulting from dredging and construction activities. Long-term effects would include conversion of some existing shallow-water habitat to deep-water habitat, depth reductions in other shallow-water areas, and elevation of some low-lying floodplain areas. The Project would provide overwintering habitat for fish, and increase floodplain forest diversity. No significant social or economic impacts would result. No federally-protected species would be impacted. No impacts to historic properties are anticipated.

B. Natural Resources. Changes in habitat resulting from the project alternatives, including the recommended plan, are described in Appendix D. In general, the proposed Project alternatives would result in improved natural resource conditions at the project site. Project alternatives would provide both site-specific benefits, as well as systemic benefits throughout Pool 12.

Construction activities could result in short-term impacts such as increased turbidity within backwater lake areas, as well as adjacent side channels and possibly downstream river areas. Downstream effects would likely be limited to increased sediment and turbidity levels during construction. To the extent possible, efforts would be made to limit downstream turbidity effects. However, riverine species are often subject to highly turbid conditions on an intermittent or seasonal cycle. Significant, long-term adverse effects to downstream aquatic resources are not anticipated to result from minor short-term increases in turbidity from construction activities. Moreover, resulting conditions following construction should include a long-term improvement in backwater habitat conditions.

Long-term changes in the project site would include a deepening of the backwater lake habitat at the selected sites discussed above. The recommended plan also would include reduced backwater depths in a limited number of areas to accommodate deflection berm creation with dredged material. This may promote emergent vegetation within these shallow areas, and may eventually result in more diverse habitat over time. However, this provides a way to place dredged material that may extend the project life of the excavated channels.

Project alternatives would result in some tree clearing and a small loss of bottomland forest wetland habitat through creation of dredged material placement areas. Clearing of trees would be avoided to the extent possible, especially in the case of existing mature mast-producing trees. Dredged material placement would enhance topographic diversity. This would convert marsh to bottomland forest with soft mast-producing trees and would convert bottomland forest with soft mast-producing trees to forest with conditions suitable to support a mix of hard and soft mast-producing trees.

The recommended plan would result in an increase in mast-producing trees, which would be considered a benefit within the existing floodplain forest community. Approximately 40 acres of mast-producing trees would be planted on elevated dredged material placement areas (table 9-1). While providing benefits to the floodplain forest community, these dredged material placement areas also should help to direct flow and sediments away from dredged areas during flood conditions, hopefully prolonging the life expectancy of backwater lake habitats.

Table 9-1. Project Feature Details

	Channel Dredging			Berm		
	Length (ft)	**Vol. (cy)**	**Area (acres)**	**Aquatic Footprint Area (acres)**	**Land Footprint Area (acres)**	**Tree Clearing (acres)**
Sunfish Lake	12,140	240,000	26.6	15.0	14.1	14.1
Kehough Slough	6,520	165,000	9.6	11.3	4.3	4.3
Tippy Lake	5,975	120,000	13.0	5.2	9.0	9.0
Stone Lake	5,790	146,000	13.3	0	13.0	13.25[1]
Project Total	**30,425**	**671,000**	**62.5**	**31.5**	**40.4**	**40.65**

[1]The rock structure area will have to be cleared; therefore, 0.25 acres were added.

In addition to placing dredged material to construct elevated habitat areas for mast-producing trees (land berms), under the recommended plan, 1.5 shallow aquatic acres would be affected by aquatic berm construction. This would include placing material 1 to 2 feet deep along shorelines which is not anticipated to dramatically affect existing trees. Understory vegetation would be buried through this placement, but should re-vegetate the following growing season.

In general, any adverse effects discussed above should be offset through the positive environmental benefits of the project. These trade-offs were discussed at length and ultimately agreed upon through coordination meetings with the IADNR, ILDNR and USFWS during project planning.

C. Threatened and Endangered Species. Construction activities are not expected to occur within proximity of nesting bald eagles. As a part of pre-construction monitoring, refuge staff would monitor the various Project areas for bald eagle nesting activity during the latter part of January and February. If any nesting is observed, the refuge would contact the Corps to take appropriate actions determined necessary to avoid adverse effects to nesting activity. The Corps would maintain close contact with the refuge staff regarding initiation of construction in the Project areas. For these reasons, no adverse effects to the species are expected to result from the proposed Project.

Prior to initiation of any tree clearing activities, the Corps will conduct a survey to determine the potential presence or absence of Indiana bats within or adjacent to the construction area. If suitable habitat is found, clearing activities may only be accomplished between October 1 of the year of the bat survey and March 31 of the year following the survey, to avoid potential impacts to the federally-protected species. If no suitable habitat is found as a result of this survey, clearing activity may proceed without seasonal restrictions. As part of a survey conducted in July 2012, no Indiana bats were found during mist netting, but suitable habitat was found in the clearing area for Sunfish Lake; therefore tree clearing for construction at this location will be restricted to the aforementioned time period. No clearing activities are anticipated to be required at Kehough Slough. Habitat assessments, acoustic surveys, and mist netting will be completed at Tippy Lake and Stone Lake prior to initiation of construction at these locations, to determine if seasonal restrictions on clearing activities are necessary. For these reasons, the Corps has determined that construction of the proposed Project is not likely to adversely affect the Indiana bat. If Indiana bats are found during future surveys of Tippy Lake and Stone Lake, the USFWS will be consulted to assist in determining the primary habitat and a suitable buffer (spatial and temporal) to avoid adverse impacts to the bat. Should adverse impacts be unavoidable, consultation will be reinitiated.

The Higgins' eye pearly mussel, spectaclecase mussel, or sheepnose mussel are not anticipated to be present within the backwater lake habitats evaluated as part of this Project. These species are more likely to occur within main channel border and secondary channels which generally have greater flow and coarser bottom substrates. The areas under consideration for dredging typically have minimal flows and fine substrates. The Corps finds the recommended plan is not likely to adversely affect these federally listed species.

One of the general goals of the HREP (and the Refuge Master Plan) is to conserve, restore, and enhance federally listed endangered and threatened species and the habitats upon which they depend. Construction of a feature that has the potential to adversely affect any endangered species is in direct conflict with this stated goal. If potential significant effects were identified prior to construction, the Corps and the interagency team would meet to determine the best course of action to avoid impacts.

D. Invasive Species. Invasive species that could benefit from the project include silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) which use connected backwaters as nursery areas, and emerald ash borer (*Agrilus planipennis*) which could infest green ash plantings. Over the life of the project, invasive aquatic plants may colonize the Project area as sedimentation reduces depths to the point where light can penetrate to the bottom and rooted aquatic plants can become established.

E. Cumulative Impacts. The primary resources to be affected by the recommended plan include backwater lake and adjacent floodplain forest habitats of Pool 12 of the UMR. Thus, the following discussion is focused on cumulative impacts associated with these resources. Additional discussion on cumulative changes to the UMRS can be found in *Ecological Status and Trends of the Upper Mississippi River System* (Lubinski and Theiling 1999); and *Upper Mississippi River and Illinois Waterway Cumulative Effects Study, Volume I and II* (WEST 2000).

Cumulative ecological effects are caused by the interaction of multiple stressors affecting all or portions of an ecosystem. Several definitions exist for cumulative impacts. One basic definition would be "…*the changes to the environment caused by an activity in combination with other past, present, and reasonably foreseeable future actions*."

1. Past Actions. For Pool 12, changes to the environmental condition of the Project area began with European settlement. With changes in land-use practices during settlement, river conditions within the river basin began to change to a more disturbed system. This included changes in water quality and in-stream physical habitat conditions. The most significant change to the system occurred with the damming of the river in the 1930s, with Lock and Dam 12 completed in 1939.

Damming of the river created abundant deepwater, lentic, backwater lake habitat, possibly beyond the quantity previously found in the area. This may have resulted in a short-term boom in aquatic species that flourish in lake-like habitat, including a possible increase in fish species such as largemouth bass, bluegill, and black crappie. However, Pool 12 has since begun to suffer from sedimentation. Sediments eroding from lands within the upper watershed were carried downstream and deposited within these backwater lakes. The reduced velocities associated with the backwater lakes led to most sediments falling from the water column and accumulating within the artificial impoundment. Current maintenance of the 9-foot channel project, including Lock and Dam 12 and channel training structures, limits the ability for the river to naturally create new backwater lake areas.

2. Present. At present, the backwater habitat of Pool 12 is degraded, with limited value as aquatic habitat. Some habitat improvement activities have occurred within adjacent areas of the UMRS, including backwater lake projects in Pool 11 and Pool 13. However, these projects likely do not provide measurable benefits to Pool 12.

3. Future Actions. The Pool 12 HREP is the main effort to improve backwater habitat at the Project area for the immediate future. Other efforts include management measures by the USFWS in accordance with the UMR National Wildlife and Fish Refuge CCP (USFWS 2006), as well as the potential for future USACE projects within pool 12 in accordance with the Environmental Pool Plans developed through the FWIC. While the current Pool 12 HREP project is an important factor in furthering the goals and objectives of the EMP program, it remains independent of the other efforts within pool 12 and will not impact or be impacted by those efforts in regards to funding, performance, and/or maintenance. With the proposed Project, backwater habitat would be improved over existing conditions, with improved overwintering habitat for a variety of species. Habitat modifications should have long-term benefits to the fish and wildlife utilizing this area. This project, in concert with other EMP projects in the UMR System, should counter other impacts to the river ecosystem such as sedimentation, pollution, and general decline in river habitats.

Without this Project, Pool 12 may continue to see reduced overwintering habitat for the foreseeable future. Without any improvements, Pool 12 would continue to be degraded, with any remaining overwintering habitat continuing to disappear.

At present, it is uncertain what other planning actions would address backwater habitat improvement in Pool 12. Efforts have been made in recent years for systemic habitat planning for the UMRS (e.g., "Pool Plans"). Although this effort would identify Pool 12 as an area in need of habitat restoration, it is unclear where authorization or appropriation would occur to address the issue. It is also possible that some larger restoration effort could result from the *Upper Mississippi River-Illinois Waterway System Navigation Study*. However, this is highly uncertain and may not immediately target improving habitat in Pool 12.

F. Socioeconomic Resources

1. Community and Regional Growth. No impacts to the growth of the community or region would be realized as a result of the proposed Project.

2. Community Cohesion. The proposed environmental enhancement project would not adversely impact community cohesion. No public opposition has been expressed, nor is any expected.

3. Displacement of People. No residential relocations would be required as a result of the project.

4. Property Values and Tax Revenues. The proposed Project would have no direct impact on property values or related tax revenues. All project lands are in Federal ownership and are managed by the U.S. Fish and Wildlife Service.

5. Public Facilities and Services. The proposed Project would maintain and enhance recreational opportunities for the general public within Pool 12. Hunting and fishing in the immediate

Project area may be temporarily impacted during construction. However, following construction, dredging of the Project area would provide improved recreational opportunities. A number of recreational facilities exist in Pool 12 including public use areas, marinas, and boat ramps. No adverse impacts to these facilities are anticipated.

The proposed Project and features are adjacent to the Mississippi River 9-foot channel, but no adverse impacts to commercial navigation traffic on the river are expected. The potential exists for access problems and traffic conflicts near the Galena Boat Club during project construction; however, these impacts would be short-term.

The height of the power lines crossing the entrance to Kehough Slough is a concern. Care would need to be taken during dredging of this area to avoid interference with the lines.

6. Life, Health, and Safety. The proposed Project poses no threats to the life, health, or safety of recreationists or others in the area. A Phase I Environmental Site Assessment for the project was completed and revealed no evidence of hazardous substances, HTRW, or other regulated contaminants.

7. Business and Industrial Growth. No long-term impacts to business or industrial growth would result from the proposed Project. No business relocations would be required.

8. Employment and Labor Force. There could be a slight increase in short-term employment opportunities in the project vicinity due to project construction. No long-term impacts would result.

9. Farm Displacement. No farms would be displaced and no prime and unique farmland would be impacted by the proposed Project.

10. Noise Levels. The proposed Project sites are basically rural in nature. Project construction would generate a temporary increase in noise levels; no long-term impacts would result.

11. Aesthetics. The proposed environmental enhancement project would not diminish the aesthetic resources of the area. The recommended plan would result in an increase in mast-producing trees, which would be considered a benefit within the existing floodplain forest community. Any clearing of trees would be avoided to the extent possible, especially in the case of existing mature mast-producing trees.

G. Hazardous, Toxic, and Radioactive Waste (HTRW). An HTRW HDR was completed in July 2012. The assessment revealed no evidence of HTRW in connection with the Project sites at the Pool 12 Overwintering HREP. As described in the Water Quality discussion, samples tested for the presence of metals, exceeded the IL acute general water quality standards for copper, lead, mercury, nickel and zinc. Best management practices will be incorporated in the design and construction of the project to ensure all Federal, state and local regulations are adhered to.

H. Historic Properties. The Pool 12 project has no historic properties listed on or eligible for inclusion in the National Register of Historic Places. Appendix A includes Corps letters dated March 19, 2004 and April 20, 2004, to the Illinois State Historic Preservation Office (SHPO). The Illinois SHPO's reply of April 9, 2004 (IHPA Log #: 064032204) indicates concurrence with the findings of

the archeological survey and the Corps determination of "no historic properties affected" by the Pool 12 undertaking. If the scope of the project should change, the Corps will coordinate any changes with the Illinois SHPO. In addition, if the execution of the project should uncover any item of archaeological, historical, or architectural interest, the Corps will ensure that reasonable efforts are taken to avoid or minimize harm to the property until its significance can be determined (36 CFR 800.11); the Corps will also comply with appropriate Federal and State laws should human remains be discovered.

I. Mineral Resources. No impacts are expected to occur to mineral resources as a result of this Project.

J. Adverse Impacts Which Cannot Be Avoided. During construction, temporary noise impacts and a temporary increase in turbidity cannot be avoided. Placement of material within the river floodplain cannot be avoided, as this is the only viable placement alternative, and would in fact provide project benefits in most instances.

K. Short-Term Versus Long-Term Productivity. Short-term construction impacts would be offset by the long-term improvement of habitat quality.

L. Irreversible or Irretrievable Resource Commitments. Materials and human resources used in proposed construction are the sole irreversible commitments.

M. Relationship of the Proposed Project to Land-Use Plans. The lands are identified as Wildlife Management/Reserve Forest Lands in the Land Use Allocation Plan (USACE 1989). The proposed Project does not conflict with this zoning. The proposed Project does not conflict with any laws or regulations pertaining to establishment and management of the UMR National Wildlife and Fish Refuge (Refuge). In addition, the proposed Project has been identified in the USFWS CCP which guides the administration and management of the Refuge.

N. Compliance with Environmental Quality Statutes. Table 9-2 lists Federal environmental protection statutes potentially applicable to the Pool 12 HREP, and the status of the recommended plan with respect to compliance with these statutes. Additional information relevant to compliance with specific laws and regulations is as follows:

1. Clean Air Act, as amended. No aspect of the proposed Project has been identified that would result in violations to air quality standards.

2. Clean Water Act (Sections 401 and 404). A Section 404(b)(1) evaluation for the recommended plan is found in Appendix B of this report. Certification of the proposed Project under Section 401 has been requested from the State of Illinois and will be obtained before construction begins.

3. Endangered Species Act of 1973, as amended. Construction activities should not disturb nesting bald eagles. No adverse effects to bald eagles would be anticipated**.** No impacts to the Higgins' eye mussel are anticipated to result from the project. Proposed construction and clearing activities are not likely to adversely affect the Indiana bat. The results of mist netting surveys conducted at Sunfish Lake in July 2012 (no Indiana bats were collected) have been coordinated with

the USFWS.

4. Farmland Protection. No farmland would be impacted by the proposed Project.

5. Federal Water Project Recreation Act. Recreational opportunities were considered during the development of this Project. Hunting and fishing in the immediate Project area may be temporarily impacted during construction. However, following construction, dredging in the Project area would provide improved opportunities for fishing and hunting in these areas.

6. Fish and Wildlife Coordination Act. Project plans have been coordinated with the USFWS, the IADNR, and the ILDNR. Coordination with these agencies, as well as others, is detailed in Section XIII, *Coordination, Public Views, and Comments*; and Appendix A, *Correspondence*. The Fish and Wildlife Coordination Act Report can be found in Appendix A.

7. National Environmental Policy Act of 1969, as amended. The completion of the EA and signing of the FONSI will fulfill NEPA compliance.

8. National Historic Preservation Act of 1966, as amended. The Pool 12 Overwintering Project has no historic properties listed on or eligible for inclusion in the National Register of Historic Places. The Project has been coordinated with the Illinois State Historic Preservation Office (SHPO).

9. Wild and Scenic Rivers Act of 1968, as amended. The Mississippi River is not listed as a component river in the National Wild and Scenic River System.

10. Executive Order 11988 Flood Plain Management. The Project would not directly or indirectly induce growth (construction of structures and/or facilities) in the floodplain. Therefore, the project is judged to be in full compliance with this executive order.

11. Executive Order 11990 (Protection of Wetlands). Existing forested and non-forested wetland habitat would be affected by placement of dredged material on islands and in shallow water areas. However, placement areas would be allowed to naturally revegetate or be replanted with desirable vegetation (mast-producing trees) that is of high value to the floodplain community. The shallow aquatic berms are necessary for placement of dredged material and for extending the life expectancy of dredge cuts.

12. Executive Order 13112 and USACE Invasive Species Policy Memorandum dated June 2, 2009. Common invasive species know to be present in Pool 12 include: purple loosestrife (*Lythrum salicaria*); curly-leaf pondweed (*Potamogeton crispus*); Eurasian watermilfoil (*Myriophyllum spicatum*); Asian clam (*Corbicula fluminea*); zebra mussel (*Dreissena polymorpha*); and common carp (*Cyprinus carpio*). Though not abundant, silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) have been captured both upstream and downstream of Pool 12 and are likely to be present in Pool 12. Invasive species that could benefit from the project include silver and bighead carp, and the emerald ash borer (*Agrilus planipennis*) which could infest green ash plantings. Over the life of the project, invasive aquatic plants may colonize the Project area as sedimentation reduces depths to the point where light can penetrate to the bottom and rooted aquatic plants can become established.

Table 9-2. Environmental Protection Statutes and Other Environmental Requirements

Federal Policies	Compliance
American Indian Religious Freedom Act of 1978 (42U.S.C. 1996)	Full compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, *et seq.*	Full compliance
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	Not applicable
Bald and Golden Eagle Protection Act, 16 U.S.C. 668-668d	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, *et seq.*	Full compliance
Clean Water Act, 33 U.S.C. 1857h-7, et seq.	Full compliance
Coastal Zone Management Act, 16 U.S.C. 1451, *et seq.*	Not applicable
Endangered Species Act, 16 U.S.C. 1531, *et seq.*	Full compliance
Farmland Protection Policy Act, 7 U.S.C., 4201, *et seq.*	Not applicable
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12), *et seq.*	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 601, *et seq.*	Full compliance
Flood Plain Management (Executive Order 11988)	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, *et seq.*	Not applicable
Marine Protection Research and Sanctuary Act, 33 U.S.C. 1401, *et seq.*	Not applicable
Migratory Bird Treaty Act, 16 U.S.C. 703-711	Full compliance
National Environmental Policy Act, 42 U.S.C. 4321, *et seq.*	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a, *et seq.*	Full compliance
Native American Graves Protection and Repatriation Act	Full compliance
Protection of Wetlands (Executive Order 11990)	Full compliance
River and Harbor Act, 33 U.S.C. 403, *et seq.*	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, *et seq.*	Full compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271, *et seq.*	Full compliance

Full compliance. Having met all requirements of the statute for the current stage of planning (either pre or postauthorization)
Not applicable. No requirements for the statute required; compliance for the current stage of planning

X. PROJECT PERFORMANCE ASSESSMENT

A. Project Monitoring. This section summarizes the monitoring and data collection aspects of the project. The primary project objectives have been summarized elsewhere in this document. The performance assessment is intended to gauge progress toward meeting these objectives.

The tables in this section present an overall description of the project; the activities that are to take place, agency responsibilities, and monitoring data collection summaries. Table 10-1 presents overall types, purposes and responsibilities of monitoring and data collection. Table 10-2 presents actual monitoring and data parameters grouped by project phase, as well as data collection intervals. Table 10-3 presents the post-construction evaluation plan, which displays specific parameters and the levels of enhancement that the project hopes to achieve. Plates 34-36 show monitoring locations.

Table 10-1. Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Sedimentation Problem Analysis	Define system-wide problem Evaluate planning assumptions	USFWS	USGS (UMESC)	LTRM	--
	Pre-Project Monitoring	Identify and define problems at HREP site; establish need of proposed Project features	Sponsor	Sponsor	Sponsor	--
	Baseline Monitoring	Establish baseline for performance evaluation	Corps	Field station or Sponsor through Cooperative Agreements, or Corps	HREP/ Sponsor	See Table 10-2
Design	Data Collection for Design	Include quantification of project objectives, design of project and development of performance evaluation plan	Corps	Corps	HREP	See Table 10-2
Construction	Construction Monitoring	Assess construction impacts; assure permit conditions are met	Corps	Corps	HREP	See State Section 401 Stipulations
Post Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives	Corps (quantitative) Sponsor (field observations)	Sponsor through O&M, or Corps	HREP/ Sponsor	See Table T0-3

USGS (UMESC) = U.S. Geological Survey (Upper Midwest Environmental Sciences Center)

Table 10-2. Resource Monitoring and Data Collection Summary[1]

	Water Quality Data						Engineering Data			Natural Resource Data			
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase	
TYPE MEASUREMENT	**Jun-Sep**	**Dec-Mar**	**Jun-Sep**	**Dec-Mar**	**Jun-Sep**	**Dec-Mar**							**Sampling Agency**
Point Measurements													Corps & IADNR
Water Quality Stations [2]													
Air Temperature		M		M		M							
Wind Direction		M		M		M							
Wind Velocity		M		M		M							
Percent Cloud Cover		M		M		M							
Wave Height		M		M		M							
Water Depth		M		M		M							
Velocity		M		M		M							
Dissolved Oxygen		M		M		M							
Water Temperature		M		M		M							
PH		M		M		M							
Specific Conductance		M		M		M							
Secchi Disk Transparency		M		M		M							
Turbidity	-	M	-	M	-	M							
Suspended Solids	-	M	-	M	-	M							
Chlorophyll	-	M	-	M	-	M							
Ice Thickness		M		M		M							
Snow Depth		M		M		M							
Elutriate Analysis [3]				1									Corps
Boring Stations [4]													
Geotechnical Borings								1					Corps
Fish Monitoring													
Radiotracking Survey											1		IADNR 2002-2003
Transect Measurements													
Sedimentation Transects Hydrographic Soundings							1	1	Y5				Corps
Tree Survival / Regen Survey[5]										1		Y5, 10 & 20	Corps

Table 10-2 - LEGEND

M = Monthly
Yn = Yearly interval
1,2,3, = Number of times data are collected within designated project phase

[1] See plates 34 through 36 (O-101 to O-102) for monitoring sites; plates 4 through 10 (B-101 to B-306) for geotechnical borings and locations.

[2] Water Quality Stations

Post Construction	W-M563.9T	Sunfish Lake (LTRM) - IADNR	Pre-Project	W-M564.5T	Sunfish Lake (LTRM) - IADNR
Post Construction -	W-M564.7R	Sunfish Lake (Corps)	Pre-Project	W-M566.2R	Fishtrap Lake (LTRM) - IADNR
Pre-Project	W-M566.3P	Fishtrap Lake (Corps)	Pre-Project	W-M566.6T	No Name Lake (only water temperature data) (Corps)
Pre-Project	W-M567.5Y	Kehough Slough (Corps)	Post Construction	W-M571.4N	Tippy Lake (Corps)
Post Construction	W-M567.4X	Kehough Slough (Corps)	Pre Project	W-M571.9W	Stone Lake (only water temperature data) (Corps)

[3] Elutriate Analysis

E-M564.3S	Sunfish Lake	E-M566.3P	Fishtrap Lake
E-M566.7T	No Name Lake	E-M567.7Y	Kehough Slough
E-M570.8K	Tippy Lake	E-M571.9X	Stone Lake

[4] Boring Stations
See Appendix G, *Geotechnical Considerations*

[5] Year 5-tree survival survey; Years 10 and 20 - fixed area plot sampling to record stem/acre of mast regeneration

Table 10-3. Pool 12 Overwintering Post-Construction Evaluation Plan
Enhancement Potential

Goal	Objective	Enhancement Feature	Unit	Year 0 Without Alternative	Year 1 With Alternative	Year 20 With Alternative	Year 50 Target With Alternative	Feature Measurement	Annual Field Observations by Site Manager
Restore and Protect Off-Channel Aquatic Habitat	Increase the amount of deep water habitat in the backwater lakes complex of Pool 12 as measured by acres to provide pool-wide overwintering habitat for fish. Target depth is 6 to 8 feet. Increase depth diversity in the backwater lakes complex of Pool 12 as measured by acres to provide year round habitat for fish. Increase sustainability of aquatic habitat in the backwater lakes complex of Pool 12 as measured by acres by decreasing the sedimentation in the complex	Excavate channels in backwater areas	Winter water temperature (°C)	0.5	≥1.0	≥1.0	≥1.0	Perform water quality tests at established monitoring stations during winters with forecasts for heavy snow and/or lower average temps	Describe presence or absence of fish stress or kills. Describe water clarity.
			Winter DO (mg/l)	3-5 mg/l minimum	≥5 mg/l minimum	≥5 mg/l minimum	≥5 mg/l minimum		
			Water depth (ac > 1.2 m)	0	63	63	63	Conduct bathymetric survey	Observe condition of berms; note any evidence of revegetation, erosion, excessive slumping or filling of adjacent dredge cuts
Restore Floodplain Forest Habitat	Increase areal coverage in acres of forest stands with hard mast-producing trees as a dominant or component species in floodplain forest areas surrounding the backwater lakes of Pool 12	Establish native mast-producing trees on areas of enhanced topographic diversity	Elevated acres that meet or exceed site-specific target elevations (feet above MSL)	0	25	25	25	Spot-check berm elevations	Observe condition of berms; note any evidence of uneven or excessive settling or lack of drainage
			Elevated acres containing live mast trees	0	25	25	25	Survey planted areas for survival of planted stock	Describe presence or absence of live planted stock, note any evidence of forage or other mortality causes, if observed
		Construct areas with elevations above the 2-year flood recurrence	Evidence of regeneration of mast trees	0	16	16	16	Conduct fixed area acre plot sampling to record stem/acre of mast	Note any evidence of forage or other causes of mortality if observed

B. Monitoring and Adaptive Management Plan

1. Tree Planting. Four mast-tree planting measures will be implemented as part of the recommended plan. Mast-tree planting will initiate at Sunfish Lake after year 1 of construction is completed. In order to implement four tree planting measures, the total estimated land berm acreage at Sunfish Lake will be roughly divided into quarters. Each quarter will have a different mast-tree planting measure implemented on it. The first two measures will be implemented after the first year of construction on half of the total land berm acreage estimated for construction, approximately 20 acres. The second two measures will be implemented after the second year of construction on the remaining two quarters of total land berm acreage estimated for construction. The following measures will be implemented:

Sunfish Lake Tree Planting – After Year 1 of Construction:
Container stock w/ advanced natural regeneration (25% of total Lake-area berm acreage)
Container stock w/ button bush cover crop (25% of total Lake-area berm acreage)

Sunfish Lake Tree Planting – Year 2:
Direct Seeding (25% of total Lake-area berm acreage)
Container Stock (25% of total Lake-area berm acreage)

The various types of tree planting measures will be monitored for success. For the three measures that involve planting container stock, success will be determined by the survival rate of the planted trees. The survival rate will be measured by establishing random plots, one-half acre in size, from which to gather sample data. A tree survival rate of 80% or greater after one growing season will be considered a success for that measure. A tree survival rate of 50% or greater after five growing seasons will be considered a success for that measure. For direct seeding, the only measure that does not include planting of container stock, success will be determined by the percent coverage of established seedlings. The percent coverage of established seedlings will be measured within random fixed radius plots. The seedlings must win out of competing herbaceous cover to become established.

Based on the data collected for each of the tree planting measures, any one or more measure may be eliminated as a possible measure for implementation at the remaining lake sites if there is failure to demonstrate success of the measure. Only those tree planting measures that have demonstrated success will be carried forward for implementation at future lakes.

All tree planting measures will be monitored for success annually throughout the construction period of the project. In addition to the success criteria outlined above, professional judgment and best management practices will guide the decisions of the foresters for implementation of tree planting measures at the lakes being constructed after Sunfish Lake. If one or more of the tree planting measures implemented at Sunfish Lake fail to demonstrate success, then adaptive management would be implemented at the location of the failed measure(s). The adaptive management would include re-planting each of those failed tree planting areas with the tree planting measure that has demonstrated the greatest amount of success.

For purposes of cost estimating, a worst case scenario was assumed for the tree planting measures implemented at Sunfish Lake. It was assumed that three of the four measures implemented failed to demonstrate success and that only one tree planting measure was successful. In terms of adaptive

management, this would mean that 75 percent of the land berms at Sunfish would have to be replanted by means of the one successful measure.

Since it cannot be foreseen which measure will be most successful, an assumption was made that the most costly measure would be the most successful and would be used to complete the adaptive management replanting at Sunfish Lake. In this way, the greatest possible adaptive management costs have been accounted for.

2. Rock Closure Structures. The Upper Mississippi River System often experiences prolonged ice cover, and winter conditions take on great importance in the evaluation of the quality of aquatic habitat for bluegills and other fish species. Fishery biologists have identified dissolved oxygen, water depth, current velocity and water temperature as the most important variables affecting habitat quality in the winter. These variables are the key indicators used in the bluegill wintering model to determine wintering habitat quality.

The variable of water depth will be addressed through the implementation of channel dredging measures during the construction of the project. The wintering model states that a depth of four feet or greater is optimal. Dredged channels as part of the project will be eight feet in depth, providing the optimal depth for this variable, while allowing for expected sedimentation. Water temperature is another variable to consider in the evaluation of quality aquatic habitat. While temperature is a difficult variable to control, the placement of the dredged channels in backwater areas will be the key measure for addressing this variable. Overwintering habitat in backwater lakes will benefit from slightly warmer temperatures due to the little flow coming from the main channel, which tends to have cooler water temperatures. In addition, by providing adequate depth, suitable habitat will be maintained beneath any ice cover occurring at the water surface.

The water velocity and dissolved oxygen variables will be monitored to determine if adaptive management measures are required. While both variables are important, dissolved oxygen is the most critical of the variables to manage with adaptive measures. Both water velocity and dissolved oxygen will be managed with the construction of rock closure structures. Three rock closure structures will be constructed as part of the project at Sunfish Lake, Kehough Slough, and Stone Lake. The rock closure structures at Sunfish Lake and Kehough Slough will have a 20-foot wide notch at flat pool elevation. The rock closure structure at Stone will be constructed 3 feet below flat pool. Monitoring at each rock closure structure (table 10-2) will determine if desired water velocities and dissolved oxygen levels are being met. If desired water velocities and dissolved oxygen levels for overwintering habitat are not present, adaptive management measures will be implemented. Based on monitoring data, the elevation of the rock closure structures will be adjusted, either up or down to achieve desired velocities and/or dissolved oxygen levels.

A dissolved oxygen level of 5 mg/l or greater is considered optimal. If monitoring data demonstrates that the dissolved oxygen levels within a backwater lake are too low, then small quantities of rock will be removed from the rock closure structure allowing additional flow and increasing dissolved oxygen levels. The elevation of the rock closure structures will be adjusted as needed until the desired dissolved oxygen levels are achieved.

Zero current velocity is considered to be the optimal overwintering condition. Areas with water velocities above zero may still provide overwintering habitat; however, the suitability of the habitat

goes down as water velocities get higher. If monitoring data shows that the velocities are too high for suitable fish overwintering habitat, then additional rock will be added to the rock closure structures to further impede flow and reduce water velocities to a desired level. While zero velocity is considered optimal, the amount of dissolved oxygen present must also be considered. It is more important to have adequate dissolved oxygen than zero velocity. Determination of the optimal balance between the two variables will be based on data from past HREPs and best professional judgment.

Costs have been estimated for all three rock closure structures in the event that removing/adding rock is needed to reduce/increase water velocities and achieve the desired overwintering habitat.

After construction, at years one through five, post-project fish surveys would be taken to determine fish use of the area with at least one survey taken in winter to determine overwinter fish use. Experience in other restoration projects indicates that fish are drawn to areas that meet the requirements of the four variables stated above and success (fish usage) is not anticipated to be an issue. Documentation of fish use by centrarchids would be considered a success as there is currently limited use in the area by these species.

XI. REAL ESTATE REQUIREMENTS

The Pool 12 Overwintering HREP is a part of the UMRS-EMP authorized by Section 1103 of the WRDA of 1986, Public Law 99-662, as amended. The Project is located on the Mississippi River in Pool 12 between RM 563.0 and 573.0.

All project lands are presently owned by the United States and are under the control of USACE. The USFWS manages these lands under a cooperative agreement between the USFWS and the USACE, dated February 14, 1963, and an amended cooperative agreement dated July 31, 2001.

The Project is comprised of four different backwater lakes to be constructed:

Sunfish Lake. The dredged material (land berm) to be located in the Sunfish Lake area would cover approximately 14.1 acres of land.

Kehough Slough. The dredged material (land berm) to be located in the Kehough Slough area would cover approximately 4.3 acres of land.

Tippy Lake. The dredged material (land berm) to be located in the Tippy Lake area would cover approximately 9.0 acres of land.

Stone Lake. The dredged material (land berm) to be located in the Stone Lake area would cover approximately 13.0 acres of land.

The USFWS is a Federal participant in the Project. The Project would be 100 percent Federal cost. A map showing the Project area is included on Plate 1 of this report.
There are no proposed Public Law 91-646 relocations as there are no acquisitions required.

No borrow material would be needed for this Project. All berm construction materials would be

dredged from within navigational servitude and project waters. Access to the project would be via the Mississippi River. There are no known hazardous, toxic, or radioactive sites within the Project area. A draft Memorandum of Agreement between the USFWS and the USACE is included as Appendix C. The Real Estate Plan is included as Appendix J. Estimated operation and maintenance costs can be found in table 8-3.

XII. IMPLEMENTATION RESPONSIBILITIES AND VIEWS

A. US Army Corps of Engineers. The Corps is responsible for project management and coordination with the USFWS, the States of Illinois and Iowa, and other affected agencies. The Corps will submit the subject DPR; program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration. Section 906(3) of WRDA 1986 states that the first cost funding for enhancement features will be 100 percent Federal cost because project features will be located on federally owned land that is managed by the USFWS as a national wildlife refuge. The Corps has agreed to support this HREP's monitoring and data collection needs as outlined in tables 10-1 and 10-2.

B. U.S. Fish and Wildlife Service. The USFWS is a Federal participant in the project and has provided final comments for this Project pursuant to 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 (Appendix A). The Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R) of the project is the responsibility of the USFWS in accordance with Section 107(b) of WRDA 1992, Public Law 102-580. The annual OMRR&R costs are estimated at $11,262. These functions will be further specified in the Project O&M Manual to be provided by the Corps prior to final acceptance of the Project by the sponsor. The USFWS has agreed to support this HREP's monitoring and data collection needs as outlined in tables 10-1 and 10-2.

C. Illinois and Iowa Departments of Natural Resources. The ILDNR and IADNR are project proponents and have provided technical and other advisory assistance during all phases of the project and would continue to provide assistance during project implementation. The ILDNR and IADNR have agreed to support this HREP's monitoring and data collection needs as outlined in tables 10-1 and 10-2.

XIII. COORDINATION, PUBLIC VIEWS, AND COMMENTS

Coordination has been made throughout the planning and design process with the following State and Federal agencies:

Illinois Department of Natural Resources
Iowa Department of Natural Resources
Illinois Historic Preservation Agency
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

A. Coordination Meetings. Numerous coordination meetings were held with project cooperators to discuss potential enhancement features. The following meetings demonstrated ongoing coordination:

February 6, 1996. Meeting with Corps, USFWS, ILDNR, and IADNR. Team proposed to combine the Molo Slough HREP and Pool 12 Overwintering HREP.

December 13, 2000. General scoping meeting with Corps, USFWS, ILDNR, and IADNR

August 20, 2001. Site visit with Corps, USFWS, ILDNR, and IADNR

August 13, 2002. Meeting with Corps, USFWS, ILDNR, and IADNR to formulate preliminary dredging alternatives

December 17, 2002. Meeting with Corps, USFWS, ILDNR, and IADNR to determine the baseline conditions for use in quantifying habitat benefits.

February 20, 2003. Meeting with Corps, USFWS, ILDNR, and IADNR to project future without project conditions and future with project conditions for use in quantifying habitat benefits

February 4, 2004. Meeting with Corps, USFWS, ILDNR, and IADNR to select the recommended plan

March 25, 2004. Site visit with Corps, USFWS, ILDNR, and IADNR

November 17, 2011. Teleconference with Corps, USFWS, ILDNR, and IADNR to discuss the project schedule and milestones.

December 5, 2011. Teleconference with Corps, USFWS, ILDNR, and IADNR to discuss the project schedule and milestones.

January 24, 2012. Teleconference with Corps, USFWS, ILDNR, and IADNR to discuss additional sediment sampling, schedules, and milestones.

February 16, 2012. Teleconference with Corps, USFWS, and IADNR to discuss sediment sampling results and real estate concerns.

March 16, 2012. Meeting with Corps, USFWS, ILDNR, and IADNR to refine the selected plan.

April 9, 2012. Site visit with Corps, USFWS, and IADNR to further investigate HTRW concerns.

May 31, 2012. Teleconference with Corps and USFWS to discuss mast tree planting options.

B. Coordination by Correspondence. The following are found in Appendix A, *Correspondence.* All are letters unless otherwise noted.

April 19, 2001 from the USFWS UMR National Wildlife and Fish Refuge to the Corps expressing concerns regarding placement sites.

July 2, 2001 from the Corps to the USFWS UMR National Wildlife and Fish Refuge addressing concerns related to placement sites and providing a project status update.

July 2, 2003 to multiple addressees at the ILDNR, IADNR, US EPA, the USFWS, U.S. Coast Guard, Burlington Northern Santa Fe Railroad, and Galena Boat Club requesting comments on the final group of alternatives to be evaluated, any significant resources or other issues. The letter also requested USFWS comments on federally protected species.

July 31, 2003 from the USFWS UMR National Wildlife and Fish Refuge to the Corps providing information on federally-protected species that may occur in the Project area and requesting that the Corps evaluate potential upland placement sties.

August 4, 2003 from ILDNR to the Corps stating that it does not appear that the proposed Project would adversely impact any Illinois threatened or endangered species and stating concurrence with the final group of alternatives. The letter also notes that the project would require permits from ILDNR Office of Water Resources.

March 8, 2004 from the Corps to the USFWS and IADNR requesting comments on potential impacts to federally-protected species.

March 19, 2004 from the Corps to the IHPA requesting review of Corps' opinion that the project will have "no effect" on historic properties.

Stamp of Concurrence dated April 9, 2004 from the IHPA stating concurrence with the Corps March 19, 2004 letter.

April 20, 2004 from the Corps to consulting parties describing proposed Project and results of historic property surveys. The letter also asks consulting parties for information related to the project's potential effects on historic properties. The IHPA stated concurrence with Corps March 19, 2004 letter.

November 16, 2004 from the USFWS Rock Island Field Office, providing the Final Fish and Wildlife Coordination Act Report.

September 7, 2005, from the Corps to Distribution List distributing the Draft Definite Project Report with Integrated Environmental Assessment for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project for public review and comment with comment period ending November 4, 2005. The letter also announced the details of the October 5, 2005 Open House on the project.

Joint Public Notice dated September 19, 2005 by the Corps, IL EPA, and ILDNR, Office of Water Resources under the provisions of Sections 401 and 404 of the Clean Water Act and Act in Relation to the Regulation of Rivers, Lakes and Streams in the State of Illinois Chapter 615, IL Compiled Statues 1994.

September 20, 2005 from the Natural Resources Conservation Service to the Corps stating that no farmland would be impacted by the project and supporting the goals of the project.

September 27, 2005 from the Sac and Fox Tribe of the Mississippi in Iowa to the Corps, stating no objections to the September 19, 2005 Public Notice. The letter notes that if human skeletal remains or associated objects are uncovered during construction, construction should be stopped and the tribe should be contacted.

September 28, 2005 from the Prairie Band Potawatomi Nation to the Corps, stating no objection to the September 19, 2005 Public Notice.

October 3, 2005 from the Peoria Tribe of the Indians of Oklahoma to the Corps stating the tribe has no objections to the proposed construction but requesting construction cease and the tribe be notified if human skeletal remains or associated objects are uncovered during construction.

October 4, 2005 form the Sac and Fox Nation of Missouri in Kansas and Nebraska to the Corps stating that the tribe has no objections to the project, but requesting construction cease and the tribe be notified if human skeletal remains or associated objects are uncovered during construction.

Stamp of Concurrence dated October 6, 2005 from the USFWS stating no objection to the September 19, 2005 Public Notice.

October 6, 2005 from the Winnebago Tribe of Nebraska to the Corps stating that the Corps may proceed with construction, but if any burial sites or other cultural properties are discovered, that the tribe be notified.

October 11, 2005, from the Osage Nation Tribal Historic Preservation Office to the U.S. Army Corps of Engineers. The letter asks that construction cease and the Osage Nation Office be contacted if construction activities should expose any Osage archaeological materials,

October 17, 2006 from the ILDNR to the Corps stating that the agency has no objections to issuance of the permit for Section 404 of the Clean Water Act.

October 18, 2005 from the IHPA to the U.S. USACE documenting compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

November 4, 2005 from the USFWS to the Corps providing comments on the draft Definite Project Report with Integrated Environmental Assessment dated September 2005 and reiterating the USFWS support for the project and commitment to operate and maintain the project.

November 8, 2005 from the IL EPA to the Corps stating that a permit application had not been received for the subject project and stating that certification would be required under 401 of the Clean Water Act and that a state construction permit would also be required.

March 26, 2008, from the ILDNR enclosing the project's floodplain construction permit number DS2007019.

October 12, 2012 from the USFWS providing refuge comments on the revised draft Definite Project Report.

November 28, 2012 from the USFWS Rock Island Field Office, providing the Revised Final Fish and Wildlife Coordination Act Report.

January 8, 2013 from the USFWS amending a comment provided in their October 12, 2012, letter to the Corps.

C. Public Views. An open house was held on October 5, 2005, in Galena, Illinois, to discuss the draft recommended plan with the interested public and to gather public input. The open house was held during the 30-day public review period for the *Draft DPR with Integrated Environmental Assessment*. Representatives from the Corps, USFWS, and IADNR were present to talk one-on-one with attendees. Maps of the six backwater sites were arranged around the room. Hand-outs of the Executive Summary of the *Draft DPR with Integrated Environmental Assessment*, a project map, and a comment sheet were available to attendees. Twenty-seven members of the public attended the afternoon session and 23 members of the public attended the evening session. Thirty-three comment forms were returned. Respondents indicated that they used the Project area for recreation, fishing, boating, and hunting. Some respondents owned cabins or camps in the area. Attendees were supportive of the project. A summary of the open house is on file with the Rock Island District Corps of Engineers.

XIV. CONCLUSIONS

Full realization of the potential habitat value in the Pool 12 has been hindered by the sedimentation of off-channel areas and changed flow regimes due to impoundment which has led to the loss of diverse bottomland forests and deep-water, off-channel habitats. Establishing off-channel areas containing reliable aquatic/wetland habitat and establishing floodplain areas that would support survival and regeneration of hard mast-producing trees would allow the Project area to realize the highest benefit to fish and migratory birds.
The recommended project restoration features for Sunfish Lake, Kehough Slough, Tippy Lake and Stone Lake (land and aquatic berms, mechanically dredged channels, mast tree establishment) are designed to meet the project's goals of restoring and protecting off-channel aquatic and backwater habitat and restoring floodplain forest habitat. These goals would be met by dredging off-channel deep-water areas, increasing depth diversity in backwaters, diversifying forest stands with hard mast-producing trees, and constructing areas that support regeneration of hard mast-producing trees.

Assessment of the future with-project scenario shows definite increases in total habitat units over the 50-year project life for the target species, as well as a majority of other aquatic and wetland dwelling species. These increases represent quantification of the projected outputs: improved habitat quality and increased preferred habitat quantity.

This Project is consistent with and fully supports the overall goals and objectives of the UMRS-EMP, the USFWS CCP, the North American Waterfowl Management Plan, and the Partners in Flight Program.

UPPER MISSISSIPPI RIVER RESTORATION
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

RECOMMENDATIONS

I have weighed the outputs to be obtained from the full implementation of this habitat rehabilitation and enhancement project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this Project, as proposed, justifies expenditure of Federal funds. I recommend that the Division Engineer approve the proposed Project to include dredging backwaters, building land and aquatic berms, and establishing mast-producing trees at the following four backwater sites: Sunfish Lake, Kehough Slough, Tippy Lake, and Stone Lake.

The current estimated Federal construction cost of this Project is $17,529,000. Total Federal estimated project cost, including planning, engineering, and design; construction management; and adaptive management measures is $20,656,000.

At this time, I further recommend that funds in the amount of $1,355,000 be allocated for the preparation of the project plans and specifications.

19 March 2013
Date

Mark J. Deschenes
Colonel, U.S. Army
District Engineer

UPPER MISSISSIPPI RIVER RESTORATION
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

FINDING OF NO SIGNIFICANT IMPACT

I have reviewed the information provided by this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that the proposed habitat enhancement project in Pool 12, Jo Daviess County, Illinois, would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination may be re-evaluated if warranted by further developments.

An array of management measures were considered from which alternatives were derived. The measures include:

A. dredging activities at one or more of four potential locations within Pool 12;
B. constructing land and aquatic berms adjacent to select dredge cuts; and
C. establishing native mast tree species on berms.

The recommended plan addresses the primary goals of the *Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project*; to restore and protect off-channel aquatic habitat and restore floodplain forest habitat. The recommended plan would restore backwater habitat at four lakes by excavating approximately 63 acres of deep backwater channels to provide overwintering and year-round habitat for fish in the surrounding 6,942 acres. The recommended plan also includes building land/aquatic berms and the planting of mast-producing trees on approximately 40 acres of the berms. The plan provides 88 AAHUs of fish habitat.

Factors considered in making a determination that an Environmental Impact Statement was not required are as follows:

A. The Project is anticipated to improve the habitat value of Pool 12 for fish, and to improve the diversity of the floodplain forest community.

B. Aside from temporary disturbances during construction, no long-term significant impacts to natural or cultural resources are anticipated. No federally protected species would be affected by the proposed action.

C. Land use after the project should remain unaltered, and no significant social or economic impacts to the Project area are expected.

D. The Project will comply with Sections 401 and 404 of the Clean Water Act.

19 March 2013
Date

Mark J. Deschenes
Colonel, U.S. Army
District Engineer

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX A

CORRESPONDENCE

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

April 19, 2001

Mr. Dean Cerny
U.S. Department of the Army
Corps of Engineers, Rock Island District
Clock Tower Building
PO Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Cerny:

The Fish and Wildlife Service (Service) is writing in regards to the proposed Pool 12 overwintering Habitat Rehabilitation and Enhancement Project. In order to move forward with this project a strategy will need to be developed that has identified tasks and a specific time frame. We need to ensure that the project coming out of the planning process is agreeable to all agencies involved and that the following concerns be addresses before we proceed with detailed planning.

1. The Service believes that disposal sites located outside of the flood plain should be used on this project. If disposal sites outside of the flood plain cannot be identified for each lake site, then we should delay detailed planning on those respective sites until further disposal alternatives are identified. In order to identify what the materials consist of borings are necessary.

2. We request an update from Corps Realty regarding potential disposal sites located outside of the flood plain and that a list of potential disposal sites be identified prior to the next meeting.

3. We request that a visit to each disposal site be scheduled.

4. We request a loose prioritization of the viable lake sites based on availability of disposal sites with some criteria - cost, distance, etc.

5. We request a depth survey (bathymetry) of each lake site that has a suitable disposal site.

6. We request that flow rates be identified for existing channels which enter those lakes where suitable disposal sites have been identified.

7. We request a historical review of vegetation changes and estimated sedimentation rates of each lake that has a suitable disposal site.

8. We request that a mussel survey be conducted at each of lakes which has a suitable disposal site.

9. We request a clarification on cost share of this project. Since disposal of material will occur outside of the flood plain and off-Refuge, then will the Illinois DNR be responsible for cost sharing this part of the project?

If you have any further questions or need additional information, please contact Ed Britton at (815)273-2732.

Sincerely,

James R. Fisher
Complex Manager

cc: Mike Griffin, IDNR
Dan Sallee, IL DNR
Heidi Weober, RIFO
Pam Thiel, La Crosse Fishery Resources Office
Ed Britton, Savanna District Manager
Charlene Carmack, RI COE

STEFANIK/nlh/5285

July 2, 2001

Planning, Programs, and
Project Management Division

Mr. James R. Fisher
Complex Manager
Upper Mississippi River National
Wildlife and Fish Refuge
51 East Fourth Street, Room 101
Winona, Minnesota 55987

Dear Mr. Fisher:

Thank you for your letter, dated April 19, 2001, in which you suggested possible construction strategies and dredged material placement locations for the Environmental Management Program (EMP) Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project.

Potential uses of dredged material were discussed during initial project meetings with the U.S. Fish and Wildlife Service, the Iowa Department of Natural Resources (DNR), the Illinois DNR, the U.S. Army Corps of Engineers (Corps), and Long Term Resource Monitoring (LTRM) representatives. The feasibility report for this project will consider more than one alternative for placement of materials dredged from backwater and side channel areas. Typically, the most cost-effective alternative per habitat value is recommended.

Upland dredged material placement alternatives will be considered during the project planning process. The initial concerns with upland placement include the additional cost of pumping dredged material to placement sites on top of the bluff, as well as the additional cost and extended time that would be required to provide lands for material placement. Ultimately, these concerns could lead to a significant delay in project construction and completion.

In addition, we believe that at least some of the dredged material can be beneficially utilized to improve environmental conditions. Dredged material could be utilized to increase topographic diversity of adjacent terrestrial areas, which could result in more diverse plant communities. An example of a similar project is the Big Timber Habitat and Rehabilitation Enhancement Project in Pool 17. This project included dredging activities to improve backwater fishery habitat, as well as dredged material placement in adjacent terrestrial areas within the floodplain. Revegetation of the dredged material placement sites has subsequently added to the diversity of the area's lowland forest habitat. Furthermore, sediment delivery by overland flows

from the Mississippi River into the project area has been reduced by the construction of check dams from dredged material. Dredged material from this EMP project in Pool 12 could be utilized in a similar fashion.

We are currently finalizing our Baseline Monitoring Report, which will discuss project goals and objectives. This report will include a discussion of project scope and size. All seven identified areas are candidates for this project. However, we must consider the habitat needs of Pool 12, as well as the systemic needs of the Upper Mississippi River, when identifying the available resources and funding that will be directed for this effort. Restoration efforts for this project will be prioritized based on environmental benefits.

We have completed initial depth soundings for the three lower sites. During our first site visit, we sampled the immediate sediments and found that they consist generally of a soft clay underlain with a stiffer clay. We are planning a boring exploration at all seven sites. Borings will be performed to the depth of the proposed channels. In addition, some flow rate information also has been gathered at select sites. Generally there is very little, if any, flow in these backwater areas except during high water events.

Mr. Mike Steuck of the Iowa DNR/LTRM provided comments on the layout of potential alternatives. Prior to the next team meeting, we will combine those comments with your suggestions and the hydraulic engineering recommendations. Mr. Elliott Stefanik, our Project Biologist, will contact you regarding the next team meeting. We hope to make substantial progress on the report this summer, to include completing the monitoring plans, soundings, and soil borings. We also look forward to discussing potential concerns about mussel communities within the project area.

Thank you for your effort in formulating this project. As a team, we can make this project a success. If you have any questions, please call Mr. Stefanik at 309/794-5285, or you may write to our address above, ATTN: Planning, Programs, and Project Management Division (Elliott Stefanik).

Sincerely,

ORIGINAL SIGNED BY

Gary L. Loss, P.E.
Chief, Planning, Programs, and
Project Management Division

Copies Furnished:

Mr. Charles Wooley
Assistant Regional Director for
Ecological Services
U.S. Fish and Wildlife Service
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, Minnesota 55111-4056

Ms. Heidi Woeber
U.S. Fish and Wildlife Service
Rock Island Field Office
4469 - 48th Avenue Court
Rock Island, Illinois 61201

Ms. Pam Thiel
U.S. Fish and Wildlife Service
Fisheries Resources Offices
555 Lester Avenue
La Crosse, Wisconsin 54650

Mr. Ed Britton
Upper Mississippi River National
Wildlife and Fish Refuge
Savanna District
7071 Riverview Road
Thomson, Illinois 61285

Mr. Dick Steinbach
Complex Manager
Mark Twain National Wildlife Refuge
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Mr. Mike Griffin
Iowa Department of Natural Resources
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Bellevue, Iowa 52031

Copies Furnished (continued):

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Bellevue Field Station - LTRM
Iowa Department of Natural Resources
206 Rose Street
Bellevue, Iowa 52031

Mr. Tom Boland
Iowa Department of Natural Resources
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Bellevue, Iowa 52031

Mr. Dan Sallee
Illinois Department of Natural Resources
Box 149
Aledo, Illinois 61231

Mr. Scott Stuewe
Illinois Department of Natural Resources
Lincoln Tower Plaza
524 South Second Street
Springfield, Illinois 62706

CF:
Dist File (PM-M)
ED-D
ED-DM (Cerny)
ED-DN (Holmes)
OD-MN (Swenson)
PM-AR (Stefanik)
PM-M (Niles, Perk)

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

REPLY TO ATTENTION OF

July 2, 2003

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers is currently preparing a Definite Project Report (DPR) with integrated Environmental Assessment (EA) for the Pool 12 Environmental Management Program - Habitat Rehabilitation and Enhancement Project (EMP-HREP), Upper Mississippi River Miles 563 –573, Jo Daviess County, Illinois. The authority for this effort is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88), Section 1103 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) and subsequent amendments.

This information describes the alternatives being considered by the Rock Island District for the Pool 12 HREP. The purpose of this HREP is to restore and protect aquatic habitat by improving overwintering areas for fish. The proposed project feature would increase depths in backwater aquatic areas through dredging in select areas of Pool 12. These activities would benefit fish species that rely on backwaters as overwintering habitat, as well as meeting habitat needs during other seasons of the year. The project also could provide some additional benefits to terrestrial resources through increasing ground elevation from dredged material placement, creating conditions suitable for regeneration of mast producing bottomland hardwood trees.

The enclosed plate shows final alternative locations and general plans for dredging and dredged material placement at six (6) separate sites in lower Pool 12. The location and design of these project features were formulated through lengthy discussions and coordination with the U.S. Fish and Wildlife Service (FWS), Iowa Department of Natural Resources (DNR), and Illinois DNR. Discussions on this project among the Rock Island District and Federal and State resources agencies have been ongoing since the late 1990s. Over this time, several meetings were held to discuss specific backwater sites, dredge cut locations within individual sites, as well as dredged material placement issues. The alternatives described in the enclosed plate represent the best potential project sites, dredging cut locations, dredge cut size, placement berms, and dredged material placement sites, given constraints of the EMP program's budget and project authority.

The DPR and integrated EA will identify a recommended plan should one or more of these sites prove to be environmentally justified. At this time, we would like to receive concurrence from those agencies involved to date on this final group of alternatives. The Rock Island District needs this support to ensure efficient alternative evaluation, timely report completion, and construction, should EMP funding become available for construction during 2004. By copy of this letter, we also are requesting the FWS to provide information on any species listed or proposed to be listed as federally endangered or threatened which may be present in the project area, and to comment concerning potential effects to such species, in order to facilitate compliance with Section 7 of the Endangered Species Act of 1973.

We also would like to receive comments from all parties on this distribution to identify any existing significant resources associated with these sites, such as state listed endangered or threatened species, wetlands, known land-use plans, Hazardous, Toxic, and Radioactive Waste concerns and floodplain issues, such as potential loss of floodplain storage and potential impedance of flows, etc. The enclosure contains detailed information on the proposed plan to assist your evaluation. Please provide us with any reports, studies, or other research concerning environmental resources in the project vicinity that may be of use in analyzing potential impacts of the project. Your ideas are appreciated.

The Rock Island District would like to emphasize that this is not the final opportunity for comments on the subject project. The evaluation performed by the Rock Island District will be coordinated closely with the partner agencies, and their input will be sought during alternatives analysis, report preparation, public review, as well as during Plans and Specifications.

Please forward all comments within 30 days of the date of this letter to Ms. Charlene Carmack of our Economic and Environmental Analysis Branch at our address above, ATTN: Planning, Programs, and Project Management Division (Charlene Carmack).

Sincerely,

Gary L. Loss, *P.E.*
Chief, Planning, Programs, and
Project Management Division

Enclosure

DISTRIBUTION LIST
POOL 12 HREP

Mr. Scott Steuwe
Illinois Department of Natural Resources
One Natural Resources Way
Springfield, IL 62702-1271

Mr. Bob Schanzle
Illinois Department of Natural Resources
Division of Natural Resources
Review and Coordination
One Natural Resources Way
Springfield, IL 62702-1271

Mr. Dennis Kennedy
Illinois Department of Natural Resources
Office of Water Resources
One Natural Resources Way
Springfield, IL 62702-1271

Mr. Ed Walsh
Illinois Department of Natural Resources
P.O. Box 149
Aledo, IL 61231

Scott Schaffer
Illinois Department of Natural Resources
295-East Seminary
MT Carroll, IL 61053

Mr. Kevin Szcodronski
Iowa Department of Natural Resources
Wallace State Office Building
502 East 9th Street
Des Moines, IA 50319-0034

Mr. Mike Griffin
Iowa Department of Natural Resources
206 Rose Street
Bellevue, IA 52031

Mr. Mike Steuck
Iowa Department of Natural Resources
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Mr. John Pitlo
Iowa Department of Natural Resources
Bellevue Fisheries Station
24143 HWY 52
Bellevue, IA 52075

Mr. Tom Boland
Iowa Department of Natural Resources
Bellevue Fisheries Station
24143 HWY 52
Bellevue, IA 52075

Regional Administrator
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

Bill Franz
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3590

Mr. Dennis Grams
Regional Administrator
U.S. Environmental Protection Agency
Region 7
901 North 5
Kansas City, KS 66101

Ms. Sharonne Baylor
Assistant Manager
Upper Mississippi River
National Wildlife and Fish Refuge
51 East 14th Street, Room 101
Winona, MN 55987

Mr. Ed Britton
District Manager
Savanna District
Upper Mississippi River
National Wildlife and Fish Refuge
7071 Riverview Road
Thomson, IL 61285

DISTRIBUTIION LIST (Continued)

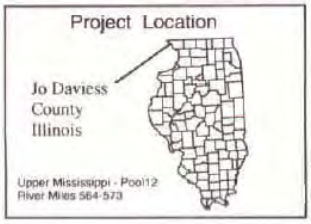
Ms. Heidi Woeber
U.S. Department of Interior
U.S. Fish & Wildlife Service
4469 – 48th Avenue Court
Rock Island, IL 61201

CDR Scott Cooper
Commanding Officer
Marine Safety Office
U.S. Coast Guard, 2nd District
1222 Spruce Street, Suite 1215
St. Louis, MO 63103-2385

Burlington Northern Santa Fe Railroad
1501 Portland Avenue
Savanna, IL 61074

Mr. Gerald Richardson
Galena Boat Club
11570 West Cross Road
Galena, IL 61036

MISSISSIPPI RIVER POOL 12 OVERWINTERING HREP



Stone Lake

Tippy Lake

Kehough Slough

No Name Lake

Fishtrap Lake

Sunfish Lake

Proposed Overwintering Fish Channel

Note: Section Lines Shown in White

Fish Channel Feature Data Courtesy of CEMVR-ED-DM

US Army Corps of Engineers
Rock Island District

Map Produced By the CEMVR-PM-M GIS Team 16 June 2003

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 East Fourth Street - Room 101
Winona, Minnesota 55987

31 July, 2003

Ms. Charlene Carmack
Economic and Environmental Analysis Branch
Rock Island District, Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ms. Carmack:

Thank you for the opportunity to comment on the Pool 12 Overwintering HREP alternatives provided in Rock Island District's letter dated July 2, 2003. We look forward to this project because we believe that it will improve aquatic habitat in Pool 12. The following are our comments regarding the six alternatives.

1. We propose that the Corps of Engineers eliminate No Name Lake from the Pool 12 HREP alternatives because of planned commercial harbor maintenance dredging in this area. A Corps of Engineers permit (CEMVR-OD-P-441440) was issued to Gerald Richardson for performing maintenance dredging of Harris Slough, a small section of Deadman Slough, and the Ferry Landing harbor area. The purpose of Mr. Richardson's dredging project is to improve boat access and provide additional docking space at the Ferry Landing marina. Mr. Richardson's project includes: 4,200 lineal feet of dredging; dredge widths from 187 to 372 feet wide; and a depth of five feet. This project is much more extensive, although shallower, than the HREP alternative proposed. In addition, all dredged material will be removed from the floodplain and deposited in an adjacent upland site. We believe that since there is other dredging planned in the No Name Lake area, there is no reason to pursue that particular Pool 12 HREP alternative.

2. As we have discussed before, we prefer that the majority, if not all, of the dredged material be removed from the floodplain. It appears from the alternatives plate that all dredged material will be placed near the dredge cut locations. To our knowledge, there has been no attempt to find upland sites for dredged material disposal. We understand that with this Pool 12 HREP project there may be some potential cost savings and beneficial use possibilities by constructing berms with the dredged material. However, as government agencies and natural resource managers, we should be setting an example of how to complete habitat restoration projects in accordance with guidelines set to conserve wetland habitat. In this project area, a commercial marina is performing a similar dredging project (identified above) in which all dredged material will be removed from the floodplain. We should all strive to do the same.

3. With respect to any species, listed or proposed to be listed, which may be present in the area of a proposed action, we give you the following:

Classification	Common Name	(Scientific Name)	Habitat
Threatened	Bald eagle	*Haliaeetus leucocephalus*	Breeding, wintering
Endangered	Indiana bat	*Myotis sodalis*	Caves, mines; small stream corridors with well developed riparian woods; upland forests
Endangered	Higgins' eye	*Lampsilis higginsi*	Mississippi River
Endangered	Iowa Pleistocene snail	*Discus macclintocki*	North-facing algific talus slopes of the driftless area

The endangered Indiana bat (*Myotis sodalis*) is listed as potentially occurring statewide in Illinois. During the summer, the Indiana bat frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of crop lands, along wooded fence rows, and over farm ponds and in pastures. This species should be considered if any tree-clearing or forested impacts are expected as a result of project construction.

The threatened bald eagle (*Haliaeetus leucocephalus*) is listed as breeding in Jo Daviess County, Illinois. It is also listed as wintering along large rivers, lakes and reservoirs in Jo Daviess County, Illinois. During the winter, this species feeds on fish in the open water areas created by dam tailwaters, the warm water effluents of power plants and municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter, the greater the ice coverage and the more concentrated the eagles become. They roost at night in groups in large trees adjacent to the river in areas that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. There is no critical habitat designated for this species. The eagle may not be harassed, harmed, or disturbed when present nor may nest trees be cleared.

The endangered Higgins' eye pearly mussel (*Lampsilis higginsi*) is listed for the Mississippi River north of Lock and Dam 20 which includes Jo Daviess County, Illinois. This species prefers sand/gravel substrates with a swift current and is most often found in the main channel border or an open, flowing side channel.

The endangered Iowa pleistocene snail (*Discus macclintocki*) is found on north-facing slopes of the driftless area in Jo Daviess County, Illinois. It occupies algific (cold producing) talus slopes

at the outlet of underground ice caves along limestone bluffs within a narrow regime of soil moisture and temperature. There is no critical habitat designated. It must not be harmed, harassed or disturbed. This species should be considered pursuant to upland dredge disposal.

4. For Section 106 of the National Historic Preservation Act, and not for the other cultural resources laws that apply to Federal land, we suggest the Corps be the lead Federal agency. If this is not acceptable to the Corps, please promptly inform us. Otherwise, the Regional Director will be requesting the Colonel accept the Corps being the lead agency.

5. For purposes of the National Environmental Policy Act, the Service will be a cooperating agency. The Corps must contact the Regional Environmental Coordinator, Jeff Gosse, at 612-713-5138 before planning on this project proceeds further.

6. Please add the following Fish and Wildlife Service personnel to your Pool 12 HREP distribution list as they will be involved in this project.

Ms. Pam Thiel
US Fish and Wildlife Service
555 Lester Ave.
Onalaska, WI 54650

Mr. John Dobrovolny
US Fish and Wildlife Service
1 Federal Drive
BHW Federal Building
Fort Snelling, MN 55111

Thank you again for the chance to comment on the Pool 12 HREP alternatives. We look forward to working with Rock Island District and the state agencies on this beneficial project. If you need additional information for development of the DPR, or if you have any questions about these comments, please contact Ms. Sharonne Baylor, our EMP coordinator, at (507) 494-6207.

Sincerely,

Don Haltman
Refuge Manager

cc: FWS; Ed Britton
FWS; Pam Thiel
FWS; John Dobrovolny
IA DNR; Mike Griffin
IL DNR; Scott Steuwe

Illinois Department of
Natural Resources
One Natural Resources Way • Springfield, Illinois 62702-1271
http://dnr.state.il.us

Rod R. Blagojevich, Governc
Joel Brunsvold, Directc

August 4, 2003

Mr. Gary L. Loss, P.E.
Chief, Planning, Programs and Project Management Division
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Loss:

Reference is made to your July 2, 2003 letter concerning the Definite Project Report (DPR) with integrated Environmental Assessment (EA) for the Pool 12 Environmental Management Program - Habitat Rehabilitation and Enhancement Project (EMP-HREP), Upper Mississippi River Miles 563-573, Jo Daviess County, Illinois. Attachments to the subject letter identify six separate sites in lower Pool 12 where dredging and dredged material placement may occur in conjunction with the HREP, the purpose of which is to restore and protect aquatic habitat by improving overwintering areas for fish.

The Illinois Natural Heritage Database indicates that the various dredging and placement locations lie within the Mississippi River Backwaters - Jo Daviess County Illinois Natural Areas Inventory (INAI) site. Although a number of Illinois threatened or endangered species occur within this reach of the Mississippi River, it does not appear that any will be adversely impacted by dredging and placement operations at the six identified locations.

The location and design of the various project features have been formulated through previous discussions and coordination involving the U.S. Fish and Wildlife Service, the Iowa Department of Natural Resources, and the Illinois Department of Natural Resources. We concur with the selection of this final group of alternatives, and look forward to providing additional input to your agency in conjunction with the report preparation, public review, and plans and specifications phases of the HREP. As you are aware, construction of the project will require IDNR Office of Water Resources authorization under the Part 3704 Public Water Rules.

Please contact me at 217-785-4863 if the Department can be of further assistance.

Sincerely,

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

RWS:rs

cc: IDNR/OWR (Kennedy), IDNR/ORC (Stuewe, Walsh, Anderson, Dufford), IEPA (Yurdin), IADNR (Griffin), USFWS (Woeber), USEPA (Pierard)

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

REPLY TO
ATTENTION OF

March 8, 2004

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is preparing environmental documentation for the development of the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP) near Galena, Illinois. The Corps hopes to complete coordination and environmental documentation this coming fall.

The purpose of this project is to improve aquatic and terrestrial habitat conditions in lower Pool 12. The proposed actions would include dredging to deepen several backwater lakes in lower Pool 12, as well as using dredged material to increase island topographic diversity, thus improving floodplain vegetation. This would result in beneficial impacts to both aquatic and terrestrial habitat.

The project area is part of the Upper Mississippi River (UMR), extending from River Miles (RM) 563 –573 (see Enclosure 1). The project area includes six backwater lakes under consideration as a part of this project. The project area lies within or adjacent to the UMR navigation system, as well as the U.S. Fish and Wildlife Service (USFWS) Upper Mississippi River Wildlife and Fish Refuge. Because the main channel flows against the Iowa bluffs throughout this reach, almost all off-channel aquatic habitat within the project area is located within the State of Illinois.

The proposed project would include dredging and material placement at and adjacent to the following areas: Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake and Stone Lake (Enclosure 1). Dredging for aquatic habitat would be to a depth of 8 feet below flat pool elevation (592 mean sea level) to maximize aquatic habitat benefits. A small amount of dredging may be needed for equipment access to backwater sites; however, this dredging would only be to a depth required for equipment access and would be minimized to the extent possible. All proposed location of dredging and material placement (including any dredging and placement for equipment access) is provided in the enclosed plates (Enclosure 2).

In accordance with the Endangered Species Act, we wish to obtain your comments on the potential impacts of the proposed actions on federally designated threatened and endangered species. Three federally protected species could be found in the project area: the bald eagle (*Haliaetus leucocephalus*), the Higgins' eye pearly mussel (*Lampsilis higginsii*), and the Indiana bat (*Myotis sodalis*).

The Corps has discussed issues with potential occurrence of these species with the project team, which has included representatives from the USFWS and the Iowa and Illinois Departments of Natural Resources. The group concluded that although *Lampsilis higginsii* could be present in the general vicinity of the proposed project, their presence within areas of potential effect would be unlikely as this species typically is not found in places dominated by fine silt sediment and low current velocities. These are the habitat areas that would be targeted for dredging and adjacent material placement. Thus, it appears the proposed action is not likely to adversely affect *Lampsilis higginsii*.

For the bald eagle (*Haliaetus leucocephalus*), the USFWS has provided to the Corps the locations of eagles nests within the project area. This information has been reviewed by the project team, including representatives of the USFWS Savannah Refuge District office. The consensus was that existing eagle nests would generally be at least 500 m (1,600 feet) from areas of disturbance. There could be potential for some form of disturbance during construction; however, these would be short term. Therefore, the proposed project is not likely to adversely affect *Haliaetus leucocephalus*.

For the Indiana Bat (*Myotis sodalis*), potential exists for disturbance of desirable habitat. For example, construction activities could result in tree clearing. To avoid impacts to habitat for Indiana bat, all Indiana bat habitat would be altered (i.e., trees cleared) only between the dates of October 1 and March 31. This should help to avoid any impacts that could occur to as a result of the project. Other impacts associated with disturbance during construction would be short term. Therefore, the proposed project is not likely to adversely affect *Myotis sodalis*.

The Corps' determination is that the project would not be likely to adversely affect the Higgins' eye pearly mussel, bald eagle, or Indiana bat. We would appreciate receiving your comments on our determination by March 30, 2004, for incorporation in the Environmental Assessment and Definite Project Report to be sent out for public review. If you have any questions or comments, please call Ms. Jodi Staebell at 309/794-5448.

Sincerely,

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosures

DISTRIBUTION LIST

Mr. Richard Nelson
Rock Island Field Office
U.S. Fish and Wildlife Service
4469 - 48th Avenue Court
Rock Island, IL 61201

Ms. Heidi Woeber
U.S. Department of the Interior
U.S. Fish & Wildlife Service
4469 - 48th Avenue Court
Rock Island, IL 61201

Mr. Ed Britton
Savanna District Manager
U.S. Fish and Wildlife Service
7071 Riverview Road
Thompson, IL 61285

Mr. Mike Griffin
Iowa Department of Natural Resources
206 Rose Street
Bellevue, IA 52031

Mr. Mike Steuck
Iowa Department of Natural Resources
206 Rose Street
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Mr. John Pitlo
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Bellevue Fisheries Station
24143 Highway 52
Bellevue, IA 52075

Mr. Tom Boland
Iowa Department of Natural Resources
Bellevue Fisheries Station
24143 Highway 52
Bellevue, IA 52075

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

REPLY TO
ATTENTION OF

March 19, 2004

Planning, Programs, and
Project Management Division

Ms. Anne Haaker
Deputy State Historic Preservation Officer
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, Illinois 62704

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has reviewed the draft Archaeological Survey Report (Enclosure 1) entitled Phase I Archaeological Survey and Geomorphological Evaluation for Historic Properties, Pool 12 EMP Project Areas Jo Daviess County, Illinois and Smith's Creek EMP Project Area, Jackson County, Iowa, dated January 2004. David W. Benn and Eyan Bond of Bear Creek Archeology, Inc., Cresco, Iowa, prepared the report for the Corps under Contract No. DACW25-03-D-0001, Work Order No. 3.

The Corps concurs with the findings of the investigation as presented on pages 33-37 of the enclosed report. Specifically, it is the opinion of the Corps that there are no historic properties within the top 100 centimeters below surface based on the results of this investigation. It is the opinion of the Corps that the results of this investigation document that activities associated with the Upper Mississippi River Pool 12 EMP project will have "no effect" on historic properties. The Corps requests your review and comment on the enclosed report within 30 days from the date of this letter, pursuant to 36 CFR 800.4(d)(1). A full disclosure of the Upper Mississippi River Pool 12 EMP undertaking will be provided under separate cover.

If you have any questions regarding this matter, please call Mr. Jim Ross of our Economic and Environmental Analysis Branch, telephone 309/794-5384, or write to our address above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosure

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

MAR 2 2 2004

REPLY TO ATTENTION OF

March 19, 2004

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IHPA REVIEW
H/A _____ ____
AC _____ ____
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File LA/COE

Planning, Programs, and
Project Management Division

Ms. Anne Haaker
Deputy State Historic Preservation Officer
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, Illinois 62704

Dear Ms. Haaker:

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Sincerely,

CONCUR
By: Anne E. Haaker
State Historic Preservation Officer
Date: JJH 4/9/04

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

Enclosure

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

REPLY TO
ATTENTION OF

April 20, 2004

Planning, Programs, and
Project Management Division

SEE DISTRIBUTION LIST

The Pool 12 Over-wintering Habitat Rehabilitation and Enhancement Project (HREP) is located in JoDaviess County, Illinois upstream of Bellevue, Iowa, in the lower half of Pool 12 between Upper Mississippi River Miles (RM) 563 and 573. All project lands are in Federal ownership and are managed by the U.S. Fish and Wildlife Service as part of the Upper Mississippi River Wildlife and Fish Refuge. The Rock Island District of the U.S. Army Corps of Engineers (Corps) has selected HREP alternatives. (**Enclosure 1**).

The project area is comprised primarily of a series of islands, backwater channels, and backwater lakes modified or created following construction of Lock and Dam 12 in 1938. This construction contributed to an abundance of deep backwater habitat within lower Pool 12 which are particularly ideal over-wintering habitat for certain fish species such as bluegill, largemouth bass, and white and black crappie. Following lock and dam construction, river sediments have been slowly accumulating in backwater areas and have reduced the depth and area of quality backwater habitats and blocked entryways to backwater areas. Construction of Lock and Dam 12 also resulted in changes to the floodplain forest communities of lower Pool 12. Areas of this Pool are currently dominated by similar-aged species of cottonwood and silver maple. This lack of species diversity has less overall habitat value than one that was more diverse.

The goals of the proposed project are to restore and protect aquatic habitat and improve topographic diversity and associated vegetative assemblages within the terrestrial floodplain. The objectives are to: (1) reduce resuspension of sediments; (2) create areas with depth diversity; (3) reduce sedimentation in backwaters; (4) create off-channel deep-water areas to provide over-wintering and year-round habitat for centrarchids and associated species; and (5) create higher elevation areas relative to the surrounding floodplain of supporting mast producing trees.

Federal Undertaking

Pursuant to the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR Part 800, the Corps has determined that construction associated with the Pool 12 HREP has potential to cause effects to archeological historic properties [36 CFR 800.3(a)(1)] and as a consequence will require a determination of effect within the Area of Potential Effect (APE).

Area of Potential Effect

The APE includes project areas located in fractional parts of Sections 12, 13, and 24, Township 28 North, Range 2 West, Sections 18, 19, 33, 34, and 35, Township 28 North, Range 1 West, Sections 1 and 12, Township 27 North, Range 1 West, Jo Daviess County, Illinois (**Enclosure 2**). The project areas will be used for dredged material placement associated with fish habitat improvements proposed for the adjacent backwaters. The total acreage associated with dredged material placement is approximately 75 acres. All material will be pumped onto the sites and will result in an impact not expected to exceed 50 centimeters below surface.

Consulting Parties

The Corps finds the organizations identified on the Distribution List are entitled to be consulting parties, as set out in 36 CFR 800.2, and invites them by copy of this letter to participate in the Section 106 process.

State Historic Preservation Office (SHPO) Invitation

The Corps invites the SHPO to:

- Identify any other consulting parties as per 36 CFR 800.3(f);
- Comment as per 36 CFR 800.2(d)(3) on the Corps plan to involve the public by using the Corps' normal procedures for public involvement under the National Environmental Policy Act; and,
- Comment on or contribute to identification efforts including definition of the APE, all as per 36 CFR 800.4(a-b).

Identification of Historic Properties

Review of Existing Information and Level of Future Identification Efforts:

The Corps Geographic Information Systems archeological site file data base (current as of September 2003) for the Mississippi River was queried for the project locations, and no known historic properties were identified. Numerous archeological sites are recorded in proximity to the project areas on similar landforms. The Corps determined that an archeological survey with geomorphological assessment was necessary and commissioned Bear Creek Archeology Incorporated (BCA) of Cresco, Iowa, under terms of Indefinite Quantities Contract DACW25-03-D-0001, Work Order Number 3, to conduct the work.

The BCA investigation failed to recover any evidence of archeological historic properties within the project areas and recommended project clearance without the need for additional archeological investigation. The Corps concurred with that recommendation and provided a determination of "no historic properties affected" to the Illinois Historic Preservation Agency (IHPA) by letter dated March 19, 2004. The IHPA concurred with the Corps determination by stamped concurrence dated April 9, 2004. It is the opinion of the Corps that the Pool 12 HREP as proposed will not affect any historic properties.

Request for Information from Consulting Parties:

The Corps is seeking information from all consulting parties regarding their concerns with issues relating to this undertaking's potential effects on historic properties and, particularly, the tribes' concerns with identifying properties that may be of religious and cultural significance to them and may be eligible for the National Register [36 CFR 800.4(a)(3-4)]. Concerns about confidentiality [36 CFR 800.11(c)] regarding locations of properties can be addressed under Section 304 of the National Historic Preservation Act, which provides withholding from public disclosure the location of properties under several circumstances, including in cases where it would cause a significant invasion of privacy, impede the use of a traditional religious site by practitioners, endanger the site, etc.

We request your written comments on this project within 30 days pursuant to 36 CFR 800.3(c)(4). The Corps has identified the consulting parties for this undertaking as set out in 36 CFR 800.2 and invites them by copy of this letter to participate in the Section 106 process (see Distribution List). Results of this consultation and determination shall be included in an Environmental Assessment for additional public review later this year.

Please comment or concur with our opinion and recommendations within 30 days, or the Corps will assume that you have reviewed the information package and agree with our findings. If you have any questions regarding this matter, please call Mr. Jim Ross of our Economic and Environmental Analysis Branch at 309/794-5540, or you may write to the address given above, ATTN: Planning, Programs, and Project Management Division (Jim Ross).

Sincerely,

John P. Can (for)

Kenneth A. Barr
Chief, Economic and Environmental
Analysis Branch

2 Enclosures

DISTRIBUTION LIST

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Keshena, WI 54135-0910

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Cultural Resources Management Consultant
Citizen Potawatomi Nation
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Shawnee, OK 74801

Mr. Lawrence F. Snake
President
Delaware Tribe of Western Oklahoma
P.O. Box 825
Anadarko, OK 73005

Ms. Anne E. Haaker
Deputy State Historic Preservation Officer
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1507

Galena/JoDaviess County Historical Society and Museum
211 South Bench Street
Galena, Illinois 61036

JoDaviess County Courthouse
330 North Bench Street
Galena, IL 61036

JoDaviess County Board of Supervisors
5598 S Pleasant Hill Drive
Elizabeth, IL 61028

JoDaviess County Engineer
791 U.S. Route 20 West
Elizabeth, IL 61028

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office
4469 48th Avenue Court
Rock Island, Illinois 61201
Phone: (309) 793-5800 Fax: (309) 793-5804

IN REPLY REFER TO
FWS/RIFO

November 16, 2004

Colonel Duane P. Gapinski
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Gapinski:

This letter constitutes our Final Fish and Wildlife Coordination Act (FWCA) report for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP), Mississippi River Miles 563 through 573, Jo Daviess County, Illinois. It has been prepared 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.); the Endangered Species Act of 1973, as amended; and in accordance with the Fish and Wildlife Service's Mitigation Policy.

The Pool 12 Overwintering HREP is a component of the Upper Mississippi River System Environmental Management Program (EMP) authorized in Section 1103 of the Water Resources Development Act of 1986. The goal of the EMP is to implement "...numerous enhancement efforts...to preserve, protect, and restore habitat that is deteriorating due to natural and man-induced activities."

DESCRIPTION OF THE PROJECT AREA

Pool 12 is the 26.3 mile segment of the Mississippi River extending upstream from Lock and Dam 12 at Bellevue, Iowa, to Lock and Dam 11 at Dubuque, Iowa. In Pool 12, most of the floodplain is natural, as levees are limited to the urban and industrial complex near Dubuque. Although Dubuque area development dominates the upper pool, the riparian environment downstream to Bellevue is largely undeveloped. There are no major tributaries entering the pool. Smaller streams include Catfish Creek (Iowa) and the Menominee, Sinsinawa, and Galena Rivers (Illinois). The total watershed entering the pool is 800 square miles.
A distinguishing characteristic of Pool 12 is that islands are interspersed throughout the pool. There is no large expanse of open water typical of many pools. Sedimentation and suspended

sediments are a serious problem resulting in loss of backwater depth and clarity. Impacts are especially obvious in the lower pool area below the Galena River, possibly because this river, along with the Sinsinawa, contribute most of the sediment to side channels and backwater areas of Pool 12. Vegetation throughout the pool is generally very sparse, although emergent aquatic plants are pioneering on accreted areas in the lower pool.

Public lands and waters in the floodplain within Pool 12 are primarily held by the Upper Mississippi River Wildlife and Fish Refuge, with lands also held under General Plan Lands of the Nine-Foot Navigation Project, and lands and waters owned by the States of Iowa, Wisconsin, and Illinois.

The construction of Lock and Dam 12 (L/D 12) in 1938 contributed to an abundance of deep, lentic, backwater habitat within lower Pool 12. These types of areas provide habitat for multiple life-stages of various fish species, but are particularly ideal over-wintering habitat for certain fishes, including centrarchid species such as bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), and white crappie (*P. annularis*). Following lock and dam construction, river sediments have been slowly accumulating in backwater areas of Pool 12. This sedimentation has reduced the depth and total area of quality backwater habitats. It also has blocked openings to and connectivity between backwater areas, which reduces the overall value of otherwise useable backwater habitat. In summary, sedimentation has resulted in a reduction in the quantity and quality of backwater habitat utilized by several fish species.

The project area is located on the Upper Mississippi River (UMR), and extends from River Miles (RM) 563-573. The project area includes six backwater lakes under consideration as a part of this project. The project area lies within or adjacent to the UMR navigation system, as well as the U.S. Fish and Wildlife Service (USFWS) Upper Mississippi River Wildlife and Fish Refuge. Because the main channel flows against the Iowa bluffs throughout this reach, almost all off-channel aquatic habitat within the project area is located within the State of Illinois.

The proposed project would include dredging and material placement at and adjacent to the following areas: Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake, and Stone Lake (Enclosure 1). Dredging is proposed to a depth of eight feet below flat pool elevation (592 mean sea level) to maximize aquatic habitat benefits. A small amount of dredging may be needed for equipment access to backwater sites.

PROJECT OBJECTIVES

The goals of the Pool 12 Overwintering HREP are to restore, enhance, and protect aquatic habitat by improving overwintering areas for a variety of fish species. In addition to providing overwintering benefits, the proposed projects also would improve backwater habitat for year-round conditions. The proposed project should also benefit the floodplain forest community through the promotion of desirable forest vegetation within the areas of dredged material

placement. Specific objectives for the proposed project were developed according to the management plans and input of State and Federal biologists. Several alternatives were considered to determine the best way to meet the project objectives.

THREATENED AND ENDANGERED SPECIES

To facilitate compliance with Section 7 of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the Fish and Wildlife Service information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action.

The following list of species which may be present in the concerned area:

Classification	Common Name	Scientific Name	Habitat
Threatened	Bald eagle	*Haliaeetus leucocephalus*	Winters along major rivers and reservoirs
Endangered	Higgins eye pearlymussel	*Lampsilis higginsii*	Mississippi River
Endangered	Indiana bat	*Myotis sodalis*	Caves, mines; small stream corridors with well developed riparian woods; upland forests

Bald eagles (*Haliaeetus leucocephalus)* winter along the Mississippi River, including Pool 12. Suitable perch trees where eagles can loaf and perch are numerous. Migrating bald eagles perch in trees, occasionally feeding on migrating waterfowl. There is no critical habitat designated for this species. Three Bald eagle nest sites are known to occur within the project area; however, due to their distance from proposed construction activities and the timing of construction, potential disturbance during construction is unlikely. Also, project features will not affect known nest sites.

The endangered Higgins eye pearlymussel (*Lampsilis higginsii*) is listed for the Mississippi River north of Lock and Dam 20 which includes Jo Daviess County, Illinois. This species prefers sand/gravel substrates with a swift current and is most often found in the main channel border or an open, flowing side channel. The mussel could be present in the general vicinity of the proposed project. However, their presence within areas targeted for dredging and adjacent material placement would be unlikely as this species typically is not found in places dominated by fine silt sediment and low current velocities.

The endangered Indiana bat *(Myotis sodalis)* is listed as potentially occurring in Jo Daviess County, Illinois. Because the potential exists for disturbance of desirable habitat, any

alteration of Indiana bat habitat (i.e., trees cleared) should be prefaced by a survey to determine the bat's presence. The survey should be performed according to recovery plan guidelines. Other impacts or disturbance associated with project construction would be short term.

Two other Federally listed species, the Iowa Pleistocene snail (*Discus macclintockii*) and northern wild monkshood (*Aconitum noveborasence*), are known to occur in counties bordering Pool 12. However, suitable habitat for these species is not found within the project area.

State of Illinois threatened and endangered species may occur in the project area. State-endangered fishes found in the basin include the lake sturgeon, western sand darter, and pallid shiner. The State-endangered ornate box turtle and the State threatened Blanding's turtle may utilize the area. The western hognose snake is a State-threatened species which may be found in the project area. The State-endangered river otter and State-threatened bobcat are also listed for Jo Daviess County.

Because of planning efforts to avoid impacts, the proposed HREP project will not adversely affect federally endangered species or their habitats. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

DISCUSSION OF PROJECT FEATURES

The coordinating team recommended the following backwater sites within Lower Pool 12 as best able to meet the project goals and objectives as well as meeting their respective agencies' goals and objectives:

Sunfish Lake
Fishtrap Lake
No Name Lake
Kehough Slough
Tippy Lake
Stone Lake

The interagency planning team decided that all of the six sites considered should be included in the plan to best meet the planning objectives. Therefore, the project area includes six backwater lakes which lie within or adjacent to the UMR navigation system, as well as the USFWS's Upper Mississippi River Wildlife and Fish Refuge. This plan included enhancement features such as 1) excavating channels in backwater areas, 2) constructing deflection embankments, 3) creating higher-level terraces, or islands from dredged material, 4) establishing native mast-producing trees in created higher-elevation areas, and 5) creating areas above the 2-year flood recurrence.

DISCUSSION OF SELECTED FEATURES/FUTURE WITH PROJECT

For all project alternatives, resulting future with-project and future without-project conditions were modeled over a 50-year planning horizon. Physical habitat conditions for each alternative were estimated at identified points in time to model and quantify corresponding habitat conditions. Two of the primary factors affecting future conditions are backwater depth and bathymetry. A sedimentation analysis was performed for potential backwater sites (Appendix H in the Definitive Project Report). The analysis estimated sedimentation rates under base conditions, as well as under potential project conditions. It was assumed that sedimentation rates observed under base conditions would likely be similar to those under future without project conditions. Thus, changes in bathymetry under future without project conditions were estimated by using current bathymetry data along with existing sedimentation rates.

For future with-project conditions, changes in bathymetry were estimated by comparing resulting bathymetry conditions following dredging with estimated future with project sedimentation rates. Other key factors for overwintering habitat include water quality conditions, which includes dissolved oxygen, temperature, and water velocities. Assumptions were made regarding key water quality criteria and agreed upon by the coordinating team. It is realized that the assumed conditions are uncertain, however, it represents an agreed upon judgment of likely future habitat conditions within dredged areas during winter conditions. Because of this uncertainty, it should be recognized that these assumptions should only be used for the purpose of comparing project alternatives, and not definitive predictions in changes in water quality.

This ecosystem restoration project will result in improved overwintering conditions for a variety of species. Increasing backwater depths with the resulting improvement in water quality should promote and improve seasonal refugia with resulting benefits to the warm-water fisheries communities. Improvements would occur at each individual site. However, these improvements would extend beyond each individual site and are expected to benefit the entire fish community within adjacent areas.

The identified HSI model was modified to greatly reduce habitat quality when percent depth greater than four feet is reduced to zero. It is recognized that some habitat may exist within aquatic areas shallower than four feet. However, since these models should only be utilized for comparison of alternatives, this change was made to account for changes to bathymetry through sedimentation.

Dredged material placement adjacent to island areas would provide greater topographical diversity and areas of increased floodplain elevation. Such areas would provide suitable habitat for mast producing trees, increasing age, and species diversity over the existing forest that is currently dominated by even age silver maple and a few other species. The potential planting sites include from less than one to four acres of embankment that could be planted with desirable trees. Additional acres may be planted, but the acreages at the top of the

embankment are the most likely to be successfully planted. Mast-producing trees will be established on approximately 23.5 acres of selected embankments and terraces. Riprap will be placed where needed to protect defection embankments.

FUTURE WITHOUT PROJECT

The No Federal Action alternative is considered the future without project condition allowing the area to continue as is. Without active management, successional changes in habitat and further degradation by sedimentation will result in continued degradation of fisheries habitat being filled with sediments. Reduced depths will limit the suitability of backwaters as year round habitat.

The without project analysis for backwater restoration indicated loss of these backwater habitats affects aquatic acreage on a scale much greater than the actual project area dimensions. The value of these areas as protected off-channel lacustrine fisheries habitat is limited due to a lack of depth and vegetation diversity. Changes in water quality would occur with additional sedimentation, especially within backwater areas with depths greater than four feet under baseline conditions. Changes in temperature would likely occur as well. Refer to the sedimentation analysis performed for potential backwater sites included in the Corps' Definite Project Report for the Pool 12 HREP for a more detailed discussion of this analysis.

The floodplain forest will continue to change. Future conditions without active forest management may result in forest species being replaced with more flood tolerant herbaceous vegetation such as reed canary grass. Shade intolerant species such as cottonwood and willow will decline and shade tolerant species such as box elder and mulberry will increase. A continued reduction of mast-producing trees is also anticipated. In summary, the area and diversity of the forest will continue to decline.

Changes in the floodplain forest will impact wildlife that depends on this habitat. Bald eagles, great blue heron, and cerulean warblers favor taller trees such as cottonwood and swamp white oak for roosting and nesting habitat. Resident and migratory songbirds that utilize the closed canopy will also be impacted.

DISCUSSION

The primary goal of the Pool 12 Overwintering HREP is to increase overwintering habitat for fish. With the projected fishery value of Pool 12 expected to decline over the next 25-50 years, the ideal solution would be to dredge the entire length of the main channel borders and then protect it from sedimentation. The high costs of dredging prohibit restoring the entire channel, so the alternative of backwater restoration becomes the most economical alternative. Because of the high costs associated with mobilization, access to the dredge sites, demobilization, etc., no single project site would be constructed alone. Single site construction would result in higher total costs for an individual site. All six sites are therefore recommended for approval. Two phases of construction are proposed. Three sites – Sunfish,

Fishtrap, and Stone – would be constructed in the first phase. The remaining three sites – No Name, Kehough, and Tippy – would be constructed as additional EMP funds become available.

The team recognized that there would be inefficiencies in separating the project into two phases; however, the current EMP budget would not accommodate construction of all sites in a single phase. This plan does meet the project objective of increasing overwintering habitat for fish and the improved backwater habitat will provide year around benefits for spawning and rearing of fish species like bluegill and crappie. In addition, other wildlife species, including diving ducks, herons, and invertebrates will benefit from the backwater improvements.

CONCLUSIONS AND RECOMMENDATIONS

The Pool 12 Overwintering HREP offers a unique opportunity to restore and enhance a diverse fish and wildlife resource. The multi-agency coordination effort has demonstrated the value of this project towards maintaining a high quality UMR ecosystem while avoiding adverse impacts.

Therefore we recommend the preferred alternative which includes:

> Backwater restoration of Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake and Stone Lake through the means of mechanical and hydraulic dredging with placement of dredged material in an effort to improve island site suitability for mixed bottomland tree species by raising ground.

We appreciate the opportunity to provide these comments and look forward to continued coordination on this project. If you have any questions, please contact Ms. Heidi Woeber of my staff at (309) 793-5800, ext. 209.

Sincerely,

for Richard C. Nelson
Field Supervisor

Enclosure

S:\Office Users\Heidi\PO12CAR.doc

PM-Dist
PM-F
PM-A

REFERENCES

Fish and Wildlife Interagency Committee, 2003. Mississippi River – Pool 12 Environmental Plan Desired Future Habitat Conditions. 5pp.

Gent, R., J. Pitlo Jr. and T. Boland. 1995. Largemouth bass response to habitat and water quality rehabilitation in a backwater of the upper Mississippi River. North American Journal of Fisheries Management. 15:784-793.

Iowa Department of Natural Resources. 1992. Study No. 1. An evaluation of largemouth bass populations in the Upper Mississippi River. Federal Aid to Fish Restoration Completion Report: Mississippi River Investigations Project No. F-109-R.

Palesh, G., and D. Anderson. 1990. Modification of the habitat suitability index model for the bluegill (Lepomis macrochirus) for winter conditions for Upper Mississippi River backwater habitats. Corps of Engineers, St. Paul District. 8pp.

Raibley, P., K. Irons, T. O'Hara, D. Blodgett, and R. Sparks. 1997. Winter habitats used by largemouth bass in the Illinois River, a large river-floodplain ecosystem. North American Journal of Fisheries Management. 17:401-412.

Stuber, R.J., G. Gebhart, and O.E. Maughan. 1982. Habitat suitability index models: Bluegill. U.S.D.I. Fish and Wildlife Service. FWS/OBS-82/10.8. 26pp.

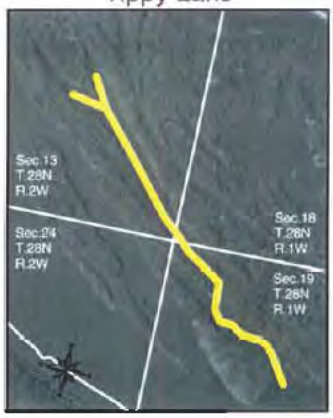
Theiling, C.H., C. Korschgen, H. De Haan, T. Fox, J. Rohweder, and L. Robinson. 2000. Habitat Needs Assessment for the Upper Mississippi River System: Technical Report, U.S.Geological Survey, Upper Midwest Environmental Sciences Center, La Crosse, Wisconsin. Contract report prepared for U.S. Army Corps of Engineers, St. Louis District, St. Louis, Missouri. 248 pp. + Appendices A to AA.

U.S. Fish and Wildlife Service, 1987. Final Environmental Impact Statement/Refuge Master Plan, Upper Mississippi River National Wildlife and Fish Refuge. Twin Cities, MN.

MISSISSIPPI RIVER POOL 12 OVERWINTERING HREP

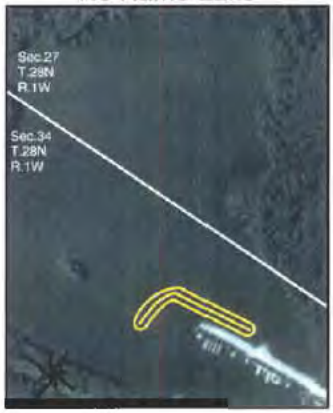
Stone Lake

Tippy Lake



Kehough Slough

No Name Lake



Fishtrap Lake

Sunfish Lake

Proposed Overwintering Fish Channel

Note: Section Lines Shown in White

Fish Channel Feature Data Courtesy of CEMVR-ED-DM

US Army Corps of Engineers
Rock Island District

Map Produced By the CEMVR-PM-M GIS Team 16 June 2003

United States Department of the Interior

U.S FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO

December 3, 2004

Ms. Jodi Staebell
Planning and Policy Branch
Rock Island District, Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ms. Staebell,

Thank you for the opportunity to review and comment on the Pool 12 Overwintering HREP draft Definite Project Report with Integrated Environmental Assessment (R-19D) dated October 2004. Even though this is only a draft, it is a well written and useful document. We have the following comments regarding the document:

1. Several places in the document refer to a 50-year project life. Based on past experiences such as Brown's Lake and Potter's Marsh, this project very well may not have a 50-year project life.

2. We have some concerns about the maintenance requirements of this project:

   - The maintenance paragraph on page 45 indicates that we will be required to remove debris from the channels and dredge entry channels if they silt in and block winter fish passage. We understand the importance of maintaining the project to achieve project goals and objectives. However, due to the difficulty of this work (remote locations and use of marine plant) and funding issues, there may be delays in performing this maintenance.

   - The estimated annual maintenance cost of $6,000 shown in Table 8-3 appears to be low. Since we will most likely have to contract out the entry channel dredging and perhaps some of the debris removal, the annual costs for those two items could be well above $3,500 ($2,000 for debris, $1,500 for dredging), even assuming we have only one contract in 10 years.

   - The maintenance paragraph on page 45 should specify where the dredged material can be placed. Whether the material can be placed on site or must be hauled off site will also affect the estimated annual maintenance costs. We prefer to place the material on site next to the dredge cuts if possible.

3. The permits paragraph on page 46 does not mention Special Use Permits from the Refuge; include this permit in your list. We will provide you a Special Use Permit for each construction contract as we have done on other HREPs.

4. Please reconcile the following two project acceptance statements in the document. We realize that you do not usually provide the O&M manual to us as soon as construction is complete.

   - Page 68, paragraph b: "...Project Operation and Maintenance manual, which will be provided prior to final acceptance of the project by the sponsors."

   - Page C-3 of the draft Memorandum of Agreement, paragraph 1: "Upon completion of construction as determined by the District Engineer, Rock Island, the USFWS shall accept the project and shall operate, maintain, and repair the project..."

5. The scanned attachments in Appendix A are very poor quality. Please replace with legible copies.

6. The Endangered and Threatened Species section on page 9 needs to refer to the Indiana bat as potentially occurring statewide in Illinois. The DPR just mentions the bat in Iowa Coun This issue will also be addressed in the forthcoming Coordination Act Report.

7. We plan to participate in the BCOE reviews for both phases of construction. Ensure that E Britton and Sharonne Baylor each receive a hard copy of the BCOE documents and have adequate time to review and comment before the solicitations are sent out for bid.

8. We recommend showing a stronger logical connection between the objectives (i.e. needs) and the selected plan in both the main text of the DPR and the FONSI.

We are pleased to see this project moving forward, and look forward to our continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, our EMP coordinator, at (507) 494-6207.

Sincerely,

Don Hultman
Refuge Manager

cc: Ed Britton, Savanna District Manager
Mike Griffin, Iowa DNR
~~Mike~~ Stuewe, Illinois DNR
Scott

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

REPLY TO
ATTENTION OF

October 8, 2004

Planning, Programs, and
Project Management Division

SEE REPORT DISTRIBUTION LIST I (APPENDIX K)

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed the draft Definite Project Report (R-19D) with integrated Environmental Assessment for the Pool 12 Overwintering, Habitat Rehabilitation and Enhancement Project, Jo Daviess County, Illinois. This project is a part of the Upper Mississippi River System - Environmental Management Program. The Pool 12 Overwintering project was proposed by the Iowa and Illinois Department of Natural Resources and the U.S. Fish and Wildlife Service and is being developed in cooperation with the Corps' Rock Island District and other appropriate Federal and State agencies.

In order to maintain progress and meet current schedules, please provide comments on the initial draft report by November 12, 2004. This draft report is also being reviewed concurrently by the Corps' Mississippi Valley Division for policy compliance and internally by the Corps' Rock Island District for value engineering improvements and independent technical review. Comments from all these ongoing reviews will be incorporated into the Pool 12 Overwintering public review draft, currently scheduled for completion by the end of January 2005. The final Pool 12 Overwintering report is scheduled for completion in May 2005. Project approval is anticipated in July 2005 with construction award in March 2007.

The goals of the proposed project are to restore and protect aquatic habitat and restore floodplain forest habitat. The objectives identified to meet these goals were: (1) create off-channel deep-water areas to provide overwintering and year-round habitat for centrarchids and associated species, (2) maintain and increase depth diversity in backwaters, (3) increase forest stands with hard mast-producing trees as a dominant or component species, and (4) create areas within the pool with sufficient elevations to support regeneration of hard mast-producing trees.

The recommended plan includes excavating backwater channels at six backwater sites: Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake and Stone Lake. Excavated material will be used to construct deflection embankments or higher-level terraces, or material will be placed in confined disposal sites. Mast-producing trees will be established on selected embankments and terraces.

If you have any questions concerning review of the draft Pool 12 Overwintering report, please provide them to Ms. Jodi Staebell, Planning and Policy Branch, by telephoning 309/794-5448, emailing jodi.k.staebell@usace.army.mil, or writing to our address above, ATTN: Planning, Programs, and Project Management Division (Jodi Staebell).

Sincerely,

Gary L. Loss, P.E.
Chief, Planning, Programs, and Project
Management Division

Enclosure

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

REPLY TO
ATTENTION OF

September 7, 2005

Planning, Programs and
Project Management Division

SEE REPORT DISTRIBUTION LIST (APPENDIX L)

Enclosed is the Draft Definite Project Report (DPR) with integrated Environmental Assessment for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project, Mississippi River Miles 563-573, Jo Daviess County, Illinois. The project is part of the Upper Mississippi River System – Environmental Management Program.

The Pool 12 Overwintering Project was proposed by the U.S. Fish and Wildlife Service (USFWS), the Illinois Department of Natural Resources, and the Iowa Department of Natural Resources and is being developed in cooperation with the Corps' Rock Island District and other appropriate Federal and State agencies.

The goals of the proposed project are to restore and protect aquatic habitat and restore floodplain forest habitat. The objectives identified to meet these goals were: (1) create off-channel deep-water areas to provide overwintering and year-round habitat for fish; (2) maintain and increase depth diversity in backwaters; (3) increase forest stands with hard mast-producing trees as dominant or component species; and (4) create areas within the pool with sufficient elevation to support regeneration of hard mast-producing trees.

The recommended plan would restore backwater habitat at six lakes (Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake, Stone Lake) by excavating approximately 80 acres of deep backwater channels to a depth of 8 feet below flat pool, providing overwintering and year-round habitat for fish in the surrounding 6,942 acres (see Figure ES-1 of the enclosed DPR). Excavated material would be used to construct deflection berms or higher level terraces, or would be placed in confined placement sites at two nearby locations. The recommended plan would also establish mast-producing trees on approximately 24 acres of raised berms.

All project features would be located on federally owned lands managed through cooperative agreements by the USFWS. As a result, first cost funding for restoration features would be 100 percent Federal. Implementation of the recommended plan would increase the quality and quantity of preferred habitat.

An open house will be held on October 5, 2005, in the North Woods Room at the Stoney Creek Inn, 940 Galena Square Drive, Galena, Illinois. Two sessions, identical in structure, will be held. The afternoon session will be held from 1-3 p.m., and the evening session will be held from 5-7 p.m. Project team members from the Corps of Engineers, USFWS, and the Department of Natural Resources will be on hand to discuss with and gather comments from the public one-on-one.

Please provide any questions or comments regarding this report, no later than November 4, 2005, to Ms. Jodi Staebell, Study Manager, Rock Island District. You may reach Ms. Staebell by calling (309) 794-5448, or by writing to the address above, ATTN: Planning, Programs and Project Management Division (Jodi Staebell).

Sincerely,

for Duane P. Gapinski
Colonel, U.S. Army
District Engineer

Enclosure

review individual projects by providing an antidegradation assessment, which includes an evaluation of alternatives to any proposed increase in pollutant loading that may result from this activity. The "Fact Sheet" containing the antidegradation assessment for this proposed project may be found on the IEPA's web site, at www.epa.state.il.us/public-notices/. In the event that the IEPA is unable to publish the "Fact Sheet" corresponding to the timeframe of this Joint Public Notice, a separate public notice and "Fact Sheet" will be published by the IEPA at the web site identified above. You may also obtain a copy of the "Fact Sheet" by contacting the IEPA at the address or telephone number shown below. Written comments specifically concerning possible impacts to water quality should be addressed to: Illinois Environmental Protection Agency, Bureau of Water, Watershed Management Section, 1021 N. Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276. A copy of the written comments should be provided to the Corps of Engineers. If you have any questions, please contact IEPA at (217) 782-3362.

(2) The Illinois Department of Natural Resources, Office of Natural Resources (IDNR/OWR), application is being processed pursuant to an Act in Relation to the Regulation of the Rivers, Lakes and Streams of the State of Illinois, Chapter 615, ILCS 5 (Illinois Compiled Statutes (1994)). Comments concerning the IDNR/OWR permit should be addressed to the Illinois Department of Natural Resources, Office of Water Resources, One Natural Resources Way, Springfield, Illinois 62702-1271, with a copy provided to the Corps of Engineers (see paragraph 11. of this public notice for address). Mr. Mike Diedrichsen, IDNR/OWR (217/782-3863), may be contacted for additional information.

5. **Historical/Archaeological.** The Pool 12 project has no historic properties listed on or eligible for inclusion in the National Register of Historic Places. If the execution of the project should uncover any item of archaeological, historical, or architectural interest, the Corps will ensure that reasonable efforts are taken to avoid or minimize harm to the property until its significance can be determined (36 CFR 800.11). The Corps will also comply with appropriate Federal and State laws should human remains be discovered.

6. **Endangered Species.** One of the general goals of the project is to conserve, restore, and enhance federally listed endangered and threatened species and the habitats upon which they depend. Construction of a feature that has the potential to adversely affect any endangered species is in direct conflict with this stated goal. Four federally listed threatened or endangered species are listed for Dubuque Jackson Counties, Iowa and Jo Daviess County, Illinois.

- Bald eagle. The bald eagle (*Haliaeetus leucocephalus*) is recorded for both counties. Migrating bald eagles perch in trees throughout Pool 12. Three bald eagle nest sites are known to occur in the project area. Construction activities are not expected to occur within proximity of nesting bald eagles. As a part of pre-construction monitoring, refuge staff will monitor the various project areas for bald eagle nesting activity during the latter part of January and February. If any nesting is observed, the refuge will contact the Corps to take appropriate actions determined necessary to avoid adverse effects to nesting activity. The Corps will maintain close contact with the refuge staff regarding initiation of construction in the project areas. For these reasons, no adverse effects to the species are expected to result from the proposed project.

- Higgins' eye pearly mussel. The Higgins' eye pearly mussel (*Lampsilis higginsii*) has been collected during surveys of main channel border habitats several miles downstream of the project area. However, this species is typically not found in backwater habitats dominated by fine sediments and reduced flows, and will unlikely be found within the project area. The Higgins' eye pearly mussel is not anticipated to be present within the backwater lake habitats evaluated as part of this project. This species is more likely to occur within main channel border and secondary channels which generally have greater flow and coarser bottom substrates. The areas under consideration for dredging typically have minimal flows and fine substrates. The Corps finds the recommended plan is not likely to adversely affect this Federally listed species.

- Iowa Pleistocene snail. The Iowa Pleistocene snail (*Discus macclintockii*) and northern wild monkshood (*Aconitum noveborasence*) also are listed for the counties that border Pool 12. However, suitable habitat for these species is not found within the project area.

- Indiana bat. The Indiana bat (*Myotis sodalis*) is listed as potentially occurring in Jo Daviess County, Illinois and suitable habitat exists in the floodplain forests of the study area. Prior to initiation of any tree clearing activities, the Corps will conduct a survey to determine the presence or absence of Indiana bats within or adjacent to the construction area. If any bats are found, clearing activities may only be accomplished between October 1 of the year of the bat survey and March 31 of the year following the survey, to avoid potential impacts to the Federally protected species. If no bats are found as a result of this survey, clearing activity may proceed without seasonal restrictions. For these reasons, no adverse effects to the Indiana bat are anticipated.

7. **Dredge/Fill Material Guidelines**. The evaluation of the impact of the proposed activity on the public interest will also include application of the guidelines promulgated by the Administrator of the United States Environmental Protection Agency under authority of Section 404(b) of the Clean Water Act (40 CFR Part 230).

8. **Environmental Documentation**. The District staff has prepared a document entitled "Upper Mississippi River System, Environmental Management Program, Definite Project Report with Integrated Environmental Assessment (R-19), Pool 12 Overwintering, Habitat Rehabilitation and Enhancement Project, Pool 12 , Mississippi River miles 563.0 through 573.0, Jo Daviess County, Illinois, U.S. Army Corps of Engineers, Rock Island District" for the project. This documentation is available for review at the Clock Tower Building (see address in paragraph 1.) during working hours (7:30 am to 4:00 pm).

9. **Public Interest Review**. The decision whether to proceed with the project will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

10. **Who Should Reply**. The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity. These statements should be submitted on or before the expiration date specified at the top of page 1. These statements should bear upon the adequacy of plans and suitability of locations and should, if appropriate, suggest any changes considered desirable.

11. **Public Hearing Requests**. Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, the reasons for holding a public hearing. A request may be denied if substantive reasons for holding a hearing are not provided.

12. **Reply to the Corps of Engineers**. Comments concerning the project should be addressed to the District Engineer, U. S. Army Corps of Engineers, Rock Island District, ATTN: OD-P (Wayne Hannel), Clock Tower Building - Post Office Box 2004, Rock Island, Illinois 61204-2004. **Mr. Wayne Hannel (309/794-5378)** may be contacted for additional information concerning regulatory issues. **Ms. Charlene Carmack (309/794-5570)** may be contacted for additional information concerning environmental issues.

Attach
Plan

Melody D. Smith
Major, U.S. Army
Acting District Engineer

REQUEST TO POSTMASTERS: Please post this notice conspicuously and continuously until the expiration date specified at the top of page 1.

NOTICE TO EDITORS: This notice is provided as background information for your use in formatting news stories. This notice is not a contract for classified display advertising.

United States Department of Agriculture
NRCS Natural Resources Conservation Service

NRCS State Office
2118 W. Park Court, Champaign, IL 61821
Phone: 217/353-6600 **Fax:** 217/353-6676 **Web site:** www.il.nrcs.usda.gov

September 20, 2005

Ms. Jodi Staebell, Study Manager
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Building, PO Box 2004
Rock Island, Illinois 61204-2004

RE: Draft Definite Project Report with integrated Environmental Assessment for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project, Mississippi River Miles 563-573, Jo Daviess County, Illinois.

Dear Ms. Staebell:

We have reviewed the above project as requested. No farmland will be impacted by the proposed project.

The goals of the proposed project are to restore and protect aquatic habitat and restore floodplain forest habitat. We support these goals and have no further comment on this project.

Sincerely,

WILLIAM J. GRADLE
State Conservationist

L-Staebell9.19.2005

Sac & Fox Tribe of the Mississippi in Iowa

349 Meskwaki Road, Tama, IA 52339-9629 • (641) 484-4678 FAX (641) 484-5424

"MESKWAKI NATION"

September 27, 2005

US Army Corps of Engineers- Rock Island District
Wayne Hannel
ATTN: OD-P, Clock Tower Bldg
Post Office Box 2004
Rock Island, IL 61204-2004

Dear Mr. Hannel:

Thank you for the notices of concerning the projects:

- **CEMVR-OD-P-2005-1080**
- **CEMVR-OD-P-2005-1088**
- **CEMVR-OD-P-2005-1063**
- **CEMVR-OD-P-2005-0257**
- **CEMVR-OD-P-2005-1274**

At this time, the Historical Preservation Department of the Sac and Fox of the Mississippi in Iowa has determined that the above listed has:

- ☐ No interest in the area geographically
- ☐ No comment on the proposed undertaking
- ☑ No objections. However, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify the NAGPRA Representative, Johnathan L Buffalo.
- ☐ Have an objection or require additional project information. Please send the following:

  _____.

Sincerely,

Johnathan L. Buffalo
Historical Preservation Coordinator
Sac and Fox of the Mississippi in Iowa

Cc: File

Prairie Band Potawatomi Nation
Government Center

September 28, 2005

USACE Rock Island District
ATTN: OD-P
Clock Tower Building, PO Box 2004
Rock Island, Illinois 61204-2004

Dear Sir or Madam;

I am writing to inform you that I am in receipt of your recent National Historic Preservation Act (NHPA) Section 106 and Section 110 correspondence.

After reviewing the contents of your recent mailing we would like to inform that we have no objections to the following project(s):

Project(s): CEMVR-OD-P-2005-0852, CEMVR-OD-P-2005-1088, CEMVR-OD-P-2005-1129, CEMVR-OD-P-2005-1130, CEMVR-OD-P-2005-1128, CEMVR-OD-P-2005-1152

At this time we are unaware of any historical cultural resources in the proposed development area. However, we do request to be immediately contacted if any inadvertent discoveries are uncovered at anytime throughout the various phases of the project.

Please feel free to call me at (785) 966-4007 or additional information can be faxed to (785) 966-4009. We look forward to working with you.

Respectfully,

Zach Pahmahmie
Tribal Chairman
NAGPRA Representative
Prairie Band Potawatomi Nation

ZP/vrs

16281 Q Road • Mayetta, KS 66509 • 785.966.4000 • Fax: 785.966.4002 • Toll Free: 877.715.6789

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

October 3. 2005

District Engineer
U.S. Army Corps of Engineers
Rock Island District
ATTN: OD-P (Wayne Hannel)
Clock Tower Building—P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: CEMVR-OD-P-2005-1088

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 human skeletal remains and/or any objects falling under NAGPRA are uncovered during 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

Sac and Fox Nation of Missouri in Kansas and Nebraska

305 North Main Street • Reserve, Kansas 66434
Phone (785) 742-7471 • Fax (785) 742-3785

October 4, 2005

District Engineer
U.S. Army Corps of Engineers
Rock Island District
ATTN: OD-P (Wayne Hannel)
Clock Tower Building - Post Office Box 2004
Rock Island Illinois 61204-2004

Dear Mr. Hannel:

Thank you for your letter, which is in compliance with Section 106 of the National Historic Preservation Act, and Section 110.

Project: CEMVR-OD-P-2005-1088
U.S. Army Corps of Engineers

The Sac and Fox Nation of Missouri in Kansas and Nebraska NAGPRA department have determined the above project as:

No objections. However, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify NAGPRA representative, Deanne Bahr, at the address above.

There are two other bands of Sac and Fox that also need to be contacted, the Sac and Fox Nation of Oklahoma and the Sac and Fox of the Mississippi in Iowa.

Johnathan Buffalo, NAGPRA Representative
Sac and Fox of the Mississippi in Iowa
349 Meskwaki Rd.
Tama, IA 52339-9629

Sandra Massey, NAGPRA Representative
Sac and Fox Nation of Oklahoma
Rt. 2, Box 246
Stroud, OK 74079

If you have any questions, please contact me at the number or address above.

Sincerely,

Deanne Bahr
Sac and Fox Nation of Missouri in Kansas and Nebraska
NAGPRA Contact Representative

OCT 1 1 2005

This purpose of this public notice is to solicit comments on the proposed project. **POC: Wayne Hannel, Telephone: 309/794-5378**

PUBLIC NOTICE

US Army Corps
of Engineers
Rock Island District

Applicant: U. S. Army Corps of Engineers

Date: September 19, 2005

Expires: October 18, 2005

CEMVR-OD-P-2005-1088

Section 404

NO OBJECTION
U.S. Fish & Wildlife Service
Rock Island, Illinois
Supervisor
Date 10/6/05

Joint Public Notice
U. S. Army Corps of Engineers
Illinois Environmental Protection Agency
Illinois Department of Natural Resources/Office of Water Resources

1. **Applicant.** U.S. Army Corps of Engineers, Clock Tower Building, Rock Island, Illinois 61204-2004.

2. **Project Location.** Section 27, Township 88 North, Range 1 West; near Galena, Jo Daviess County, Illinois. The proposed project is located on the right descending bank of the Mississippi River (River Miles 563.0 - 573.0) in Jo Daviess County, Illinois. The project area is located within the Savanna District of the Upper Mississippi River Wildlife and Fish Refuge.

3. **Project Description.**

a. Purpose. The basic purpose of this project is to enhance aquatic habitat on the Upper Mississippi River. The overall project purpose of the project is to provide to construct the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP) as part of the Upper Mississippi River System – Environmental Management Program (EMP). The project is the result of planning efforts by the States of Illinois and Iowa, the U.S. Fish and Wildlife Service (USFWS), and the U.S. Army Corps of Engineers.

b. Proposed Project. The proposed project involves activities at six backwater areas: Sunfish Lake, Fishtrap Lake, No Name Lake, Kehough Slough, Tippy Lake, and Stone Lake. Construction of project features will require dredging and placement of dredged material to create deflection berms and elevated areas suitable for mast tree planting and regeneration.

- **Sunfish Lake (RM 564).** Backwater restoration at Sunfish Lake will involve dredging and constructing a series of deflection and terrestrial berms. All dredged material will be utilized to construct berms at Sunfish Lake. Approximately 13,850 feet of channel will be mechanically dredged with the material placed adjacent to the dredge cut. The 265,000 cubic yards of dredged material will be used to construct approximately 6560 feet of aquatic berm and 6700 feet of land berm. Mast-producing trees (approximately 670 trees) will be planted on the land berm.

- **Fishtrap Lake (RM 566).** Backwater restoration at Fishtrap Lake will involve dredging and constructing a series of deflection and terrestrial berms. The dredged material will be side cast onto both sides of the peninsula in order to raise the topography and widen this area. Approximately 9720 feet of channel will be mechanically dredged with the material placed adjacent to the dredge cut. The 155,000 cubic yards of dredged material will be used to construct approximately 600 feet of aquatic berm and 5140 feet of land berm. Mast-producing trees (approximately 510 trees) will be planted on the land berm.

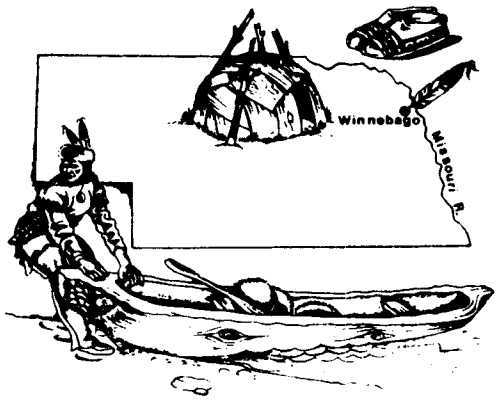
- **Stone Lake (RM 572).** Backwater restoration at Stone Lake will involve dredging and constructing a series of berms. Dredged material will be utilized to construct berms on existing land. A flow diversion structure near the entrance will be constructed. Approximately 8430 feet of channel will be mechanically dredged with the material placed adjacent to the dredge cut. The 130,000 cubic yards of dredged material will be used to construct approximately 200 feet of aquatic berm and 5900 feet of land berm. Mast-producing trees (approximately 590 trees) will be planted on the land berm.

- **No Name Lake (RM 566.5).** Backwater restoration at No Name Lake will involve dredging. Approximately 650 feet of channel will be dredged. There is an estimated 16,000 cubic yards of material to be dredged. Excavated dredged material will be placed within a low-level hydraulic placement facility on the northwest of the lake, adjacent to Kehough Slough or double-handled and placed mechanically at an alternate location, such as along the islands at Kehough Slough.

SEP 21 2005

WINNEBAGO TRIBE of NEBRASKA

WINNEBAGO TRIBAL COUNCIL P.O. BOX 687 WINNEBAGO, NEBRASKA 68071



October 6, 2005

US Army Corps of Engineers
District Engineer
Rock Island District
ATTN: OD-P (Wayne Hannel)Clock Tower Bldg.
P.O. Box 2004
Rock Island, ILL 61204-2004

Re: CEMVR-OD-P-2005-1088

Dear Mr. Wayne Hannel:

Thank you for your recent letter. The Cultural Preservation Office of the Winnebago Tribe of Nebraska would like to inform you that the Winnebago Tribe has cultural properties in the area of your proposed construction. According to the oral tradition, the Winnebago Tribe has lived in the area in the pre-historic period. The tribe had lived in the area in the early years of the historic period before the depopulation of the tribe.

You may proceed with your proposed construction, but if there are any burial sites or other cultural properties discovered in the area, please notify my office right away. Thank you.

Sincerely,

Emily DeLeon

Emily Lucy De Leon
Repatriation and Cultural Preservation Office
(402)878-3313
esmith@lptc.bia.edu

TRIBAL HISTORIC PRESERVATION OFFICE

October 11, 2005

U.S. Army Corps of Engineers
Attn: Wayne Hannel
Clock Tower Bldg. P.O. Box 2004
Rock Island, Illinois 61204-2004

RE: CEMVR-OD-P-1088

To Whom It May Concern:

The Osage Tribe of Oklahoma has evaluated the above reference sites, and we have determined that the site could have religious or cultural significance to the Osage Tribe being our former reservation & homeland. However, if construction activities should expose Osage archeological materials, such as bone, pottery, chipped stone, etc., we ask that construction activities cease, and this office be contacted so that an evaluation can be made.

Should you have any questions, you can reach me at (918) 287-5332.

Thank you.

Sincerely,

John C. Shaw
Project Specialist Office

627 Grandview, Pawhuska, OK 74056, (918) 287-5446, Fax (918) 287-5562

Illinois Department of
Natural Resources
One Natural Resources Way • Springfield, Illinois 62702-1271
http://dnr.state.il.us

Rod R. Blagojevich, Governor
Joel Brunsvold, Director

October 17, 2005

Mr. Richard J. Baugh, P.E.
Regulatory Branch
Rock Island District, Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Baugh:

The Illinois Department of Natural Resources, Office of Realty and Environmental Planning, has reviewed the project(s) listed below and has no objections to permit issuance:

Permit No.	Applicant
✔ 2005-1088	U.S. Army Corps of Engineers
2005-1382	Woodland Shores Association

Please contact me at 217-785-4863 if we can be of further assistance.

Sincerely,

Robert W. Schanzle
Permit Program Manager

RWS:rs 9-07(05), 10-05(05)

cc: IDNR/OWR (Diedrichsen), IEPA (Yurdin), USFWS (Millar), USEPA (Pierard)

This recommendation regarding the issuance/denial of the U.S. Army Corps of Engineers permit by the IDNR, Office of Realty and Environmental Planning does not supersede permit decisions made by the IDNR, Office of Water Resources under the Illinois Rivers, Lakes and Streams Act.

Illinois Historic
Preservation Agency

Voice (217) 782-4836
1 Old State Capitol Plaza • Springfield, Illinois 62701-1512 • Teletypewriter Only (217) 524-7128
www.illinois-history.gov

JoDaviess County PLEASE REFER TO: IHPA LOG #016092205
Galena
Right Descending Bank Mississippi River Miles 563.0 - 573.0)

COERI-CEMVR-OD-P-2005-1088
Aquatic Habitat Enhancement - Sunfish, Fishtrap, No Name, Kehough, Tippy and Stone Lakes

October 18, 2005

Wayne Hannel
U.S. Army Corps of Engineers, Rock Island District
Regulatory Branch
Clock Tower Building
Post Office Box 2004
Rock Island, IL 61204-2004

Dear Mr. Hannel:

We have reviewed the documentation submitted for the referenced project(s) in accordance with 36 CFR Part 800.4. Based upon the information provided, no historic properties are affected. We, therefore, have no objection to the undertaking proceeding as planned.

Please retain this letter in your files as evidence of compliance with section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two (2) years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

If you are an applicant, please submit a copy of this letter to the state or federal agency from which you obtain any permit, license, grant, or other assistance.

Sincerely,

Anne E. Haaker

Anne E. Haaker
Deputy State Historic
Preservation Officer

United States Department of the Interior

U.S FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO

November 4, 2005

Ms. Jodi Staebell
Planning and Policy Branch
Rock Island District, Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ms. Staebell,

Thank you for the opportunity to review and comment on the Pool 12 Overwintering HREP public review draft Definite Project Report with Integrated Environmental Assessment (R-19PR) dated September 2005. We have the following comments regarding the document:

1. Page 9, paragraph J, Historic Properties: We suggest that the Corps of Engineers address AIRFA, American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996), in this section or elsewhere in the DPR.

2. Page A-21. Ken Barr's April 20, 2004 letter: We suggest visiting the National Park Service's Native American Graves Protection and Repatriation Act (NAGPRA) internet site for an updated list of NAGPRA contacts.

3. Please provide a copy of the report, "Phase I Archaeological Survey and Geomorphological Evaluation for Historic Properties, Pool 12 EMP Project..." by David Benn (2004) to our cultural resources person, Mr. John Dobrovolny.

4. We recommend expanding the cumulative impacts discussion on pages 52-53. This project is part of the much larger Environmental Management Program which should benefit not just Pool 12, but this river reach and the system.

5. Page 34, Table 6-1: There are discrepancies between the land berm minimum target elevations shown in the table and those described in the narrative on pages 35-38.

6. We are concerned about the control of invasive species in areas disturbed during construction. We realize it may be more appropriate to address this issue in the design and construction phases rather than the DPR; however we feel it is important to begin this discussion now. If invasive species do become a problem, they could significantly increase our maintenance requirements of the project.

The final DPR must include a copy of the draft Memorandum of Agreement for the operation, maintenance, and rehabilitation of the project. The Service will cover operation and maintenance costs as discussed in the report. The Regional Director's letter on the final Definite Project Report will include the certification of support for operation and maintenance.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), the Endangered Species Act of 1973, (16 U.S.C. 1531-1543), as amended, and the U.S. Fish and Wildlife Service's Mitigation Policy.

We are pleased to see this project moving forward, and look forward to our continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, our EMP coordinator, at (507) 494-6207.

Sincerely,

Don Hultman
Refuge Manager

cc: Ed Britton, Savanna District Manager
Mike Griffin, Iowa DNR
Scott Stuewe, Illinois DNR

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 – (217) 782-3397
JAMES 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 – 0 2005

Ms. Charlene Carmack
Rock Island District
Corps of Engineers
Clock Tower Building
Rock Island, IL 61201

Re: U.S. Army Corps of Engineers, Rock Island District (Jo Daviess County)
Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project - Mississippi River
Log # C-0942-03 [CoE appl # 2005-1088]

Dear Ms. Carmack:

We have been advised by the Rock Island District Corps of Engineers by copy of their letter to you dated September 19, 2005 that Section 401 water quality certification will be required from this office.

To date we have not received an application for the proposed work and cannot, therefore, complete a review as required under Section 401 of the Clean Water Act. Please provide this office with the necessary completed application forms, plans and other pertinent documents so that we may complete our review in a timely manner.

Please also be advised that any construction and operation of the hydraulically dredged material disposal facilities will require the issuance of permits by the Agency under 35 Il. Adm. Code Sections 309.202 and 309.203. Application forms WPC-PS-1 and Schedule J are enclosed for your use. These forms and the plans and specifications for the disposal facilities must be submitted to this office.

Please be advised that supernatant tests are required for open water disposal and for hydraulic dredging. Attached is a fact sheet on testing requirements for dredging projects.

The application should include names and addresses of all adjacent property owners at the project location.

Please provide the methods and practices to be used to create the berms in the waterway with the fine grained dredge material that will prevent resuspension of material and violation of the water quality standards of 35 Ill. Adm. Code Subtitle C.

Section 401 certification will be held in abeyance pending a review of the requested information. Upon receipt of a satisfactory written reply and supplemental information required, we shall finalize our review of this subject. Your response should be submitted to this office within thirty (30) days.

Please be advised that a fee for the requested state construction permit is required under the Illinois Environmental Protection Act, Section 12.2 (415 ILCS 5/12.2). Section 12.2 requires, in part, that beginning July 1, 2003, the Agency must collect a fee in the amount set forth in subsection (c)(6) from each applicant for a state permit to construct any treatment works or industrial wastewater source that does not require pretreatment. The amount of the fee for a state permit to construct any treatment works or industrial wastewater source that does not require pretreatment is $1,000.00. Section 12.2 requires the Agency to deny the application if the appropriate fee is not

submitted. Checks for fee payment should be made payable to: Treasurer, State of Illinois, Environmental Protection Permit and Inspection Fund. The above referenced log number should be placed on the submitted check.

Please be advised that a fee for 401 water quality certification is required under the Illinois Environmental Protection Act, Section 12.6 (415 ILCS 5/12.6). The amount of the fee for a 401 water quality certification is $350 or 1% of the gross value of the project, whichever is greater, but not to exceed $10,000. We will process the application but cannot issue a 401 water quality certification until the appropriate fee has been submitted. Once we have completed our review, we will send you a Section 401 Water Quality Certification Fee Worksheet at the end of the 401 review process. You will need to fill out the worksheet, submit it to the Agency, and include the appropriate fee to complete the 401 water quality certification application prior to the issuance of the certification.

Should you have any questions or comments regarding the content of this letter, please contact James Allison at the above telephone number and address.

Sincerely,

Bruce J. Yardin
Manager, Watershed Management Section
Bureau of Water

BJY:JRA:

Attachment

cc: Records Unit
CoE, Rock Island District (Hannel)
IDNR, OWR, DWRM, Springfield

PM-Dist
√PM-F (Stacbell)
PM-A (Carmack)
PM-M (Hubbel)
ED-HH (Zager)
OD-PP (Hannel)
ED-DW (Wicket)

Illinois Department of
Natural Resources
One Natural Resources Way • Springfield, Illinois 62702-1271
http://dnr.state.il.us

Rod R. Blagojevich, Governor
Sam Flood, Acting Director

March 26, 2008

SUBJECT: Permit No. DS2008019
Pool 12 Overwintering HREP
Mississippi River (Miles 563 - 573)
Jo Daviess County

U.S. Army Corps of Engineers
Rock Island District
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

ATTN.: Roger A. Less, P.E., Acting Chief, Engineering & Construction Div.

Dear Mr. Less:

Enclosed is Illinois Department of Natural Resources, Office of Water Resources Permit No. DS2008019 authorizing the subject project. The issuance of this permit is based on our determination that the completed project will not appreciably impact the river's flood carrying capacity or adversely impact the public's rights, interests or uses in the public body of water. In addition to the general conditions of the permit, this approval is subject to the following special conditions:

a) Final construction plans must be submitted to this office for review and approval prior to beginning construction on the project; and

b) To preserve the public's interests in the public body of water, the land constructed within public waters shall permanently remain in public ownership.

If any changes of the permitted work are found necessary, revised plans should be submitted promptly to this office for review and approval. Also, this permit expires on the date indicated in Condition (13). If unable to complete the work by that date, the permittee may make a written request for a time extension.

Upon receipt and review of this permit and all of its conditions, please properly execute and return the attached acceptance blank within sixty (60) days from the date of the permit. Please feel free to contact Jerry Bishoff of my staff at 217/558-6617 if you have any questions concerning this authorization.

Sincerely,

Michael L. Diedrichsen, P.E.
Acting Manager, Downstate Regulatory Programs

MLD:JMB:crw
Enclosure
cc: IEPA, Watershed Management Section
IDNR, Office of Realty & Environmental Planning
IDNR, Office of Resource Conservation
Jo Daviess County (Linda Delvaux, Zoning Administrator)

PERMIT NO. DS2007019
DATE: March 26, 2007

State of Illinois

Department of Natural Resources, Office of Water Resources

Permission is hereby granted to:

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

to excavate channels and construct deflection berms, higher-level terraces and islands within the backwaters of the Mississippi River (Miles 563 to 573) in Jo Daviess County,

in accordance with an application dated June 8, 2005, and the plans and specifications entitled:

MISSISSIPPI RIVER EMP POOL 12 OVERWINTERING
JO DAVIESS COUNTY, ILLINOIS
(Plates 1 - 10, Dated 2/9/2004).

Examined and Recommended:

Michael L. Diedrichsen

Michael L. Diedrichsen, Acting Manager
Downstate Regulatory Programs

Approval Recommended:

Gary R. Clark

Gary R. Clark, Director
Office of Water Resources

Approved:

Sam Flood

Sam Flood, Acting Director
Department of Natural Resources

This PERMIT is subject to the terms and special conditions contained herein.

THIS PERMIT IS SUBJECT TO THE FOLLOWING CONDITIONS:

1) This permit is granted in accordance with the Rivers, Lakes and Streams Act "615 ILCS 5."

2) This permit does not convey title to the permittee or recognize title of the permittee to any submerged or other lands, and furthermore, does not convey, lease or provide any right or rights of occupancy or use of the public or private property on which the activity or any part thereof will be located, or otherwise grant to the permittee any right or interest in or to the property, whether the property is owned or possessed by the State of Illinois or by any private or public party or parties.

3) This permit does not release the permittee from liability for damage to persons or property resulting from the work covered by this permit, and does not authorize any injury to private property or invasion of private rights.

4) This permit does not relieve the permittee of the responsibility to obtain other federal, state or local authorizations required for the construction of the permitted activity; and if the permittee is required by law to obtain approvals from any federal or other state agency to do the work, this permit is not effective until the federal and state approvals are obtained.

5) The permittee shall, at the permittee's own expense, remove all temporary piling, cofferdams, false work, and material incidental to the construction of the project. If the permittee fails to remove such structures or materials, the Department may have removal made at the expense of the permittee.

6) In public waters, if future need for public navigation or other public interest by the state or federal government necessitates changes in any part of the structure or structures, such changes shall be made by and at the expense of the permittee or the permittee's successors as required by the Department or other properly constituted agency, within sixty (60) days from receipt of written notice of the necessity from the Department or other agency, unless a longer period of time is specifically authorized.

7) The execution and details of the work authorized shall be subject to the review and approval of the Department. Department personnel shall have the right of access to accomplish this purpose.

8) Starting work on the activity authorized will be considered full acceptance by the permittee of the terms and conditions of the permit.

9) The Department in issuing this permit has relied upon the statements and representations made by the permittee; if any substantive statement or representation made by the permittee is found to be false, this permit will be revoked; and when revoked, all rights of the permittee under the permit are voided.

10) In public waters, the permittee and the permittee's successors shall make no claim whatsoever to any interest in any accretions caused by the activity.

11) In issuing this permit, the Department does not ensure the adequacy of the design or structural strength of the structure or improvement.

12) Noncompliance with the conditions of this permit will be considered grounds for revocation.

13) If the construction activity permitted is not completed on or before December 1, 2014, this permit shall cease and be null and void.

THIS PERMIT IS SUBJECT TO THE FOLLOWING SPECIAL CONDITIONS:

a) Final construction plans must be submitted to this office for review and approval prior to beginning construction on the project.

b) To preserve the public's interests in the public body of water, the land constructed within public waters shall permanently remain in public ownership.

PERMIT NO. DS2008019
U.S ARMY CORPS OF ENGINEERS

PERMIT ACCEPTANCE

This Acceptance must be signed and returned to the address below to validate this permit. See Condition No. 8.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES
OFFICE OF WATER RESOURCES
One Natural Resources Way
Springfield, Illinois 62702-1271

The undersigned permittee, personally, or if a corporation by its duly authorized officers, hereby accepts the permit bearing the above serial number subject to all conditions named therein, on this 18 day of June, 2009

By Denny Libby P.E.

By _____

If a corporation
affix seal here.

Pool 12 Overwintering
PDT Meeting Minutes

Thursday November 17th 2011 at 2pm (CST)
PM Conf Room, 2nd Floor of Clock Tower

Agenda:

1. Recap of In-Progress Review (IPR) with Division
    a. AFB – AFB will be held with Division in March 2012
    b. Scaled ATR – ATR can be scaled back, but the level of review will depend on how much the Tentatively Selected Plan (TSP) differs from the 2005 recommended plan. At this point, we are estimating one month of ATR review time.
    c. Alternative schedule for cost certification from Walla Walla – Division has allowed us to do an alternative schedule for cost certification, with the anticipated completion date just prior to DPR submittal to Division.
    d. Letter of Support from the EPA – Division is requiring that we attain a Letter of Support from the EPA prior to submitting the DPR for approval as we would normally due.

2. Proposed Schedule; We have an aggressive schedule laid out to position this project for construction contract award in FY12 if the opportunity arises.
    a. November 16 – PMP out for team review – A.I. Ellen Milliron will distribute a copy of this to the sponsors for their review.
    b. November 30 – PMP submitted to PMP Counsel for review
    c. November 30 – draft of Review Plan submitted to Division
    d. February 28 – Redraft of DPR complete
    e. March 1 – Scaled ATR begins
    f. March 28 – Cost certification complete
    g. March 30 – ATR ends with comments addressed
    h. April 1 – Submit DPR to MVD
    i. April 2 – Plans and Specs begin
    j. May 18 – MVD Approval Memo

This schedule accounts for a scaled ATR, no additional public review, and an alternative cost certification schedule. Charlene Carmack said that she spoke with Wayne Hannel in regulatory and he indicated that as long as the EPA still considers our application for Pool 12 open, which it does, than there is no need to do additional public review or have the FONSI resigned as long as we are still within the original project footprint.

3. Critical Path - 401 Application;
    a. Recap of meeting with Water Quality
    b. Questions for EPA

c. Possible alternatives for Confined Disposal Facilities (CDF)

There is not time to get additional samples if we are trying to meet the schedule set forth above. It was suggested that we could talk to the EPA about looking at the grain size of the sediment and seeing how that varies with the background levels as a way to estimate what the zinc levels would be without doing additional sampling. This remains a possibility.

It was decided that we should approach the EPA by telling them that we would like to do only mechanical dredging/side casting and ask them what we need to do in order to make that happen, rather than proposing alternatives to them such as geotubes or other CDFs.

A.I. Laura Oman will be drafting the factsheet/questions and sending them in an email to the EPA along with a meeting request to discuss permit approval.

4. Proposal to change the channel cuts from 60' wide to 45'wide

This option was briefly discussed with the idea that the reduced dredge cut width would reduce the quantities of dredge material that would go into a CDF (if required), but it was decided that the benefit of having less dredge material was not worth the loss of habitat benefits.

5. O&M Responsibilities

As the project sponsor, USFWS would be held responsible for the O&M of the project. Sharrone had a question about what the exact O&M requirements would be. There was discussion about how the Corps has shifted from looking at a 50 year project life to an indefinite project life and how that would impact O&M responsibilities.

A.I. Ellen Milliron will follow up to determine what is the current Corps O&M policy.

6. Next PDT Meeting: Wednesday, November 30th or Thursday, December 1st?

The next PDT meeting will be Wednesday, November 30th at 2pm. Call-in information will be the same as this meeting: 877/336-1280 Access code: 6711984

Pool 12 Overwintering
PDT Meeting Minutes

Tuesday January, 24th 2012 at 2pm (CST)
PM Conf Room, 2nd Floor of Clock Tower

ACTION ITEMS:

1. Laura St. Louis will provide an update on the sampling results at the next PDT meeting.

2. Darron Niles will send a request to Dan Sallee for a Letter of Support and an example letter.

3. Joe Lundh will provide the tree inventory data to Ellen Milliron for dissemination to other team members.

4. Charlene Carmack will draft a Scope of Work for the bat survey.

5. Ellen Milliron will set up a face-to-face meeting with FWS, IL DNR, and IA DNR for alternative development.

1. Sampling Update – Laura St. Louis
    a. Someone from the Water Quality Section is planning to go out in the field Thursday of Friday of next week to collect sediment samples in Fishtrap Lake.
    b. 15 samples will be collected. One sample will be from the same site as the elutriate sample site. Samples will also be collected from the same sites as the soil boring sites that were done previously. Additional samples will be taken at the intersections of dredge cuts or in dredge cuts that are particularly long.
    c. The samples will be sent to a lab for analysis and that will have a turn-around time of 7 to 10 business days.
    d. The engineering team will need a few days to a week to interpret the lab results. An update will be provided at our next PDT meeting.
    e. A grain size analysis of the soil at the Elutriate testing site in Fishtrap was not conducted previously because the soil composition is clay, which would entirely pass through a sieve. According to the Foth report, the soil at the Fishtrap site was different from the other Lake sites.

2. Letter of Support – Ellen Milliron
    a. We need a letter of support from the IL DNR to be included in the DPR when it gets submitted to MVD. Dan Sallee requested that a request for the letter be sent to him so that he can do the coordination for the letter. Darron Niles will send Dan the request and a sample letter.
3. CAR – Ellen Milliron

a. Ellen stated that there was a CAR included in the old report and asked if this is something that will have to be updated. Amber Andress said that, yes, the CAR will need to be updated and she will work with Charlene Carmack. Ellen asked if a bat survey will have to be completed prior to FWS providing an updated CAR. Amber responded that as long as the bat survey is done within two years prior to construction that should be sufficient, and will not be required prior to providing the CAR.
b. Charlene is going to write a Scope of Work for the bat survey.
c. Amber asked if there is good data on the trees that are located in the project area. Joe Lundh said that he would provide the data that he has for the tree inventory.
d. Charlene and Amber will continue to coordinate to complete the update of the CAR

4. Alternative Development – Ellen Milliron
    a. The alternatives for the project are going to need to be hashed out by the team. A face-to-face meeting with reps from FWS, IL DNR, and IA DNR is the preferred method. The results of the Fishtrap sampling are going to affect the alternatives that are acceptable.
    b. Ellen will be sending out an email with some options for dates, times, and locations for the alternative development meeting.

5. Proposed Schedule
    a. A team schedule was presented to the group. Each task on the schedule was talked about by the team to determine who would be responsible for accomplishing the task and if the dates/timeline presented were realistic.
    b. See the revised schedule (attached).
    c. A discussion of the land verification ensued. The Jo Davies County Conservation Foundation purchased private land near Kehough Slough. Federal landownership needs to be verified throughout the project footprint. The POC for the Jo Davies County Conservation Foundation is Jeff Horn. Contact info is jeff@jdcf.org or 815-858-9100.

6. Next PDT Meeting: Thursday February 9, 2012
    a. The next PDT meeting will be Thursday February 9, 2012 at 2pm. Call-in information will be the same as this meeting: 877/336-1280 Access code: 6711984

Pool 12 Overwintering
PDT Meeting Minutes

Thursday February, 16th 2012 at 2pm (CST)
PM Conf Room, 2nd Floor of Clock Tower

Attendees:

Darron Niles (USACE)
Julie Millhollin (USACE)
Steve Rumple (USACE)
Charlene Carmack (USACE)
Ellen Milliron (USACE)
Camie Knollenberg (USACE)
Roger Perk (USACE)
Tom Kirkeeng (USACE)
Debra VanOpdorp (USACE)
Kara Mitvalsky (USACE)
Heather Anderson (USACE)
Chris Depooter (USACE)

Via Phone:

Sharrone Baylor (FWS)
Amber Andress (FWS)
Kirk Hansen (IA DNR)
Joe Lundh (USACE)

ACTION ITEMS:

- Ellen Milliron will send Kirk Hansen the revised project objectives.

1. Sampling Update – Julie Millhollin
    a. Bulk sediment samples were tested for zinc in Fishtrap Lake. The results were analyzed by EC-DN.
    b. A map was distributed showing the 16 zinc sample sites and testing results, as well as the suggested dredging limits as recommended by EC-DN.
    c. Based on sample results, Julie stated that the recommended dredging would only include part of Dredge Cut A and part of Dredge Cut B, with Dredge Cut C eliminated entirely.
    d. The amount of dredging would be about one-third of the originally proposed dredging in Fishtrap. The dredge material would be approximately 60,000 cubic yards. The proposed dredge cuts would not allow for suitable access into the site.
    e. Kirk Hansen agreed that there would not be suitable access to the site if the dredging did not occur in Dredge Cut A, along Harris Sough and into Fishtrap because the water depths are typically very shallow, i.e. site #7 has a max depth of about 2 feet.
    f. Charlene Carmack stated that, with the two-thirds decrease in dredging, it could be assumed that the benefits in Fishtrap would also decrease by two-thirds or more.
    g. Kirk Hansen stated that the overwintering areas are located in Dredge Cuts B and C, so without dredging those areas, there would be no overwintering benefits to fish.

    h. Additional discussion led to the conclusion that Fishtrap should be dropped out of the project. However, the final decision on eliminating Fishtrap will not be made until input from Mike Griffin (IA DNR) and Dan Sallee (IL DNR) could be obtained.
2. Revised Objectives – Ellen Milliron
    a. The revised objectives were distributed to the team a week prior to the meeting. Ellen asked if there was any comments or changes from the group. Sharonne Baylor stated that FWS had no comments. Kirk Hansen asked to have the revised objectives resent.
3. Real Estate – Debi VanOpdorp
    a. In prior PDT meetings, a concern had been raised about the ownership of a parcel of land near Keough Slough. The possibility that the Jo Davies Conservation Foundation owned part of the land was further explored.
    b. Debi stated that she had the segment maps and land ownership information showing Federal ownership of those parcels.
4. Alternative Development – Ellen Milliron
    a. A discussion of a face-to-face alternative development meeting took place. March 16 was set as the tentative date, pending the availability of Dan Sallee and Mike Griffin.
5. Next PDT Meeting: TBD
    a. The next PDT meeting will be scheduled after the alternative development meeting.

Pool 12 Overwintering (EMP) Project - Alternative Development Meeting

Date: March 16th, 2012 **Time:** 1:00 – 4:00pm **Location:** Mississippi River Project Office

List of Attendees:

Attendee:	Organization:
Andress, Amber	USF&W
Baylor, Sharonne	USF&W
Depooter, Chris	USACE
Griffin, Mike	IA DNR
Hansen, Kirk	IA DNR
Lundh, Joseph	USACE
Millhollin, Julie	USACE
Milliron, Ellen	USACE
Niles, Darron	USACE
Sallee, Dan	IL DNR
St. Louis, Laura	USACE

Meeting handouts:

1. Project schedule
2. Table of dredging quantities, linear feet, and cost for the individual lakes in the old report vs. the new estimates.
3. Maps of the individual lakes showing proposed dredge cuts and placement sites.
4. Plate of a typical berm section.
5. Maps of the tree species and diversity in project area (Lundh).

Please see the attachments to these minutes to view the items listed above.

NOTE: Large maps of each lake were posted during the meeting that the group was able to draw on to help depict where changes would be made. EC-DN has those maps in order update the project plates. These are the maps that are being referred to in these minutes when stated "see marked up maps".

Schedule: Ellen Milliron

Ellen distributed a project schedule and reiterated the importance of staying on schedule as Pool 12 is the only EMP project that is expected to be ready for contract award in FY13.

Discussion of individual lakes: Julie Millhollin

Julie provided a walkthrough of each lake site including quantities, construction duration, and estimated costs. A summation of that information is included in the table below. Please note that the estimated costs include tree clearing, dredging, and placement, but do NOT include mob & de-mob and rock (if needed).

	Stone Lake	Sunfish Lake	Kehough Slough	Tippy Lake	No Name Lake	Fishtrap Lake
Construction Duration (Days)	187	312	Not provided- plan was changed during meeting	149	Dropped from the project due to its value as open marsh habitat.	Dropped previously due to soil contaminants issues
Cost ($M)	2.3M	3.9	Not provided- plan was changed during meeting	2.9-3.5		
Clearing (Acres)	14	23.6	8.3	14.2		
Dredging (Acres)	14.7	26.6	8.6	13		
Placement (Acres)	14	23.6	8.3	14.2		

Stone Lake – The existing berm above the dredge cut on the northeast end of Stone Lake was extended to the railroad embankment. This will avoid flows from being concentrated between the project's embankment and the Illinois shore. (see marked up maps).

No Name Lake – No Name Lake was dropped from the project because of its importance as an open marsh area. The area is not conducive to overwintering.

Kehough Slough – Additional dredging length was added at Kehough Slough. The group outlined those additional areas on the large map (see marked up maps). The placement area for this additional dredging will be adjacent, but will involve no tree clearing (good species diversity).

Sunfish Lake – The sediment deflection berm was extended along the loop area in the upper lake (see marked up maps). A rock closure will also be constructed on the Stone Slough side of Sunfish Lake about mid-project. The rock closure will be monitored to ensure desired dissolve oxygen levels are maintained in the lake. A potential adaptive management feature would be adding or removing rock from the closure.

Tippy Lake – The plan for Tippy is to use a single wide dredge cut (~60' in width) with side placement of the material next to, but not in the trees.. The fork of Tippy Lake may have to be reduced to just one side of the fork if there is not enough placement area in that location to do side casting. A site visit to the area will help determine if this plan is possible due to the sedimentation depths in the Lake and the quality of trees present (lower quality may allow some clearing for material placement). The single width/side placement plan will be much more cost effective as opposed to dredging an extra wide channel to accommodate a hopper barge and double handling of the material.

Project Costs - Chris Depooter will complete his evaluation of the costs/alternatives for the four remaining lakes (Stone, Sunfish, Kehough, and Tippy). When costing out tree clearing, it will be

assumed that the areas will be completely cleared, but not grubbed. Trees can be left on-site in brush piles to provide additional habitat and avoid costs of removal of the felled trees.

Phasing – A discussion was held regarding the pros and cons of phasing the project. The previous report had planned for two phases, with the second phase being part of the overall adaptive management plan.

It was established that Tippy Lake is lower in priority when compared to the other three lakes, although its completion is still of high importance. The long construction duration of the other three lakes were also considered since it will likely be about 5 years until construction would begin at Tippy (if it is the last lake slated for construction). The decision was made to pursue the project in one phase; however, there may be reasons that would prevent doing a one-phased approach, such as funding restrictions or adaptive management commitments. These items will be further investigated.

Action Items:

Joe Lundh:

- provide information on forestry cover and diversity in pdf or shapefile form
- look into possibility of timber sale in areas scheduled to be cleared
- identify trees/ methods to selectively clear areas (leave some trees)
- check on areas to side cast at Tippy Lake

Julie Millhollin:

- Stone Lake –
  - check on tying into railroad with berm
- Sunfish Lake –
  - add berm to surround dredge cut loop
  - Add rock structure (similar to Mud Lake) to address Dan and Kirk's concerns about oxygen availability. **Top of structure to be 3 feet below flat pool, so as not to disrupt boating.** (See marked up drawing.)
- Kehough
  - Increase dredge cut . (See marked up drawing.)
  - Calculate new quantities, cost, and duration to include revised dredge cut.

Sharonne Baylor (USFWS):

- Work with locals to install a No Wake Zone at Tippy Lake along the main dredge cut that will have wingdams.

The Point of Contact of this Memo is Ellen Milliron Haring at: Ellen.s.milliron@usace.army.mil.

Pool 12 HREP
Tree Planting Discussion
Meeting Summary

May 31, 2012 at 11am

Participants:

Darron Niles
Joe Lundh
Ellen Milliron
Julie Millhollin
Garrett Mattila
Russ Engelke (via phone)

Discussion:

Joe Lundh started off by proposing several tree planting options that we could try throughout the project area. Those options included;

1. Container Stock. This measure involves planting trees that are 4' to 6' in height with 3' spiral, plastic wrap on the trunk. There would be approximately 50 trees planted per acre. A 4' perimeter would be sprayed around each tree to deter weed growth. Approximately 5% of the total trees planted (2 or 3 trees per acre) would have fencing placed around them. The fencing would be 3 foot tall plastic fencing zip-tied to wood stakes one foot in diameter. Individual fencing of various trees would help to determine if it is effective in preventing beaver damage. The amount of fencing in this measure is limited because large scale implementation of fencing can become problematic in the floodplain due to high water events causing debris to get caught up in the fence, possibly causing the fencing to fail and knocking the tree plantings down. Fencing can also be expensive.
2. Container Stock with Advanced Natural Regeneration. This measure would allow natural regeneration for two years after construction completion. There would be no intervention, including no mowing. The contractor would then come back after the two years of natural regeneration and hand plant the same number and species of container stock trees as measure 1.
3. Container Stock with Button Bush Cover Crop. This measure involves the contractor collecting button bush seeds in the fall or early winter and planting those seeds in spring after berm construction. Planting would require disking as site prep and harrowing after spreading the seed. Those seeds would then be allowed to grow for one season before the contractor would come back and do hand planting of the container stock trees. The button bush would provide a good cover crop, a nurse crop for the trees, and help prevent beaver damage to the trees. The container stock would be the same number, species, and size as measure 1.

4. Direct Seeding. This measure involves a broadcast seeding of desirable tree species in the approximate amount of 10,000 seeds per acre immediately after construction. This measure would require the ground to be disked prior to seeding and harrowed after distribution of the seeds. Direct seeding has been implemented at other places with varied levels of success. Some instances have had high mortality rates. This measure also requires mobilization of equipment to the berm sites, which would likely involve barging the equipment. Included in this

measure is spraying herbicide at least once in the May timeframe, and again in the July timeframe if needed.

DECISION: We will not use weed mats for any of the options as was outlined previously in the DPR. Weed mats tend to become impediments after the first high water and are not desirable at this project area.

DECISION: Any spraying done will involve spraying in a 4' radius around each tree with a back pack sprayer. The type of spray will have to be approved by the refuge manager prior to use. This method will allow for as much natural regeneration as possible, while not allowing the growing trees to be choked out by weeds.

Species List for Container Plantings (20% for each):
Kentucky Coffee Tree
American Sycamore
Pin Oak
Northern Pecan
Swamp White Oak

Species List for Direct Seeding:
Kentucky Coffee Tree
American Sycamore
Pin Oak
Northern Pecan
Swamp White Oak
Bur Oak
Green ash

The decision was made to screen out any undesirable tree planting measures based on the viability of large-scale implementation of the measure in a floodplain. After which, based on the remaining measures, a tree planting implementation plan for the first lake in the construction sequence (Sunfish Lake) was devised.

DECISION:
Four tree planting measures will be implemented at Sunfish Lake. The lake-area berm acreage will be roughly divided into quarters. Each quarter will have a different tree planting measure implemented on it. The first two measures will be implemented after the first year of construction. The second two measures will be implemented after the second year of construction.

Sunfish Lake Tree Planting – After YEAR 1 of Construction:
Container stock w/ advanced natural regeneration (25% of total Lake-area berm acreage)
Container stock w/ button bush cover crop (25% of total Lake-area berm acreage)

Sunfish Lake Tree Planting – YEAR 2:
Direct Seeding (25% of total Lake-area berm acreage)
Container Stock (25% of total Lake-area berm acreage)

The various types of tree planting measures will be monitored for tree survival and mortality rates. If any one or more measure has an exceedingly high rate of mortality, it will be eliminated as a possible measure for implementation at the remaining lake sites.

Cost estimate:
Cost estimates will be developed for all four types of tree planting measures. Sunfish Lake will have each measure implemented on approximately 25% of the total berm acreage on which trees can be planted. Because the remainder of the tree planting at the other lakes is yet to be determined based on the outcome at Sunfish, we will assume that at the other 3 lakes we will implement the highest cost option for the entire lake. In this way, we will capture the highest possible cost, while the actual cost of implementation is likely to be lower. The highest cost option is yet to be determined.

POC for this summary is Ellen Milliron Haring at Ellen.S.Milliron@usace.army.mil or 309-794-5256.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

October 12, 2012

Ellen S. Milliron Haring
Community Planner
US Army Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ellen:

Thank you for the opportunity to review and comment on the Pool 12 Overwintering HREP draft Definite Project Report with Integrated Environmental Assessment (R-19F) dated October 2012 (distributed August 27, 2012). We have the following comments regarding the document.

1. Coordination Act Report: Our Ecological Services Office will be providing you an updated Coordination Act Report.

2. Sunfish Lake Maintenance Dredging, page 50, Section VI.H: This section states that the Sunfish Lake entry channel reach has a high sedimentation rate. We are concerned about future maintenance costs in this reach, and question why this channel would be constructed knowing it may have such a high sedimentation rate.

3. Entry Channel Maintenance Dredging, page 50, Section VI.H: The report states that the entry channels are not expected to fill in with sediment. The USFWS will consider entry channel maintenance dredging on a case-by-case basis based upon project performance and Refuge budgets.

4. Repair, Rehabilitation, and Replacement Consideration, page 54, Section VIII.B: This paragraph states that the USFWS is "expected to operate and maintain the Project until it is no longer authorized," and "should expect to incur costs…outside the 50-year period of analysis. However, the Memorandum of Agreement states that the agreement shall "remain in effect for a period of no more than 50 years." As such, the USFWS will only agree to operate and maintain the project for 50 years.

5. Asian Carp, page 15, Section II.H: Revise this and other Asian carp references to reflect that Asian carp have be caught in Pool 12 rather than are just likely to be present.

6. Ornate Box Turtle, page 15, Section II.I: Ornate box turtles will not use the project area because they are land turtles.

7. Refuge Comprehensive Conservation Plan, page 18, Section III.C.1; Appendix L: Update the Refuge's 1987 Master Plan reference to the 2006 Comprehensive Conservation Plan.

8. Estimated Annual Maintenance Costs, page 57, Table 8-3: Table 8-3 title states estimated "annual" maintenance costs, but the table shows total costs over 50 years. Please reconcile the discrepancy.

9. Cultural Resources: Ensure the cultural resource comments provided in our November 4, 2005 letter are adequately addressed in the revised Definite Project Report with Integrated Environmental Assessment.

The final DPR must include a copy of the draft Memorandum of Agreement for the operation, maintenance, and rehabilitation of the project. The Service will cover operation and maintenance costs as discussed in the report. The Regional Director's letter on the final Definite Project Report will include the certification of support for operation and maintenance.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), the Endangered Species Act of 1973, (16 U.S.C. 1531-1543), as amended, and the U.S. Fish and Wildlife Service's Mitigation Policy.

We are pleased to see this project moving forward, and look forward to our continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, our Environmental Engineer, at (507) 494-6207 or at Sharonne_Baylor@fws.gov.

Sincerely,

Tim Yager
Deputy Refuge Manger

cc via email: Ed Britton, Savanna District Manager
Pam Thiel, Project Leader, La Crosse Fish and Wildlife Conservation Office
Amber Andress, Biologist, Rock Island Ecological Services
Jon Duyvejonck, Biologist, Rock Island Ecological Services
James Myster, Cultural Resources
Mike Griffin, Iowa DNR
Dan Salee, Illinois DNR

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

IN REPLY REFER TO:

FWS/RIFO

November 28, 2012

Colonel Mark Deschenes
District Engineer
U.S. Army Corps of Engineers
Rock Island District
Attn: Ken Barr
Clock Tower Building, P. O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Deschenes:

The Rock Island Field Office of the U.S. Fish and Wildlife Service (Service) has reviewed the draft Pool 12 Overwintering Project Report and Environmental Assessment, including Biological Assessment dated October 2012. The *Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project* is located in Jo Daviess County, Illinois, upstream of Bellevue, Iowa, in Pool 12 between Upper Mississippi River Miles 563 and 573. All Project lands are in Federal ownership and are managed by the Service as part of the Upper Mississippi River National Wildlife and Fish Refuge. A Coordination Act Report for this project was submitted to the Corps in November of 2004, but the project has been recently modified. This letter report serves as an addendum to the 2004 Coordination Act Report and addresses the most recent project plans.

The Tentatively Selected Plan (TSP) would restore backwater habitat at four lakes by excavating approximately 63 acres of deep backwater channels to a depth of 8 feet below flat pool, providing overwintering and year-round habitat for fish in the surrounding 6,942 acres. The plan provides 88 Average Annual Habitat Units of fish habitat. Excavated material would be used to construct land and aquatic berms to enhance topographic diversity. Rock closure structures will be constructed to reduce overwintering water velocities while maintaining necessary levels of dissolved oxygen. The TSP would also establish mast-producing trees on approximately 40 acres of elevated land.

Upper Mississippi River (UMR) floodplain forests are generally dominated by over-mature stands of silver maple which provide little wildlife value compared to mast producing tree

species. According to a report[1] published by the Upper Mississippi River Conservation Committee, hard mast species (e.g. oak and hickory) comprise less than 10% of the floodplain forest and are still declining. The recently published "Upper Mississippi River Systemic Forest Stewardship Plan[2]" emphasizes the continuing UMR system-wide decline in forests and that "...within 50-70 years... this will result in open conditions and promote undesirable species such as reed canary grass that make it difficult for floodplain forest trees to regenerate." Such changes will result in declines of wildlife species dependent upon a productive and diverse floodplain forest.

Implementation of forest management projects, such as Pool 12 Overwintering, is critical if management agencies are to even maintain current forest conditions, let alone reverse the decline. Forest managers have gained considerable knowledge in recent years concerning actions needed to assure the success of floodplain forest projects. Two common causes for poor tree survival have been flooding and the lack of sustained attention to tree maintenance. Flood impacts will be minimized by the elevated berms where trees will be planted. In order to assure successful tree planting however, a maintenance crew (responsible for tree care) should routinely attend to plantings during the growing season for two to four years following construction. Maintenance should include mowing or clearing of undesirable vegetation around the newly planted trees to reduce competition and the repair and replacement of tree shelters/fencing as needed to reduce herbivory.

In addition to forestry management objectives, the proposed project seeks to improve Pool 12 fishery resources by creating deep water habitat to enhance fish survival over the winter. Compared to the forestry objectives, where more acreage provides more benefits, increased acres of off-channel deep water habitat do not necessarily provide more fishery benefits. However, as indicated in the draft report, calculating an optimum acreage of overwintering backwater habitat is extremely difficult given our current knowledge of UMR fishery resources. In addition, the forestry/wildlife benefits are likely to endure much longer than fish overwintering benefits which tend to be short-lived due to sedimentation.

The overall cost of the project is estimated at almost $24 million; a sum that could obligate the entire EMP construction budget for more than 2 years. Although the Service supports the proposed project, we believe that many of the project objectives could be achieved more efficiently through similar, but smaller, more widely spaced actions. Throughout the UMR, there are many locations that are not suitable for large-scale projects, but would benefit from smaller management actions. We urge the Corps and EMP partner agencies to plan and implement smaller scale habitat rehabilitation projects that can be completed within 2-3 years rather than the decades sometimes required for the larger projects.

Four federally listed threatened or endangered species are listed for Dubuque and Jackson Counties, Iowa and Jo Daviess County, Illinois. The Higgins eye pearlymussel (*Lampsilis*

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[1] Urich, R., G. Swenson, and E. Nelson, editors. 2002. Upper Mississippi and Illinois River Floodplain Forests. Desired Future and Recommended Actions. Upper Mississippi River Conservation Committee.

[2] Guyon, L. et. al. Upper Mississippi River Systemic Forest Stewardship Plan. August 2012. US Army Corps of Engineers. 124 pp.

higginsii) has been collected during surveys of main channel border habitats several miles downstream of the project area (Stanley 1987). However, this species is typically not found in backwater habitats. The Iowa Pleistocene snail (*Discus macclintockii*) and northern wild monkshood (*Aconitum noveborasence*) also are listed for the counties that border Pool 12. However, suitable habitat for these species (algific talus slopes and areas with cool soil conditions, respectively) is not found within the project area. The Service concurs that there is no suitable habitat present for these three species, and this concludes consultation for them.

Additionally, the Service removed bald eagles from protection under the Endangered Species Act on August 8, 2007. However, they remain protected today under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act of 1940 (Eagle Act). The Eagle Act prohibits take which is defined as, "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb" (50 CFR 22.3). Disturb is defined in regulations as, "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." The bald eagle (*Haliaeetus leucocephalus*) is also recorded for both counties. Should any active bald eagle nests be observed near the project area, please contact our office for technical assistance regarding actions necessary to minimize impacts.

The Indiana bat (*Myotis sodalis*) is listed as potentially occurring in Jo Daviess County, Illinois and suitable habitat exists in the floodplain forests of the study area. Suitable habitat was found in the project vicinity and a mist net survey was performed in July 2012. No Indiana bats were captured. For other project locations where mist netting was not performed, the Corps intends to conduct habitat assessments. Depending upon the results of the habitat assessments, acoustic surveys and mist netting may be performed at Tippy Lake and Stone Lake prior to initiation of construction. Study results will determine if seasonal restrictions on clearing activities are necessary. If suitable habitat exists in project feature locations, the Corps will restrict construction activities to the period between October 1 and March 31. Based on these findings, the Corps concluded that"... the project is not likely to adversely affect the Indiana bat." The Service concurs with this finding. Should any unavoidable impact to Indiana bats be identified during the future survey, consultation should be reinitiated.

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 related to this letter can be directed to Jon Duyvejonck (extension 207), or Amber Schorg (extension 222) of the Rock Island Field Office (309-757-5800).

Sincerely,

for Richard C. Nelson
Field Supervisor

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United States Department of the Interior

FISH AND WILDLIFE SERVICE

Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

January 8, 2013

Ellen S. Milliron Haring
Community Planner
US Army Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ellen:

In October 2012 the U.S. Fish and Wildlife Service, Upper Mississippi River National Wildlife and Fish Refuge (Refuge) provided comments on the Pool 12 Overwintering HREP draft Definite Project Report with Integrated Environmental Assessment (R-19F). Please consider this letter as an addendum to the Refuge letter dated October 12, 2012.

In reference to the aforementioned letter, please amend comment #3 to state the following:

> "3. Entry Channel Maintenance Dredging, page 50, Section VI.H: The report states that the entry channels are not expected to fill in with sediment. The USFWS will perform entry channel maintenance dredging as required by the Operation and Maintenance Manual and as Refuge funding allows."

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), the Endangered Species Act of 1973, (16 U.S.C. 1531-1543), as amended, and the U.S. Fish and Wildlife Service's Mitigation Policy.

The Refuge is pleased to see this project moving forward, and look forward to the continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, Environmental Engineer, at (507) 494-6207 or at Sharonne_Baylor@fws.gov.

Sincerely,

Tim Yager

Tim Yager
Deputy Refuge Manger

cc via email: Sharonne Baylor, Environmental Engineer
Ed Britton, Savanna District Manager
Pam Thiel, Project Leader, La Crosse Fish and Wildlife Conservation Office
Amber Andress, Biologist, Rock Island Ecological Services
Jon Duyvejonck, Biologist, Rock Island Ecological Services
James Myster, Cultural Resources
Mike Griffin, Iowa DNR
Dan Salee, Illinois DNR

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
PO BOX 2004 CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

February 14, 2013

CEMVR-PM-M

Mr. Tim Yager
Deputy Refuge Manager
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street – Room 101
Winona, Minnesota 55987

RE: US Army Corps of Engineers, Rock Island District (District) *Pool 12 Overwintering HREP Draft Definite Project Report with Integrated Environmental Assessment* (R-19F).

Dear Mr. Yager:

Thank you for your letter dated January 8, 2013 (Encl 1) in which you provided a comment in addition to the comments previously submitted in your letter dated October 12, 2012 (Encl 2). The October 12, 2012 letter referenced a letter dated November 4, 2005 (Encl 3), from Mr. Don Hultman, Refuge Manager, USFWS. Enclosed please find the District's responses to all comments submitted (Encl 4).

Points of contact for the Pool 12 HREP are:
Marvin Hubbell, EMP Program Manager, 309-794-5428
Ellen Milliron, Planning /Study Management, 309-794-5256
Darron Niles, Planning /Study Management, 309-794-5400

Sincerely,

Gary R Meden

Gary R. Meden, P.E., P.M.P.
Chief, Programs and
Project Management Division

4 Encl
as

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

January 8, 2013

Ellen S. Milliron Haring
Community Planner
US Army Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

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Sincerely,

Tim Yager

Tim Yager
Deputy Refuge Manger

cc via email: Sharonne Baylor, Environmental Engineer
Ed Britton, Savanna District Manager
Pam Thiel, Project Leader, La Crosse Fish and Wildlife Conservation Office
Amber Andress, Biologist, Rock Island Ecological Services
Jon Duyvejonck, Biologist, Rock Island Ecological Services
James Myster, Cultural Resources
Mike Griffin, Iowa DNR
Dan Salee, Illinois DNR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

October 12, 2012

Ellen S. Milliron Haring
Community Planner
US Army Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

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The final DPR must include a copy of the draft Memorandum of Agreement for the operation, maintenance, and rehabilitation of the project. The Service will cover operation and maintenance costs as discussed in the report. The Regional Director's letter on the final Definite Project Report will include the certification of support for operation and maintenance.

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We are pleased to see this project moving forward, and look forward to our continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, our Environmental Engineer, at (507) 494-6207 or at Sharonne_Baylor@fws.gov.

Sincerely,

Tim Yager
Deputy Refuge Manger

cc via email: Ed Britton, Savanna District Manager
Pam Thiel, Project Leader, La Crosse Fish and Wildlife Conservation Office
Amber Andress, Biologist, Rock Island Ecological Services
Jon Duyvejonck, Biologist, Rock Island Ecological Services
James Myster, Cultural Resources
Mike Griffin, Iowa DNR
Dan Salee, Illinois DNR

United States Department of the Interior

U.S FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
51 E. Fourth Street - Room 101
Winona, Minnesota 55987

IN REPLY REFER TO:

November 4, 2005

Ms. Jodi Staebell
Planning and Policy Branch
Rock Island District, Corps of Engineers
Clock Tower Building
PO Box 2004
Rock Island, IL 61204-2004

Dear Ms. Staebell,

Thank you for the opportunity to review and comment on the Pool 12 Overwintering HREP public review draft Definite Project Report with Integrated Environmental Assessment (R-19PR) dated September 2005. We have the following comments regarding the document:

1. Page 9, paragraph J, Historic Properties: We suggest that the Corps of Engineers address AIRFA, American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996), in this section or elsewhere in the DPR.

2. Page A-21, Ken Barr's April 20, 2004 letter: We suggest visiting the National Park Service's Native American Graves Protection and Repatriation Act (NAGPRA) internet site for an updated list of NAGPRA contacts.

3. Please provide a copy of the report, "Phase I Archaeological Survey and Geomorphological Evaluation for Historic Properties, Pool 12 EMP Project..." by David Benn (2004) to our cultural resources person, Mr. John Dobrovolny.

4. We recommend expanding the cumulative impacts discussion on pages 52-53. This project is part of the much larger Environmental Management Program which should benefit not just Pool 12, but this river reach and the system.

5. Page 34, Table 6-1: There are discrepancies between the land berm minimum target elevations shown in the table and those described in the narrative on pages 35-38.

6. We are concerned about the control of invasive species in areas disturbed during construction. We realize it may be more appropriate to address this issue in the design and construction phases rather than the DPR; however we feel it is important to begin this discussion now. If invasive species do become a problem, they could significantly increase our maintenance requirements of the project.

The final DPR must include a copy of the draft Memorandum of Agreement for the operation, maintenance, and rehabilitation of the project. The Service will cover operation and maintenance costs as discussed in the report. The Regional Director's letter on the final Definite Project Report will include the certification of support for operation and maintenance.

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We are pleased to see this project moving forward, and look forward to our continued partnership with the Rock Island District, Illinois, and Iowa on this beneficial project. If you have any questions or need more information, please contact Ms. Sharonne Baylor, our EMP coordinator, at (507) 494-6207.

Sincerely,

Don Hultman
Refuge Manager

cc: Ed Britton, Savanna District Manager
Mike Griffin, Iowa DNR
Scott Stuewe, Illinois DNR

USACE, Rock Island District, Responses to USFWS Comments Regarding the EMP – Pool 12 Overwintering HREP Definite Project Report with Integrated Environmental Assessment (R-19F)

USFWS November 4, 2005 Comments with District Responses

1. Page 9, paragraph J, Historic Properties: We suggest that the Corps of Engineers address AIRFA, American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996, in this section or elsewhere in the DPR.
RESPONSE: The American Indian Religious Freedom Act of 1978 has been addressed and Table 9-1 has been updated to reflect full compliance.

2. Page A-21, Ken Barr's April 20, 2004 letter: We suggest visiting the National Park Service's Native American Graves Protection and Repatriation Act (NAGPRA) internet site for an updated list NAGPRA contacts.
RESPONSE: The letter that was sent in 2004 had the current contacts for that time. If any additional letters need to be sent, updated contacts will be used.

3. Please provide a copy of the report, "Phase I Archaeological Survey and Geomorphological Evaluation for Historic Properties, Pool 12 EMP Project…" by David Benn (2004) to our cultural resources person, Mr. John Dobrovolny.
RESPONSE: A copy of the report was provided to the new cultural resources person, James Myster, as well as Sharrone Baylor and Ed Britton, in Oct of 2012.

4. We recommend expanding the cumulative impacts discussion on pages 52-53. This project is part of the much larger Environmental Management Program which should benefit not just Pool 12, but this river reach and the system.
RESPONSE: Concur. The section has been expanded to include this additional language in Section IX.E.3 to state "Other efforts include management measures by the USFWS in accordance with the Upper Mississippi River National Wildlife and Fish Refuge Comprehensive Conservation Plan (USFWS 2006), as well as the potential for future USACE projects within pool 12 in accordance with the Environmental Pool Plans developed through the FWIC. While the current Pool 12 HREP project is an important factor in furthering the goals and objectives of the EMP program, it remains independent of the other efforts within pool 12 and will not impact or be impacted by those efforts in regards to funding, performance, and/or maintenance."

5. Page 34, Table 6-1: There are discrepancies between the land berm minimum target elevations shown in the table and those described in the narrative on pages 35-38.
RESPONSE: Table 6-1 has been revised. Final elevations will be determined during Plans and Specs to account for the floodplain permit restrictions and dredged material quantities.

6. We are concerned about the control of invasive species in areas disturbed during construction. We realize it may be more appropriate to address this issue in the design and construction phases rather that the DPR; however we feel it is important to begin this discussion now. If invasive species do become a problem, they could significantly increase our maintenance requirements of the project.
RESPONSE: Concur. A section entitled "Invasive Species" has been added in the DPR under Section IX.N.12. to address this concern.

USFWS October 12, 2012 Comments with District Responses

1. Coordination Act Report: Our Ecological Services Office will be providing you an updated Coordination Act Report.
RESPONSE: Concur.

2. Sunfish Lake Maintenance Dredging, page 50, Section VI.H: This section states that the Sunfish Lake entry channel reach has a high sedimentation rate. We are concerned about future maintenance costs in the reach, and question why this channel would be constructed knowing it may have such a high sedimentation rate.
RESPONSE: In areas where the predicted sediment deposition rate is high, such as the Sunfish Lake entry channel, the results do not portray a realistic outcome. The projected sedimentation rates were calculated for 1 year and then extrapolated over a 50-year period of time. This method can exaggerate the predicted sedimentation rates. A preferred method would have been to calculate the predicted sedimentation rate for a 10-year period, and then adjust the model to account for changed conditions (bathymetry, flow, velocity, sedimentation, etc.), before rerunning the model for the next 10 years.

However, the Sunfish Lake entry channel is a critical inlet for the dispersal of dissolved oxygen throughout the backwater area. In the event that this section of channel depth is reduced to less than four feet, it will continue to perform its primary role of allowing flow carrying dissolved oxygen into the backwater. OMRR&R responsibilities have been considered during plan selection. Because project sustainability is a primary objective, the PDT has considered the event in which it would be necessary to do maintenance dredging in order to keep the channel depth to greater than four feet. This model currently estimates this event to take place at year 40 after project construction. The cost of that activity is estimated at $2,872 (annualized over a 50-year period at present day value) and is included in the total annualized OMRR&R cost of $11,262.

3. Entry Channel Maintenance Dredging, page 50, Section VI.H: The report states that the entry channels are not expected to fill in with sediment. The USFWS will consider entry channel maintenance dredging on a case-by-case basis based upon project performance and Refuge budgets.
RESPONSE: This comment has been amended by the USFWS per the letter dated January 8, 2013 from Tim Yager, Deputy Refuge Manager to state "3. Entry Channel Maintenance Dredging, page 50, Section VI.H: The report states that the entry channels are not expected to fill in with sediment. The USFWS will perform channel maintenance dredging as required by the Operation and Maintenance Manual and as funding allows." USACE concurs with this amended response.

4. Repair, Rehabilitation, and Replacement Consideration, page 54, Section VIII.B: This paragraph states that the USFWS is "expected to operate and maintain the Project until it is no longer authorized," and "should expect to incur costs… outside the 50-year period of analysis." However, the Memorandum of Agreement states that the agreement shall "remain in effect for a period of not more than 50 years." As such, the USFWS will only agree to operate and maintain the project for 50 years.
RESPONSE: The report text has been updated to reflect and be consistent with the language in the MOA that states "Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the project."

5. Asian Carp, page 15, Section II.H: Revise this and other Asian carp references to reflect that Asian carp have been caught in Pool 12 rather than are just likely to be present.
RESPONSE: Concur. Report has been revised as suggested.

6. Ornate Box Turtle, page 15, Section II.I: Ornate box turtles will not use the project area because they are land turtles.
RESPONSE: Concur. The following language has been added to Section II.I, "The State-endangered ornate box turtle may utilize areas adjacent to the project site; however, it is unlikely that project area will provide suitable habitat for the ornate box turtle."

7. Refuge Comprehensive Plan, page 18, Section III.C.1: Appendix L: Update the Refuge's 1987 Master Plan reference to the 2006 Comprehensive Conservation Plan.
RESPONSE: Concur. References in the main report and appendix have been updated to reflect the 2006 Comprehensive Conservation Plan

8. Estimated Annual Maintenance Costs, page 57, Table 8-3 title states estimated "annual" maintenance costs, but the table shows total costs over 50 years. Please reconcile the discrepancy.
RESPONSE: Concur. Table title has been changed. In addition, a line item has been added to the table to show Annualized costs at present day value.

9. Cultural Resources: Ensure the cultural resource comments provided in our November 4, 2005 letter are adequately addressed in the revised Definite Project Report with Integrated Environmental Assessment.
RESPONSE: Concur. These comments have been addressed as shown above.

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX B

CLEAN WATER ACT
SECTION 404(B) (1) EVALUATION

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CLEAN WATER ACT
SECTION 404(B) (1) EVALUATION

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APPENDIX B

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

I. PROJECT DESCRIPTION

A. Location. The proposed project is located on the right descending bank of the Mississippi River (River Miles 563.0 - 573.0) in Jo Daviess County, Illinois. The project area is located within the Savanna District of the Upper Mississippi River Wildlife and Fish Refuge.

B. General Description. The Corps of Engineers, Rock Island District, is proposing to construct the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP) as part of the Upper Mississippi River System – Environmental Management Program (EMP). The proposed project involves activities at four backwater areas: Sunfish Lake, Kehough Slough, Tippy Lake, and Stone Lake. Construction of project features would require dredging and placement of dredged material to create deflection berms and elevated areas suitable for mast tree planting and regeneration.

C. Authority and Purpose. The authority for this action is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). Section 1103 is summarized in the DPR.

The purpose of this project, under Section 1103, is "to ensure the coordinated development and enhancement of the Upper Mississippi River (UMR)." The project is the result of planning efforts by the States of Illinois and Iowa, the U.S. Fish and Wildlife Service (USFWS), and the U.S. Army Corps of Engineers.

D. General Description of Dredged and Fill Material. For construction, an estimated minimum 550,000 cubic yards would need to be excavated from the river bottom to provide deepwater habitat (Sunfish Lake – 240,000 CY, Kehough Slough – 165,000 CY, Tippy Lake – 120,000 CY, Stone Lake – 146,000 CY). Soil borings taken in 2001 showed that substrate at the sites was primarily soft clay, underlain in most cases by relatively stiffer clay.

E. Description of the Proposed Placement Site. DPR Plates 15-18 **s**how the discharge sites for all project features in the recommended plan. Most fills will occur adjacent to dredge cuts. Where suitable placement sites adjacent to dredge cuts are unavailable, dredged material will be offloaded onto barges and transported to designated placement sites as shown on the plates.

F. Description of the Placement Method. The deflection berms, sidecast berms, and containment areas will be constructed by mechanical means.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. Substrate Elevation and Slope. The existing islands and floodplain areas within or adjacent to the project sites have elevations similar or slightly lower (2-3 feet) than the proposed berms. Aquatic berm placements will be at an elevation near or slightly above flat pool Minimum elevations for floodplain placement areas are listed as follows:

Sunfish Lake (RM 564) - elevation 596.3'
Kehough Slough (RM 567) - elevation ~597.4'
Tippy Lake (RM 571) - elevation 598.0'
Stone Lake (RM 572) - elevation 598.5'

2. Sediment Type. Berms, and containments will be placed on substrate that is similar in type (clay) to the construction material.

3. Dredged/Fill Material Movement. Most placements will occur in areas that experience low current velocities during normal or low flow conditions in the pool. Floodplain placement areas will be planted with native mast trees or allowed to revegetate naturally, which should help to ensure their stability. Some loss of slope or height may occur in shallow water placements as a result of settling or erosion during high flow events. Shallow water placements that remain exposed above flat pool during the growing season may naturally revegetate to annual or perennial emergent vegetation, providing additional stability to the material.

4. Physical Effects on Benthos. Any immobile benthos present at the placement site would be buried as a result of construction activities.

5. Actions Taken to Minimize Impacts. . The use of mechanical dredging in Pool 12 backwater areas would likely result in contaminant concentrations less than those predicted by the elutriate test. Further reductions in return water contaminant concentrations could be realized with the incorporation of best management practices to lower the concentration of suspended solids entering the receiving water body.

B. Water Circulation, Fluctuation, and Salinity Determinations

1. Water. No significant differences in water chemistry are expected following project construction, and no violations of applicable State water standards are anticipated.

2. Current Patterns and Circulation. Shallow water placements could have a minor effect on flow patterns in the immediate vicinity of the structures. However, no measurable reductions of inflow to backwater areas are anticipated. No significant effects to existing current patterns or water circulation are expected to result from this action.

3. Normal Water Level Fluctuation. No changes in normal water level fluctuations are anticipated to result from the proposed project.

4. Salinity Gradient. This consideration is not applicable in the location of the proposed project.

5. Actions Taken to Minimize Impacts. Berms were designed and aligned to minimize any potential for adverse effects to water circulation and fluctuation.

C. Suspended Particulate/Turbidity Determinations

1. Expected Changes in Suspended Particles and Turbidity Levels in Vicinity of Placement Site. Suspended solids and turbidity values would be expected to increase during dredging and placement in the shallow water sites. A return to ambient conditions should occur shortly after completion of construction. No long-term impacts to suspended solids and turbidity levels are anticipated.

2. Effects on Physical and Chemical Properties of the Water Column

a. Light Penetration. The project would have short-term adverse impacts during construction due to turbidity plumes. Following construction, turbidity and associated light penetration would be expected to return to pre-construction levels.

b. Dissolved Oxygen (DO). Placement of dredged material should have no short- or long-term adverse impacts on DO levels. Project aquatic features should help to maintain DO in the project areas at levels (5 mg/l minimum) suitable for year-round fish habitat.

c. Toxic Metals and Organics. No increase in contaminants in the aquatic environment would result from the placement of fill material. No increase in concentrations of zinc or other toxic metals or organics is expected to occur. Dredging and placement of fine material is not expected to have toxic effects on fish, wildlife, or other aquatic organisms.

d. Aesthetics. Temporary increases in suspended sediments would have a minor short-term impact on aesthetics in the project area. No long-term negative effects on aesthetics are anticipated to result from the project.

3. Effects on Biota. Minor disturbances to organisms present in the construction zone could occur as a result of fill activity. Effects on photosynthesis and filter feeders would be short-term. No long-term adverse effects to biota would be anticipated to result from this action. The overall long-term impact of the HREP project is expected to be beneficial to biota in the project area and the river system.

D. Contaminant Determinations. Possible introduction of equipment or construction-related contaminants would be controlled by adherence to runoff monitoring plans during construction activity. No toxic materials would be introduced to the area as a result of construction activities. Rock riprap would be clean, uncontaminated stone from an approved source.

Samples for bulk sediment and elutriate analyses were collected from the four Pool 12 backwater areas by Foth under contract to the Corps in 2011. General conclusions from this evaluation include:

- Based on the characterization, semi-volatile organic compounds (SVOC), volatile organic compounds (VOC), polychlorinated biphenyls (PCB), pesticides and herbicides are not anticipated to be of concern during any dredging activities.
- Common elements found in soil such as aluminum and magnesium are detected in all samples.

- No parameters tested in the bulk sediment exceeded the TACO, Tier 1 objectives.
- Cyanide exceeded the ESL in the bulk sediment sample at Tippy Lake.
- Cadmium, lead, and zinc exceeded the ESL in the bulk sediment sample at Sunfish Lake.
- Cyanide was detected between the detection and reporting limit and exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at Tippy Lake and Sunfish Lake.
- Ammonia exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at Stone Lake, Tippy Lake, Sunfish Lake, and Kehough Slough.
- Lead exceeded the ESL in the 24-hour elutriate sample at Sunfish Lake and Kehough Slough.
- These elements are persistent in the elutriate samples due to the fine grained nature of the sediment.
- Based on the results of the dissolved testing at 96 hour, filtering the sample brought levels down below standards.

The use of mechanical dredging in Pool 12 backwater areas would likely result in contaminant concentrations less than those predicted by the elutriate test. Further reductions in return water contaminant concentrations could be realized with the incorporation of best management practices to lower the concentration of suspended solids entering the receiving water body.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton. Only short-term and minimal effects are anticipated to occur as a result of dredging. No significant impacts to plankton are expected.

2. Effects on Benthos. No significant impacts to benthos either at the placement site or at the location of hydraulic dredging is anticipated (see paragraphs II. A.4 and II.C.3 above). For the most part, aquatic substrates would be affected incidentally to adjacent construction activities. Aquatic substrates would be directly affected by mechanical dredging. These substrates would eventually be covered with material of similar character. Recolonization of benthic organisms should occur quickly.

3. Effects on Nekton. The restoration of backwaters at Sunfish Lake, Kehough Slough, Tippy Lake, and Stone Lake would substantially improve the quality of fish habitat in this area. The primary factor that is limited at present and at risk in the future is overwintering habitat, due to limited deep off-channel aquatic areas protected from high current velocities. Channel excavation in the aforementioned backwater lakes would ensure that areas of suitable depth, flow, dissolved oxygen, and temperature conditions would be available during severe winter conditions through future decades.

4. Effects on Aquatic Food Web. The proposed project would have no appreciable effect on the aquatic food web.

5. Effects on Special Aquatic Sites

a. Sanctuaries and Refuges. The project area is located within the Upper Mississippi River Wildlife and Fish Refuge. No designated Fish and Wildlife Service designated "closed areas" are found in the project area.

b. Wetlands, Mud Flats and Vegetated Shallows. Approximately 31.5 acres of aquatic habitat and 40.4 acres of floodplain habitat would be affected by construction of deflection berms and containments. An additional 62.5 acres of shallow water habitat will be deepened. The proposed project should have an overall positive effect on wetland and floodplain vegetation. Some areas of submergent and floating-leaved vegetation may be buried during construction, but the overall long-term impact is expected to be beneficial.

6. Threatened and Endangered Species. Correspondence from the USFWS (see Appendix A) indicates that no impacts are envisioned to threatened or endangered species or their habitats, provided that construction activities are scheduled and monitored to avoid direct impacts to these species.

7. Other Wildlife. Wildlife species which utilize forested and non-forested wetland habitats should benefit in the long term from the proposed action.

F. Proposed Placement Site Determinations

1. Mixing Zone Determinations. Discussions pertaining to turbidity and suspended particulates are summarized in paragraph II.C.2 above. Contaminants were discussed previously in paragraph II.D. A small amount of fine-grained material would migrate from the placement sites and become diluted with adjacent side channel and main channel border flow. Fine-grained material used for construction of berms would result in temporary localized increases in suspended material. The use of mechanical dredging should help to minimize these effects.

2. Determination of Compliance with Applicable Water Quality Standards. An application for State water quality certification under Section 401 of the Clean Water Act has been submitted to the Illinois Department of Natural Resources, Office of Water Resources.

3. Potential Effects on Human-Use Characteristics. Implementation of the proposed project will have no significant adverse effects on municipal or private water supplies; recreational or commercial fisheries; water-related recreation or aesthetics; parks; national monuments; or other similar preserves. Any impacts will be minimal and of short-term duration.

G. Determination of Cumulative Effects on the Aquatic Ecosystem. No negative cumulative impacts are expected to occur as a result of this action. Habitat modifications should have long-term benefits to fish and wildlife that utilize these areas. This project, in concert with other EMP projects in the Upper Mississippi River System, should help to counter past and ongoing impacts to the river system such as sedimentation, pollution, and general decline in river habitats.

H. Determination of Secondary Effects on the Aquatic Ecosystem. No significant secondary effects should result from construction of the proposed project.

POOL 12 OVERWINTERING

APPENDIX B
CLEAN WATER ACT

III. FINDINGS OF COMPLIANCE OR NONCOMPLIANCE WITH THE RESTRICTIONS ON PLACEMENT

1. No significant adaptations of the 404(b)(1) guidelines were made relative to this evaluation.

2. Alternatives which were considered for the proposed action are as follows:

Alternative A: No Federal Action

Alternative B: Preferred Alternative. The recommended plan includes dredging deepwater channels at Sunfish Lake, Kehough Slough, Tippy Lake, and Stone Lake; and placement of dredged material in low floodplain berms and shallow water berms.

Alternative C: Management features considered but not selected included dredging deepwater channels in Hires Lake, Fishtrap Lake, and No Name Lake, and upland placement of dredged material.

3. Certification under Section 401 of the Clean Water Act will be obtained from the Illinois Environmental Protection Agency prior to initiation of project construction. The project will therefore be in compliance with the water quality requirements of the State of Illinois.

4. The project will not introduce toxic substances into nearby waters or result in increases in existing levels of toxic materials in excess of State standards.

5. No significant impact to federally listed endangered species will result from this project. The USFWS, Ecological Services Office, Rock Island, Illinois supports this determination.

6. The project is located along a freshwater inland river system. No marine sanctuaries are involved or will be affected, and no degradation of waters of the U. S. is anticipated.

7. No municipal or private water supplies will be affected. There will be no adverse impact to recreational fishing, and no unique or special aquatic sites are located in the project area. No long-term adverse changes to the ecology of the river system will result from this action.

8. Project construction materials will be chemically and physically stable. No contamination of the river is anticipated.

9. No other practical alternatives have been identified. The proposed project is in compliance with the guidelines for Section 404(b)(1) of the Clean Water Act, as amended. The proposed project will not significantly impact water quality or the integrity of the aquatic ecosystem.

10. On the basis of the guidelines, the proposed placement site for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

19 March 2013
(Date)

Mark J. Deschenes
Colonel, U.S. Army
District Engineer

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX C

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY AND THE UNITED STATES FISH AND WILDLIFE SERVICE FOR ENHANCING FISH AND WILDLIFE RESOURCES

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APPENDIX C

**MEMORANDUM OF AGREEMENT BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE UNITED STATES FISH AND WILDLIFE SERVICE
FOR ENHANCING FISH AND WILDLIFE RESOURCES**

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APPENDIX C

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENT OF THE ARMY AND THE UNITED STATES FISH AND WILDLIFE SERVICE FOR ENHANCING FISH AND WILDLIFE RESOURCES OF THE UPPER MISSISSIPPI RIVER SYSTEM AT POOL 12

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (USFWS) and the Department of the Army (DA) will operate in constructing, operating, maintaining, repairing and rehabilitating the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP), Jo Daviess County, Illinois separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

II. BACKGROUND

Section 1103 of the Water Resources Development Act (WRDA) of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The project area is managed by the USFWS and is on land managed as a national wildlife refuge. Under conditions of Section 906(e) of the WRDA of 1986, Public Law 99-662, 100 percent of the construction costs of those fish and wildlife features at Pool 12 Overwintering HREP, Jo Daviess County, Illinois are the responsibility of the DA, and pursuant to Section 107(b) of the WRDA 1992, Public Law 102-580, 100 percent of the cost of operation and maintenance for the Pool 12 Overwintering HREP, Jo Daviess County, Illinois, project areas are the responsibility of USFWS.

III. GENERAL SCOPE

The project to be accomplished pursuant to this MOA shall consist of the following:

> Restoring backwater habitat at four lakes by excavating approximately 64 acres of deep backwater channel to a depth of 8 feet below flat pool. Excavated material will then be used to construct berms and enhance topographic diversity. Mast producing trees will be established on approximately 40 acres of raised berms. The project also includes the construction of three rock closure structures and placement of rip rap where needed.

IV. RESPONSIBILITIES

A. The DA is responsible for:

1. **Construction.** Construction of the project consists of restoring backwater habitat at four lakes by excavating approximately 64 acres of deep back water channels to elevation 584.0 feet (1912 MSL), 8 feet below flat pool. Channel bottom width is 60 feet with a 3H:1V side slope. Sunfish Lake

will have a dredge cut of approximately 27 acres (12,140 linear feet) with adjacent land and aquatic berm placement of 29 acres of dredged material. Stone Lake will have a dredge cut of approximately 15 acres (5,790 linear feet) with adjacent land and aquatic berm placement of 13 acres of dredged material. Kehough Slough will have a dredge cut of approximately 10 acres (6,520 linear feet) with adjacent land and aquatic berm placement of 16 acres of material. Tippy Lake will have a dredge cut of approximately 13 acres (5,975 linear feet) with adjacent land and aquatic berm placement of 14 acres of dredged material. Mast producing trees will be established on approximately 40 acres of the land berms. Three rock closure structures will be constructed and riprap will be placed where needed to protect deflection berms.

2. **Major Rehabilitation.** The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. Construction Management. Subject to and using funds appropriated by the Congress of the United States, and in accordance with Section 906(e) of the WRDA of 1986, Public Law 99-662, the DA will construct the Pool 12 Overwintering, Habitat Rehabilitation and Enhancement Project, Jo Daviess County, Illinois as described in the Definite Project Report with Integrated Environmental Assessment, Pool 12 Overwintering HREP, Jo Daviess County, Illinois dated March 2013, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The USFWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of the Notice to Proceed. If DA encounters potential delays related to construction of the project, DA will promptly notify USFWS of such delays.

4. Maintenance of Records. The DA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. The DA shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its office, at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the USFWS.

B. The USFWS is responsible for:

Operation, Maintenance, and Repair. Upon completion of construction as determined by the Rock Island District Engineer, the USFWS shall accept the project and shall operate, maintain, and repair the project as defined in the Definite Project Report with Integrated Environmental Assessment, Pool 12 Overwintering HREP, Jo Daviess County, Illinois dated March 2013, in accordance with Section 107(b) of the WRDA of 1992, Public Law 102-580.

V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA

shall remain in effect for a period of no more than 50 years after initiation of construction of the project.

VI. REPRESENTATIVES

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties:

DA: District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

USFWS: Regional Director
U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY

_____ _____

Mark J. Deschenes
Colonel, U.S. Army
District Engineer

Date

THE U.S. FISH AND WILDLIFE SERVICE

_____ _____

Tom Melius
Regional Director
U.S. Fish and Wildlife Service

Date

CERTIFICATION OF LEGAL REVIEW

The draft Memorandum of Agreement for the Upper Mississippi River System Environmental Management Program, Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project, River Miles 563.0 through 573.0, Jo Daviess County, Illinois has been fully reviewed by the Office of Counsel, USAED, Rock Island and is legally sufficient.

Reviewed By

Robert F. Tapp
Assistant District Counsel

Approved By

Brian W. Hancks
District Counsel

DATE: 10/30/12

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UPPER MISSISSIPPI RIVER SYSTEM
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JO DAVIESS COUNTY, ILLINOIS

APPENDIX D

HABITAT EVALUATION, BENEFITS QUANTIFICATION, AND INCREMENTAL ANALYSIS

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APPENDIX D

HABITAT EVALUATION, BENEFITS QUANTIFICATION, AND INCREMENTAL ANALYSIS

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APPENDIX D

HABITAT EVALUATION, BENEFITS QUANTIFICATION, AND INCREMENTAL ANALYSIS

OVERVIEW

This appendix provides an ecological assessment of the project area and quantifies, to the extent possible, ecological benefits resulting from the proposed project alternatives. This assessment includes identification of existing conditions, as well as a forecast for future conditions resulting from potential project alternatives and a no action alternative. It also compares resulting environmental improvements to the associated costs of each alternative.

I. EXISTING CONDITIONS

The construction of Lock and Dam 12 contributed to an abundance of deep, lentic, backwater habitat within lower Pool 12. These types of areas provide habitat for multiple life-stages of various fish species, but are particularly ideal overwintering habitat for certain fishes, including centrarchid species such as bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*) and white crappie (*P. annularis*).

Following lock and dam construction, river sediments have been slowly accumulating in backwater areas of Pool 12. This sedimentation has reduced the depth and, potentially, the area of quality backwater habitats. It has also blocked entryways to backwater areas, which reduces the overall value of otherwise useable backwater habitat. Ultimately, sedimentation has resulted in a reduction in the quantity and quality of backwater habitat utilized by several fish species.

Resource managers remain concerned that sedimentation within these backwater areas is reducing habitat quality, and may be affecting fish population levels. Some studies (e.g., Gent et al. 1995 and Raibley et al. 1997) suggest localized responses by fishes associated with changes in overwintering habitat. It is possible that changes in habitat have adversely affected population levels for fishes that rely on overwintering habitat or may do so in the near future. Ultimately, these uncertainties warrant careful consideration in recommending backwater habitat restoration. Because of concerns expressed by resource managers and the apparent reduction in quality overwintering habitat, projects such as those proposed here can be considered for lower Pool 12.

The discussion below provides further information on existing conditions within the project area. Discussion is focused on the general problem areas targeted for this project, including backwater overwintering habitat, and floodplain forest habitat. Information for this summary originates from data collected by the Rock Island District (District), as well as data provided by the Iowa Department of Natural Resources (IADNR).

A. Project Location and History. The Pool 12 project area is part of the Upper Mississippi River (UMR), extending from River Miles (RM) 563 –573 (plate 1). The project area includes four backwater lakes under consideration as a part of this project (table D-1). The project area lies within or adjacent to both the UMR navigation system and the U.S. Fish and Wildlife Service's (USFWS) Upper Mississippi River Wildlife and Fish Refuge.

Because the main channel flows against the Iowa bluffs throughout this reach, almost all off-channel aquatic habitats within the project area are located within the State of Illinois. The project area is comprised primarily of a series of islands, backwater channels, and backwater lakes modified or created following construction of Lock and Dam 12 in 1939.

Table D-1. Backwater Sites Under Consideration Within Lower Pool 12

Lake	RM	Approx. Surface Area of Backwater Lake	Existing Lake Area Below Elev. 588 ft msl [1]	Proposed Dredged Area at Elev. 588 ft msl
Sunfish Lake	564	151 acres	0 acres	26.7 acres
Kehough Slough	567.5	70 acres	11.0 acres [2]	7.3 acres
Tippy Lake	571	41 acres	8.6 acres	11.0 acres
Stone Lake	572	32 acres	0 acres	12.4 acres

[1] Elevation of 588 ft msl represents depths of 4feet below a flat pool elevation of 492 ft msl.
[2] Of the 11 acres that are deeper than 588, only about 4 acres occur within the area under consideration for this project. The remaining 7 acres occur in areas of Kehough Slough outside of the area under consideration.

B. Pool 12 Aquatic Habitat Availability. Lower Pool 12 provides diverse aquatic habitat for a variety of fisheries resources. Aquatic backwater habitat is relatively abundant in lower Pool 12, with habitat types that include backwater habitat, secondary and tertiary channels, and tributary habitats (tables D-2 and D-3, figure D-1). Although high in habitat quantity, concern exists that these backwater areas are degraded and thus of lower quality.

Table D-2. Geomorphic Areas Found Within Pool 12 of the Upper Mississippi River (Theiling et al. 2000)

	Geomorphic Area Acres		
Geomorphic Area Type	**Total**	**Leveed**	**Unleveed**
1. Main Navigation Channel	1,472	0	1,472
2. Main Channel Border	3,722	0	3,722
3. Tailwater	64	0	64
4. Secondary Channel	1,828	0	1,828
5. Tertiary Channel	49	0	49
6. Tributary Channel	0	0	0
7. Excavated Channel	11	0	11
8. Contiguous Floodplain Lake	992	15	977
9. Contiguous Floodplain Shallow Aquatic Area	1,347	0	1,347
10. Contiguous Impounded Area	2,136	0	2,136
11. Isolated Floodplain Aquatic Area	435	39	396
12. Floodplain Island	3,573	0	3,573
13. Contiguous Floodplain	4,064	0	4,064
14. Isolated Floodplain	737	737	0
15. No Photo Coverage	0	0	0
TOTAL	**20,431**	**791**	**19,641**

Table D-3. General Habitat Areas Found Within Pool 12 of the Upper Mississippi River (Theiling et al. 2000)

	Habitat Acres		
Habitat Type	**Total**	**Leveed**	**Unleveed**
1. Open Water	8,234	27	8,207
2. Submersed Aquatic Bed	1,435	28	1,407
3. Floating-Leaved Aquatic Bed	1,297	0	1,297
4. Semi-permanently Flooded Emergent Annual	8	0	8
5. Semi-permanently Flooded Emergent Perennial	874	2	872
6. Seasonally Flooded Emergent Annual	0	0	0
7. Seasonally Flooded Emergent Perennial	219	0	219
8. Wet Meadow	1,283	6	1,276
9. Grassland	27	0	27
10. Scrub/Shrub	383	9	374
11. Salix Community	108	0	108
12. Populus Community	9	0	9
13. Wet Floodplain Forest	4,517	10	4,508
14. Mesic Bottomland Hardwood Forest	230	0	230
15. Agriculture	196	0	196
16. Developed	1,598	710	888
17. Sand/Mud	15	0	15
18. No Photo Coverage	0	0	0
TOTAL	**20,433**	**791**	**19,641**

C. Bathymetry and Substrate

Detailed bathymetry data was collected at each of the potential project sites during 2001. Currently, most areas under consideration are 4 feet deep or less (elevation 588 feet msl), relative to flat pool conditions (592 feet msl). Of the sites under consideration, only Kehough Slough and Tippy Lake contain areas that are currently greater than 4 feet deep (table D-1). Some of the areas, particularly Sunfish Lake, Kehough Slough, and Stone Lake, have large areas where depth is at elevation 590 or greater, indicating relatively shallow depths of only 2 feet or less below flat pool. These shallow depths are the result of fine sediments depositing over time in backwater areas. As a result, almost all backwater substrates are comprised of fine silts.

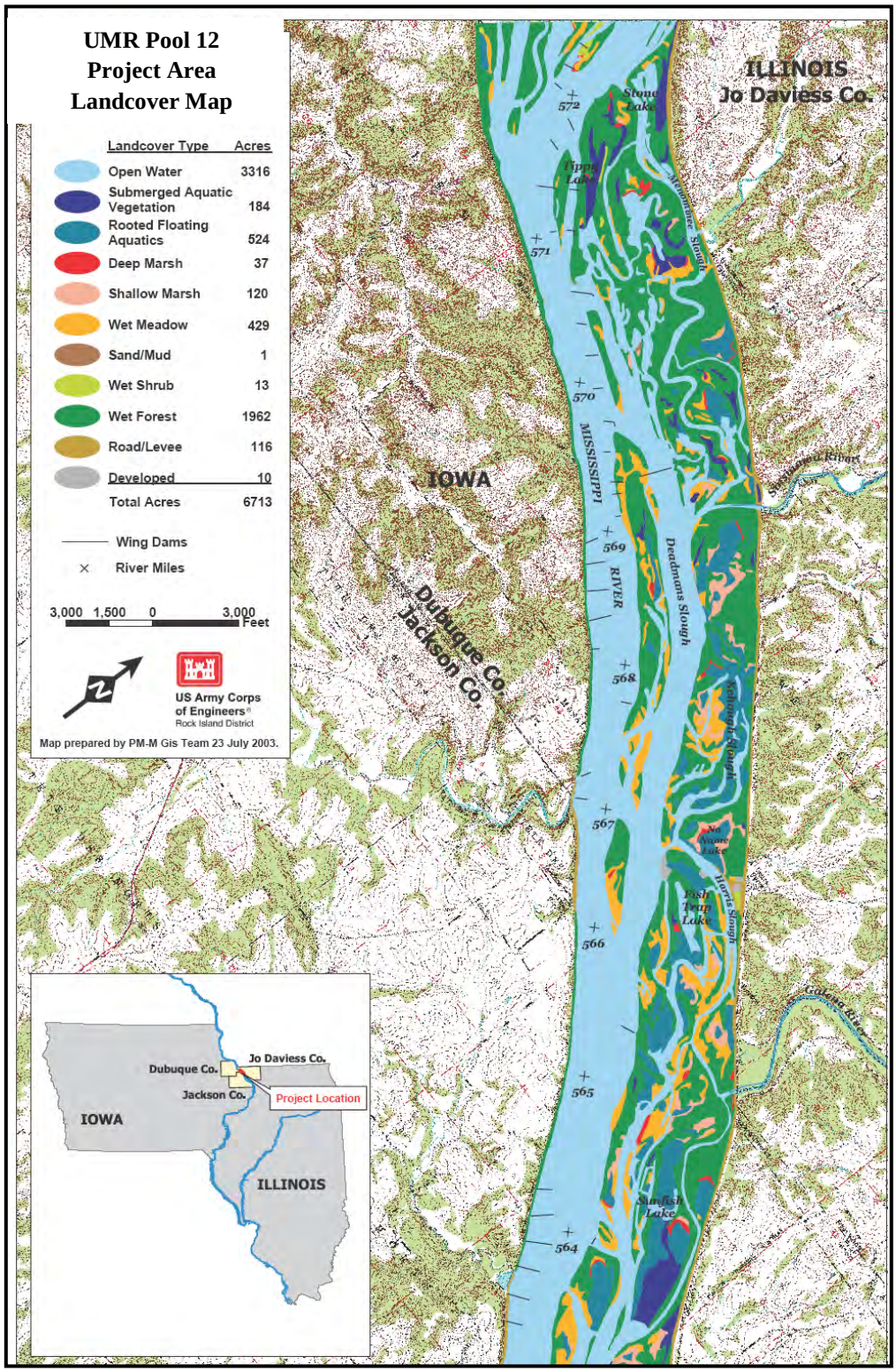

Figure D-1. Pool 12 Overwintering HREP Landcover Map

D. Fisheries Resources. Lower Pool 12 provides diverse aquatic habitat for a variety of fisheries resources. Fisheries sampling in Pool 12 backwater areas during the summer of 2000 collected 56 different species of fish. Those that were often collected include numerous minnow species (Cyprinidae), bluegill, gizzard shad (*Dorosoma cepedianum*), orangespotted sunfish (*Lepomis humilis*), brook silverside (*Labidesthes sicculus*), white crappie, largemouth bass, and black crappie (table D-4). Similarly, annual sampling from 1994 to 2002 within backwater areas of adjacent Pool 13 also yielded an average of 52 species per year, with a range of 48 to 56 different species per year.

Table D-4. Fish Species Collected By Day Electrofishing and Seining From Upper Mississippi River Pool 12 Backwater Areas During 2000

Species	Scientific Name	Total Collected	Species	Scientific Name	Total Collected
mimic shiner	*Notropis volucellus*	4,647	smallmouth bass	*Micropterus dolomieu*	11
emerald shiner	*Notropis atherinoides*	3,427	river carpsucker	*Carpiodes carpio*	9
bullhead minnow	*Pimephales vigilax*	2,187	longnose gar	*Lepisosteus osseus*	7
river shiner	*Notropis blennius*	1,586	logperch	*Percina caprodes*	6
bluegill	*Lepomis macrochirus*	1,380	walleye	*Stizostedion vitreum*	6
gizzard shad	*Dorosoma cepedianum*	1,090	mud darter	*Etheostoma asprigene*	6
Orangespotted sunfish	*Lepomis humilis*	645	flathead catfish	*Pylodictis olivaris*	5
brook silverside	*Labidesthes sicculus*	245	bowfin	*Amia calva*	5
white crappie	*Pomoxis annularis*	215	warmouth	*Lepomis gulosus*	4
largemouth bass	*Micropterus salmoides*	212	northern pike	*Esox lucius*	4
spotfin shiner	*Cyprinella spiloptera*	195	shortnose gar	*Lepisosteus platostomus*	3
common carp	*Cyprinus carpio*	161	yellow perch	*Perca flavescens*	3
johnny darter	*Etheostoma nigrum*	112	pumpkinseed	*Lepomis gibbosus*	3
pugnose minnow	*Opsopoeodus emiliae*	57	river darter	*Percina shumardi*	2
black crappie	*Pomoxis nigromaculatus*	52	rock bass	*Ambloplites rupestris*	2
sauger	*Stizostedion canadense*	51	golden redhorse	*Moxostoma erythrurum*	2
smallmouth buffalo	*Ictiobus bubalus*	49	suckermouth minnow	*Phenacobius mirabilis*	2
white bass	*Morone chrysops*	48	fathead minnow	*Pimephales promelas*	2
freshwater drum	*Aplodinotus grunniens*	47	silver lamprey	*Ichthyomyzon unicuspis*	2
tadpole madtom	*Noturus gyrinus*	44	weed shiner	*Notropis texanus*	2
golden shiner	*Notemigonus crysoleucas*	27	speckled chub	*Macrhybopsis aestivalis*	1
spottail shiner	*Notropis hudsonius*	26	green sunfish	*Lepomis cyanellus*	1
silver chub	*Macrhybopsis storeriana*	25	grass pickerel	*Esox americanus vermiculatus*	1
bigmouth buffalo	*Ictiobus cyprinellus*	25	sand shiner	*Notropis stramineus*	1
spotted sucker	*Minytrema melanops*	22	creek chub	*Semotilus atromaculatus*	1
shorthead redhorse	*Moxostoma macrolepidotum*	20	white sucker	*Catostomus commersoni*	1
highfin carpsucker	*Carpiodes velifer*	18	black bullhead	*Ameiurus melas*	1
channel catfish	*Ictalurus punctatus*	12	bluntnose darter	*Etheostoma chlorosomum*	1

Total Number of Fish Collected **16,719**
Total Number of Species Collected **56**

Mussel surveys have not been conducted in backwater areas of lower Pool 12. Surveys by Tucker et al. (1996) in backwater areas of lower Pool 26 and the Illinois River found species such as three-ridge (*Amblema plicata*), mapleleaf (*Quadrula quadrula*), washboard (*Megalonaias nervosa*), giant floater (*Pyganodon grandis*), three-horned wartyback (*Obliquaria reflexa*), fragile papershell (*Leptodea fragilis*), pink heelsplitter (*Potamilus alatus*), pink papershell (*Potamilus ohiensis*) and rock pocketbook (*Arcidens confragosus*). The federally-endangered Higgins' eye pearly mussel (*Lampsilis higginsi*) is known to occur in this area of the UMR. However, this species is typically not found in backwater habitats dominated by fine silts and reduced flows, and is unlikely to be found within the sites under consideration.

E. Water Quality. Dissolved oxygen (DO) and water temperature are the two most important water quality parameters for overwintering fish habitat. A separate discussion is included below for both of these winter parameters at each backwater site. In addition, a general discussion is provided for summer water quality conditions at Sunfish Lake. These summer conditions can be used as a reference to indicate what summer conditions may be like at other lakes under consideration within the project area.

In order to determine pre-project water quality conditions, Corps personnel initiated a baseline monitoring program in December 2000 at site W-M567.5Y (see Plate 34) in Kehough Slough. Monitoring was performed here during the winters of 2000-2001, 2002-2003 and 2003-2004. Tippy Lake (site W-M571.4N in Plate 35) was monitored during the winters of 2001-2002, 2004-2005, 2005-2006 and during additional months from 2010 through 2012. Fishtrap Lake (site W-M566.3P in Plate 34) was monitored during the winter of 2001-2002 and during additional months in 2003 through 2005, and then again during the winters of 2007-2008 and 2008-2009. Stone Lake (site W-M571.9W in Plate 35) was monitored during the winters of 2004-2005, 2005-2006, and during additional months from 2010 through 2012. Sunfish Lake (site W-M564.7R in Plate 33) was monitored only during the winter of 2002-2003. Monitoring was accomplished through collection of discrete samples as well as deployment of multiparameter *in situ* water quality sondes.

Iowa DNR personnel have performed LTRMP water quality monitoring at site W-M563.9T (lower Sunfish Lake) essentially year round since May 1993. They also monitored site W-M564.5T (upper Sunfish Lake) during the winters of 1993-1994 through 1995-1996 and at site W-M566.2R (Fishtrap Lake) during the winters of 1993-1994 and 1994-1995. Monitoring was accomplished through collection of discrete samples only.

1. Winter Dissolved Oxygen. Data collected by the district during the winters of 2001 through 2004 indicate that DO levels generally remained above 5 mg/L during the winter months observed. Continuous data recording by the District did not document any dangerously low DO levels (e.g., 2 ppm or less) at any point during the period monitored. However, the data logger deployed in Sunfish Lake during the winter of 2002/2003 was nonfunctional as the unit became encased in ice due to the shallow water conditions. The freezing of the backwater from water surface to substrate would clearly show a complete loss of winter habitat. Moreover, historic measurements taken by the IADNR have documented substantially lower DO levels in Sunfish Lake. Observations from Sunfish Lake during January and February of 1986 documented at least three dates with observations of DO at 2.0 mg/l or less, with a minimum of 0.5 mg/L.

These observations suggest that low DO levels are certainly possibly during winter conditions, but that these conditions may not happen frequently. Again, the exception is Sunfish Lake where shallow conditions would suggest a substantial loss of overwintering habitat in most years. Although the data set collected by the District is much more comprehensive than that collected by IADNR, winter conditions during 2001 through 2004 may have prevented sampling during conditions with low DO. Winter conditions that could result with adequate oxygen include those winters that are unseasonably warm; or those that promote clear ice and limited snow cover, which would likely allowed for enough photosynthesis to occur to maintain elevated DO levels.

Discussions between biologists for the District and State and Federal resource agencies concluded that while low DO may not occur every year, these conditions might happen frequently enough to have an adverse impact on those species that rely on such habitats for overwintering. These low DO conditions would most likely happen during periods of cold temperature and heavy snow cover.

2. Winter Temperatures. Data collected by the district during the period 2001 through 2004 suggest that water temperatures range between 4° C to less than 1° C during the winter months of January through March. Backwater sites such as Fishtrap and Tippy Lakes typically had water temps of 2 to 3° C, while Kehough often had temperatures at or below 1° C. Monitoring within Stone and No Name Lakes observed initial temperatures above 2° C; however, temperature units became froze into ice during 2002 at both of these sites. Ice is likely a significant problem on No Name Lake due to its extremely shallow depths. Stone Lake probably sees temperatures of 1° C or more within deeper areas of the backwater. Sunfish Lake temperatures ranged between 0° (solid ice) and 4° C. Again, the shallow conditions in Sunfish and No Name Lakes suggest a substantial loss of overwintering habitat in most years.

3. Winter Water Velocity. Water velocities were estimated for the winter months based on hydrologic and hydraulic analyses discussed in Appendix H. Most backwater areas included large areas with minimal velocities (e.g., velocities less than 1 cm/sec). However, three of the backwaters (Tippy, Kehough, and Sunfish) contained at least some area where river currents were considerably higher (e.g., velocities greater than 4 cm/sec). In the case of Kehough Slough, water velocities were frequently estimated at 4 cm/sec or greater.

4. Summer Water Quality. Samples for bulk sediment and elutriate analyses were collected from six Pool 12 backwater areas (including the four lakes selected for construction, as well as the two lakes that were later screened out) by Foth under contract to the Corps in 2011. General conclusions from this evaluation include:

- Based on the characterization, semi-volatile organic compounds, volatile organic compounds, polychlorinated biphenyls, pesticides, and herbicides are not anticipated to be of concern during any dredging activities.
- Common elements found in soil such as aluminum and magnesium are detected in all samples.
- No parameters tested in the bulk sediment exceeded the TACO, Tier 1 objectives.
- Lead and zinc in the bulk sediment sample exceeded the ESL at Fishtrap Lake.
- Cyanide exceeded the ESL in the bulk sediment sample at Tippy Lake.

- Cadmium, lead, and zinc exceeded the ESL in the bulk sediment sample at Sunfish Lake.
- Arsenic, barium, cadmium, chromium, copper, and nickel exceeded the ESL; iron, manganese, ammonia, and total suspended solids (TSS) exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard; and cyanide, lead, mercury, and zinc exceeded both standards in the 24-hour elutriate sample at Fishtrap Lake.
- In addition to Fishtrap Lake, cyanide was detected between the detection and reporting limit and exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at Tippy Lake and Sunfish Lake.
- In addition to Fishtrap Lake, ammonia exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at No Name Lake, Stone Lake, Tippy Lake, Sunfish Lake, and Kehough Slough.
- Lead exceeded the ESL in the 24-hour elutriate sample at Sunfish Lake and Kehough Slough.
- These elements are persistent in the elutriate samples due to the fine grained nature of the sediment.
- Based on the results of the dissolved testing at 96 hour, filtering the sample brought levels down below standards.

In general, the report indicates that the greatest potential for exceeding water quality standards would occur if Fishtrap Lake was dredged, which is why this lake was eliminated for further consideration as part of the construction project.

The following discussion on water quality is based on sampling performed by the IADNR on Sunfish Lake as a part of the Long Term Resource Monitoring Program. These represent a limited data set, with the discussion below based upon 60 point measures made for each variable during the months of June, July, and August between 1993 and 2001. Although limited, this dataset represents the best available data for summer water quality conditions within backwater areas of lower Pool 12.

Existing data suggest that summer water temperatures in Sunfish Lake may average around 25°C (77°F), with maximum temperatures that may exceed 30°C (86+ °F). Dissolved oxygen typically averaged between 5 and 8 mg/L, with a low observation of 2.8 mg/L. The pH of Sunfish Lake typically ranged between 7 and 8. Turbidity, as measured in nephelometric turbidity units (NTU), averaged 58.5 NTU, with a range of 10 to 279 NTUs. Transparency, as measured by secchi disk, averaged about 27 cm, with a range of 8 to 68 cm. Conductivity averaged 417 uS/cm, and ranged from 247 to 554 uS/cm.

F. Aquatic Vegetation and Physical Cover. Previous observations by the IADNR on Sunfish Lake as a part of the Long Term Resource Monitoring Program have noted both submergent and emergent vegetation. Vegetation abundance has been identified as “sparse” to “dense.” Plants potentially found in shallow areas include sago pondweed (*Potamogeton pectinatus*), coontail (*Certophyllum demersum*), elodea (*Elodea canadensis*), curly pondweed (*Potamogeton crispus*), floating-leaf pondweed (*Potamogeton natans*), lotus (*Nelumbo lutea*), water milfoil (*Myriophyllum verticillatum*), duckweed (*Lemna* sp.), and arrowhead (*Sagittaria latifolia*). In addition to aquatic vegetation, trees and woody debris supply additional cover into backwater areas.

G. Floodplain Resources. In addition to aquatic habitat, Pool 12 includes large tracts of floodplain habitat, the most significant being Wet Floodplain Forest (table D-3). As with aquatic habitat, most of the floodplain habitat within the project areas occurs on the Illinois side.

Construction of Lock and Dam 12 resulted in changes to the floodplain forest communities of lower Pool 12. As a result of habitat changes and maintenance of required pool elevations, areas of this pool are currently dominated by similar-aged species of cottonwood (*Populus deltoides*) and silver maple (*Acer saccharinum*). This lack of species diversity has less overall habitat value than one that was more diverse. The age make-up of this community is also of concern for overall community health. Such a community could entirely collapse as the result of disease, providing substantial adverse effects to the UMRS ecosystem.

In addition to these dominant species, other woody plants may include green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), elm (*Ulmus americana*), and willow (*Salix* sp.). Understory tree species include willow, silver maple, green ash, box elder, mulberry (*Morus* sp.) and hackberry (*Celtis occidentalis*).

Wildlife is also common in lower Pool 12. Animals often observed include waterfowl, wading birds, muskrats (*Ondatra zibethicus*), bald eagles (*Haliaeetus leucocephalus*), and turtles. Lower Pool 12 is an integral part of the Mississippi Flyway, a major migratory corridor for birds in the central United States. The area provides migration requirements in the fall and spring for species that spend the summer and winter in other parts of the continent. It has been estimated that 20 percent of all ducks in North America utilize the Upper Mississippi River.

II. DESIRED CONDITIONS AND RESTORATION OPPORTUNITIES

A. Aquatic Habitat

Aquatic habitat has been given many definitions, but could be defined as the place where a fish, fish population or fish assemblage finds the physical and chemical features and conditions needed for survival (Orth and White 1993). Habitat needs often can differ between types of organisms, and even between life-stages of the same organism. However, general conditions can be defined that would provide suitable backwater overwintering habitat for many fish species and life-stages in this region of the UMR. Desirable backwater overwintering habitat in the UMR has generally been defined by four key variables, including; backwater depth, dissolved oxygen, water temperature, and current velocities (Palesh and Anderson 1990).

Backwater Depth. For UMR backwaters, ideal habitat often is considered that where backwater depth are at least 4 feet deep or deeper. Habitat quality may begin to decrease when less than 50 percent of the backwater area is at least 4 feet deep.

Dissolved Oxygen. The most desirable DO conditions for overwintering are to maintain DO levels at or above 5 mg/l, with habitat quality decreasing with DO levels below 5 mg/l.

Water Temperature. The most desirable temperature conditions for overwintering are with average temperatures of 4 °C, with habitat quality decreasing with temperatures below 4 °C

Current Velocity. The most desirable velocity conditions for overwintering are with velocities at or approaching 0 cm/sec, with habitat quality decreasing with increases in velocity.

In addition to identifying what constitutes ideal habitat, it is also important to identify how much habitat is required to maintain certain population levels or fish assemblages. Unfortunately, predicting and quantifying the needed amount of overwintering habitat is not currently possible for lower Pool 12. If overwintering habitat were in fact a quantifiable limiting resource for fish populations, then identification of some threshold value, above which overwintering habitat was no longer limiting, would be useful. However, not enough is understood about fish population's dynamics and habitat response within lower Pool 12 to predict how much backwater overwintering habitat is appropriate for this section of the UMR. Yet indefinitely increasing the amount of overwintering habitat will not result in an indefinite increase in fish populations that rely on such overwintering habitat. These uncertainties emphasize the need for post-project monitoring which could identify project effectiveness, and whether additional restoration activities in lower Pool 12 may be warranted.

B. Floodplain Habitat. As discussed above, the floodplain forest community within the project area likely underwent a significant change following creation of Lock and Dam 12. A limited number of species and limited age of organisms currently dominate the community. An ideal floodplain forest would contain a higher diversity of both species and ages of trees. Mast producing trees were limited by impoundment, and their abundance is low in lower Pool 12. A healthier community would include a higher percentage of these desirable species. Any proposed project would provide habitat conditions desirable for mast producing trees, namely areas of increased elevation. These areas would be planted with mast producing trees (e.g., species of Oak, Coffee Tree, Sycamore, Pecan, etc). The acreages proposed for mast producing trees would constitute improvements to a community dominated by similar aged, singular species.

C. Ecosystem Restoration Opportunities. As outlined above, aquatic habitat conditions in lower Pool 12 have degraded since Lock and Dam 12 construction. Floodplain forest resources also are in an undesirable condition. The Pool 12 Overwintering HREP targets improvement of these two resources within lower Pool 12.

1. Project Objectives. Project objectives for this project have been discussed elsewhere and include: (1) increase the amount of deep water habitat in the backwater lakes complex of Pool 12 as measured by acres to provide pool-wide overwintering habitat for fish. Target depth is six to eight feet; (2) increase depth diversity in backwater lakes complex of Pool 12 as measured by acres to provide year round habitat for fish; (3) increase sustainability of aquatic habitat in the backwater lakes complex of Pool 12 as measured by acres by decreasing the sedimentation in the complex; and (4) increase areal coverage in acres of forest stands with hard mast-producing trees as a dominant or component species in floodplain forest areas surrounding the backwater lakes of Pool 12.

2. Project Features. Project features are those that address some/all of the identified project objectives. These project features are combined into specific project alternatives that are evaluated to identify quantifiable project costs and resulting environmental benefits. The various project features for this project have been discussed elsewhere and include: (1) backwater lake sediment dredging, and (2) floodplain forest enhancement through planting of dredged material placement areas.

3. Project Alternatives. The project alternatives for this project are discussed in Chapter V of the Definite Project Report and include 15 combinations of various project sites, as well as the No Action alternative.

4. Potential Environmental Benefits. The potential benefits to be achieved through project implementation fall into two general categories, aquatic habitat and floodplain habitat benefits. These two general categories can be further broken down for quantification purposes.

a. Aquatic Habitat Benefits. This ecosystem restoration project will result in improved conditions for a variety of fish species and fish communities in both the localized area, as well as in the area of influence for the project.

Site-specific Overwintering Benefits. Increasing backwater depths with the resulting improvement in water quality should promote and improve overwintering habitat with resulting benefits to the warm-water fisheries communities. Improvements would occur at each individual site. However, these improvements would extend beyond each individual site and would benefit the entire fish community within adjacent areas.

Year Round Aquatic Habitat Benefits. In addition to providing overwintering benefits, the proposed projects also would improve backwater habitat for year-round conditions. Fish communities would likely benefit from the increased physical space that is created through project alternatives.

Systemic Aquatic Habitat Benefits. The proposed project alternatives can benefit a wide area outside of each backwater. Benefits would depend on habitat quality, accessibility of the site, and the ability of fish to locate and migrate to these areas. The systemic benefits gained would depend on the area of influence for the implemented project features.

b. Floodplain Habitat Benefits. The proposed project also should benefit the floodplain forest community through the promotion of desirable forest vegetation within the areas of dredged material placement.

Mast Tree Planting Benefits. Dredged material would provide for topographical diversity and areas of increased floodplain elevation. Such areas would provide suitable habitat for mast producing trees, providing age and species diversity from the existing forest that is dominated by similar-aged silver maples, and a few other species.

III. HABITAT ASSESSMENT METHODOLOGY

The purpose of this analysis is to quantify, to the extent possible, environmental benefits resulting from various project alternatives. The study team identified four main categories of potential habitat restoration benefits that would be achieved through implementation of project features; site-specific overwintering benefits, year-round aquatic habitat benefits, systemic aquatic habitat benefits, and mast tree planting benefits. Differing tools and methods are used to quantify the benefits related to each of these four categories. After careful consideration of the tools available for use, the study team chose

to use the site-specific overwintering benefits as the main category of analysis to evaluate the project alternatives. Implementing project features to achieve site-specific overwintering benefits has been successfully done throughout the history of EMP. This experience lends itself to a high likelihood of achieving projected benefits for this project. In addition, quantifying site specific benefits can be done using a certified model, whereas the other benefit categories do not have the certified tools available for use at this time. Therefore, the assessment of project alternatives will be based on the analysis conducted on the site-specific benefits. However, the three remaining benefit categories will be evaluated and discussed in a separate sensitivity analysis, below, to provide estimates for the potential benefits that are in addition to the site-specific benefits.

Participants in the site specific overwintering benefits analysis included biologists from the District, the IADNR, the Illinois Department of Natural Resources (ILDNR), and the USFWS. A habitat analysis was conducted to quantitatively evaluate potential site-specific overwintering benefits of alternative habitat improvement features within Pool 12. Quantification of site-specific overwintering project benefits is expressed in terms of Habitat Units (HUs), which are a measure of both habitat quantity and habitat quality. Habitat quantity is measured in acres, while habitat quality is measured with Habitat Suitability Index (HSI) Models.

Comparison of alternative designs and combinations of features is accomplished through a cost-effectiveness analysis and incremental cost analysis. Cost-effectiveness analysis is used to identify the least costly solution to achieve a range of project benefits. Incremental cost analysis is a tool that can be used to scale the size of the project or of individual features by determining changes in costs associated with increasing levels of benefits.

A. Habitat Evaluation Methodology for Site-Specific Benefits. The methodology utilized for evaluating site-specific benefits follows the format of the Habitat Evaluation Procedures (HEP), which was developed by U.S. Fish and Wildlife Service. The HEP is a numerical system for evaluating the quality and quantity of particular habitats for an individual species. One or more Habitat Suitability Index (HSI) models measure the qualitative component of the analysis. Typically, a separate HSI model is required for individual indicator species. Each HSI model considers a number of environmental variables that are important for determining habitat conditions for the given species. Field data are collected or estimated for each of these variables, and each variable correlates the field data to a resulting habitat suitability value between 0 and 1.0. The mathematical model then calculates a single overall value for habitat suitability for a given species. This value identifies habitat quality for the identified area for the identified species.

The quantitative component of the HEP analysis is the measure of surface area of habitat that is available for the selected species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Units (HU), is calculated using the formula: HSI x Acres = HUs.

Habitat improvements of any project, as measured with HUs, can be estimated for any point in time. However, habitat conditions can change over the life of a project. Following construction, habitat conditions will have changed over existing conditions. Habitat benefits from project features also will change as the project ages over time. Thus, habitat benefits should be estimated for a series of points in time to evaluate the benefits and life expectancy of a proposed action. The particular dynamics of the ecosystem under study will determine the target years chosen for analysis. HUs can then be "annualized" to estimate average changes brought about by project features/alternatives over time.

The annualization calculates Average Annual Habitat Unit (AAHUs) for the project over a defined project life. For project planning and impact analysis, the project life was established as 50 years. To facilitate comparison, target years were established at 0 (existing conditions), 1, 5, 10, 25, and 50 years. HUs were calculated for each of the target years, with weighted averages used to calculate AAHUs for each indicator species. This AAHU represents the average change in habitat conditions expected over the life of the project. The overall value of a proposed project is evaluated by comparison of With-Project conditions to Without-Project conditions.

1. Application of Modeling Output. A HEP analysis typically utilizes one or more of the HSI models developed by the U.S. Fish and Wildlife, Biological Services Program. These models are suggested as an aid for impact assessment and habitat management activities. However, caution should be exercised when interpreting modeling output for this effort. Documentation for the models state that "*The HSI models… are complex hypotheses of species-habitat relationships, not statements of proven cause and effect relationships*." Although these models are mathematically precise (e.g., HUs or AAHUs), their output should not be interpreted as definitive absolutes. Rather, output for the Future with-project condition can be compared to the future without-project condition to identify and project a relative index of magnitude in the possible change of habitat types and overall habitat quality.

2. Habitat Identification and HSI Model Selection. The proposed project would affect backwater overwintering habitat quality. To this end, appropriate models were considered and selected to evaluate changes within this specific habitat. As discussed above, a variety of species may utilize these areas for overwintering. Some of these, including bluegills, largemouth bass, white crappie, and others do have an identified HSI model. However, review of these models revealed that they may not adequately capture habitat needs during winter months.

To better evaluate and quantify changes to overwintering habitat types, we selected a certified model component that was specifically developed to measure overwintering habitat suitability for bluegill. This was developed by St. Paul District, Corps of Engineers (Palesh and Anderson 1990) and captures the overwintering needs of bluegill. This model includes all of the limitations and stipulations outlined in Paragraph 1, *Application of Modeling Output*, and should be utilized only for the purpose of alternatives comparison. This model was approved for regional use on the Upper Mississippi River in December of 2012 by the Headquarters Model Certification Board.

3. Data Collection, Input, and Modeling Assumptions. Data was collected and/or estimated for Baseline Conditions, future without-project conditions, and future with-project conditions. For the overwintering model discussed above, four key variables were required for data input: backwater depth, dissolved oxygen, water temperature, and current velocity.

Baseline Conditions. Data on existing overwintering habitat conditions in identified areas of lower Pool 12 was collected by the District from 2001 through 2003, including bathymetry (i.e., backwater depths) and winter water quality conditions (i.e., dissolved oxygen and temperature). Additional data on winter water quality was provided by the IADNR. IADNR also provided year-round data for water quality and other parameters for Sunfish Lake based on sampling performed as a part of the Long Term Resource Management Program (LTRMP) during 1993 through 2001. Baseline conditions for current velocity were obtained as a part of the sedimentation analysis discussed in Appendix H.

In some instances, assumptions also needed to be made regarding baseline conditions. For example, because detailed water quality data was not collected from every potential project site, some of the data for these locations were represented by other similar backwater locations from the project area. In other cases, key habitat variables were estimated based on best professional judgment of the project team. Best professional judgment was used only when existing data or surrogate data were not available.

Future Conditions With- and Without-Project Alternatives. Habitat conditions may not remain static over time. Through natural processes or human activity, habitat can either evolve or change in form, quality, and/or quantity over time. Noticeable changes in habitat conditions would occur at the project site immediately following construction of any of the project alternatives. In addition, habitat conditions also would change at the project site as the project ages over time. The HEP analysis attempted to quantify these changes in habitat conditions. For all project alternatives, resulting future with-project and future without-project conditions were modeled over a 50-year planning horizon. Physical habitat conditions for each alternative were estimated at identified points in time to model and quantify corresponding habitat conditions. To this end, a number of assumptions had to be made about physical conditions, and thus input data for the HSI models for the project site under future with- and without-project conditions.

One of the primary factors affecting future conditions is backwater depth or bathymetry. To better understand potential changes to bathymetry, a sedimentation analysis was performed for potential backwater sites. A complete discussion of this sedimentation analysis is included in Appendix H. This analysis estimated sedimentation rates under base conditions, as well as under potential project conditions. It was assumed that sedimentation rates observed under base conditions would likely be similar to those under future without-project conditions. Thus, changes in bathymetry under future without-project conditions were estimated by observing existing bathymetry data along with existing sedimentation rates. For future with-project conditions, changes in bathymetry were estimated by comparing resulting bathymetry conditions following dredging with estimated future with project sedimentation rates.

The other key factors for overwintering habitat are water quality conditions, including dissolved oxygen, temperature, and water velocities. For water quality, future without-project conditions would largely reflect baseline conditions. However, under baseline conditions, some changes in water quality would occur with additional sedimentation, especially in backwater areas with depths greater than 4 feet. Thus, changes in dissolved oxygen and temperature were made proportional to these sedimentation rates under future without-project conditions. Estimates for future without-project conditions for current velocity were made as a part of the sedimentation analysis (Appendix H).

Conversely, predicting changes in water quality under future with project conditions was much more difficult. Assumptions were made regarding changes following project construction. For key water quality criteria, the following assumptions were made:

- Conditions would assume a minimum DO of 4 mg/l after dredging was completed, decreasing proportionately with the loss of percent area 4 feet deep or deeper (relative to flat pool elevation of 592 feet msl). Reductions would approach or reach Baseline and/or Future without-project conditions when all depth (percent of backwater area 4 feet deep or greater) has been lost.

- Conditions would assume an average temperature of 3° C after dredging was completed, decreasing proportionately with the loss of percent area 4 feet deep or deeper. Reductions would approach or reach Baseline and/or Future without-project conditions when all depth (percent area 4 feet deep or greater) has been lost.

- Average velocities for all backwater sites for all years were obtained from the sedimentation analysis (Appendix H).

All members of the project team mutually agreed upon these assumptions. It was realized that the assumed conditions are uncertain; however, they represent an agreed upon judgment of likely future habitat conditions within dredged areas during winter conditions. Because of this uncertainty, it should be recognized that these assumptions should be used only for the purpose of comparing project alternatives, and not definitive predictions in changes in water quality.

B. Cost Effectiveness and Incremental Cost Analysis Methodology. Only site-specific benefits were evaluated in the Cost Effective Analysis (CEA) and Incremental Cost Analysis (ICA). First, the environmental benefits were calculated for each project alternative, as well as for the future without-project condition. For this project, benefits were calculated for site-specific benefits (measured in HUs). Site-specific habitat benefits were calculated for each alternative type using the models and methodologies discussed above. For analysis of site-specific benefits with HEP, total AAHUs were summed for all target years, with weighted averages used to calculate AAHUS.

Next, the economic costs associated with each project alternative were calculated (these cost estimates are discussed in Appendix I). These total costs were then averaged to compute an annualized cost for each project alternative. Then, the environmental costs and benefits were compared to overall costs through the CEA and ICA. Once annualized habitat benefits and annualized costs are calculated, the two can be compared to identify the most cost-effective project alternatives. For the CEA, the analysis compares which alternatives provide the greatest relative combined average annual benefits for given project costs. The ICA then compares project alternatives to identify how much additional cost is required to achieve additional subsequent environmental benefits. The CEA and ICA were performed using IWR-Plan software. The U.S. Army Corps of Engineers Institute has developed this plan formulation decision support software (IWR Planning Suite 2.0.6.0 – USACE Certified 22Sept2010) for Water Resources for the specific purpose of comparing environmental costs and benefits to total project costs. The software is essentially a way of calculating and accounting costs and benefits for a range of project alternatives.

IV. RESULTS OF ENVIRONMENTAL AND CEA/ICA ANALYSIS

A. Results of Site-Specific Overwintering Habitat Benefits. Analysis of site-specific benefits suggests that all project alternatives would result in some improvement in overwintering habitat conditions within identified backwater sites (table D-5). Total AAHUs are strongly related to the number of sites dredged. Total AAHUs range from 42 to 88AAHUs for the alternatives evaluated. Thus, from a site-specific standpoint, the analysis would suggest that the more sites dredged, the greater the anticipated benefits.

Table D-5. Project Alternatives, Environmental Outputs and Associated Financial Costs for Backwater Alternatives

Alternatives	No. Sites	Combined Net Increase AAHUs[1]	Total Cost	Average Annual Cost
0 - No Action Plan	1	0	$0	$0
1 - Stone Lake	1	14	$4,576,592	$213,041
2 - Tippy Lake	1	13	$3,715,340	$172,950
3 - Kehough Slough	1	19	$4,773,495	$222,207
4 - Sunfish Lake	2	42	$6,907,400	$321,540
5 - Stone, Tippy	2	27	$7,321,931	$340,837
6 - Stone, Kehough	2	33	$8,380,086	$390,094
7 - Stone, Sunfish	2	56	$10,513,992	$489,428
8 - Tippy, Kehough	3	32	$7,518,834	$350,003
9 - Tippy, Sunfish	3	55	$9,652,740	$449,337
10 - Kehough, Sunfish	3	61	$10,710,895	$498,594
11 - Stone, Tippy, Kehough	3	46	$11,125,426	$517,891
12 - Stone, Kehough, Sunfish	3	75	$14,317,487	$666,482
13 - Sunfish, Kehough, Tippy	3	74	$13,456,234	$626,390
14 - Sunfish, Stone, Tippy	3	69	$13,259,331	$617,225
15 - Stone, Tippy, Kehough, Sunfish	4	88	$17,062,826	$794,278

[1] Average Annual Habitat Units
[2] Annualized based on FY2012 discount rate of 4.0% and a 50-year project life

B. Cost Estimation. Cost estimates have been prepared for each project alternative, and costs are shown in table D-5, as well as in Appendix I. These cost estimates include costs for project construction, monitoring and adaptive management, and any future project operation and maintenance. For the purpose of this assessment, the OMRR&R costs were brought to present day value and then the total costs were then averaged to compute an annualized cost for each project alternative.

C. Cost Effectiveness and Incremental Cost Analysis. Past environmental restoration projects have compared average annual cost to AAHUs to identify whether projects are justified. This method is subject to debate but does provide for some method to compare and prioritize potential project alternatives.

Results of the Cost Effectiveness Analysis (CEA) are provided in figure D-2. As mentioned above, total AAHUs for site-specific benefits are strongly related to the number of sites dredged. The CEA suggests essentially a linear relationship between the number of sites dredged and resulting site-specific environmental improvements. Of all the alternatives evaluated, alternatives 4, 10, 13, and 15 have been determined to be a “best buy”, meaning they provide for the most overall environmental benefits for the given average costs. However, under this analysis, all alternatives grade out relatively close, including those identified as Non-Cost Effective. For the site-specific best-buy plans identified, cost per AAHU ranged from $7,656 to $9,026.

Results of the Incremental Cost Analysis (ICA) are provided in figure D-3. For site-specific benefits, the ICA also projects that additional benefits occur roughly proportional to additional cost. In other words, additional cost provides a roughly proportional increase in site-specific benefits.

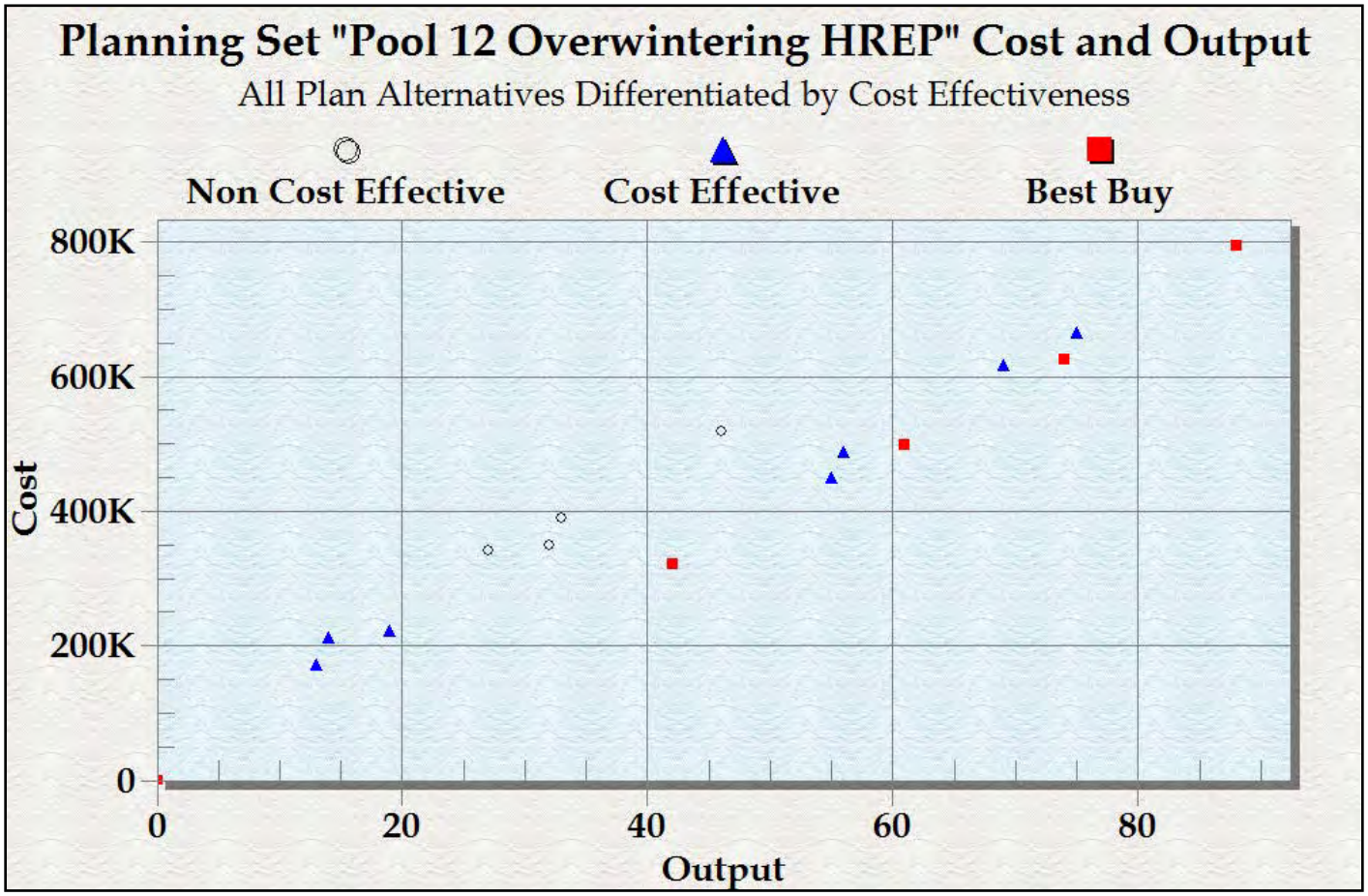

Figure D-2. Cost Effectiveness Analysis for Site-Specific Benefits Associated With Project Alternatives Evaluated for the Pool 12 Overwintering HREP Project

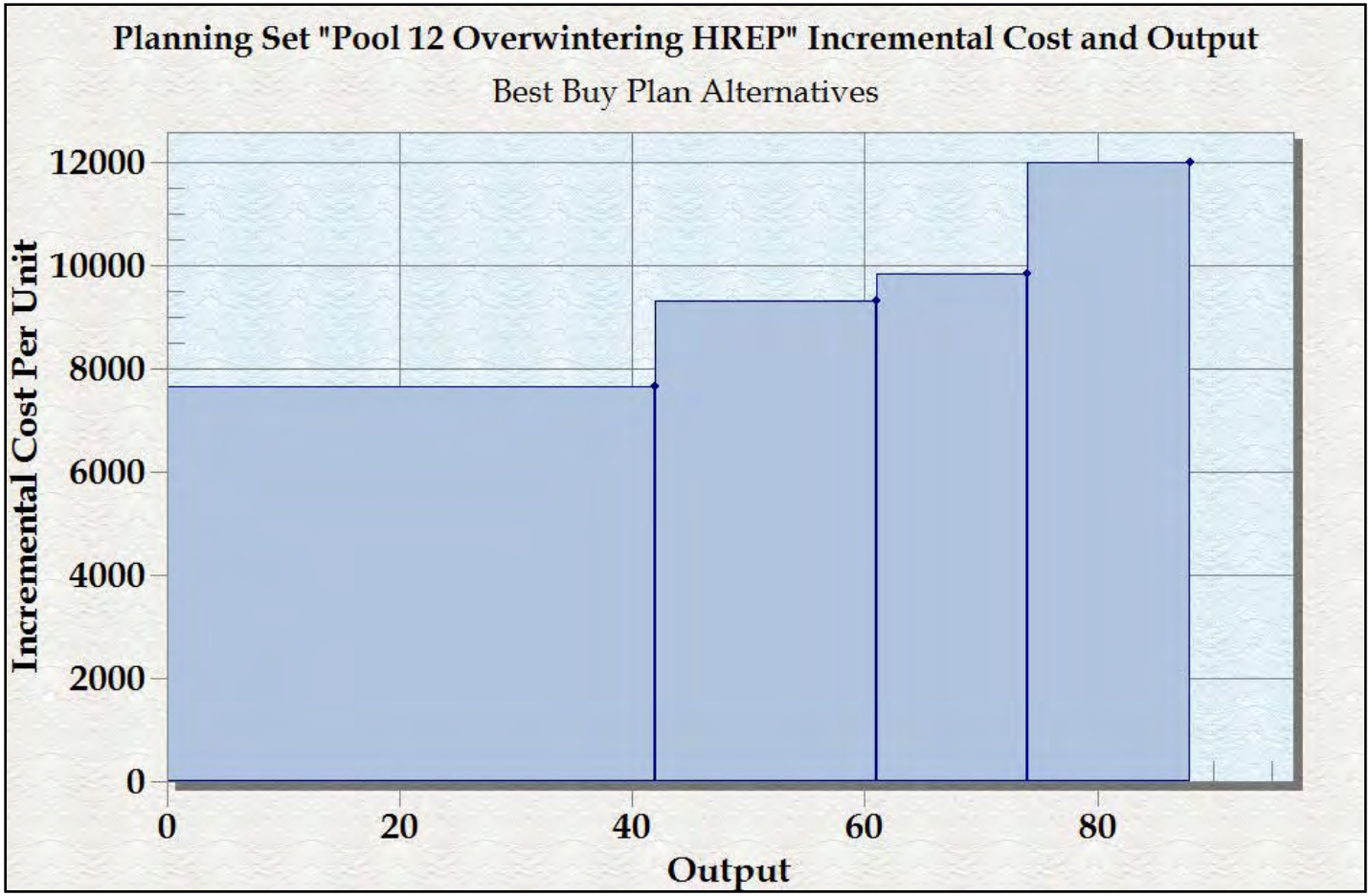

Figure D-3. Incremental Cost Analysis for Site-Specific Benefits Associated With Project Alternatives Evaluated for the Pool 12 Overwintering HREP Project

V. SENSITIVITY ANALYSIS

In addition to the site-specific overwintering habitat benefits that were evaluated in the analysis above, there are additional and equally important benefit categories to consider. Implementation of this project would provide floodplain forest benefits through the planting of mast trees, year-round aquatic habitat benefits, and systemic overwintering benefits. However, it is difficult to accurately quantify these benefits using only the data and tools currently available. For example, the study team is required to use only certified models for benefit quantification, which eliminates the use of some models historically used for quantification purposes. Additionally, the data that is collected as part of the monitoring portion of this project will inform the development of certified models to quantify systemic benefits.

Although the ability to quantify these benefits is somewhat restricted, it is important to recognize the additional benefits that this project will provide. Therefore, an effort has been made to estimate and analyze the additional benefit categories using the best available tools and data as a sensitivity analysis to ensure that the best alternative is chosen as the recommended plan.

A. Mast Tree Planting Benefits. In order to estimate the floodplain forest benefits derived from mast tree plantings, the PDT utilized the two most recently approved DPRs with mast tree planting components: Rice Lake HREP and Lake Odessa HREP. Both HREPs utilized WHAG to quantify benefits from mast tree plantings. Although WHAG is not yet a certified model, historically it has been the tool used on EMP HREPs for quantifying mast tree benefits, and no other quantification tool of this nature has been approved for use to date.

In the example of Rice Lake, 409 acres of mast trees will be planted resulting in 629 Annual Average Habitat Benefits (AAHUs). In the example of Lake Odessa, 53 acres were planted with mast trees resulting in 120 AAHUs. The PDT recognizes that both of these examples vary from the Pool 12 Overwintering HREP in that the mast trees were planted on former crop lands while Pool 12 will be converting wet floodplain forest to mast tree forest. Although converting the homogenous wet floodplain forest consisting of similar-aged, similar-species, flood-tolerant trees to mast trees will greatly benefit the habitat quality; the impacts will not be as great as those realized at Rice Lake and Lake Odessa. The existing habitat quality was considered during the estimation of habitat benefits for Pool 12's mast tree plantings.

A proportionate conversion factor was calculated for both Rice Lake and Lake Odessa to be applied to Pool 12. For example, at Rice Lake the acreage of mast tree plantings was divided by the total AAHUs, resulting in a conversion factor of 1.54 AAHUs per acre. At Lake Odessa, the resulting conversion factor is 2.26 AAHUs per acre. These factors were then averaged with a result of 1.90 and applied to the acreages of mast trees planted for each of the Pool 12 alternatives. In order to account for the difference in pre-project habitat conditions (Rice Lake and Lake Odessa being crop land vs. Pool 12's wet floodplain forest), the mast tree benefits at Pool 12 were then reduced by a factor of 0.5. The resulting estimate applied to Pool 12's mast tree plantings is a factor of 0.95 per acre of tree planting as represented in the equation:

$$(1.90 \times \text{acres of mast tree plantings}) \times 0.5 = \text{AAHU per acre}$$

The benefits generated by the mast tree plantings at all four backwater lakes are estimated at 39 AAHUs (table D-6). The Mast Tree Planting benefits were also combined with the Site Specific benefits for purposes of alternative comparison. The resulting AAHUs and construction costs for each alternative were compared using IWR Planning Suite, Cost Effective/Incremental Cost Analysis. The cost effective plans are displayed in figure D-4. The Incremental Cost Analysis resulted in four "best buy" plans as denoted in table D-6 with gray boxes. The Incremental Cost Analysis is also displayed in graphic form in figure D-5. Total Site Specific benefits and Mast Tree Planting benefits for Alternative 15 is estimated at 127 AHHUs and is a best buy plan.

B. Year Round Aquatic Habitat Benefits. The proposed project also would provide additional year-round benefits to backwater habitat. These benefits, while valuable, are not been estimated and evaluated in the detailed cost/benefit evaluation for multiple reasons. However, because they are important and deserve discussion, they will be described briefly. First, the year-round benefits for fish are probably less valuable and not as significant as those outlined for overwintering. For year-round aquatic habitat benefits, a basic assessment was performed for Sunfish Lake using the "*Habitat Suitability Index Models: Bluegill*" (Stuber et al. 1982). Input data for this lake was available from the IADNR for the spring, summer, and fall period. Bathymetry data collected by the District also was considered. Assumptions were made concerning how water quality and other parameters may change following dredging. The results from this analysis would then provide a reference to the types of changes that could potentially occur on other backwater lakes. No analysis of year-round benefits was carried out for the remaining backwater sites.

Table D-6. Estimated Benefits for Pool 12 Overwintering HREP [1]

Alternative	Site Specific Benefits (AAHUs	Est. Mast Tree Planting Benefits (AAHUs)	Site Specific and Est. Mast Tree Planting Benefits Combined (AAHUs)	Contiguous Floodplain Shallow Aquatic Area Benefits w/in a 1-mile Buffer (acres)	Contiguous Floodplain Shallow Aquatic Area Benefits w/n a 3-mile Buffer (acres)	Channel Dredging Benefits, Estimated Using the Navigation Study (acres)
No Action Plan	0	0	0	**0**	0	0
1 - Stone Lake	14	12	26	140	413	399
2 - Tippy Lake	13	9	22	244	420	390
3 - Kehough Slough	19	4	23	235	791	288
4 - Sunfish Lake	42	13	55	279	778	798
5 - Stone, Tippy	27	21	48	232	413	789
6 - Stone, Kehough	33	17	50	372	986	687
7 - Stone, Sunfish	56	26	82	418	1191	1197
8 - Tippy, Kehough	32	13	45	463	986	678
9 - Tippy, Sunfish	55	22	77	509	1191	1188
10 - Kehough, Sunfish	61	18	79	511	1152	1086
11 - Stone, Tippy, Kehough	46	25	71	465	986	1077
12 - Stone, Kehough, Sunfish	75	30	105	650	1346	1485
13 - Sunfish, Kehough, Tippy	74	26	100	742	1346	1476
14 - Sunfish, Stone, Tippy	69	34	103	511	1191	1587
15 - Stone, Tippy, Kehough, Sunfish	88	39	127	743	1346	1875

[1] Gray Boxes denote “best buy” plans using IWR Planning Suite, Incremental Cost Analysis

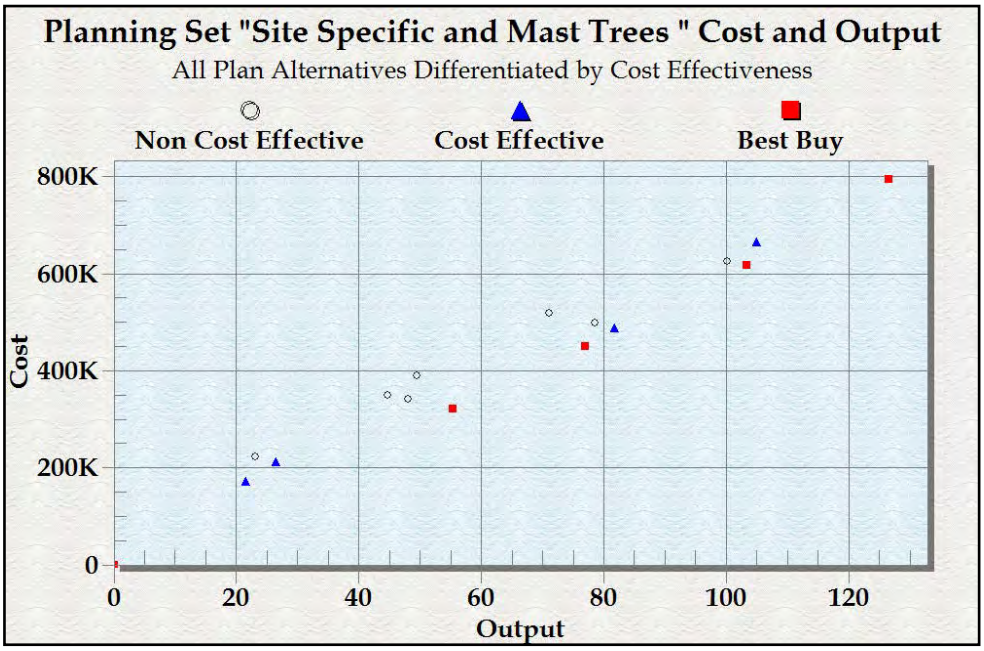

Figure D-4. Cost-effectiveness Analysis – Site-Specific and Mast Tree Benefits

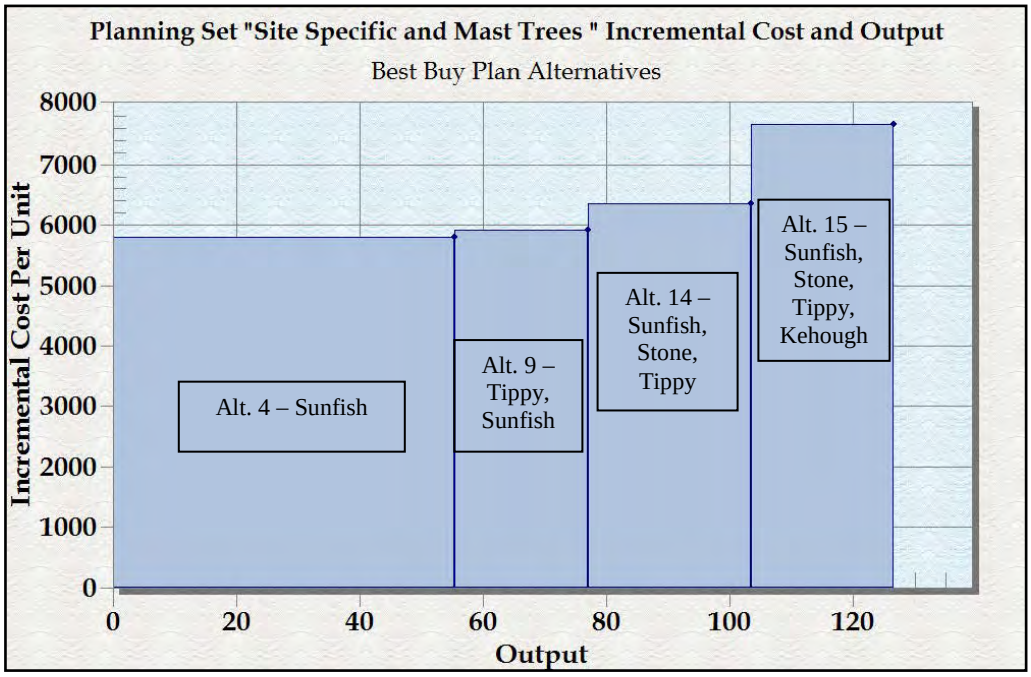

Figure D-5. Incremental Cost Analysis "Best Buy" Plans – Site Specific and Mast Tree Planting Benefits

C. Systemic Overwintering Benefits. The project alternatives would benefit fish populations not only within individual sites, but systemically within Pool 12 as well. Centrarchid species, as well as other fishes, rely on off-channel backwater habitat for use during winter conditions. Radio telemetry studies performed by IADNR in Pool 12 and other adjacent pools have documented that centrarchids migrate varying distances to overwinter at known sites, and that sites have been utilized year after year by individual fish. Migration distances vary, but previous studies by IADNR (Pitlo 1992) found that largemouth bass might typically migrate 5 miles to reach overwintering sites. Additional radio telemetry work supported by the Corps during the winter of 2002 identified that bluegills, black crappies and white crappies typically migrated distances of 3 miles to reach overwintering habitat in Pool 12 (Iowa DNR 2002 and 2003, Pitlo 2004). Inferences from these data sets indicate that suitable backwater overwintering areas need to be spaced within a pool relatively close to one another to be effective.

Pre-project monitoring in the Pool 12 area was initiated to monitor fish movement out of overwinter sites, as compared to prior studies tracking their movement into overwintering sites. Home range analysis identified the area that fish used 80% of the time for each backwater lake (table D-7). The influence of landscape features such as the proximity to the main channel, position in the pool or side channel complex, or proximity to other overwintering backwaters were observed, but not tested. Changes in home range through the winter season or in response to other environmental factors (dissolved oxygen sags, changes in temperature, water level fluctuations, etc.) were also explored. Pre-project results indicate that fish communities are relatively stable and do not range far (<1 mile) from overwintering sites. Consistent with prior findings, however, was the timing of movements and apparent relationships to environmental conditions like oxygen and flow.

Two scenarios were used to quantify potential systemic benefits and address the uncertainty regarding local fish movements. The first scenario utilizes information from previous studies indicating a bluegill migration distance of 3 miles. The second scenario utilizes information from pre-project monitoring data that indicates a migration distance of 1 mile. Buffer areas of 1-mile and 3-miles were established around each backwater lake in the project area using GIS. These buffer areas were then used to calculate the amount of backwaters (e.g., shallow contiguous aquatic habitat) that may be used by fish overwintering at a specific backwater. Overlapping areas from multiple backwaters were not "double counted" (figures D-6 and D-7).

This approach quantifies the amount of backwater aquatic habitat that could benefit from a potential project at a given backwater. However, the systemic analysis does not answer the ultimate question of "how much" backwater overwintering habitat is "needed" within a given area. Unfortunately, the understanding of cause-effect relationships between habitat and UMR fish populations is not yet strong enough to identify how much overwintering habitat is necessary to support an identified centrarchid population level. However, this project is designed to provide insight into how much of a fish's non-winter life history, such as spawning, may benefit from an alternative that improves fish overwintering condition and spring fitness. The lake selection and post-project monitoring will help evaluate how backwater sites may need to be spaced to maximize potential benefits.

Table D-7. Bluegill Home Range (ha), by Period and Mean Size During Ice Cover, as Determined by Telemetry and Kernel Methods at Fishtrap, Frentress, Greens, and Stone Lakes

Shaded areas denote periods with ice cover.

	Lake			
Period	**Fishtrap Lake**	**Frentress Lake**	**Greens Lake**	**Stone Lake**
1	19.76	9.60	8.65	5.04
2	0.21	7.17	3.22	1.23
3	0.54	3.53	6.29	1.40
4	0.27	3.59	4.45	0.52
5	0.25	3.30	9.39	2.24
6	0.65	4.52	6.08	0.46
7	-	3.48	9.06	0.98
8	-	7.30	4.04	2.01
9	-	13.42	23.18	21.39
10	-	-	14.07	20.71
11	-	-	12.86	34.03
12	-	-	11.94	41.29
13	-	-	13.57	20.73
14	-	-	9.06	6.55
15	-	-	7.02	-
16	-	-	9.88	-
17	-	-	7.54	-
18	-	-	8.03	-
19	-	-	8.55	-
Mean Ice	**0.32**	**4.70**	**6.07**	**1.26**

Benefits were quantified for every alternative at both the 1-mile and 3-mile buffer area, resulting in acreage of contiguous aquatic habitat and compared with the construction cost for each alternative. The alternatives were compared using IWR Planning Suite to determine the best buy alternatives (table D-6). Using the scenario in which fish migrate a distance of 1-mile, the resulting alternative comparison determined that there were four best buy alternatives: Alt. 2 (Tippy Lake), Alt. 8 (Tippy, Kehough), Alt. 13 (Sunfish, Kehough, Tippy) and Alt. 15 (Stone, Tippy, Kehough, Sunfish).

Using the scenario in which fish migrate a distance of 3-miles, the resulting alternative comparison determined that there were three best buy alternatives: Alt.3 (Kehough), Alt. 9 (Tippy, Sunfish), and Alt. 13 (Sunfish, Kehough, Tippy). Alt. 15 was not identified as a best buy plan because the 3-mile areas around Tippy Lake and Stone Lake overlap extensively due to their close proximity and did not show additional benefits.

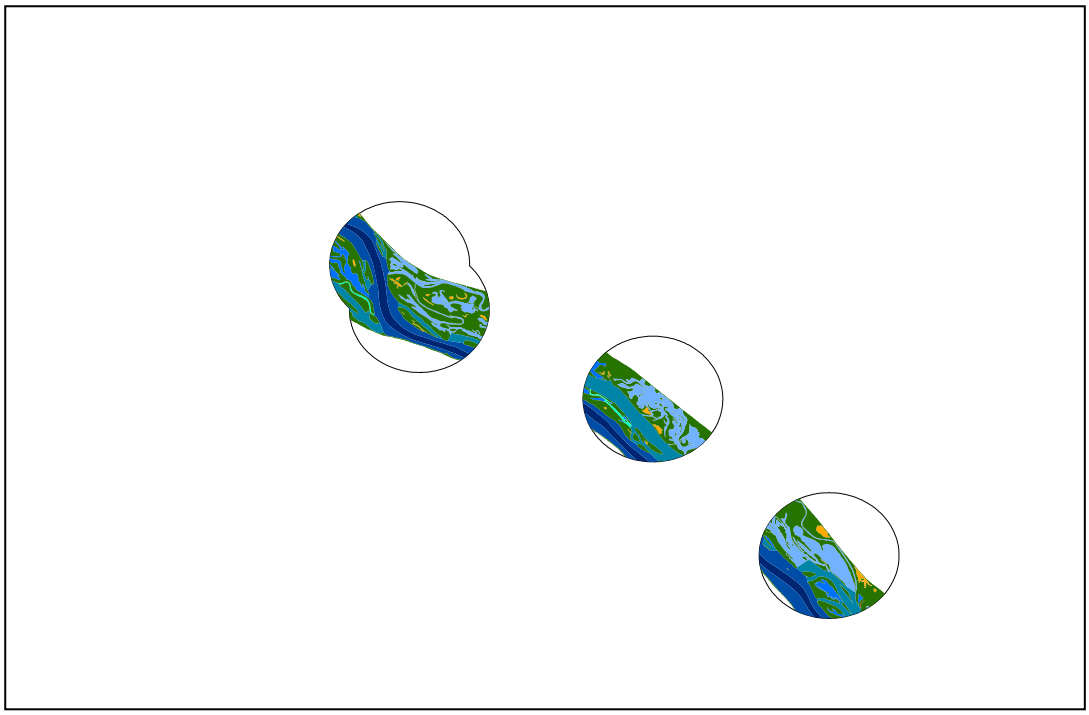

Figure D-6. Alternative 15 With 1-mile Buffer Areas

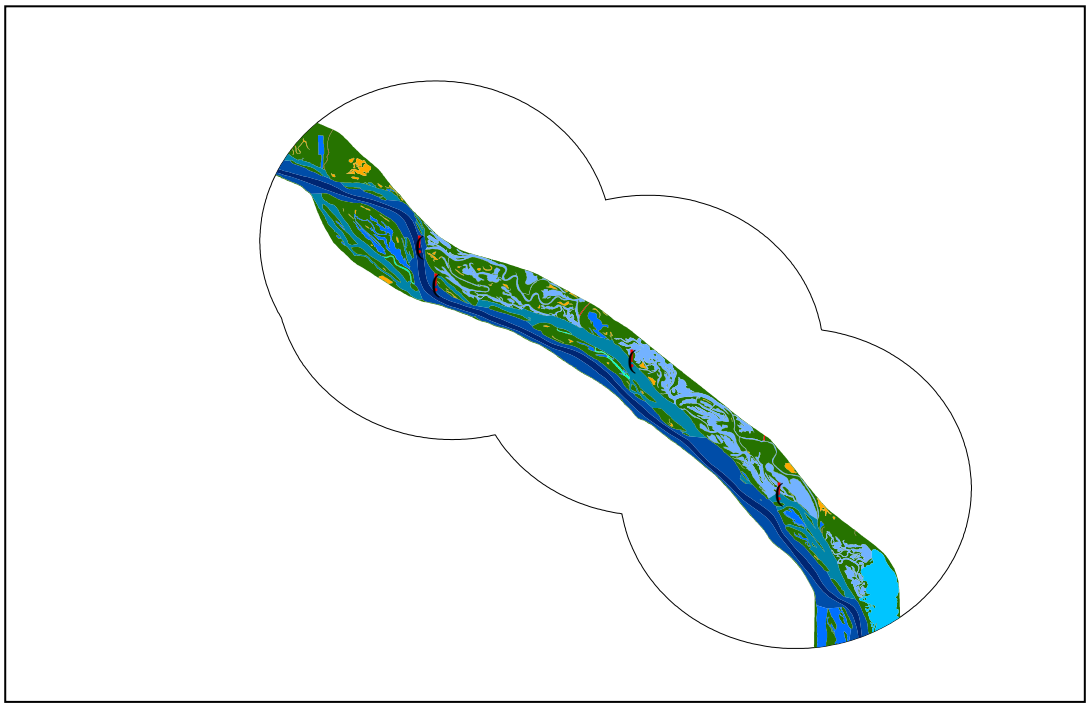

Figure D-7. Alternative 15 With 3-mile Buffer Areas

D. Navigation Study. As an additional way for the PDT to cross-check the estimated Systemic Benefits, information from the Navigation Study was used as a sensitivity analysis. As part of the Navigation Study, work groups, the science panel, coordinating committees, States, and other stakeholders formulated and refined ecosystem restoration alternatives to better and more efficiently meet the identified range of ecosystem protection and restoration opportunities. This included establishing and evaluating potential ecosystem measure performance (e.g., area of influence, cost per acre, etc.). The resulting information was compiled into table D-8, as part of the Navigation Study.

The Navigation Study quantified the area of influence for a variety of restoration measures, including backwater restoration (channel dredging). This multi-District effort examined how habitat areas were influenced by anticipated or ongoing UMRS management and restoration activities. By reviewing existing restoration efforts, the average area of influence was identified for a given project footprint. Using this methodology, the areas of influence were estimated for the management and restoration measures displayed in table D-8.

Areas of influence identified for the restoration projects reflected only the direct habitat impacts of the measures. Overall, this may be considered a conservative estimate when one takes into account the restoration effort's more far-reaching effects on migratory species.

The Navigation Study stated,

> *"Backwater dredging is conducted primarily to improve water quality conditions for backwater fish. The activity typically includes dredging channels and holes in distinct backwater areas that have experienced high rates of sedimentation over time. It is known that fish make seasonal movements to these habitats, so that they may be attracted from many miles during certain critical time periods. The area of influence for this measure, however, was restricted to the area of the backwater lake in which dredging was conducted. Based on a range of experience with other projects, it was estimated that the average project would dredge 20 acres in a 600-acre lake for a 1:30 footprint to influence ratio."*

Using this information, the PDT applied the 1:30 ratio to the dredging acreage in each of Pool 12's alternatives. For every acre of dredged channel, there are 30 acres influenced for ecosystem restoration. The area of influence was determined for each alternative and compared in IWR Planning Suite using construction costs of each alternative. The result was three best buy plans as shown in table D-6. The benefiting acreage for Alternative 15 is estimated at 1,875. This estimate is greater than the systemic benefits estimates using either the 1-mile or 3-mile buffer areas.

Table D-8. UMRS Ecosystem Measures (costs and benefits in 2003 dollars)

Ecosystem Measures	Project Footprint	Project Costs (50 years)		Benefits	Cost per Acre
		Measure	O&M	Acres of Influence	of Influence
Island Building	30 Acres	$3,459,000	$247,500	1,000	$3,500
Fish Passage[a]	1 Site	$23,500,000	$1,500,000	-	-
Floodplain Restoration (Pools 1-13)	500 Acres	$1,000,000	$375,000	500	$2,000
Floodplain Restoration (Rest of UMR-IWW)[b]	5,000 Acres	$25,000,000	$3,750,000	5,000	$5,000
Water Level Management - Pool[a]	1 Site	$4,504,000	$0	-	-
Water Level Management - Backwater	1,000 Acres	$3,400,000	$1,000,000	1,000	$3,400
Backwater Restoration (Dredging)	20 Acres	$2,326,000	$0	600	$3,900
Side Channel Restoration	100 Acres	$1,450,000	$575,000	100	$14,500
Wing Dam/Dike Alteration	5 Structures	$785,000	$68,750	10	$78,500
Island Protection	3000 Feet	$528,900	$82,500	240	$2,200
Shoreline Protection	3000 Feet	$528,900	$82,500	3	$176,300
Topographic Diversity	5 Acres	$767,500	$60,000	8	$96,000
Dam Point Control	1 Site	$10,750,000	$2,250,000	3,000	$3,600
Floodplain Restoration-Immediate Opportunities	5,000 Acres	$25,000,000	$3,750,000	5,000	$5,000

[a] Fish Passage and pool-scale Water Level Management benefits were assessed separately.
[b] Floodplain Restoration (Rest of UMR-IWW) includes an additional $3,000/acre real estate cost.

E. Total Estimated Benefits. For the recommended plan (Alt. 15), the estimated benefits are 127 Annual Average Habitat Units and up to 1,875 acres of benefits. The Site Specific Benefits are 88 AAHUs. The Mast Tree Planting Benefits are an additional 39 AAHU's. The acreages benefited by this project conservatively range from 743 to 1,875 acres of backwater lake area. Tools previously used to value these acres in terms of AAHU's are no longer available for use, but are significant nonetheless.

F. Is It Worth It? The purpose of the above sensitivity analysis is to ensure that the selection of Alt. 15 is reasonable by demonstrating it is consistent with past experiences with HREP projects and answers the fundamental question posed when doing cost effectiveness/incremental cost analysis; is a particular alternative and increment of benefit worth the additional cost over the next best buy plan or cost effective plan? The recommended plan is a best buy in five of the six analyses that were conducted using IWR Planning Suite, Incremental Cost Analysis.

Alt. 13 is the closest comparable alternative as it is a best buy in three of six categories including the original sites specific AAHU benefits. However, it is neither a best buy in the Mast Tree analysis or the Navigation Study methodology analysis. Of particular note is that it is not a Best Buy in the Mast Tree analysis or when combined with Site Specific benefits. This significant and scarce habitat type is fundamental to having a healthy Upper Mississippi River System as recognized in numerous studies and publications both within and without USACE. This significance is reflected in Program and Project objectives and manifest in many previous HREP projects.

The potential benefits for Alt. 13 range from 100 AAHU's (Mast Trees + Site Specific) to 1,476 Acres (Navigation Study Channel Benefits), while Alt. 15 range from 127 AAHU's (Mast trees + Site Specific) to 1,875 Acres (Nav Study Channel Benefits). The incremental analysis shown in table D-9 compares those two alternatives against each other with the low end of benefits being represented by the Mast Tree and Site Specific category and the upper end by the Nav Study Channel Benefits. Alternative 15, when taking into consideration the potential for additional mast tree and systemic benefits, shows a lower incremental cost per benefit unit over Alt. 13. This demonstrates that Alt. 15 is consistent with other best buys in the original site specific analysis and that the large jump displayed in figure D-5 between Alt, 13 and Alt. 15 would be similar to the incremental jumps between Alternatives 4, 10 and 13.

An additional qualitative factor that provides additional justification for Alt. 15 over other best buy plans is its contribution to greater understanding of e*cosystem process, structure and function.* This project area was identified by the interagency partnership as being the most suitable location on the Upper Mississippi River System to answer several critical questions related to spatial distribution and size of overwintering habitats in backwater lakes and its impacts on fish migration, life cycle requirements. Selection of Alt. 15 is "worth it" to the State of Iowa in so much as it will leverage approximately $800,000 in State funds for targeted monitoring and research into the above questions which will benefit future ecosystem restoration on the Upper Mississippi. The information gained and lessons learned will be transferable to other large floodplain rivers in the nation. Information gained will result in refinements to future HREP and similar ecosystem projects on the UMRS that will reduce formulation and construction costs while improving the quantity, quality and sustainability of benefits. Finally, the information gained can be used to develop tools and models to more adequately assess ecosystem benefits of those projects.

Table D-9. Direct Incremental Analysis of Alt. 13 & Alt. 15 Utilizing a Range of Benefits

Alternative	Average Annual Cost for AAHU Benefits *(Mast Tree + Site Specific)*	Incremental Benefit [1]	Incremental Cost	Incremental Cost Per AAHU	Total First Cost for Acres Benefits (Navigation Study)	Incremental Benefit*	Incremental Cost	Incremental Cost Per Acre
Alt. 13 - Sunfish, Kehough, Tippy	$626,390	23	$177,053	$7,698	$13,456,234	288	$3,803,494	$13,207
Alt. 15 - Stone, Tippy, Kehough, Sunfish	$794,278	27	$167,888	$6,218	$17,062,826	399	$3,606,592	$9,039

[1] Alt. 9 was selected as the baseline to determine the incremental benefits of Alt. 13 and 15, because Alt. 9 is a Best Buy Plan in both the Mast Tree + Site Specific and Navigation Study benefit categories (see Table D-6).

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX E

HAZARDOUS TOXIC AND RADIOACTIVE WASTE

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CEMVR-EC-DN

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE
PHASE I ENVIRONMENTAL SITE ASSESSMENT

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

UPPER MISSISSIPPI RIVER – MILES 563.0 – 573.0
POOL 12

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March 2012

Executive Summary

1. Background

This report documents the Phase I Environmental Site Assessment (ESA) or Hazardous, Toxic, and Radioactive Waste Documentation Report (HTRWDR) for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project in accordance with ER 1165-2-132, HTRW Guidance for Civil Works Projects, and ER 405-1-12, Real Estate Handbook. The Phase I ESA was performed in conformance with the scope and limitations of ASTM Standards E 1527-05 and E 1528-06. The information was obtained through site reconnaissance, informal interviews, a review of maps and aerial photographs, U. S. Army Corps of Engineers (USACE) records, and a search of federal and state environmental databases. These screening methods have been selected based on the particular nature of the ecosystem habitat project.

2. Summary

This assessment has revealed no evidence of hazardous substances, HTRW, or other regulated contaminants in connection with the project sites at the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project.

The Phase I ESA was performed in conformance with the scope and limitations of ASTM Standards E 1527-05 and E 1528-06 for the project site and surrounding area.

3. Limitations. No ESA can wholly eliminate uncertainty regarding the existence of recognized environmental conditions concerning a property. This assessment is intended to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property with reasonable limits of time and cost. Continuing the Environmental Due Diligence Audit process beyond this Phase I ESA would not reduce uncertainty, nor reveal any unidentified environmental liabilities. If any previously un-addressed recognized environmental condition should arise, this Phase I ESA will be revisited.

3. Acronyms

AIRS/AFS	Aerometric Information Retrieval System/ AIRS Facility Subsystem
ASTM	American Society for Testing and Materials
BRRTS	Bureau of Remediation and Redevelopment Tracking System
BRS	Biennial Reporting System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensations and Liability Information System
CEMVR	Corps of Engineers, Mississippi Valley Division, Rock Island District
CWA	Clean Water Act
DOD	Department of Defense
DNR	Department of Natural Resources
EC-DN	Engineering Division - Environmental Engineering Section
EC-HQ	Engineering Division - Water Quality Section
EDR	Environmental Data Resources, Inc
EM	Engineering Manual
EMCI	EnviroFacts Master Chemical Integrator
ER	Engineering Regulation
ESA	Environmental Site Assessment
FII	Facility Identification Initiative
GICS	Grants Information and Control System
GIS	Geographic Information System
HTRW	Hazardous, Toxic, and Radioactive Waste
HTRWDR	Hazardous, Toxic, and Radioactive Waste Documentation Report
ICR	Information Collection Rule
ILEPA	Illinois Environmental Protection Agency
L	Left Descending Bank
LUST	Leaking Underground Storage Tanks
MPRSA	Marine Protection, Research, and Sanctuaries Act
NAAQS	National Ambient Air Quality Standard
NCOD	National Contaminant Occurrence Database
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	National Response Center
OD-T	Operations Division
OSIT	On-Site Inspection Team
PCS	Permit Compliance System
R	Right Descending Bank
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RM	River Mile
SDWIS	Safe Drinking Water Information System
SEIDS	Site Environmental Information Data System

3. Acronyms, Cont.

SRP	Site Remediation Plan
SSHP	Site Specific Safety and Health Plan
TRIS	Toxic Release Inventory System
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank

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1. Introduction

a. Purpose and Scope. The specific purpose of a Phase I Environmental Site Assessment (ESA) is to adequately document an appropriate inquiry into Hazardous, Toxic, and Radioactive Waste (HTRW) activities on potential project lands. This ESA may also be referred to as a Hazardous, Toxic, and Radioactive Waste Documentation Report (HTRWDR). The scope of this report documents the HTRW investigation for the Project.

The primary goal of the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project is to provide critically important overwintering habitat for fish during winter months. Presently, habitat in the backwater lakes and sloughs in the project area has been degraded by sedimentation, and overwintering habitat in Pool 12 is a limiting factor for the survival of fish. In order to create the deeper lakes and sloughs, the areas will be dredged using mechanical excavation. Implementation of project features will provide the critical habitat needed for overwintering fish, and will prevent subsequent sedimentation of the lakes and sloughs.

This inquiry is required in order to minimize and prevent Federal liability under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), to reduce any threats to project workers, and avoid costly delays associated with environmental abatement activities. Appendix A contains a discussion on environmental liability. A list of documents and records reviewed or referenced is contained in Appendix B. Appendix C contains The Environmental Data Resources Area Study Report, dated 23 December 2011.

b. Authority. The U. S. Army Corps of Engineers (Corps), Rock Island District (the District) is authorized by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662) to ensure the coordinated development and enhancement of the Upper Mississippi River System (UMR). This effort includes an HREP program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement; implementation of a long-term resource monitoring program; implementation of a computerized inventory and analysis system; implementation of a program of recreational projects; assessment of the economic benefits generated by recreational activities in the system; and monitoring of traffic movement on the system.

c. Significant Assumptions. This subsection describes all assumptions made during this environmental site assessment.

(1) Federal and State NPDES permitted releases to water and NAAQS permitted releases to air, if found, are assumed to be *de minimus* recognized environmental conditions. NPDES permitted releases to water and National Ambient Air Quality Standard NAAQS permitted releases to air are not considered recognized environmental conditions as long as all reported released hazardous substances, HTRW, and other regulated contaminants were permitted or corrected in accordance with applicable or relevant and appropriate requirements. These permitted releases are assumed to be *de minimus* since permits and corrective action levels are designed by law to minimize material risk

of harm to human health and the environment to an acceptable level. NPDES permitted bio-sludge application to land and uncorrected discharges to water and air in excess of permits are not assumed to be *de minimus*.

(2) Dredged material and return water discharges are subject to a permit under Section 404 of the CWA. If the dredged material and return water discharge is subject to a permit that has been issued under Section 404 of the CWA or Section 103 of the MPRSA, then 40 CFR 261.5(g) states that RCRA Subtitle C requirements do not apply and the dredged material and return water cannot be considered a hazardous substance. The USEPA assumes that the CWA and MPRSA permit programs protect human health and the environment from consequences of dredged material disposal to an extent that is at least as protective as the RCRA Subtitle C program. (63 FR 229, 30 Nov 1998). Coordinate with CEMVR-ED-HQ for sediment and water quality evaluations with respect to CWA 404 permit information.

(3) Fertilizer, pesticide, and herbicide soil residues from normal agricultural activities, if found or suspected, are assumed to be *de minimus* recognized environmental conditions. Fertilizers, pesticides, and herbicides applied to lands during the course of normal agricultural activities, not including mixing and cleaning activities, are exempt from CERCLA and RCRA regulations. Additionally, contamination of soil from normal agricultural activities is generally not the subject of government enforcement action, therefore a *de minimus* environmental condition is given. Contamination associated with fertilizer, pesticide, and herbicide mixing/cleaning platforms is a recognized environmental condition.

(4) Trash and refuse from public recreation activities, if found or suspected, are assumed to be *de minumus* recognized environmental conditions. Public recreation is not considered a meaningful source of hazardous substance, HTRW, or other regulated materials. Public recreation is therefore a *de minimus* environmental condition. This assumption does not include the release of fuel or mechanical fluids.

(5) Unless it is made known by interview or record search or it is obvious during a site inspection, contamination related to transportation and utility features are not suspected. The release of hazardous substances, HTRW, or other regulated contaminants from utilities or transportation features is possible. Petroleum spills occur with vehicle accidents, hazardous substances are released with railway disasters, and oil slicks occur with navigational tragedies. However, the discovery of such contamination by means other than interviews, record searches, and visual site inspection would require exhaustive site characterization measures to reduce uncertainty. At this time, reducing this uncertainty is not reasonably ascertainable within time and cost constraints, nor is the threat of a release necessarily preventable. (Significant exceptions: (1) arsenic and heavy metal contamination along railroad corridors; (2) lead-based paint on

transportation bridges constructed before 1970; (3) possible PCB contamination along power line right of ways. Site-specific information, site reconnaissance, and interviews may indicate these exceptions are *de minimus*.)

d. Limitations and Exceptions. This subsection describes limitations and exceptions discovered during this site assessment.

(1) Uncertainty Limitations. No ESA can wholly eliminate uncertainty regarding the existence of recognized environmental conditions concerning a property. This assessment is intended to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property with reasonable limits of time and cost.

(2) Site Reconnaissance Limitations. Access to privately owned lands requires a legal right-of-entry. For properties where rights-of-entry were not obtained, site reconnaissance on privately owned lands was limited to a review of photographs from previous site visits and interviews with Corps employees and site managers. Likewise, some publicly owned project sites located in wetland areas and along the river are not easily accessible by land, and require a low-draft boat to reach.

(3) Records Review Limitations. Historical and regulatory record reviews are limited by the level of data collected by the recording agency, availability of record coverage, and by data transparency. If provided by the recording agency, statements regarding the limits of database were included with a copy of the findings. Record coverage research was limited to records on the District Intranet, State and Federal regulatory agency websites, EDR search results, and popular mapping websites. Data was considered transparent only if it could easily be geospatially referenced to the property.

(4) Exclusion of Flowage Easements. Slurry return water discharges into flowage easements are permitted under Section 404 of the CWA. Coordinate with District Geotechnical Engineering, Hydraulic Engineering Sections, and Environmental Assessment Sections for sediment, water quality, and CWA 404 permit information.

e. Site Safety. A Site-specific Safety and Health Plan (SSHP) was prepared for a site visit. Investigators followed all generic requirements of the Corps Safety and Health Requirements Manual (EM 385-1-1). The SSHP is contained in Appendix E.

2. Site Description

a. Location and Legal Description. The Pool 12 Overwintering HREP project area is a chain of backwater lakes and sloughs of the Mississippi River between River Miles 563.0 and 573.0. The project lies between the towns of Aiken, IL, and Menominee, IL, and near the city of Galena in Jo Daviess County, Illinois. The proposed project area includes Sunfish Lake (RM 563.6-564.5), Kehough Slough (RM 567.5), Tippy Lake (RM 571.0), and Stone Lake (RM 572.4). The confluence of the Galena River and the Mississippi River is located just north of Sunfish Lake. The southern end of the project area is approximately six miles upstream from Lock and Dam 12.

Figure 1. Map of Project Location and Adjacent Areas

At the time this report was written, Fish Trap Lake (RM 566.4) and "No Name Lake" (RM 567) were removed from the list of proposed project sites. However, these sites are covered under this report, should they be reinstated as project sites in the future.

b. Site and Vicinity Characteristics. The project sites consist of several backwater lakes, sloughs, and islands along the Mississippi River. The project study area is primarily heavily forested, undeveloped land along the river with some agricultural fields in the vicinity. There is very little settlement or development along this stretch of the river. However, the project site does include areas adjacent to the Galena Boat Club in Harris Slough. The shoreline near the landing and marina does have some private properties with dwellings. Utility lines cross the backwater area in Harris Slough.

c. Utilities/Transportation Features. The primary transportation feature near the project area is the Burlington Northern-Santa Fe (BNSF) railroad, which runs along the entire project area near the left descending bank of the Mississippi River. The Chicago & Northwestern Railroad and the Illinois Central Railroad converge with the BNSF railroad at points along the project area. The only access to the project area by land is via Pilot Knob Road, North Ferry Landing Road, Gates Road, and West Station Road, which are all small service roads.

d. Current Uses of Property. Properties are currently backwater lakes and sloughs of the Mississippi River, and are located within the Upper Mississippi National Wildlife and Fish Refuge. Inspection of recent aerial photographs (1995, 2000 and 2009) shows no indications of any settlement or development on the shorelines of the project areas. The only developments visible are the Apple River Chemical Company, located north of Tippy Lake near River Mile 572.8 on the landward side of the railroad embankment, and the Galena Boat Club public boat ramp located at the upstream end of Harris Slough. Several homesteads were observed along the project area, all on the landward side of the railroad embankment.

The Corps has real estate rights to all proposed dredging and placement sites in the project area.

e. Past uses of Property. Prior to the mid-1930s, the project sites were used for the same purposes as today. The project sites form a chain of backwater lakes and sloughs of the Mississippi River. They are used mostly for recreation, however, continual sedimentation has inhibited these activities in some areas. These sites are undeveloped and have not experienced a change in use.

f. Current and Past Uses of Adjoining Properties. The project study area has experienced changes in use. Minimal amounts of wetlands were drained for agricultural crop production, however the majority of the land remains in a nearly natural condition. Jo Daviess County was once heavily mined. See Appendix D for a map of industrial mines in Jo Daviess County. The locations of all mines and buffer areas lie outside of the project area.

3. Records Review

The purpose of a records review is to obtain and review records that will help identify recognized environmental conditions concerning the property. Some of the records reviewed pertain not just to the property, but also to properties within an approximate minimum search distance, in order to help assess the likelihood of problems from migrating hazardous substances or regulated contaminants. Factors considered in determining the approximate minimum search distance include ASTM Standards E 1527-05 and E 1528-06, the density of the setting, the distance hazardous substances or other regulated contaminants are likely to migrate, local geologic or hydrogeologic conditions, and other observable factors. This records review included querying several environmental databases. More specific information about the records and the results of the review is contained in Appendix D.

a. Standard Environmental Record Sources

(1) EDR. Environmental Data Resources, Inc. (EDR) searched areas within a one-mile search distance of the Pool 12 Overwintering HREP project sites. Results indicated that one Underground Storage Tank (UST), three Leaking Underground Storage Tanks (LUST), and one industrial impoundment facility was located within a one-mile search radius of the project sites.

The UST site consists of two 10,000-gallon diesel storage tanks owned by Air Liquide America, and no spills have been reported from this site.

The following table describes the three LUST sites identified in the search.

Leaking Underground Storage Tanks (LUST)			
Owner	**Address**	**Product**	**No Futher Action/ No Further Remediation (NFA/NFR) Letter**
Royster-Clark, Inc./ Phoenix Chemical Co.	16675 US Rte 20 West East Dubuqe, IL 61025	Non Petro	3/21/1994
Praxair	16675 US Rte 20 West East Dubuqe, IL 61025	Deisel	6/22/2000
Galena Territory Assoc.	100 Marina Dr. Galena, IL 61036	Gasoline	6/25/1997

Table 1. LUST Sites

The impoundment facility is the Apple River Chemical Company, which has 3 impoundments on site. The chemical company was identified on aerial photographs.

A map showing the results of the EDR study and the locations of the facility is located in Appendix C (Figure C-1).

(2) National Response Center (NRC). NRC searched records for Jo Daviess County on 15 July 2002. Although there were incidents recorded along the railroad and at several points on the river within the project area, the railroad incidents were accidents or derailments that did not result in a hazardous waste spill, and the river incidents reported less than 2 gallons of petroleum spilled. Therefore, there is no evidence of recognized environmental conditions.

On 2 February 2012, NRC records were searched online. The search yielded no results in the project area for spills greater than 2 gallons. Therefore, there is no evidence of recognized environmental conditions.

b. Additional Environmental Record Sources. The Rock Island District has been in the plan formulation stage of this project since at least 1996. During this time, various water quality sampling has taken place and the results have been made available. These records were reviewed during the preparation of this document. While no HTRW concerns have been identified, some water quality issues may be present. The following table depicts the results of the most recent sampling data compared to IL state standards provided by the IL Environmental Protection

Agency (ILEPA). Additional information regarding recent water quality testing can be found in Appendix D.

Chemical of Interest (COI)	Fish Trap Lake	Kehough Slough	No Name Lake	Stone Lake	Sunfish Lake	Tippy Lake
Cadmium (Cd)	◊		◊	◊	◊	◊
Copper (Cu)	●	◊		●		●
Iron (Fe)	*	*	*	*	*	*
Lead (Pb)	●			●		◊
Manganese (Mn)	*			*		*
Mercury (Hg)	●			●		●
Nickel (Ni)	●	◊	◊	●		●
Zinc (Zn)	●	◊	◊	●	◊	●

Legend

●	Exceeds ILEPA Acute General Use Water Quality Standards
◊	Exceeds ILEPA Chronic General Use Water Quality Standards
*	Exceeds ILEPA 302.208(g) Standard

2011 Sediment Sampling
Pool 12 Overwintering – HREP

(Based on Results of Elutriate Testing After a Settling Time of 1-Hour)

Figure 2. July 2011 Water Quality Sampling Results

c. Physical Setting Sources. United States Geological Survey (USGS) topographic maps showed that the immediate area was primarily undeveloped land surrounding backwater lakes and sloughs of the Mississippi River. Target properties lie in the Upper Mississippi National Wildlife and Fish Refuge as noted in the descriptions above.

d. Historical Use Information. Historic aerial photographs were obtained from Corps resources. Photos from the 1930s, 1956, 1995, 2000 and 2009 were examined to discern historical use information. These photos can be seen in Appendix D.

The 1930s photograph (Figure D-8) shows that the project sites are backwater lakes and sloughs of the Mississippi River. There is a minimal amount of development in the area, with only a few agricultural fields visible on the photographs. The Burlington Northern- Santa Fe railroad and several small roads have been constructed and are in the same location as they are at the present time. Wing dams have been built along the Mississippi River to divert flow to the river channel and prevent erosion of island shorelines.

The 1956 photograph (Figure D-9) shows a significant change in the area, which is a result of construction of Lock and Dam 12 in the middle to late 1930s. The elevation of the water surface has risen considerably, causing wing dams and islands to become submerged, the width of sloughs and the river channel to increase, and the surface area of the backwater lakes to increase. This rise in the water surface resulted in a loss of forested island habitat and wetland habitat, but has increased the backwater aquatic habitat. However, the additional flows to the backwater areas also bring increased sediment loads to the area, therefore causing detrimental effects to the aquatic ecosystem over time.

The 1995, 2000, and 2009 photographs (Figure D-10, D-11, and D-12) show little change from the 1956 photos. The river has continued to gradually erode islands and shorelines in the area, and the homesteads and chemical company have been constructed. It is likely that sedimentation has gradually decreased the depth of the backwater lakes and sloughs, resulting in diminished overwintering habitat for fish in the area.

4. Site Reconnaissance

Site reconnaissance consisted of a visit to the site by Corps team members: (2003) and (2011). Information gathered for the section of this report was based on interviews of project team members and project sponsors, who have all visited the sites on previous occasions. Assessment methods by the Corps did not involve intrusive techniques such as the taking and analyzing of soil samples.

a. Exterior Observations (2003).

- Hazardous Substances in Connection with Identified Uses. None were identified.

- Storage Tanks. None were observed on the site visit. Storage tanks were identified at the Apple River Chemical Company through inspection of aerial photographs and through an environmental records search.

- Hazardous Substance Containers and Unidentified Substance Containers. None were observed.

- Indication of PCBs. None were identified.

- Pits, Ponds, and Lagoons. There are 3 settling impoundments located at the Apple River Chemical Company, as identified by inspection of aerial photographs and the environmental records review.

- Stained Soil and Pavement. No stained soil or pavement was identified.

- Solid Waste Disposal. No solid waste disposal sites were observed.

- Wells. Although none were observed, some of the residential properties and farms on the island across from the Galena Boat Ramp are likely to have wells.

- Septic Systems. Although none were observed, some of the residential properties and farms on the island across from the Galena Boat Ramp are likely to have septic systems.

  A septic tank is a watertight covered receptacle designed to receive or process, through liquid separation or biological digestion, the sewage discharged from a building or privy. The effluent from such a receptacle is distributed for disposal through constructed permeable leach beds, if present, and then to the shallow soil. Settled solids and scum from the tank are pumped out periodically and hauled to a treatment facility.

  Septic systems are considered recognized environmental conditions because regulated contaminants, in the form of increased levels of nitrogen and phosphorus, viruses, and

pathogens, can pollute groundwater by releases from septic systems when the systems are poorly designed (tanks installed in areas with inadequate soils or shallow depth to groundwater); poorly constructed or sealed; are improperly used, located, or maintained; or are abandoned. Twenty-nine of thirty-seven sites septic systems were cited as a potential source of groundwater contamination (USEPA, 1996). The Office of Drinking Water, Underground Injection Control Program, which develops regulations under Part C of the SDWA, regulates subsurface drain fields. Under these regulations, septic tank and drain field systems are classified as Class IV or Class V injection wells (USEPA, 1986).

- Any other Condition of Concern. No other conditions of concern were noted.

b. Interior Observations (2003). No buildings or structures were visually investigated on the project sites.

c. Exterior Observations (2011).

- Hazardous Substances in Connection with Identified Uses. None were identified.

- Storage Tanks. None were observed on the site visit. Storage tanks were identified at the Apple River Chemical Company through inspection of aerial photographs and through an environmental records search.

- Hazardous Substance Containers and Unidentified Substance Containers. None were observed.

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- Septic Systems. Although none were observed, some of the residential properties and farms on the island across from the Galena Boat Ramp are likely to have septic systems.

- Isolated areas of flood debris were identified. See pictures in Appendix F. Debris does not appear to be of environmental concern.

- Any other Condition of Concern. No other conditions of concern were noted.

d. Interior Observations (2011). No buildings or structures were visually investigated on the project sites.

5. Interviews

Informal interviews were conducted with the following people regarding any potential recognized environmental conditions:

Dean Cerny, Project Engineer was interviewed on 15 July 2002 regarding his previous site visit and other specialized knowledge. He said that he has been to the project one time, and looked at most of the islands from a boat. Although he wasn't looking for HTRW concerns in particular, he was able to make some observations that were useful for this report.

During his site visit, he did not observe hazardous substances in connection with identified uses or any storage tanks on project sites. He saw no indication of PCB contamination, and does not recall seeing any power lines or utilities crossing to the islands. Dean did not observe any pits, ponds, or lagoons, and didn't notice any stained soil or pavement. No signs of solid waste disposal, such as trash, discarded appliances, etc., were observed on the site visit. Other than the Galena Boat Ramp, Dean did not observe any structures on target properties. He is not aware of any wells or septic systems on any of the sites, but said that if structures are discovered on project sites, wells or septic systems may also be present. He did not observe any signs of fish kills or vegetation that appeared to be stressed from something other than normal conditions.

Amy Moore, HTRW Coordinator (ED-DN), was interviewed on 18 July 2002 about her previous visits to the project sites. She said that she has been to the project two times, and looked at all of the project sites from an air boat. She stated that the lakes on the project sites are very shallow (~18" in some locations). She did not observe hazardous substances in connection with identified uses on any of the target properties. She did not see any storage tanks, pits, ponds, or lagoons. She did not see any indication of PCBs, but did notice that there were some power lines crossing the river from the Galena Boat Ramp to some houses on the opposite island. Amy was present when soil boring tests were being conducted, and saw no evidence of stained soil. She did not observe any signs of solid waste disposal, wells, or septic systems. No signs of fish kills or vegetation that appeared to be stressed from something other than normal conditions was observed during her site visit.

Elliott Stefanik, Biologist (PM-A), was interviewed on 24 July 2002 about his previous visits to the project sites. Mr. Stefanik did not observe any signs of hazardous substances, solid waste dumping, or other HTRW concerns. He did not observe any signs of stressed vegetation, or observe any species that are indicative of either a polluted or a pristine environment.

Dave Bierl, Water Quality (ED-HQ), was interviewed on 26 July 2002 about his previous visits to the project sites. Dave did not observe any signs of hazardous substances or any reason to suspect the presence of hazardous substances. He stated that most of his visits have been conducted during winter months when visibility is limited due to snow and ice on the ground. He is not aware of any HTRW issues from a water quality point of view, and said that dissolved oxygen and pH levels are monitored at various sites. Mr. Bierl noted that there is a lot of naturally occurring lead in the area near Galena, but has not observed elevated levels in the water near project sites.

Ed Britton, Refuge Manager, was interviewed on 8 August 2002 regarding HTRW concerns on the refuge lands. He was not aware of any hazardous substances or other toxic or radioactive waste on project sites, and has not observed any storage tanks on refuge lands.
He stated that the animal and plant life in the area is typical riverine habitat; no species indicating a particularly healthy or polluted environment are present.

The only concern he had was a bald eagle nesting site near one of the lakes (possibly Hires Lake). He recommended that construction schedules be arranged to avoid the eagle nesting period.

Mike Steuck, Bellevue Long Term Resource Monitoring Program, was interviewed 8 August 2002, regarding his knowledge of HTRW concerns on project sites. He stated that he grew up in Dubuque, Iowa and has spent a considerable amount of time fishing and boating in Pool 12, and is very familiar with the area. He conducts fish sampling in the area about two times per year. Mr. Steuck is not aware of any hazardous substances in the area, and has not observed any signs of storage tanks or other HTRW concerns.

The only potential concern that he noted was the Apple River Chemical Company, which he said is a fertilizer company located on the bluff near "No Name Lake". He was aware of one report 3 or 4 years ago that mentioned a possible fish kill in the area. He subsequently did some sampling and observations in the area but did not notice anything that significantly affected the ecosystem. He stated that while doing fish sampling, he observed some chemically sensitive species, which indicate a fairly healthy environment. He said that land on both the Iowa and Illinois side of the river is used for agricultural crop production, and the only industry that he is aware of is the aforementioned chemical company.

Dave Bierl, Water Quality (EC-HQ), was interviewed on 2 February 2012 about his latest visit to the project site. He noted houses on an island near No Name and Fishtrap Lakes and overhead power lines to the island, but did not observe any signs of hazardous substances or any reason to suspect the presence of hazardous substances. He also noted flood debris on islands near Fishtrap and No Name Lakes. He went to the project site on 26 January 2012 for water quality monitoring in Fishtrap Lake.

George Millar, Geotechnical Branch (EC-G), was interviewed on 2 February 2012 about his latest visit to the project site. He went to the project site on 26 January 2012 for water quality monitoring in Fishtrap Lake. He noted the location of the Galena Boat Ramp and overwintering boats, but did not observe any signs of hazardous substances or any reason to suspect the presence of hazardous substances.

Conversation records documenting each of these conversations are located in Appendix G.

6. Findings and Conclusions

(1) Railroad Corridor. As indicated in the site-specific information, target properties exist near a Burlington Northern- Santa Fe railroad corridor. Existing and former railroad corridors are known to contain hazardous substances, HTRW, and other regulated contaminants. A Phase IIA ESA would most likely result in a detection of contaminants of concern (COCs) such as arsenic, diesel range organics, oil, herbicides, cleaners, lubricants and solvents. However, historical records show no evidence of a significant spill or derailment that would have contaminated project sites. There will be no construction activity on property adjacent to the railroad; therefore the railroad corridor is a *de minimus* recognized environmental condition.

(2) Underground Storage Tank. As indicated in the records review, there is a 10,000-gallon diesel underground storage tank at Air Liquide Co., approximately 0.25 miles away from the upland placement site. There were no spills reported from this tank, and the tank is currently in good operating condition. The underground storage tank is therefore a *de minimus* recognized environmental condition.

(**3) Apple River Chemical Co.** As indicated in the records review, and inspection of aerial photographs, the Apple River Chemical Company has several aboveground storage tanks and settling impoundments located approximately 0.25 miles away from the upland placement site. Records indicated that there have been no spills from the site, and interviews show that the project area has not been adversely affected by normal plant operations. The Apple River Chemical Company is therefore a *de minimus* recognized environmental condition.

(4) Galena Boat Ramp. As noted during the inspection of aerial photographs, the Galena Boat Ramp is located at the downstream end of "No Name Lake." This boat access does not sell gasoline, and there is no reason to suspect a release of significant amounts of HTRW from this facility. The Galena Boat Ramp is therefore a *de minimus* recognized environmental condition.

(5) Leaking Underground Storage Tanks. As indicated in the records review, the three LUST sites identified have all been issued No Further Action/ No Further Remediation (NFA/ NFR) Letters . These sites are therefore *de minimus* recognized environmental conditions.

In conclusion, this assessment has revealed no evidence of hazardous substances, HTRW, or other regulated contaminants in connection with the project sites at the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project.

The Phase I Environmental Site Assessment was performed in conformance with the scope and limitations of ASTM Standards E 1527-00 and E 1528-00 for the project site and surrounding area. This assessment has revealed no evidence of recognized environmental conditions concerning the sites.

7. Recommendations

At this time, no further investigations are recommended. If at any time during the planning or construction phases any previously un-addressed recognized environmental condition should arise, this Phase I ESA will be revisited.

8. Limitations

No ESA can wholly eliminate uncertainty regarding the existence of recognized environmental conditions concerning a property. This assessment is intended to reduce, but not eliminate, uncertainty regarding the existence of recognized environmental conditions in connection with a property with reasonable limits of time and cost. Continuing the Environmental Due Diligence Audit process beyond this Phase I ESA would not reduce uncertainty, nor reveal any unidentified environmental liabilities. If any previously un-addressed recognized environmental condition should arise, this Phase I ESA will be revisited.

9. Signatures and Qualifications

I declare that to the best of my professional knowledge and belief, I meet the definition of *environmental professional* as defined in 312.10 of 40 CFR 312 and I have the specific qualifications based on education, training, and experience to assess a property of the nature, history and setting of the subject property. I have developed and performed *all appropriate inquiry* in conformance with the standards and practices set forth in 40 CFR Part 312.

CEMVR-EC-DN representative Laura St. Louis, E.I., was responsible for the preparation of this Phase I Environmental Site Assessment.

Prepared by Laura K St. Louis

Date 23 July 2012

CEMVR-EC-DN representative Kara Mitvalsky, P.E., conducted review activities for this Phase I Environmental Site Assessment.

Reviewed by Kara N. Mitvalsky

Date 7/23/12

APPENDIX A
ENVIRONMENTAL LIABILITY

1. Environmental Liability

a. District Guidance. The United States Army Corps of Engineers (USACE) Engineering Regulation (ER) providing guidance for the conduct of Civil Works Planning Studies is contained in ER 1105-2-100. The policies and authorities outlined in ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects; DIVR 1165-2-9, Lower Mississippi Valley Division HTRW Policy for Civil Works Projects; and ER 405-1-12, Real Estate Handbook, were developed to facilitate the early identification and appropriate consideration of environmental liability in all the various phases of a water resources study or project. The risk of environmental liability is the probability of the District acquiring a legal obligation to make future expenditures due to the past or ongoing manufacture, use, release, or threatened release of hazardous substances or other regulated contaminants (USEPA, 1998). Expenditures may include response costs, attorney's fees, indirect costs, damages to natural resources, and expenses indebted by way of tort suits. Possible phases of a water resources study or project may include reconnaissance; feasibility; engineering and design; land acquisition; construction; and operations and maintenance, repair, replacement, and rehabilitation. Information developed during each phase should provide the rationale for proceeding with the next phase of reporting or project implementation.

b. District Policy. The USACE Directorate of Civil Works states explicitly in ER 1165-2-132 that Civil Works project funds are not to be employed for HTRW-related activities except as stated below, or otherwise specifically provided in law. Therefore, construction of Civil Works projects, such as periodic channel maintenance dredging, in areas contaminated with regulatory action levels of HTRW should be avoided where practical. Where HTRW contaminated areas or impacts cannot be avoided, response actions must be acceptable to all applicable or relevant and appropriate requirements. Costs of HTRW-related activities such as environmental investigations to identify the potential existence of HTRW (Phase I ESAs), investigations incorporating environmental sampling to confirm the existence of HTRW (Phase IIA ESAs), site characterization to recognize the nature and extent of HTRW (Phase IIB ESAs), and studies required to evaluate alternatives to avoid HTRW will be cost shared the same as cost sharing for the phase the project is in, if applicable. Costs of HTRW response actions, including the removal and remediation of HTRW contamination to applicable or relevant and appropriate requirements, are the full responsibility of the local sponsor for all cost-shared projects and a project cost borne by the Department of the Army for all non-cost shared projects, except where another Federal agency is responsible for the HTRW. Funding arrangements and responsibilities for HTRW response actions involving Federally owned lands, including those administered by the Department of the Army, will be approved on an individual basis. All HTRW-related project costs borne by the Department of the Army will be part of any economic evaluation.

The Directorate of Civil Works Policy Guidance Letter 34 provides formal instruction for civil works projects on areas contaminated by other regulated contaminants. As advised in the guidance, the cost of any response action (mediation, treatment, handling, or disposal) required by applicable or relevant and appropriate requirements to reduce the risk of harm to human

health and the environment, will be included in the design and cost estimate as part of the project cost. ER 1165-2-132 indicates in such cases, the land value included in the economic analysis will be the fair market value of the land considering the contamination, and the cost of any response action will be a construction cost.

c. Federal Environmental Laws and Regulations. Environmental liability is a direct result of recent environmental laws and regulations. Two forms of environmental laws exist: statutory law and case law. Statutory law is a general law written by a legislative body, such as the United States Congress or State Legislature, and enacted by an executive body, such as the President of the United States or a State Governor. Some examples of federal statutory law which may convey environmental liability are: Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, as amended; Clean Air Act (CAA) of 1970, as amended; Federal Water Quality Improvement Act of 1970, as amended by the Federal Water Pollution Control Act Amendment (FWPCA) of 1972, predecessor to the Clean Water Act (CWA) of 1977, and other amendments; Resource Conservation and Recovery Act (RCRA) of 1976, as amended by the Hazardous Sold Waste Amendments (HSWA) and other amendments; Toxic Substance Control Act (TSCA) of 1976, as amended; Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA) and other amendments, in 1986 by the Emergency Planning and Community Right-to-Know Act (EPCRA), and in 1996 by the Lender Liability Law (LLL); Hazardous Materials Transportation Uniform Safety Act (HMTUSA) of 1990; Pollution Prevention Act (PPA) of 1990; and the Oil Pollution Act (OPA) of 1990.

Case law is created when a Federal, State, or Local judge interprets the meaning and intent of a statutory law and rules on a particular issue of the case. Case law can change rapidly and it can affect the interpretation of statutory laws, thereby creating instability on environmental liability risk assessments. Therefore, environmental professionals measure and manage the risk of environmental impact, whereas purchasers and their lawyers make business decisions based on risk tolerance.

The most far-reaching Federal statutory law that conveys environmental liability is CERCLA. CERCLA is strict, joint and several, and retroactive. Strict liability means that fault is not a prerequisite. Joint and several liability means that any of the potentially responsible parties (current or previous owners, operators, managers, or investors) in the lawsuit may be liable for the entire cost of the cleanup. Retroactive liability means that it does not matter when the pollutant was deposited on the property. It also does not matter if at the time the pollutant was released onto the property no laws were broken.

d. Environmental Due Diligence. There are only three allowable defenses to acquit potentially responsible parties of any environmental liability, as defined by CERCLA (42 USC 9601 and 9607 as amended by SARA): (1) Act of God, (2) Act of War, and (3) Act of a Third Party, otherwise known as the "innocent landowner defense." In order to qualify as an innocent landowner (Hejzlar, 1999), the purchaser must: (1) Acquire the site *after* the disposal or placement of hazardous substances on the property. (2) The purchaser did not know, nor had *no reason to know*, that any hazardous substances were present on the property. In order to establish that the purchaser had *no reason to know* about the contamination, the purchaser must: (1)

undertake *all appropriate inquiry* into the previous ownership and uses of the property, and (2) the appropriate inquiry is consistent with *good commercial and customary practice*. (Note: In lieu of proving *no reason to know*, the purchaser may qualify as an innocent landowner if they can establish, by preponderance of the evidence, that the property was acquired by eminent domain or inheritance.) An Environmental Due Diligence Audit, as defined by the USEPA, serves to meet *all appropriate inquiry*. American Society for Testing and Materials (ASTM) Standards describe the *good commercial and customary practice* for conducting the appropriate inquiry.

The ASTM standards do not address whether requirements in addition to an appropriate inquiry (42 USC 9607(b)(3)(a) and (b)) have been met in order to qualify for CERCLA's innocent landowner defense. In addition to providing proof of due diligence, a defendant must the establish by a preponderance of the evidence that (a) he exercised due care with respect to the hazardous substance concerned, taking into consideration the characteristics of such hazardous substance, in light of all relevant facts and circumstances, and (b) he took precautions against foreseeable acts or omissions of any such third party and the consequences that could result from such acts or omissions.

The USEPA recommends the use of a tiered Environmental Due Diligence Audit process to evaluate and manage the risk of environmental liability before leasing or purchasing a property (USEPA, 1998). This process is necessary in order to aid in minimizing or preventing Federal liability under CERCLA, and to reduce any threats to project workers and avoid costly delays associated with environmental abatement, correction, and/or remediation activities. This process reduces the risk of environmental liability by providing proof of due diligence to the court, as preponderance of the evidence, that the District is an "innocent landowner" and that "a third party" is responsible for any and all environmental liability.

Within the Department of the Army, an Environmental Due Diligence Audit is referred to as an Environmental Site Assessment (ESA). The ESA can involve three stages of investigation where Phase I is an initial reconnaissance assessment, Phase IIA is a project feasibility assessment that confirms the presence or absence of contaminants, and Phase IIB concluding the project feasibility assessment by determining the type, quantity, lateral and vertical extent of contamination in all affected media. Phase IIA and IIB assessments may occur in conjunction to expedite the investigation. American Society for Testing and Materials (ASTM) Standards E 1527 and E 1528 and other guidance documents provide a comprehensive guide for conducting Phase I ESAs. This Phase I ESA is based on a modified version of the ASTM E 1527 Phase I Environmental Site Assessments guidance and other appropriate assessment guidance such as the guidance on conducting Preliminary Assessments under CERCLA.

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APPENDIX B
REFERENCES AND ABSTRACTS

ASTM E 1527-05, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.

ASTM E 1528-06, Standard Practice for Environmental Site Assessments: Transaction Screen Process.

Environmental Data Resources, Inc. The EDR Area Study Report- Pool 12 Overwintering EMP, July 2002

U. S. Army Corps of Engineers, Rock Island District, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste Guidance for Civil Works Projects, 26 June 1992.

U. S. Army Corps of Engineers, ER 405-1-12, Real Estate Handbook, Chapter 8.

U. S. Army Corps of Engineers, Policy Guidance Letter No. 34, CECW-PA, Non-CERCLA Regulated Contaminated Materials at Civil Works Projects, 5 May 1992.

U. S. Army Corps of Engineers, ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OEW) Activities, 18 March 1994.

U. S. Army Corps of Engineers, ER 500-1-1, Natural Disaster Procedures.

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APPENDIX C

ENVIRONMENTAL DATA RESOURCES HISTORICAL TOPOGRAPHIC MAP REPORT AND AREA STUDY REPORT

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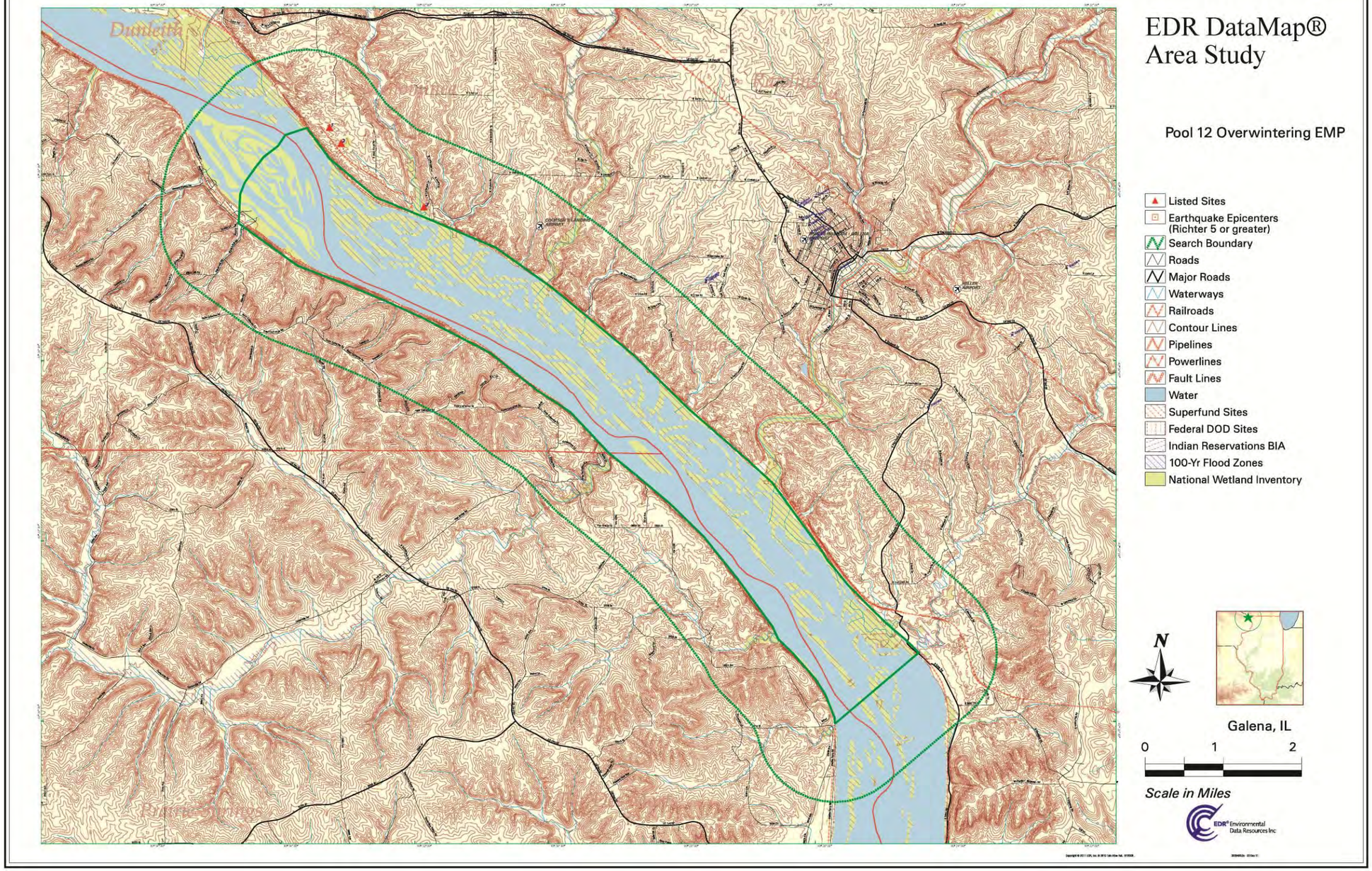

Figure C-1. Environmental Data Resources Map illustrating facilities located within a one-mile search radius of project sites.

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Pool 12 Overwintering EMP
Galena, IL 61036

Inquiry Number: 3229493.2s
December 23, 2011

EDR DataMap™ Area Study

Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

TARGET PROPERTY INFORMATION

ADDRESS

GALENA, IL 61036
GALENA, IL 61036

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records within the requested search area for the following databases:

FEDERAL RECORDS

NPL	National Priority List
Proposed NPL	Proposed National Priority List Sites
Delisted NPL	National Priority List Deletions
NPL LIENS	Federal Superfund Liens
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP	CERCLIS No Further Remedial Action Planned
LIENS 2	CERCLA Lien Information
CORRACTS	Corrective Action Report
RCRA-TSDF	RCRA - Treatment, Storage and Disposal
RCRA-LQG	RCRA - Large Quantity Generators
RCRA-SQG	RCRA - Small Quantity Generators
RCRA-CESQG	RCRA - Conditionally Exempt Small Quantity Generator
RCRA-NonGen	RCRA - Non Generators
US ENG CONTROLS	Engineering Controls Sites List
US INST CONTROL	Sites with Institutional Controls
ERNS	Emergency Response Notification System
HMIRS	Hazardous Materials Information Reporting System
DOT OPS	Incident and Accident Data
US CDL	Clandestine Drug Labs
US BROWNFIELDS	A Listing of Brownfields Sites
DOD	Department of Defense Sites
FUDS	Formerly Used Defense Sites
LUCIS	Land Use Control Information System
CONSENT	Superfund (CERCLA) Consent Decrees
ROD	Records Of Decision
UMTRA	Uranium Mill Tailings Sites
ODI	Open Dump Inventory
DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations
MINES	Mines Master Index File
TRIS	Toxic Chemical Release Inventory System
TSCA	Toxic Substances Control Act
FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing
SSTS	Section 7 Tracking Systems

EXECUTIVE SUMMARY

ICIS ---- Integrated Compliance Information System
PADS ---- PCB Activity Database System
MLTS ---- Material Licensing Tracking System
RADINFO ---- Radiation Information Database
FINDS ---- Facility Index System/Facility Registry System
RAATS ---- RCRA Administrative Action Tracking System
SCRD DRYCLEANERS ---- State Coalition for Remediation of Drycleaners Listing
FEMA UST ---- Underground Storage Tank Listing
FEDERAL FACILITY ---- Federal Facility Site Information listing
PCB TRANSFORMER ---- PCB Transformer Registration Database
COAL ASH EPA ---- Coal Combustion Residues Surface Impoundments List
US HIST CDL ---- National Clandestine Laboratory Register
COAL ASH DOE ---- Sleam-Electric Plan Operation Data

STATE AND LOCAL RECORDS

IL SSU ---- State Sites Unit Listing
IA SHWS ---- Registry of Hazardous Waste or Hazardous Substance Disposal Sites
IA ALLSITES ---- Contaminated Sites Tracking Database
IL SWF/LF ---- Available Disposal for Solid Waste in Illinois - Solid Waste Landfills Subject to State Surcharge
IA SWF/LF ---- Permitted Solid Waste Management Facilities
IL NPDES ---- A Listing of Active Permits
IL UIC ---- Underground Injection Wells
IL NIPC ---- Solid Waste Landfill Inventory
IL LF SPECIAL WASTE ---- Special Waste Site List
IA LUST ---- Leaking Underground Storage Tank Data
IL LUST TRUST ---- Underground Storage Tank Fund Payment Priority List
IA HIST LUST ---- Leaking Underground Storage Tank Database
IA UST ---- Underground Storage Tank Data
IA LAST ---- Leaking Aboveground Storage Tank Sites
IA LIENS ---- Liens Filed Listing
IA AST ---- Aboveground Storage Tank Sites
IA DEL SHWS ---- Delisted Contaminated Sites Listing
IL SPILLS ---- State spills
IA SPILLS ---- Spills Database
IL ENG CONTROLS ---- Sites with Engineering Controls
IL INST CONTROL ---- Institutional Controls
IA INST CONTROL ---- Sites with Institutional Controls
IL SRP ---- Site Remediation Program Database
IA VCP ---- Land Recycling Program Sites
IL DRYCLEANERS ---- Illinois Licensed Drycleaners
IA DRYCLEANERS ---- Iowa Drycleaner List
IL BROWNFIELDS ---- Municipal Brownfields Redevelopment Grant Program Project Descriptions
IA BROWNFIELDS ---- Brownfields Site Listing
IL CDL ---- Meth Drug Lab Site Listing
IA NPDES ---- List of NPDES Permittees
IL AIRS ---- AIRS
IA AIRS ---- Minor and Title V Sources Listing
IL TIER 2 ---- Tier 2 Information Listing
IA TIER 2 ---- Tier 2 Information Listing
IL PIMW ---- Potentially Infectious Medical Waste
IL CCDD ---- Clean Construction or Demolition Debris

TRIBAL RECORDS

INDIAN RESERV ---- Indian Reservations

EXECUTIVE SUMMARY

INDIAN ODI ---------- Report on the Status of Open Dumps on Indian Lands
INDIAN LUST ---------- Leaking Underground Storage Tanks on Indian Land
INDIAN UST ---------- Underground Storage Tanks on Indian Land
INDIAN VCP ---------- Voluntary Cleanup Priority Listing

EDR PROPRIETARY RECORDS

Manufactured Gas Plants ---- EDR Proprietary Manufactured Gas Plants

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STATE AND LOCAL RECORDS

IL LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the Illinois Environmental Protection Agency's LUST Incident Report.

A review of the IL LUST list, as provided by EDR, and dated 10/25/2011 has revealed that there are 3 IL LUST sites within the searched area.

Site	Address	Map ID	Page
ROYSTER-CLARK, INC. NFA/NFR Letter: 03/21/1994	***16675 US RTE 20 WEST***	***1***	***4***
PRAXAIR NFA/NFR Letter: 06/22/2000	16675 U.S. 20 WEST	1	5
GALENA TERRITORY ASSOC NFA/NFR Letter: 06/25/1997	***100 MARINA DR***	***3***	***6***

IL UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the Illinois State Fire Marshal's STC Facility List.

A review of the IL UST list, as provided by EDR, and dated 10/31/2011 has revealed that there is 1 IL UST site within the searched area.

Site	Address	Map ID	Page
ROYSTER-CLARK, INC.	***16675 US RTE 20 WEST***	***1***	***4***

EXECUTIVE SUMMARY

IL HWAR: Each year, Illinois hazardous-waste generators tell the Illinois EPA the amounts and kinds of hazardous waste they produced during the previous year. Generators indicate by code the types of wastes produced and the steps they took to manage these wastes. If some or all of these wastes were sent to commercial treatment, storage, and disposal facilities (TSDFs), that information and the identity of each receiving facility also are submitted. Illinois TSDFs likewise report the types and quantities of wastes received from in-state and out-of-state generators; they also report the procedures they used to manage these wastes.

A review of the IL HWAR list, as provided by EDR, and dated 12/31/2009 has revealed that there is 1 IL HWAR site within the searched area.

Site	Address	Map ID	Page
GALENA TERRITORY ASSOC	***100 MARINA DR***	***3***	***6***

IL IMPDMENT: Statewide inventory of industrial, municipal, mining, oil & gas , and large agricultural impoundment. This study was conducted by the Illinois EPA to assess potentail for contamination of shallow aquifers. This was a one-time study.Although many of the impoundments may no longer be present, the sites may be contaminated.

A review of the IL IMPDMENT list, as provided by EDR, and dated 12/31/1980 has revealed that there is 1 IL IMPDMENT site within the searched area.

Site	Address	Map ID	Page
N-REN CORP-ST PAUL AMMONIA PRO		2	5

EXECUTIVE SUMMARY

Please refer to the end of the findings report for unmapped orphan sites due to poor or inadequate address information.

MAP FINDINGS SUMMARY

Database	Total Plotted
FEDERAL RECORDS	
NPL	0
Proposed NPL	0
Delisted NPL	0
NPL LIENS	0
CERCLIS	0
CERC-NFRAP	0
LIENS 2	0
CORRACTS	0
RCRA-TSDF	0
RCRA-LQG	0
RCRA-SQG	0
RCRA-CESQG	0
RCRA-NonGen	0
US ENG CONTROLS	0
US INST CONTROL	0
ERNS	0
HMIRS	0
DOT OPS	0
US CDL	0
US BROWNFIELDS	0
DOD	0
FUDS	0
LUCIS	0
CONSENT	0
ROD	0
UMTRA	0
ODI	0
DEBRIS REGION 9	0
MINES	0
TRIS	0
TSCA	0
FTTS	0
HIST FTTS	0
SSTS	0
ICIS	0
PADS	0
MLTS	0
RADINFO	0
FINDS	0
RAATS	0
SCRD DRYCLEANERS	0
FEMA UST	0
FEDERAL FACILITY	0
PCB TRANSFORMER	0
COAL ASH EPA	0
US HIST CDL	0
COAL ASH DOE	0
STATE AND LOCAL RECORDS	
IL SSU	0

MAP FINDINGS SUMMARY

Database	Total Plotted
IA SHWS	0
IA ALLSITES	0
IL SWF/LF	0
IA SWF/LF	0
IL NPDES	0
IL UIC	0
IL NIPC	0
IL LF SPECIAL WASTE	0
IL LUST	3
IA LUST	0
IL LUST TRUST	0
IA HIST LUST	0
IL UST	1
IA UST	0
IA LAST	0
IA LIENS	0
IA AST	0
IA DEL SHWS	0
IL HWAR	1
IL SPILLS	0
IA SPILLS	0
IL ENG CONTROLS	0
IL INST CONTROL	0
IA INST CONTROL	0
IL SRP	0
IA VCP	0
IL DRYCLEANERS	0
IA DRYCLEANERS	0
IL IMPDMENT	1
IL BROWNFIELDS	0
IA BROWNFIELDS	0
IL CDL	0
IA NPDES	0
IL AIRS	0
IA AIRS	0
IL TIER 2	0
IA TIER 2	0
IL PIMW	0
IL CCDD	0

TRIBAL RECORDS

INDIAN RESERV	0
INDIAN ODI	0
INDIAN LUST	0
INDIAN UST	0
INDIAN VCP	0

EDR PROPRIETARY RECORDS

Manufactured Gas Plants	0

MAP FINDINGS SUMMARY

Database	Total Plotted

NOTES:

Sites may be listed in more than one database

1 **ROYSTER-CLARK, INC.** **IL LUST** **U000784932**
16675 US RTE 20 WEST **IL UST** **N/A**
EAST DUBUQUE, IL 61025

LUST:

Incident Num:	922365
IL EPA Id:	0850105002
Product:	Non Petro
IEMA Date:	08/26/1992
Project Manager:	Wallace
Project Manager Phone:	(217) 524-1283
Email:	Donna.Wallace@illinois.gov
PRP Name:	Phoenix Chemical Co.
PRP Contact:	William Stampe
PRP Address:	Box 229
PRP City,St,Zip:	East Dubuque, IL 61025
PRP Phone:	Not reported
Site Classification:	Not reported
Section 57.5(g) Letter:	731
Non LUST Determination Letter:	Not reported
20 Report Received:	09/18/1992
45 Report Received:	10/23/1992
Section 57.5(g) Letter:	Not reported
NFA/NFR Letter:	**03/21/1994**
NFR Date Recorded:	Not reported

UST:

Facility ID:	1009346
Facility Status:	CLOSED
Facility Type:	**INDUSTRIAL / MANUFACTURING**
Owner Name:	Praxair, Inc.
Owner Id:	U0027671
Owner Address:	11499 Courthouse Blvd.
Owner City,St,Zip:	Dakota, MN 55077
Tank Number:	1
Tank Capacity:	10000
Tank Substance:	Diesel Fuel
Last Used Date:	Not reported
OSFM First Notify Date:	05/02/1986
Tank Status:	**Removed**
Red Tag Issue Date:	Not reported
Install Date:	Not reported
Green Tag Decal:	**A000021**
Green Tag Issue Date:	**8/18/1999**
Green Tag Expire Date:	**12/31/2002**
Self Service Permit Inspection Date:	**Not reported**
Self Service Permit Expire Date:	**Not reported**
Fee Due:	No
Tank Number:	2
Tank Capacity:	10000
Tank Substance:	Diesel Fuel
Last Used Date:	07/12/2002
OSFM First Notify Date:	07/26/1999
Tank Status:	**Removed**
Red Tag Issue Date:	Not reported
Install Date:	07/01/1999

ROYSTER-CLARK, INC. (Continued) **U000784932**

Green Tag Decal:	**A000021**
Green Tag Issue Date:	**8/18/1999**
Green Tag Expire Date:	**12/31/2002**
Self Service Permit Inspection Date:	**Not reported**
Self Service Permit Expire Date:	**Not reported**
Fee Due:	No

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1 **PRAXAIR** **IL LUST** **S104529223**
16675 U.S. 20 WEST **N/A**
EAST DUBUQUE, IL 61025

LUST:

Incident Num:	982842
IL EPA Id:	0850105002
Product:	Deisel
IEMA Date:	11/17/1998
Project Manager:	Heaton
Project Manager Phone:	(217) 524-3312
Email:	Mike.Heaton@illinois.gov
PRP Name:	Praxair
PRP Contact:	Scott Harvey
PRP Address:	1225 South Front St.
PRP City,St,Zip:	Pekin, IL 61554
PRP Phone:	3093475575
Site Classification:	Not reported
Section 57.5(g) Letter:	732
Non LUST Determination Letter:	Not reported
20 Report Received:	03/02/1999
45 Report Received:	01/18/2000
Section 57.5(g) Letter:	Not reported
NFA/NFR Letter:	**06/22/2000**
NFR Date Recorded:	09/11/2000

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2 **N-REN CORP-ST PAUL AMMONIA PROD DIV** **IL IMPDMENT** **S105250494**
N/A

, IL

SIA:

Area:	0.00000000000
Perimeter:	0.00000000000
County FIPS Code:	085
Place Code:	21683
Type of Impoundment Facility:	INDUSTRIAL
SIA Number:	00313
# of impoundments at Site:	003
IEPA ID:	0
NPDES Permit #:	IL0003930
SIC Code 2:	2873
Latitude:	422620
Longitude:	0903314
Date Facility Id'd and Inventoried:	41279
Land owner street address:	APPLE RIVER CHEM DIV P O BOX D
Land Owner City,St,Zip:	EAST DUBUQUE, IL 61025
Operator of impoundment:	Not reported
Operator address:	Not reported
Operator City,St,Zip:	0

N-REN CORP-ST PAUL AMMONIA PROD DIV (Continued) **S105250494**

State Abbreviation:	IL
County FIPS Code:	085
Place Code:	21683
Type of Impoundment Facility 2:	INDUSTRIAL
SIA Number:	00313
Unique impoundment Number:	003
Purpose For Impoundment:	TREATMENT
Explanation For Above:	SETTLING
Age of Impoundment in Years:	02
Impoundment Currently In Use:	Yes
# of years in Operation if In Use:	02
Unique Record # assigned by S. Schock:	P0357
Last Year of Operation if Not in Use:	0000
Surface Area of all impoundments (acres):	000300
Surface Area of all impoundments (acres):	0000900
Average Influent (Gal/day) Into Impoundment:	000000000
Year of Record for above (influent) average:	0000
Average Effluent (gal/day) out of impoundment:	000000000
Year of record for above (effluent) average:	0000
Year of record for above average:	000000000
Year of record for above average:	0000
Avg Effluent for all Impoundments at facility:	000000000
Year of Record for above Average:	0000
Bottom of Liner:	NONE
If Liner Type ?? Above, Thickness (inches):	000
Description of Liner Type If ?? Above:	Not reported
If Agricultural Impoundment, Type of Livestock:	Not reported
If Agricultural Impoundment, Average Daily # Livestock:	000000
Number of Monitoring Wells:	00
Frequency Of Groundwater Samplings:	Not reported
Explanation Of GW Sampling if Other:	Not reported
GW Quality Changes Detected:	Not reported
Seepage Affected Drnk Water Wells Within 1 Mile:	UNKNOWN
Site Features:	DL
Dun and Bradst # Identifying Facility Type 2:	052436003
Dun and Bradst # Identifying Operator Business 2:	Not reported
Dun and Bradst # Identifying Facility Type 2:	052436003
Dun and Bradst # Identifying Operator Business 2:	Not reported
SIC Code 2:	2873

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3 **GALENA TERRITORY ASSOC** **IL LUST** **S104003463**
100 MARINA DR **IL HWAR** **N/A**
GALENA, IL 61036

LUST:

Incident Num:	961865
IL EPA Id:	0850205028
Product:	Gasoline
IEMA Date:	10/09/1996
Project Manager:	Wallace
Project Manager Phone:	(217) 524-1283
Email:	Donna.Wallace@illinois.gov
PRP Name:	Galena Territory Assoc. Inc.
PRP Contact:	David Oldendurg
PRP Address:	2000 Territory Dr.
PRP City,St,Zip:	Galena, IL 61036
PRP Phone:	Not reported
Site Classification:	Not reported

GALENA TERRITORY ASSOC (Continued) **S104003463**

Section 57.5(g) Letter:	732
Non LUST Determination Letter:	Not reported
20 Report Received:	11/12/1996
45 Report Received:	01/21/1997
Section 57.5(g) Letter:	Not reported
NFA/NFR Letter:	**06/25/1997**
NFR Date Recorded:	07/23/1997

HWAR:

Location Telephone Number:	8157772000
Location Contact Name:	DAVID OLDENDURG
Latitude Decimal Degrees (Assumed Nn.Nnnnnn):	42437400
Longitude In Decimal Degrees (Assumed Decimal):	090325900
Owner Or Alternate Company Name:	GALENA TERRITORY ASSOC
Owner Or Alternate Street Address:	2000 TERRITORY DR
Owner Or Alternate Post Office Box:	Not reported
Owner Or Alternate City:	GALENA
Owner Or Alternate State:	IL
Owner Or Alternate Zip Code:	61036
Owner Or Alternate Telephone Number:	8157772000
Owner Or Alternate Contact Name:	DAVID OLDENDURG
Operator Or Alternate Company Name:	GALENA TERRITORY ASSOC
Operator Or Alternate Street Address:	2000 TERRITORY DR
Operator Or Alternate Post Office Box:	Not reported
Operator Or Alternate City:	GALENA
Operator Or Alternate State:	IL
Operator Or Alternate Zip Code:	61036
Operator Or Alternate Telephone Number:	8157772000
Operator Or Alternate Contact Name:	DAVID OLDENDURG
Secondary Or Alternate Usepa Identification Number:	Not reported
Standard Industrial Classification Code:	Not reported
Primary NAIC System Code:	Not reported
Secondary NAIC System Code:	Not reported
Haz Waste Large Quantity Generator Ind (H/Historic, 0-9 Year Latest Report, E Last Report > 10 Yrs):	Not reported
Haz Waste Small Quantity Generator(or Smaller) Ind (as above):	Not reported
Nonhazardous Waste Generator Ind (as above):	E
Compost Annual Reort Ind (as above):	Not reported
Landfill Annual Report Ind (as above):	Not reported
Potentially Infectious Medical Waste Annual Report Ind (as above):	Not reported
Haz Waste Permit Ind (S Indicates Activity):	Not reported
Solid Waste Permit Ind (S Indicates Activity):	Not reported
Used Tire Program Activity Ind (S Indicates Activity):	Not reported
Compliance Order Tracking Activity Ind (S Indicates Activity):	Not reported
Facility Compliance Tracking System Activity Ind (S Indicates Activity):	Not reported
Ind Of Groundwater Data In Mainframe Groundwater System (S Indicates Activity):	Not reported
Lust Program Activity Ind (S Indicates Activity):	S
Lust Reimbursement Program Activity Ind (S Indicates Activity):	Not reported
Site Remediation Program Activity Ind (S Indicates Activity):	Not reported
FSRS Activity Ind (S Indicates Activity):	Not reported
State Response Action Activity Ind (S Indicates Activity):	Not reported
Name And Address Change Date:	12/10/02
Hazardous Annual Report Company Name:	Not reported
Hazardous Annual Report Street Address:	Not reported
Hazardous Annual Report Post Office Box:	Not reported
Hazardous Annual Report City:	Not reported
Hazardous Annual Report State:	Not reported
Hazardous Annual Report Zip Code:	Not reported

GALENA TERRITORY ASSOC (Continued) **S104003463**

Hazardous Annual Report Telephone Number:	Not reported
Hazardous Annual Report Contact First Name:	Not reported
Hazardous Annual Report Contact Last Name:	Not reported
Hazardous Annual Report Contact Person Title Code:	Not reported
Hazardous Annual Report New Notifier Code:	Not reported
FIPS Country Code:	001
FIPS State Code:	17
FIPS County Code:	085
FIPS City Or Township Code:	020
IEPA Region Identifier:	1
Original Entry Date:	10/18/96
Change Date:	02/07/11
Primary USEPA Identification Number:	Not reported
Status:	Not reported
Code:	BP
Total Tanks:	Not reported

Count: 19 records

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
BELLEVUE	U003639419	JOHN HOFF	RT 1	52031	IA UST
BELLEVUE	U003638665	LEON TEBBE	RT 1	52031	IA UST
BELLEVUE	1011282304	JOSEPH A SCHAEFER	RT 2	52031	FINDS, IA UST
BELLEVUE	1004689293	ENSIGN COIL CO-SEE ENSIGN CORP	HWY 52 N	52031	RCRA-NonGen, FINDS
BELLEVUE	U003935337	LOCK AND DAM 12	LOCK	52031	IA UST
BELLEVUE	1011289125	LOCK AND DAM 12	LOCK AND DAM	52031	FINDS
BELLEVUE	92293621	POOL 13 SOUTH OF LOCK 12 SHEEN BETWEEN MILE 556 AND 549	POOL 13 SOUTH OF LOCK 12 SHEEN BETWEEN MILE 556 AND 549	52031	ERNS
EAST DUBUQUE	1003870103	N-REN CORP E DUBUQUE PLT ST PAUL AMMONIA	HWY 20 4MI S OF EAST DUBUQUE	61025	CERC-NFRAP
EAST DUBUQUE	1004692661	KIEFER BODY SHOP INC	20100 RT 20W	61025	RCRA-CESQG, FINDS, WI MANIFEST
EAST DUBUQUE	1011861968	LANGE SIGN GROUP	1780 RTE 35 N	61025	RCRA-CESQG
EAST DUBUQUE	U001136591	MENOMINEE FIRE STATION	MENOMINEE VLG	61025	IL UST
GALENA	1012209937	BAUTSCH GRAY MINE SITE	1000 N. BLACKJACT ROAD	61036	CERCLIS
GALENA	S108110630	ALLENDORF, KENNETH H	GEAR ST	61036	IL SWF/LF
GALENA	S108112696	PHILLIPS, LLOYD	GEAR ST	61036	IL SWF/LF
GALENA	1008122542	MONTGOMERY LANDFILL	648 PILOT KNOB RD	61036	FINDS, IL SWF/LF, IL HWAR
GALENA	U001136604	TOOL HOUSE	N SAINT ADDRESS PROVIDED	61036	IL UST
GALENA	S108111598	GRONNER, FRANK	SPRING ST	61036	IL SWF/LF
GALENA	1004693615	ILDOT DIV OF HIGHWAYS	114 M W OF IL RTE 84 N HIGH	61036	RCRA-NonGen, FINDS
HANOVER	U000859176	ZEALS SER GARAGE	RT 84 S	61036	IL UST

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

FEDERAL RECORDS

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 06/30/2011
Date Data Arrived at EDR: 07/12/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 79

Source: EPA
Telephone: N/A
Last EDR Contact: 10/12/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 06/30/2011
Date Data Arrived at EDR: 07/12/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 79

Source: EPA
Telephone: N/A
Last EDR Contact: 10/12/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Quarterly

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 06/30/2011
Date Data Arrived at EDR: 07/12/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 79

Source: EPA
Telephone: N/A
Last EDR Contact: 10/12/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/25/2011
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 62

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 11/29/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Quarterly

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 02/25/2011
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 62

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 11/29/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Quarterly

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 09/09/2011
Date Data Arrived at EDR: 09/16/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 03/09/2011
Date Data Arrived at EDR: 03/15/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 91

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 11/14/2011
Next Scheduled EDR Contact: 02/27/2012
Data Release Frequency: Quarterly

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 06/15/2011
Date Data Arrived at EDR: 07/07/2011
Date Made Active in Reports: 08/08/2011
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 312-886-6186
Last EDR Contact: 10/05/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Quarterly

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 06/15/2011
Date Data Arrived at EDR: 07/07/2011
Date Made Active in Reports: 08/08/2011
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 312-886-6186
Last EDR Contact: 10/05/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 06/15/2011
Date Data Arrived at EDR: 07/07/2011
Date Made Active in Reports: 08/08/2011
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 312-886-6186
Last EDR Contact: 10/05/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 06/15/2011
Date Data Arrived at EDR: 07/07/2011
Date Made Active in Reports: 08/08/2011
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 312-886-6186
Last EDR Contact: 10/05/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Varies

RCRA-NonGen: RCRA - Non Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 06/15/2011
Date Data Arrived at EDR: 07/07/2011
Date Made Active in Reports: 08/08/2011
Number of Days to Update: 32

Source: Environmental Protection Agency
Telephone: 312-886-6186
Last EDR Contact: 10/05/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 03/16/2011
Date Data Arrived at EDR: 03/25/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 81

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 03/16/2011
Date Data Arrived at EDR: 03/25/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 81

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Varies

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 10/03/2011
Date Data Arrived at EDR: 10/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 38

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 10/04/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Annually

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 10/04/2011
Date Data Arrived at EDR: 10/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 38

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 10/04/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Annually

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/29/2011
Date Data Arrived at EDR: 08/09/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 94

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 11/08/2011
Next Scheduled EDR Contact: 02/20/2012
Data Release Frequency: Varies

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 06/08/2011
Date Data Arrived at EDR: 09/16/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 13

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 12/05/2011
Next Scheduled EDR Contact: 03/19/2012
Data Release Frequency: Quarterly

US BROWNFIELDS: A Listing of Brownfields Sites

Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become Brownfields Cleanup Revolving Loan Fund (BCRLF) cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: 06/27/2011
Date Data Arrived at EDR: 06/27/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 78

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 09/28/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: Semi-Annually

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 10/20/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 08/12/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 112

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 11/22/2011
Next Scheduled EDR Contact: 03/05/2012
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 06/01/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 41

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 10/03/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Varies

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 07/31/2011
Date Data Arrived at EDR: 09/14/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 15

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 12/14/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/21/2010
Date Made Active in Reports: 01/28/2011
Number of Days to Update: 99

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 11/29/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 12/21/2011
Next Scheduled EDR Contact: 04/09/2012
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 21

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 12/07/2011
Next Scheduled EDR Contact: 03/19/2012
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/17/2010
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 94

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 12/02/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 09/27/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing

A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing

A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System

The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 01/07/2011
Date Data Arrived at EDR: 01/21/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 59

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 12/21/2011
Next Scheduled EDR Contact: 04/09/2012
Data Release Frequency: Quarterly

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/01/2010
Date Data Arrived at EDR: 11/10/2010
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 98

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 10/19/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/21/2011
Date Data Arrived at EDR: 07/15/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 60

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 12/12/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/11/2011
Date Data Arrived at EDR: 01/13/2011
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 34

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 10/13/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/14/2010
Date Data Arrived at EDR: 04/16/2010
Date Made Active in Reports: 05/27/2010
Number of Days to Update: 41

Source: EPA
Telephone: (312) 353-2000
Last EDR Contact: 12/13/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 62

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 11/30/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Biennially

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010
Date Data Arrived at EDR: 01/03/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 12/08/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 01/01/2008
Date Data Arrived at EDR: 02/18/2009
Date Made Active in Reports: 05/29/2009
Number of Days to Update: 100
Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 11/04/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

FEDERAL FACILITY: Federal Facility Site Information listing
A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 12/10/2010
Date Data Arrived at EDR: 01/11/2011
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 36
Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 10/14/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76
Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 12/08/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Varies

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55
Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 10/17/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Varies

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54
Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 10/24/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Varies

STATE AND LOCAL RECORDS

IL SSU: State Sites Unit Listing
The State Response Action Program database identifies the status of all sites under the responsibility of the Illinois EPA's State Sites Unit.

Date of Government Version: 08/16/2011
Date Data Arrived at EDR: 08/23/2011
Date Made Active in Reports: 09/30/2011
Number of Days to Update: 38
Source: Illinois Environmental Protection Agency
Telephone: 217-524-4826
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Semi-Annually

IA SHWS: Registry of Hazardous Waste or Hazardous Substance Disposal Sites

State Hazardous Waste Sites. State hazardous waste site records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. Available information varies by state.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 03/01/2011
Date Made Active in Reports: 03/28/2011
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: 515-281-8801
Last EDR Contact: 10/24/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Annually

IA ALLSITES: Contaminated Sites Tracking Database

All the sites included in the Contaminated Sites Tracking Database. The database includes several regulatory complinace programs and actions.

Date of Government Version: 07/21/2011
Date Data Arrived at EDR: 07/22/2011
Date Made Active in Reports: 08/12/2011
Number of Days to Update: 21

Source: Department of Natural Resources
Telephone: 515-281-4171
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Quarterly

IL SWF/LF: Available Disposal for Solid Waste in Illinois - Solid Waste Landfills Subject to State Surcharge

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 05/17/2011
Date Made Active in Reports: 05/27/2011
Number of Days to Update: 10

Source: Illinois Environmental Protection Agency
Telephone: 217-785-8604
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Annually

IL LF WMRC: Waste Management & Research Center Landfill Database

The Waste Management & Research Center Landfill Database includes records from the Department of Public Health, Department of Mines & Minerals, Illinois Environmental Protection Agency, State Geological Survey, Northeastern Illinois Planning Commission and Pollution Control Board.

Date of Government Version: 12/31/2001
Date Data Arrived at EDR: 10/06/2006
Date Made Active in Reports: 11/06/2006
Number of Days to Update: 31

Source: Department of Natural Resources
Telephone: 217-333-8940
Last EDR Contact: 09/18/2009
Next Scheduled EDR Contact: 12/28/2009
Data Release Frequency: No Update Planned

IA SWF/LF: Permitted Solid Waste Management Facilities

Solid Waste Facilities/Landfill Sites. SWF/LF type records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. Depending on the state, these may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 10/19/2011
Number of Days to Update: 36

Source: Department of Natural Resources
Telephone: 515-281-8801
Last EDR Contact: 12/13/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

IL NPDES: A Listing of Active Permits

A listing of facilities currently active in the state. The types of permits are public, private, federal and state.

Date of Government Version: 07/12/2011
Date Data Arrived at EDR: 07/12/2011
Date Made Active in Reports: 08/05/2011
Number of Days to Update: 24

Source: Illinois EPA
Telephone: 217-782-0610
Last EDR Contact: 11/08/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Varies

IL UIC: Underground Injection Wells

Injection wells are used for disposal of fluids by "injection" into the subsurface. The construction of injection wells range from very technical designs with twenty-four hour monitoring to simply a hole dug in the ground to control runoff. As a result of this diversity, the UIC Program divides injection wells into five different classes.

Date of Government Version: 09/15/2011
Date Data Arrived at EDR: 09/20/2011
Date Made Active in Reports: 10/04/2011
Number of Days to Update: 14

Source: Illinois EPA
Telephone: 217-782-9878
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Varies

IL NIPC: Solid Waste Landfill Inventory

Solid Waste Landfill Inventory. NIPC is an inventory of active and inactive solid waste disposal sites, based on state, local government and historical archive data. Included are numerous sites which previously had never been identified largely because there was no obligation to register such sites prior to 1971.

Date of Government Version: 08/01/1988
Date Data Arrived at EDR: 08/01/1994
Date Made Active in Reports: 08/12/1994
Number of Days to Update: 11

Source: Northeastern Illinois Planning Commission
Telephone: 312-454-0400
Last EDR Contact: 05/23/2006
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IL LF SPECIAL WASTE: Special Waste Site List

These landfills, as of January 1, 1990, accept non-hazardous special waste pursuant to the Illinois EPA Non-Hazardous Special Waste Definition. List A includes landfills that may receive any non-hazardous waste, Non-Regional Pollution Control Facilities are so noted. List B includes landfills designed to receive specific non-hazardous wastes. List B landfills are designated as a Regional Pollution Control Facility by RPCF, or Non-Regional Pollution Control Facility by Non-RPCF.

Date of Government Version: 01/01/1990
Date Data Arrived at EDR: 06/17/2009
Date Made Active in Reports: 07/15/2009
Number of Days to Update: 28

Source: Illinois EPA
Telephone: 217-782-9288
Last EDR Contact: 06/10/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IL LUST: Leaking Underground Storage Tank Sites

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 10/25/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 29

Source: Illinois Environmental Protection Agency
Telephone: 217-782-6762
Last EDR Contact: 12/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Semi-Annually

IA LUST: Leaking Underground Storage Tank Data

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 09/27/2011
Date Data Arrived at EDR: 11/16/2011
Date Made Active in Reports: 11/28/2011
Number of Days to Update: 12

Source: Department of Natural Resources
Telephone: 515-281-6001
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

IL LUST TRUST: Underground Storage Tank Fund Payment Prioirty List

In case sufficient funds are not available in the Underground Storage Tank Fund, requests for payment are entered on the Payment Priority List by "queue date" order. As required by the Environmental Protection Act, the queue date is the date that a complete request for partial or final payment was received by the Agency. The queue date is "officially" confirmed at the end of the payment review process when a Final Decision Letter is sent to the site owner.

Date of Government Version: 10/21/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 29

Source: Illinois EPA
Telephone: 217-782-6762
Last EDR Contact: 12/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

IA HIST LUST: Leaking Underground Storage Tank Database

A listing of leaking underground storage tank site locations with detailed information. The information is from the UST System Database which is no longer updated or current. It has been replaced by the LUST listing.

Date of Government Version: 05/03/2007
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 05/27/2009
Number of Days to Update: 20

Source: Department of Natural Resources
Telephone: 515-242-5818
Last EDR Contact: 04/13/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IL UST: Underground Storage Tank Facility List

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 10/31/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 29

Source: Illinois State Fire Marshal
Telephone: 217-785-0969
Last EDR Contact: 11/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

IA UST: Underground Storage Tank Data

Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

Date of Government Version: 09/27/2011
Date Data Arrived at EDR: 10/04/2011
Date Made Active in Reports: 10/31/2011
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: 515-281-6001
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

IA LAST: Leaking Aboveground Storage Tank Sites

A listing of leaking aboveground storage tank sites.

Date of Government Version: 10/02/2007
Date Data Arrived at EDR: 10/10/2007
Date Made Active in Reports: 12/04/2007
Number of Days to Update: 55

Source: Department of Natural Resources
Telephone: 515-281-6001
Last EDR Contact: 12/09/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Quarterly

IA LIENS: Liens Filed Listing

A listing of liens filed with the Iowa Comprehensive Petroleum Underground Storage Tank Fund.

Date of Government Version: 11/14/2011
Date Data Arrived at EDR: 11/15/2011
Date Made Active in Reports: 12/08/2011
Number of Days to Update: 23

Source: Department of Natural Resources
Telephone: 515-281-5523
Last EDR Contact: 11/14/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

IA AST: Aboveground Storage Tank Sites

Bulk fuel facilities, commercial fuel operations, private farm sites, and any other storage facility that meets the Department of Public Safety?s registration criteria. They register any class I, II or III petroleum product (gas, diesel and oil) above 1,100 gallons.

Date of Government Version: 10/24/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 12/08/2011
Number of Days to Update: 44

Source: Department of Public Safety
Telephone: 515-281-5821
Last EDR Contact: 12/21/2011
Next Scheduled EDR Contact: 04/09/2012
Data Release Frequency: Varies

IA DEL SHWS: Delisted Contaminated Sites Listing

A listing of sites delisted from the Contaminated Sites Listing.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 02/25/2011
Date Made Active in Reports: 03/28/2011
Number of Days to Update: 31

Source: Department of Natural Resources
Telephone: 515-281-8801
Last EDR Contact: 10/24/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Annually

IL HWAR: Hazard Waste Annual Report

Each year, Illinois hazardous-waste generators tell the Illinois EPA the amounts and kinds of hazardous waste they produced during the previous year. Generators indicate by code the types of wastes produced and the steps they took to manage these wastes. If some or all of these wastes were sent to commercial treatment, storage, and disposal facilities (TSDFs), that information and the identity of each receiving facility also are submitted. Illinois TSDFs likewise report the types and quantities of wastes received from in-state and out-of-state generators; they also report the procedures they used to manage these wastes.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 05/19/2011
Date Made Active in Reports: 06/06/2011
Number of Days to Update: 18

Source: Illinois EPA
Telephone: 217-524-3300
Last EDR Contact: 11/14/2011
Next Scheduled EDR Contact: 02/27/2012
Data Release Frequency: Annually

IL SPILLS: State spills

A listing of incidents reported to the Office of Emergency Response.

Date of Government Version: 09/06/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 10/04/2011
Number of Days to Update: 26

Source: Illinois EPA
Telephone: 217-558-1677
Last EDR Contact: 11/14/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Varies

IA SPILLS: Spills Database

Spill reporting data that is collected during the initial report of an incident.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 10/18/2011
Number of Days to Update: 35

Source: Department of Natural Resources
Telephone: 515-281-4367
Last EDR Contact: 12/13/2011
Next Scheduled EDR Contact: 03/26/2012
Data Release Frequency: Annually

IL ENG CONTROLS: Sites with Engineering Controls

Sites using of engineered barriers (e.g., asphalt or concrete paving).

Date of Government Version: 10/21/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 36

Source: Illinois Environmental Protection Agency
Telephone: 217-782-6761
Last EDR Contact: 12/01/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

IL Inst Control: Institutional Controls

Legal or administrative restrictions on land use and/or other activities (e.g., groundwater use restrictions) which effectively limit exposure to contamination may be employed as alternatives to removal or treatment of contamination.

Date of Government Version: 10/21/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 36

Source: Illinois Environmental Protection Agency
Telephone: 217-782-6761
Last EDR Contact: 12/01/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Quarterly

IA INST CONTROL: Sites with Institutional Controls

Sites currently enrolled in the Land Recycling Program that have Institutional Controls.

Date of Government Version: 10/24/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 12/08/2011
Number of Days to Update: 44

Source: Department of Natural Resources
Telephone: 515-242-5818
Last EDR Contact: 10/25/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Varies

IL SRP: Site Remediation Program Database

The database identifies the status of all voluntary remediation projects administered through the pre-notice site cleanup program (1989 to 1995) and the site remediation program (1996 to the present).

Date of Government Version: 10/21/2011
Date Data Arrived at EDR: 10/25/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 36

Source: Illinois Environmental Protection Agency
Telephone: 217-785-9407
Last EDR Contact: 12/01/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Semi-Annually

IA VCP: Land Recycling Program Sites

Sites currently enrolled in the Land Recycling Program.

Date of Government Version: 07/21/2011
Date Data Arrived at EDR: 07/22/2011
Date Made Active in Reports: 08/12/2011
Number of Days to Update: 21

Source: Department of Natural Resources
Telephone: 515-242-5818
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Varies

IL DRYCLEANERS: Illinois Licensed Drycleaners

Any retail drycleaning facility in Illinois must apply for a license through the Illinois Drycleaner Environmental Response Trust Fund. Drycleaner Environmental Response Trust Fund of Illinois.

Date of Government Version: 08/31/2011
Date Data Arrived at EDR: 09/20/2011
Date Made Active in Reports: 10/04/2011
Number of Days to Update: 14

Source: Drycleaner Environmental Response Trust Fund of Illinois
Telephone: 800-765-4041
Last EDR Contact: 11/29/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Varies

IA DRYCLEANERS: Iowa Drycleaner List

A listing of drycleaners in Iowa.

Date of Government Version: 02/26/2009
Date Data Arrived at EDR: 02/27/2009
Date Made Active in Reports: 04/02/2009
Number of Days to Update: 34

Source: Department of Natural Resources
Telephone: 515-242-5100
Last EDR Contact: 10/24/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Varies

IL IMPDMENT: Surface Impoundment Inventory

Statewide inventory of industrial, municipal, mining, oil & gas , and large agricultural impoundment. This study was conducted by the Illinois EPA to assess potentail for contamination of shallow aquifers. This was a one-time study. Although many of the impoundments may no longer be present, the sites may be contaminated.

Date of Government Version: 12/31/1980
Date Data Arrived at EDR: 03/08/2002
Date Made Active in Reports: 06/03/2002
Number of Days to Update: 87

Source: Illinois Waste Management & Research Center
Telephone: 217-333-8940
Last EDR Contact: 02/20/2002
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IL BROWNFIELDS: Municipal Brownfields Redevelopment Grant Program Project Descriptions

The Illinois Municipal Brownfields Redevelopment Grant Program (MBRGP) offers grants worth a maximum of $240,000 each to municipalities to assist in site investigation activities, development of cleanup objectives, and performance of cleanup activities. Brownfields are abandoned or underused industrial and/or commercial properties that are contaminated (or thought to be contaminated) and have an active potential for redevelopment.

Date of Government Version: 09/14/2011
Date Data Arrived at EDR: 09/15/2011
Date Made Active in Reports: 10/04/2011
Number of Days to Update: 19

Source: Illinois Environmental Protection Agency
Telephone: 217-785-3486
Last EDR Contact: 12/12/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

IA BROWNFIELDS: Brownfields Site Listing

Brownfields are abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination.

Date of Government Version: 07/21/2011
Date Data Arrived at EDR: 07/22/2011
Date Made Active in Reports: 08/12/2011
Number of Days to Update: 21

Source: Department of Natural Resources
Telephone: 515-281-8489
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 02/06/2012
Data Release Frequency: Quarterly

IL BROWNFIELDS: Redevelopment Assessment Database

The Office of Site Evaluations Redevelopment Assessment database identifies the status of all properties within the State in which the Illinois EPA's Office of Site Evaluation has conducted a municipal Brownfield Redevelopment Assessment.

Date of Government Version: 10/31/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 29

Source: Illinois Environmental Protection Agency
Telephone: 217-524-1658
Last EDR Contact: 11/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

IL CDL: Meth Drug Lab Site Listing

A listing of clandestine/meth drug lab locations.

Date of Government Version: 10/20/2011
Date Data Arrived at EDR: 12/06/2011
Date Made Active in Reports: 12/14/2011
Number of Days to Update: 8

Source: Department of Public Health
Telephone: 217-782-5750
Last EDR Contact: 10/17/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Varies

IA NPDES: List of NPDES Permittees

The files listed below contain information on facilities that hold NPDES permits, or those that are authorized to discharge wastewater to surface waters in Iowa.

Date of Government Version: 08/23/2011
Date Data Arrived at EDR: 08/26/2011
Date Made Active in Reports: 09/14/2011
Number of Days to Update: 19

Source: Department of Natural Resources
Telephone: 515-281-4736
Last EDR Contact: 11/23/2011
Next Scheduled EDR Contact: 03/05/2012
Data Release Frequency: Varies

IL AIRS: AIRS

A listing of air permits and emissions information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 04/15/2011
Date Made Active in Reports: 04/26/2011
Number of Days to Update: 11

Source: Illinois EPA
Telephone: 217-557-0314
Last EDR Contact: 10/11/2011
Next Scheduled EDR Contact: 01/23/2012
Data Release Frequency: Varies

IA AIRS: Minor and Title V Sources Listing
A listing of Minor and Title V sources.

Date of Government Version: 09/19/2011
Date Data Arrived at EDR: 09/20/2011
Date Made Active in Reports: 10/19/2011
Number of Days to Update: 29

Source: Department of Natural Resources
Telephone: 515-281-8468
Last EDR Contact: 12/15/2011
Next Scheduled EDR Contact: 04/02/2012
Data Release Frequency: Varies

IL TIER 2: Tier 2 Information Listing
A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 05/24/2011
Date Made Active in Reports: 05/27/2011
Number of Days to Update: 3

Source: Illinois Emergency Management Agency
Telephone: 217-785-9860
Last EDR Contact: 11/17/2011
Next Scheduled EDR Contact: 03/05/2012
Data Release Frequency: Annually

IA TIER 2: Tier 2 Information Listing
A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 04/12/2011
Date Made Active in Reports: 05/19/2011
Number of Days to Update: 37

Source: Department of Natural Resources
Telephone: 515-725-0302
Last EDR Contact: 12/21/2011
Next Scheduled EDR Contact: 04/09/2012
Data Release Frequency: Annually

IL PIMW: Potentially Infectious Medical Waste
Potentially Infectious Medical Waste (PIMW) is waste generated in connection with the diagnosis, treatment (i.e., provision of medical services), or immunization of human beings or animals; research pertaining to the provision of medical services; or the provision or testing of biologicals.

Date of Government Version: 09/26/2011
Date Data Arrived at EDR: 09/28/2011
Date Made Active in Reports: 10/13/2011
Number of Days to Update: 15

Source: Illinois EPA
Telephone: 217-524-3289
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: Varies

IL CCDD: Clean Construction or Demolition Debris
Construction and demolition (C and D) debris is nonhazardous, uncontaminated material resulting from construction, remodeling, repair, or demolition of utilities, structures, and roads.

Date of Government Version: 10/31/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/30/2011
Number of Days to Update: 29

Source: Illinois EPA
Telephone: 217-524-3300
Last EDR Contact: 11/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

TRIBAL RECORDS

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 10/20/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Semi-Annually

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands
Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 11/07/2011
Next Scheduled EDR Contact: 02/20/2012
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 08/11/2011
Date Data Arrived at EDR: 08/12/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 32

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Semi-Annually

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 25

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 11/02/2011
Date Data Arrived at EDR: 11/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 7

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 02/16/2011
Date Data Arrived at EDR: 06/02/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 103

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 01/31/2011
Date Data Arrived at EDR: 02/01/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 48

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 10/01/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 10

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 11/01/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 08/04/2011
Date Data Arrived at EDR: 08/05/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 39

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 25

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 11/02/2011
Date Data Arrived at EDR: 11/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 7

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Quarterly

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 08/11/2011
Date Data Arrived at EDR: 08/12/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 32

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Semi-Annually

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/10/2011
Date Data Arrived at EDR: 05/11/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 34

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Semi-Annually

INDIAN UST R5: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 07/01/2011
Date Data Arrived at EDR: 08/26/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 18

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 04/01/2011
Date Data Arrived at EDR: 06/01/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 13

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN UST R1: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 10/01/2011
Date Data Arrived at EDR: 11/01/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 10

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 10/31/2011
Next Scheduled EDR Contact: 02/13/2012
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 08/04/2011
Date Data Arrived at EDR: 10/04/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 38

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 10/04/2011
Next Scheduled EDR Contact: 01/16/2012
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

EDR PROPRIETARY RECORDS

Manufactured Gas Plants: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 11/21/2011
Date Data Arrived at EDR: 11/22/2011
Date Made Active in Reports: 12/22/2011
Number of Days to Update: 30

Source: Department of Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 11/22/2011
Next Scheduled EDR Contact: 03/05/2012
Data Release Frequency: Annually

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 07/20/2011
Date Made Active in Reports: 08/11/2011
Number of Days to Update: 22

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 10/18/2011
Next Scheduled EDR Contact: 01/30/2012
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 11/01/2011
Date Data Arrived at EDR: 11/08/2011
Date Made Active in Reports: 12/22/2011
Number of Days to Update: 44

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 11/08/2011
Next Scheduled EDR Contact: 02/20/2012
Data Release Frequency: Annually

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2008
Date Data Arrived at EDR: 12/01/2009
Date Made Active in Reports: 12/14/2009
Number of Days to Update: 13

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: Annually

RI MANIFEST: Manifest information
Hazardous waste manifest information

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 06/24/2011
Date Made Active in Reports: 06/30/2011
Number of Days to Update: 6

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 11/28/2011
Next Scheduled EDR Contact: 03/12/2012
Data Release Frequency: Annually

WI MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2010
Date Data Arrived at EDR: 08/19/2011
Date Made Active in Reports: 09/15/2011
Number of Days to Update: 27

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 12/19/2011
Next Scheduled EDR Contact: 04/02/2012
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Homes & Centers Listing
Source: Department of Children & Family Services
Telephone: 312-814-4150

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

STREET AND ADDRESS INFORMATION

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APPENDIX D
RECORDS REVIEW DOCUMENTATION

1. EDR

The EDR corridor study reviews several federal, state, and proprietary databases and makes available study reports. EDR also maps the results of the study. Specific databases that EDR retrieves information from include:

FEDERAL RECORDS

NPL ..... National Priority List
Proposed NPL ..... Proposed National Priority List Sites
Delisted NPL..... National Priority List Deletions
NPL LIENS..... Federal Superfund Liens
CERCLIS .....Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP CERCLIS .....No Further Remedial Action Planned
LIENS 2 .....CERCLA Lien Information
CORRACTS ..... Corrective Action Report
RCRA-TSDF RCRA ..... Treatment, Storage and Disposal
RCRA-LQG RCRA ..... Large Quantity Generators
RCRA-SQG RCRA ..... Small Quantity Generators
RCRA-CESQG RCRA ..... Conditionally Exempt Small Quantity Generator
RCRA-NonGen RCRA ..... Non Generators
US ENG CONTROLS ..... Engineering Controls Sites List
US INST CONTROL .....Sites with Institutional Controls
ERNS ..... Emergency Response Notification System
HMIRS..... Hazardous Materials Information Reporting System
DOT OPS .....Incident and Accident Data
US CDL ..... Clandestine Drug Labs
US BROWNFIELDS ..... A Listing of Brownfields Sites
DOD..... Department of Defense Sites
FUDS ..... Formerly Used Defense Sites
LUCIS..... Land Use Control Information System
CONSENT ..... Superfund (CERCLA) Consent Decrees
ROD ..... Records Of Decision
UMTRA ..... Uranium Mill Tailings Sites
ODI..... Open Dump Inventory
DEBRIS REGION 9 ..... Torres Martinez Reservation Illegal Dump Site Locations
MINES ..... Mines Master Index File
TRIS..... Toxic Chemical Release Inventory System
TSCA ..... Toxic Substances Control Act
FTTS ..... FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)
TSCA ..... Toxic Substances Control Act

HIST FTTS ..... FIFRA/TSCA Tracking System Administrative Case Listing
SSTS ..... Section 7 Tracking Systems
ICIS ..... Integrated Compliance Information System
PADS ..... PCB Activity Database System
MLTS ..... Material Licensing Tracking System
RADINFO ..... Radiation Information Database
FINDS ..... Facility Index System/Facility Registry System
RAATS ..... RCRA Administrative Action Tracking System
SCRD DRYCLEANERS ..... State Coalition for Remediation of Drycleaners Listing
FEMA UST ..... Underground Storage Tank Listing
FEDERAL FACILITY ..... Federal Facility Site Information listing
PCB TRANSFORMER ..... PCB Transformer Registration Database
COAL ASH EPA ..... Coal Combustion Residues Surface Impoundments List
US HIST CDL ..... National Clandestine Laboratory Register
COAL ASH DOE ..... Steam-Electric Plan Operation Data

STATE AND LOCAL RECORDS

IL SSU ..... State Sites Unit Listing
IA SHWS ..... Registry of Hazardous Waste or Hazardous Substance Disposal Sites
IA ALLSITES ..... Contaminated Sites Tracking Database
IL SWF/LF ..... Available Disposal for Solid Waste in Illinois - Solid Waste Landfills Subject to State Surcharge
IA SWF/LF ..... Permitted Solid Waste Management Facilities
IL NPDES ..... A Listing of Active Permits
IL UIC ..... Underground Injection Wells
IL NIPC ..... Solid Waste Landfill Inventory
IL LF SPECIAL WASTE ..... Special Waste Site List
IA LUST ..... Leaking Underground Storage Tank Data
IL LUST TRUST ..... Underground Storage Tank Fund Payment Priority List
IA HIST LUST .....Leaking Underground Storage Tank Database
IA UST ..... Underground Storage Tank Data
IA LAST ..... Leaking Aboveground Storage Tank Sites
IA LIENS ..... Liens Filed Listing
IA AST ..... Aboveground Storage Tank Sites
IA DEL SHWS ..... Delisted Contaminated Sites Listing
IL SPILLS .....State spills
IA SPILLS .....Spills Database
IL ENG CONTROLS .....Sites with Engineering Controls
IL INST CONTROL ..... Institutional Controls
IA INST CONTROL .....Sites with Institutional Controls
IL SRP .....Site Remediation Program Database
IA VCP ..... Land Recycling Program Sites
IL DRYCLEANERS ..... Illinois Licensed Drycleaners
IA DRYCLEANERS ..... Iowa Drycleaner List

IL BROWNFIELDS..... Municipal Brownfields Redevelopment Grant Program Project Descriptions
IA BROWNFIELDS .....Brownfields Site Listing
IL CDL..... Meth Drug Lab Site Listing
IA NPDES..... List of NPDES Permittees
IL AIRS..... AIRS
IA AIRS ..... Minor and Title V Sources Listing
IL TIER 2 .....Tier 2 Information Listing
IA TIER 2..... Tier 2 Information Listing
IL PIMW .....Potentially Infectious Medical Waste
IL CCDD..... Clean Construction or Demolition Debris

TRIBAL RECORDS
INDIAN RESERV ..... Indian Reservations
INDIAN ODI .....Report on the Status of Open Dumps on Indian Lands
INDIAN LUST..... Leaking Underground Storage Tanks on Indian Land
INDIAN UST..... Underground Storage Tanks on Indian Land
INDIAN VCP..... Voluntary Cleanup Priority Listing

PROPRIETARY
Manufactured Gas Plants – EDR Proprietary Manufactured Gas Plants

All of the aforementioned databases were queried. Facilities within a one-mile search distance of the site location are shown in the following table, along with comments. A total of one UST site, three LUST sites and one IMPDMENT site were found within this search area.

Database: Illinois UST				
Owner	**Address**	**Product**	**Capacity**	**Map ID**
Royster-Clark, Inc./ Phoenix Chemical Co.	16675 US Rte 20 West East Dubuque, IL 61025	Diesel	Two 10,000 Gallon Tanks	1

Database: Illinois LUST			
Owner	**Address**	**Product/ Map ID**	**No Futher Action/ No Further Remediation (NFA/NFR) Letter**
Royster-Clark, Inc./ Phoenix Chemical Co.	16675 US Rte 20 West East Dubuque, IL 61025	Non Petro / 1	3/21/1994
Praxair	16675 US Rte 20 West East Dubuque, IL 61025	Diesel/ 1	6/22/2000
Galena Territory Assoc.	100 Marina Dr. Galena, IL 61036	Gasoline/ 3	6/25/1997

Database: Illinois EPA Impoundment Facilities
Apple River Chemical Co., P.O. Box D, East Dubuque, IL Map ID 2 Three impoundment facilities used for settling.

2. NRC

For releases of hazardous substances, the federal government has established a reportable quantity that triggers the reporting requirements under CERCLA. If a hazardous substance is released to the environment in an amount that equals or exceeds its reportable quantity, the release must be reported to federal authorities at the National Response Center (NRC) so that emergency response personnel can evaluate whether a response action is needed.

NRC handles reporting under several federal laws:

- Clean Water Act (for oil and chemical spills in water);
- Clean Air Act, Clean Water Act, and Comprehensive Environmental Response, Compensation, & Liability Act (for releases of reportable quantities of hazardous materials);
- Federal Railroad Safety Act (for railroad incidents);
- Hazardous Liquid Pipeline Safety Act (for incidents involving pipelines other than those carrying liquid natural gas);
- Hazardous Materials Transportation Act (for any transportation incident);
- National Gas Pipeline Safety Act (for incidents involving natural gas pipelines);
- Outer Continental Shelf Lands Act (for oil spills);
- Resource Conservation & Recovery Act (for contingency plans with emergency notification procedures);
- Toxic Substances Control Act (for spills and fires involving polychlorinated biphenyls);
- Trans Alaska Pipeline Authorization Act (for incidents involving any vessel carrying oil from the Trans Alaska Pipeline).

The Database was accessed via http://www.nrc.uscg.mil/. Information was accessed online by searching all data for the existence of an environmental release within a one-mile approximate search distance of target properties. The search was conducted on 15 July 2002. There were spill events recorded along the railroad and at several points on the river within the project area. However, the events were accidents or derailments that did no result in a hazardous waste spill, and the river events reported less than 2 gallons of petroleum released. Therefore, there is no evidence of recognized environmental conditions.

3. U.S. Army Corps of Engineers –Water Quality Testing Data.

The Rock Island District has been in the plan formulation stage of this project since at least 1996. During this time, various water quality sampling has taken place and the results have been made

available. These records were reviewed during the preparation of this document. While no HTRW concerns have been identified, some water quality issues may be present.

From July 20-22, 2011, Foth Infrastructure and Environment, LLC, performed a series of water quality tests in each of the six laked as specified in Contract #W912EK-09-D008. The results of these tests are available in the 2011 Sediment Sampling Analysis Report, presented by Foth, which is available at the Rock Island District Office of the Corps. The tests done at this time included sediment characterization and elutriate analysis.

Additional sediment sampling was done in Fishtrap Lake on January 31, 2012. These samples were collected by Corps personnel and were sent to Sherry Laboratories to be analyzed under Work Order #12013418. The results from this sampling event are available at the Rock Island District Office of the Corps.

MAPS AND PHOTOGRAPHS

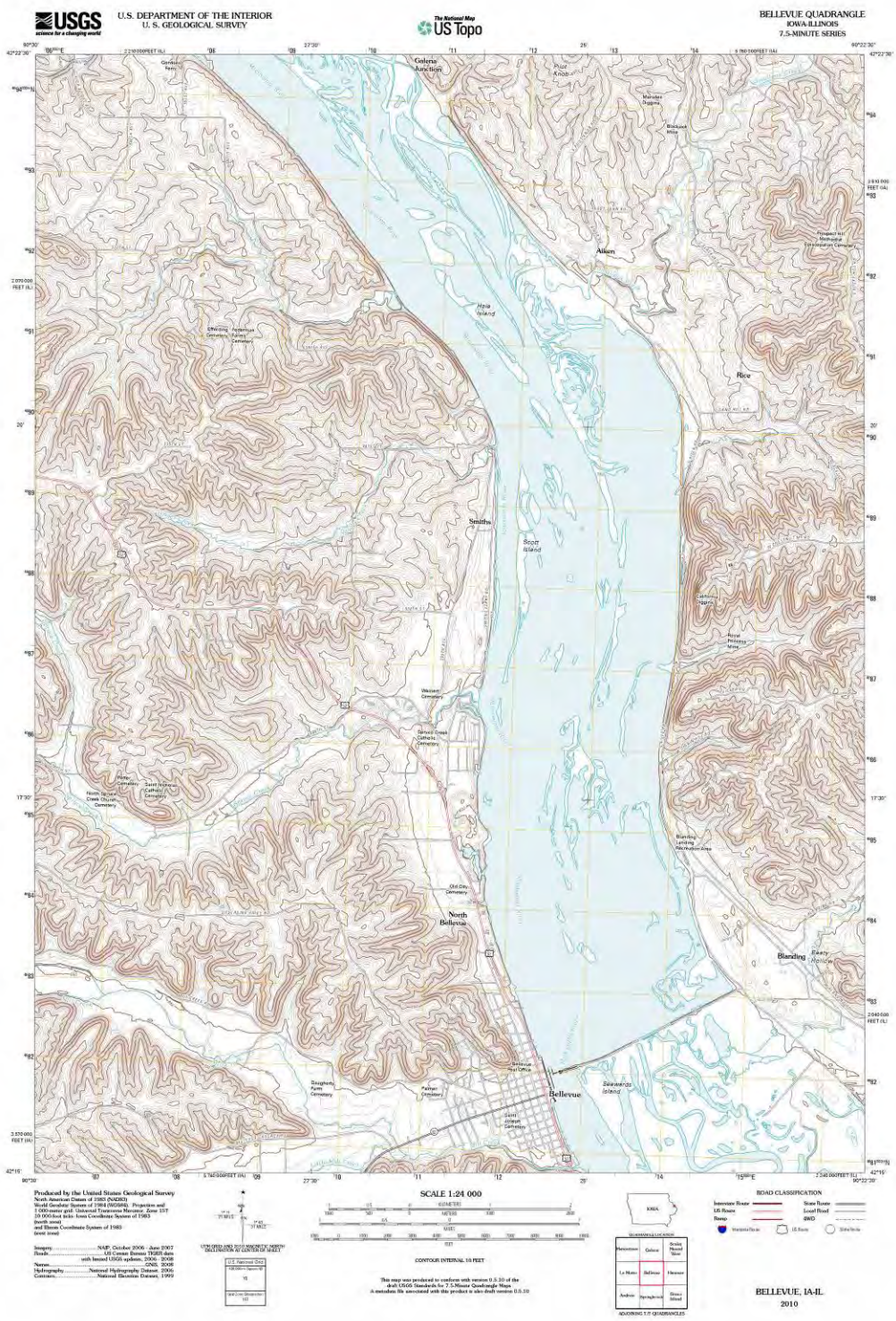


Figure D-1. USGS Map of project site and vicinity (Bellevue Quadrangle - 2010).

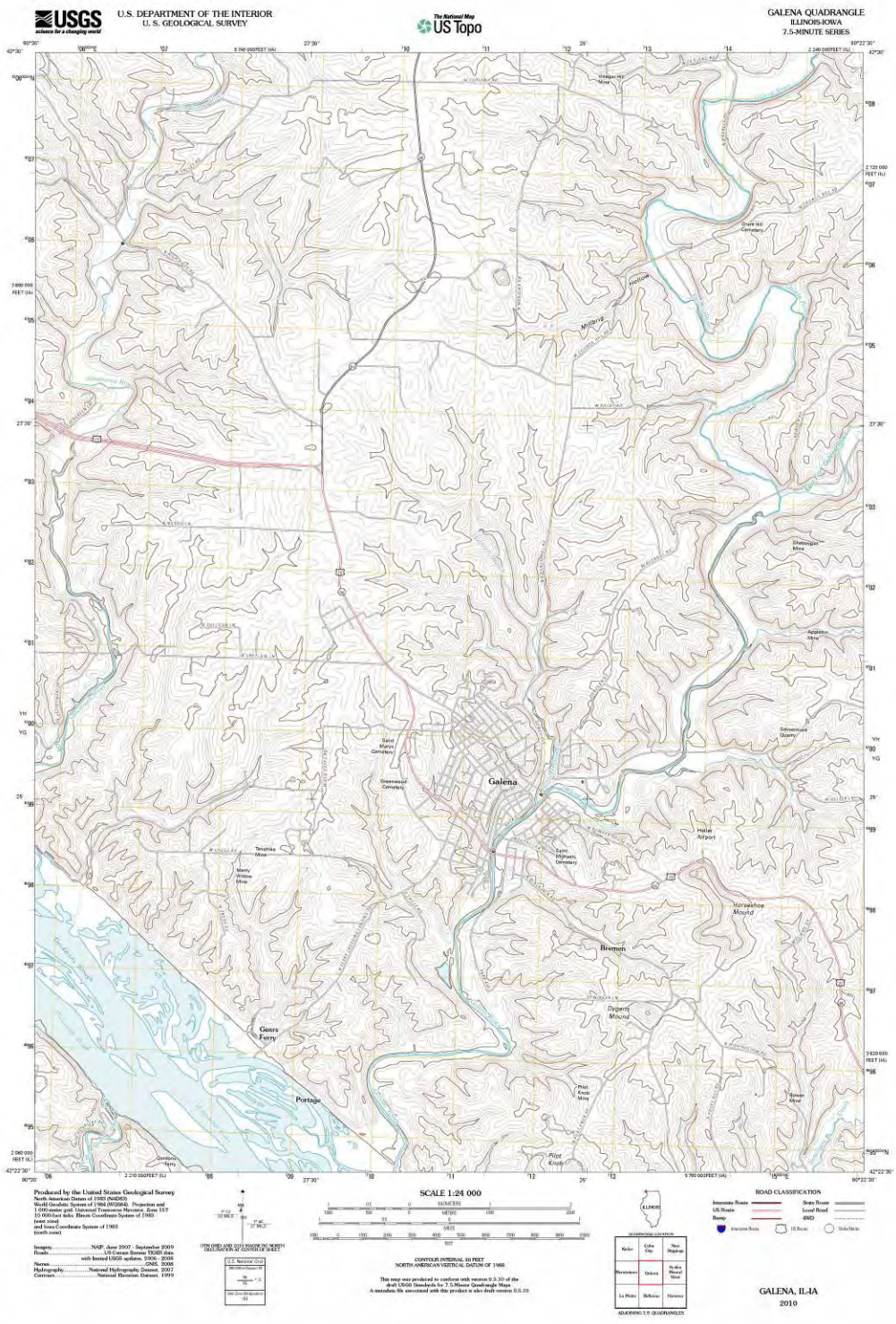


Figure D-2. USGS Map of project site and vicinity (Galena Quadrangle – 2010).

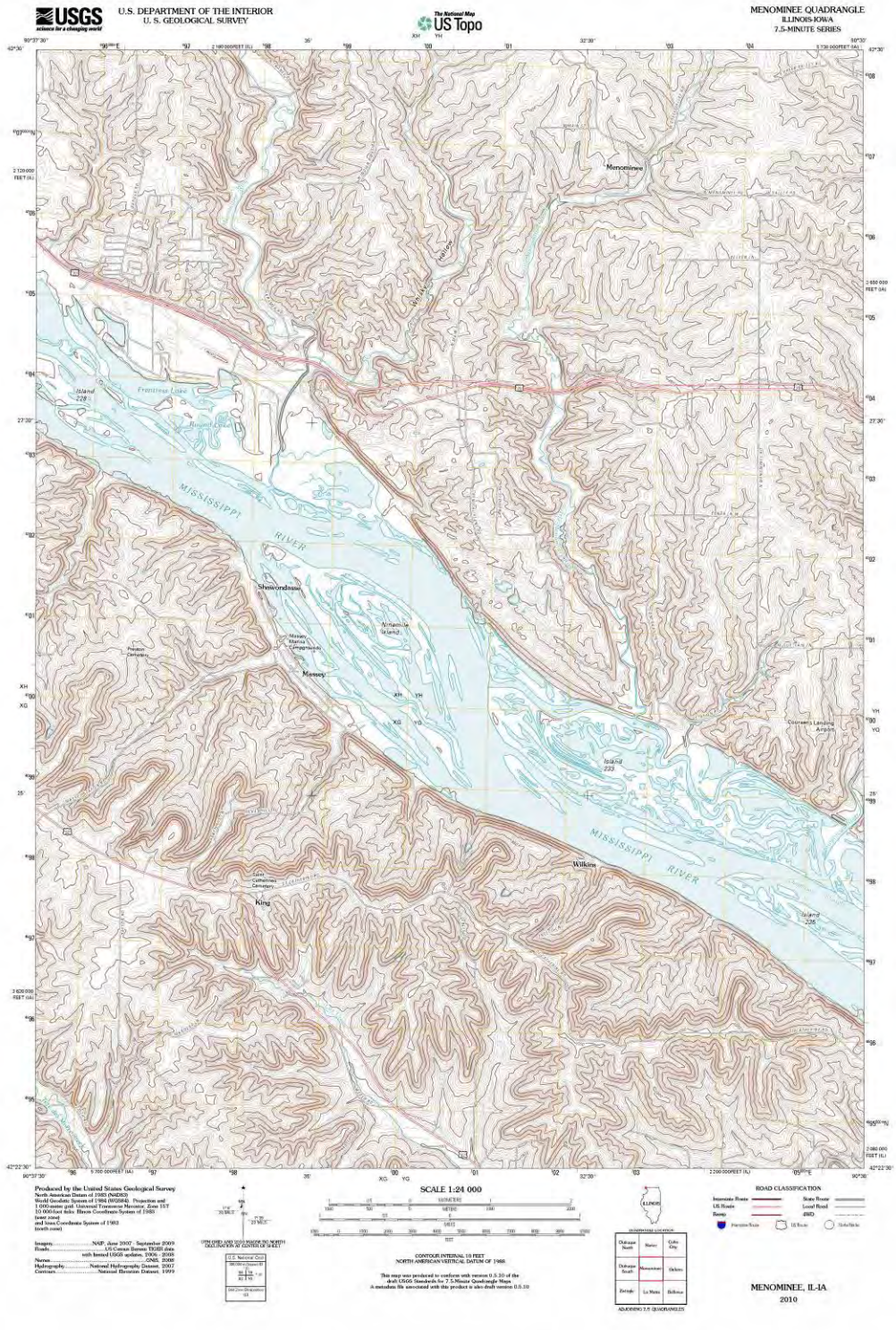


Figure D-3. USGS Map of project site and vicinity (Menominee Quadrangle – 2010).

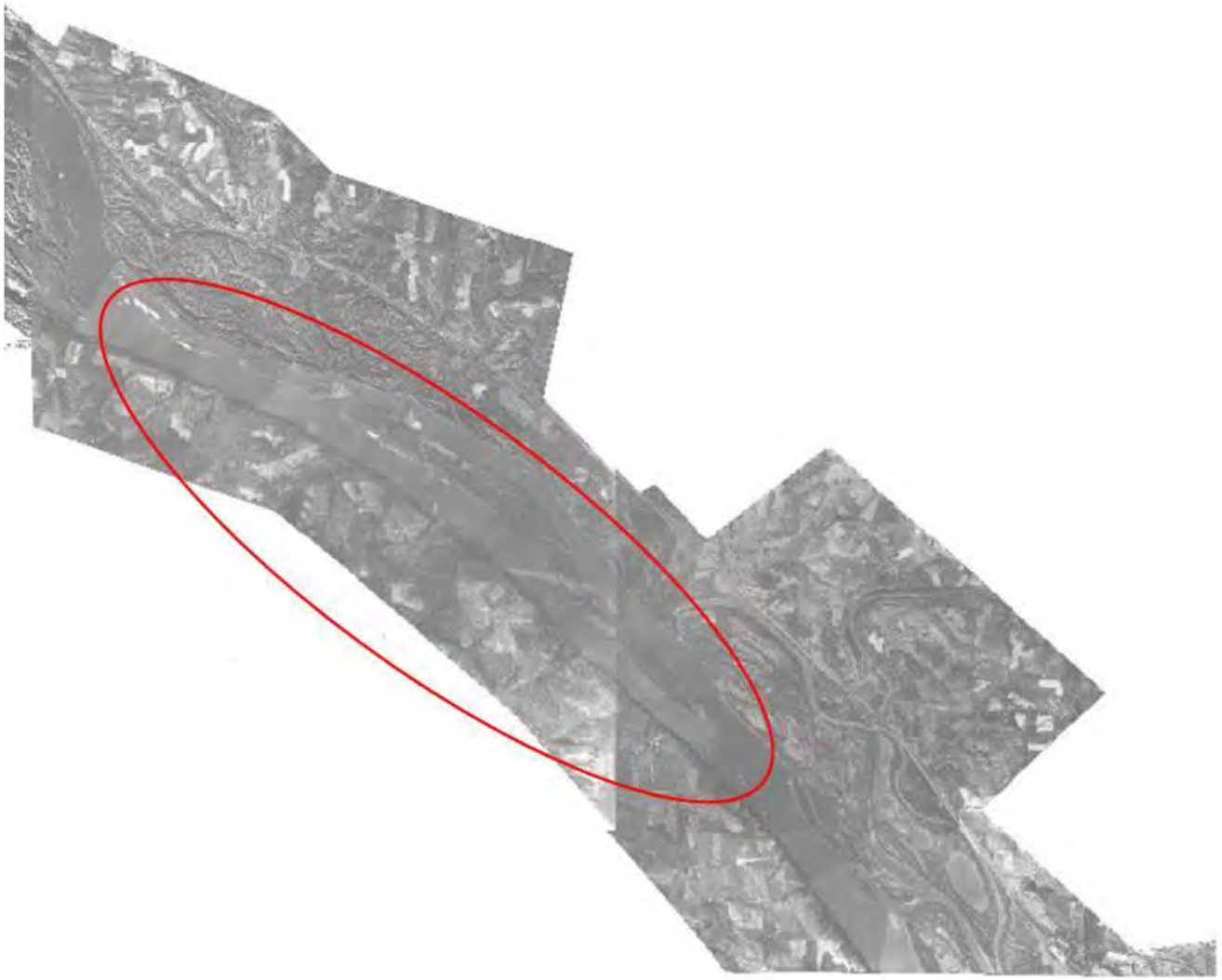


Figure D-4. 1930 Aerial Photograph.

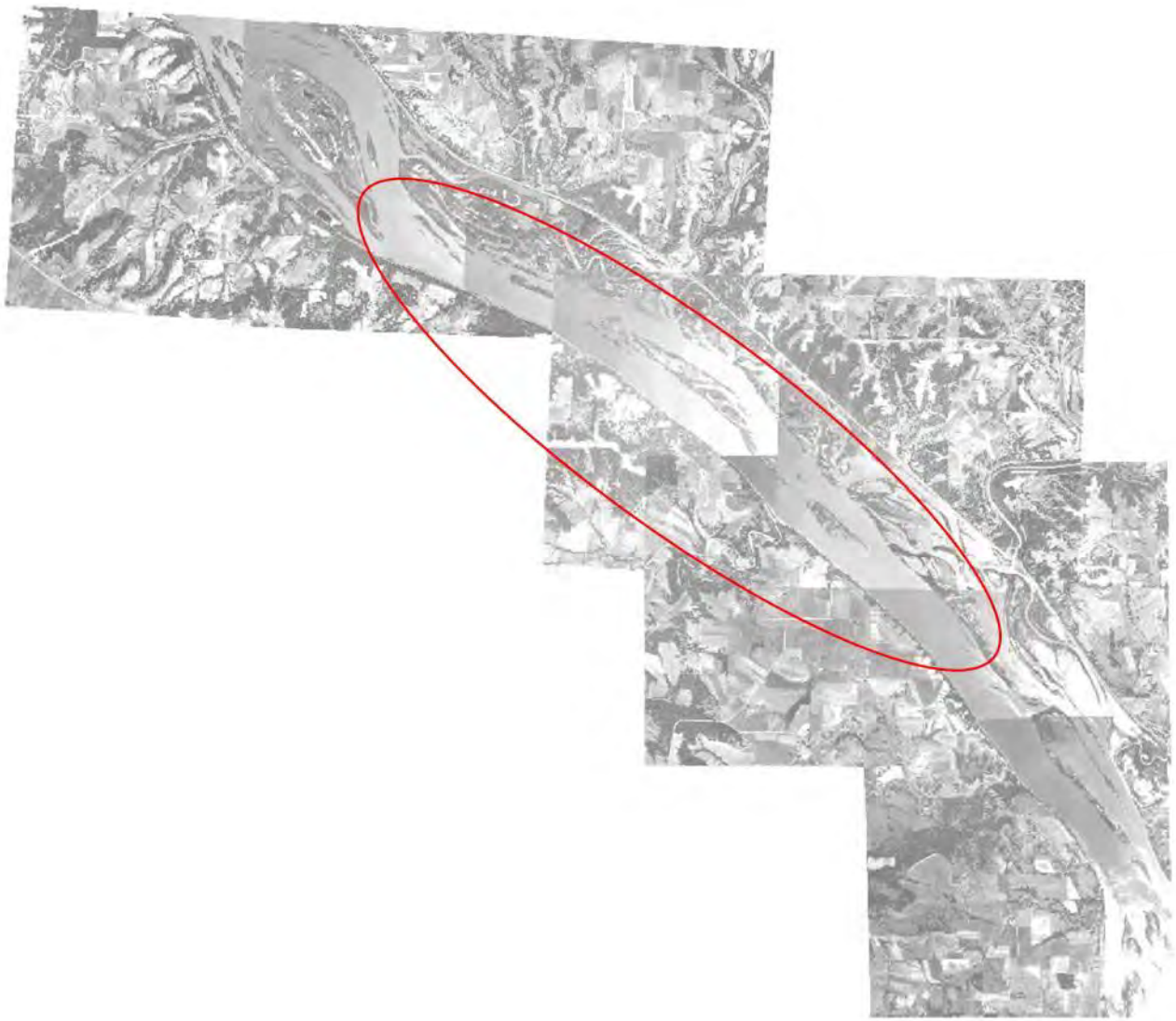
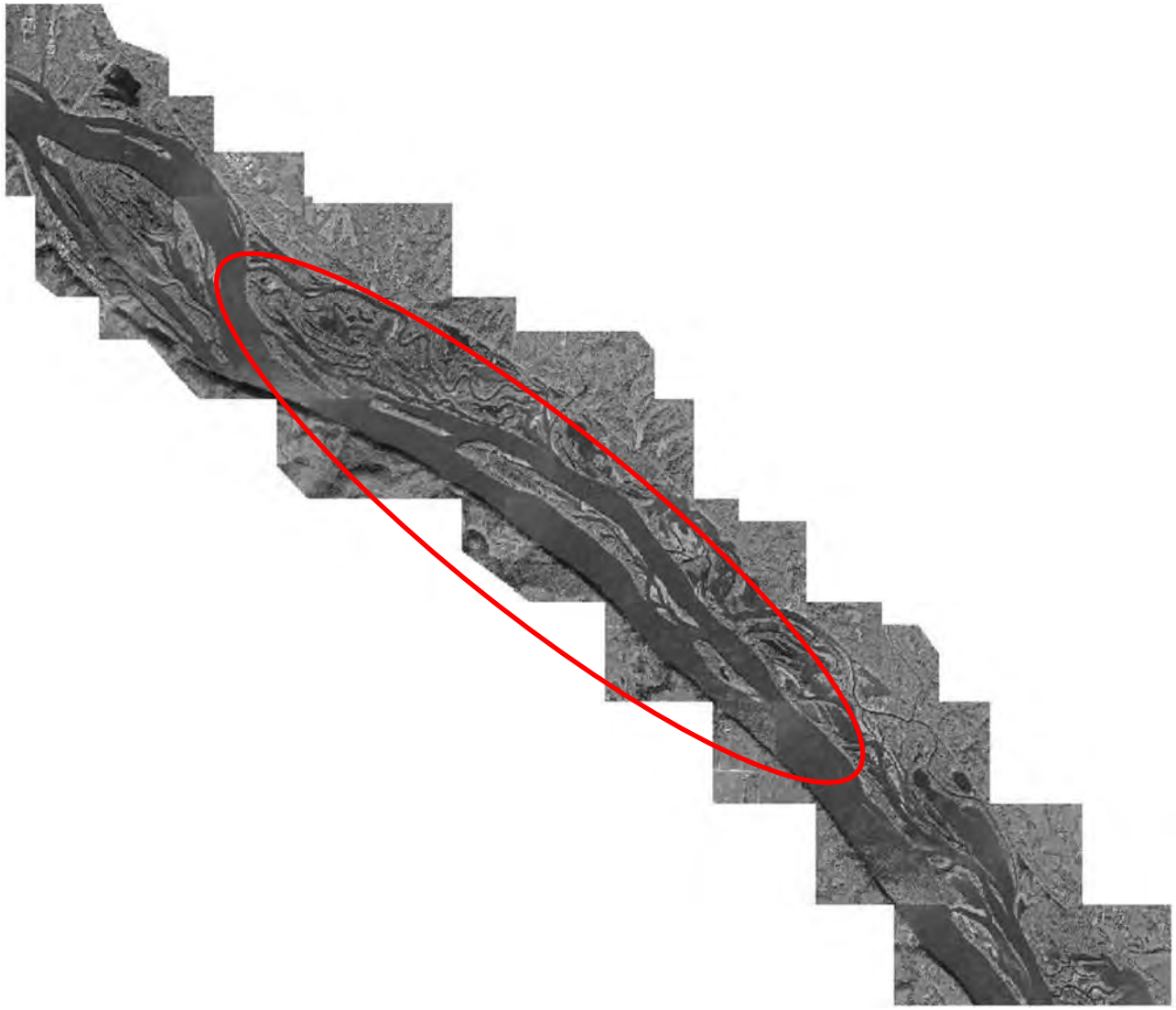


Figure D-5. 1956 Aerial Photograph.



D-6. 1995 Aerial Photograph.

Figure D-7. 2000 Aerial Photograph.

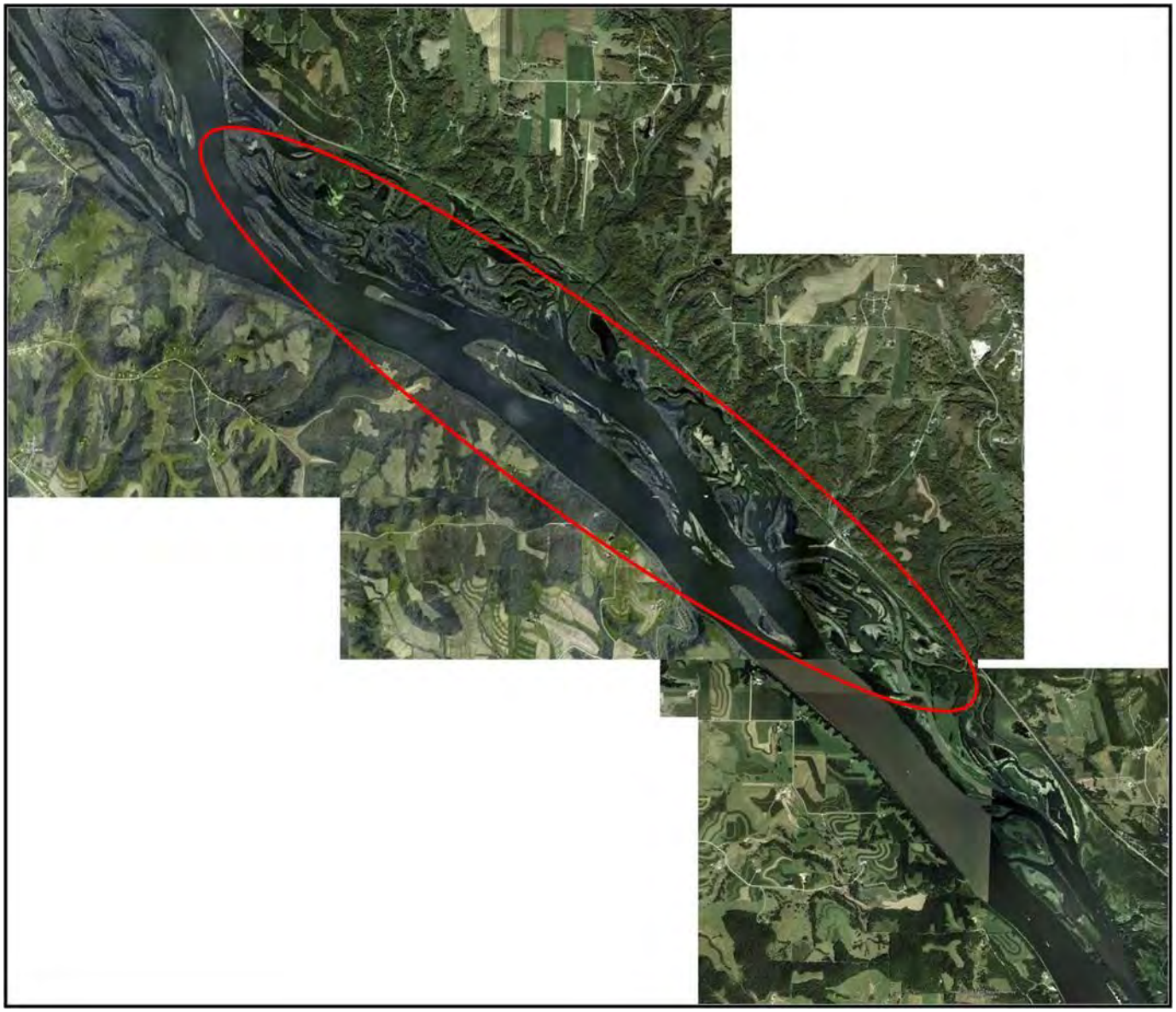


Figure D-8. 2009 Aerial Photograph

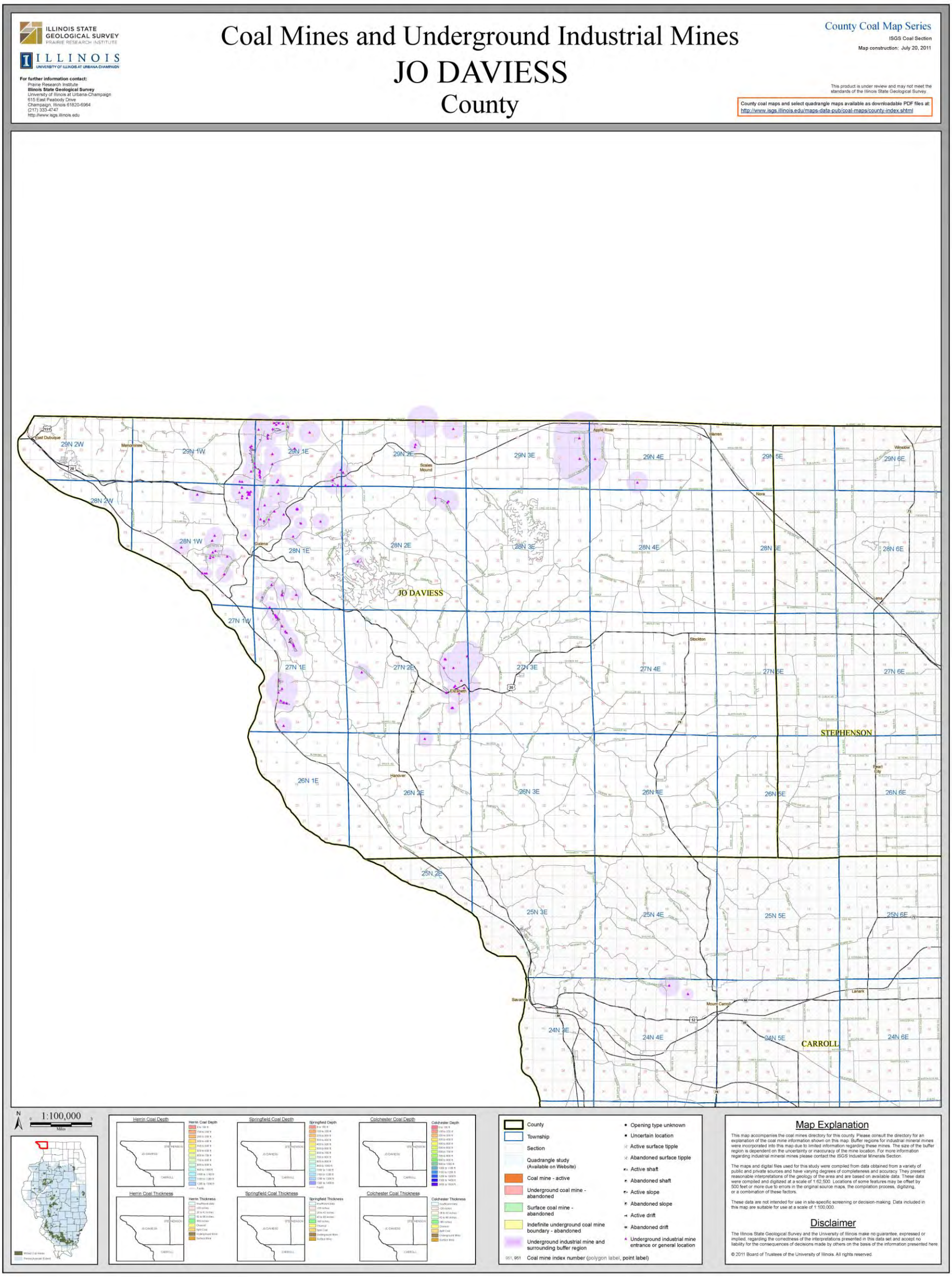


Figure D-9. Coal Mines and Underground Industrial Mines. Jo Daviess County

APPENDIX E
SITE SPECIFIC SAFETY AND HEALTH PLAN (SSHP)

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SITE SPECIFIC SAFETY AND HEALTH PLAN TITLE PAGE Rock Island District Corps of Engineers	This SSHP is a part of the Rock Island District HTRW Program, which includes EM 385-1-1 and ER 385-1-92.
PROJECT NAME: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project	REQUEST FOR SERVICES NO.:
JOBSITE ADDRESS: Jo Daviess County, IL	COST CODE:
PROJECT MANAGER: Julie Millhollin	PHONE NO.: (309) 794-5349
SITE CONTACT: N/A	PHONE NO.: N/A
( ) AMENDMENT NO. _____ TO EXISTING APPROVED SSHP. DATE EXISTING APPROVED SSHP:	

OBJECTIVES OF FIELD WORK: Environmental Site Assessment for the HREP area. A site visit of the project area will be made. Environmental concerns will be documented. No intrusive investigations (soil samples, etc.) will be conducted.	SITE TYPE: Check as many as applicable: ( ) Active ( ) Landfill (X) Natural ( ) Inactive ( ) Uncontrolled ( ) Military ( ) Secure ( ) Industrial ( ) Other specify: Agricultural Field ( ) Unsecure ( ) Residential ( ) Enclosed space ( ) Well Field

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dikes, power lines, hills, slopes, river, etc.). The Project sites are backwater lakes and sloughs of the Mississippi River. There is little development or settlement around the site. There are no known utilities serving the site. There is a railroad corridor running along the river.

SURROUNDING POPULATION: ( ) Residential ( ) Industrial (X) Rural ( ) Urban ( ) Commercial: ( ) Other:

SITE SPECIFIC SAFETY AND HEALTH PLAN
EMERGENCY CONTACTS & APPROVAL PAGE
Rock Island District Corps of Engineers

This SSHP is a part of the Rock Island District HTRW Program, which includes EM 385-1-1 and ER 385-1-92.

EMERGENCY CONTACTS		
Water Supply	N/A	
Site Telephone	N/A	
EPA Release Report No.	800-424-8802	

EMERGENCY CONTACTS	**NAME**	**PHONE**
Project Manager	Julie Millhollin	309-794-5349
Safety and Health Manager	Troy Larson	309-794-5280
Industrial Hygienist		
Environmental Agency	Illinois EPA	
State Spill Number	Illinois Emergency Management Agency	800-782-7860 (within state)

CONTINGENCY PLANS Read and Refer to **DM 385-1-2, Appendix H**. Enter any additional Site Specific Information and clarifications below:

1. Evacuation Routes will be to the roads that lead away from the site and perpendicular to the alignment.

2. Personnel will evacuate if there appear to be any conditions that could expose any of the site visitors to an environmental or safety hazard.

3. All accidents will be reported in accordance with **DM 385-1-1, Appendix B**, including preparing an accident report form ENG 3394, as required by the appendix.

4. The overall plan is to evacuate the site in case of an emergency. In case of a medical emergency, the local EMS will be contacted from the nearest available telephone (resident or business).

Fire Department		911
Police Department		911
Poison Control Center		
Occupational Health Unit		

HEALTH AND SAFETY PLAN APPROVALS	
Prepared by: Kara Mitvalsky	Date: 07 Mar 12
Reviewed by:	Date:

MEDICAL EMERGENCY	
Hospital Name:	
Hospital Address:	
Name of Contact at Hospital:	
Name of 24-Hour Ambulance:	

Route to Hospital (Provide description below and attach map with route to hospital on the following page). A route map was not prepared, since the emergency plan is to call 911 from the nearest telephone should there be an emergency.

Figure E-1. Site Specific Safety and Health Plan

APPENDIX F
SITE RECONNAISANCE

Date of Site Visit: 9 April 2012

Attendees:

Name	Office
Julie Millhollin	USACE (CEMVR-EC-DN)
Ellen Milliron	USACE (CEMVR-PD-F)
Darron Niles	USACE (CEMVR-PD-F)
Laura St. Louis	USACE (CEMVR-EC-DN)
Joe Lundh	USACE (CEMVER-OD-MN)
Ben Vandermyde	USACE (CEMVER-OD-MN)
Kirk Hansen	IA DNR
Mike Griffin	IA DNR
Russ Engelke	FWS
Ed Britton	FWS

Photos from 2011 Site Visit

Deadman's Slough

Deadman's Slough

Deadman's Slough – Flood Debris

Deadman's Slough – Flood Debris

Stone Slough – Tree Stand/ Tree House

Stone Slough – Tree Stand/ Tree House

Stone Slough

Sunfish Lake – Shoreline Placement, as close to bank as possible.

Sunfish Lake

Sunfish Lake

Slough to Galena River

Darron Niles (USACE)

Mike Griffin (Ia DNR), Joe Lundh (USACE), Russ Engelke (FWS), Ben Vandermyde (USACE)

Sunfish Lake

Docks and houseboats at Galena Boat Harbor

Kehough Slough – Support for power lines. Power lines are no longer present.

Kehough Slough - Location of former overhead power line.

Kehough Slough –Existing overhead power lines at entrance to slough.

Kehough Slough –Existing Overhead Power Lines at entrance to slough.

Structures at entrance to Kehough Slough.

Structures at entrance to Kehough Slough.

Kehough Slough

Kehough Slough

Kehough Slough

Kehough Slough

Entrance from Deadman's Slough to Kehough Slough

Entrance from Deadman's Slough to Kehough Slough

Out of gas!

Stuck in the mud!

Stone Lake

Stone Lake

Stone Lake

Tippy Lake

Tippy Lake

Tippy Lake

APPENDIX G
INTERVIEWS

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CONVERSATION RECORD	**TIME** 3:45 P.M.	**DATE** 07-16-02

TYPE			**ROUTINE**	
[X] **VISIT** [ ] **CONFERENCE** [ ] **TELEPHONE**			**NAME/SYMBO**	**INI**
Location of Visit/Conference:		[ ] **INCOMING** [ ] **OUTGOING**		
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Dean Cerny	**ORGANIZATION** (Office, dept., bureau, etc.): Corps, R.I. District	**TELEPHONE NO:** 309-794-5538		
SUBJECT Pool 12 Overwintering HREP Project				

SUMMARY

I asked Dean about his previous site visit(s) to the project sites. Dean is the Project Engineer for the Pool 12 Overwintering HREP. He said that he has been to the project one time, and looked at some of the islands from a boat. Although he wasn't looking for HTRW concerns in particular, he was able to answer the following questions:

-Have you observed hazardous substances in connection with identified uses? No.
-Did you observe any storage tanks on project sites? No.
-Did you see any indication of PCBs? Any powerlines crossing over to the island? None that he is aware of…
-Did you observe any Pits, Ponds, or Lagoons? No.
-Did you see any stained soil or pavement? No.
-Did you observe signs of solid waste disposal, such as trash, discarded appliances, etc? No.
-Are you aware of any structures on target properties? No.
-Are you aware of any wells or septic systems on any of the sites? No. However, if structures are discovered on project sites, wells or septic systems may be present also.
He has not observed any signs of fish kills or vegetation that appeared to be stressed from something other than normal conditions.

Dean recommended that I contact Ed Britton of the National Fish and Wildlife Service, and Dave Bierl (ED-HQ), because they are more familiar with the sites.

ACTION REQUIRED

Interview individuals noted above.

NAME OF PERSON DOCUMENTING CONVERSATION Troy Hythecker	**SIGNATURE**	**DATE** 7-16-02

ACTION TAKEN

Interviewed Dave Bierl (7-26-2002). Interviewed Ed Britton 8-2-02).

SIGNATURE Troy Hythecker	**TITLE** Environmental Engineering Co-Op	**DATE** 8-2-02

	CONVERSATION RECORD	**OPTIONAL FORM 271 (12-76)** **DEPARTMENT OF DEFENSE**

CONVERSATION RECORD	**TIME** **4:30 P.M.**	**DATE** **07-18-2002**

TYPE			**ROUTINE**	
[X] **VISIT** [ ] **CONFERENCE** [ ] **TELEPHONE**			**NAME/SYMBO**	**INI**
		[ ] **INCOMING** [ ] **OUTGOING**		
Location of Visit/Conference:				
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: **Amy Moore**	**ORGANIZATION** (Office, dept., bureau, etc.)**:** **Corps, R.I. District**	**TELEPHONE NO:** **309-794-5831**		
SUBJECT **Pool 12 HREP Environmental Site Assessment**				

SUMMARY

Amy was interviewed about her previous site visit(s) to the project sites. Amy is the HTRW coordinator for the Pool 12 Overwintering HREP. She said that she has been to the project two times, and looked at all of the project sites from an air boat. She stated that the lakes on the project sites can be very shallow (~18"). Although she wasn't looking for HTRW concerns in particular at the time, she was able to answer the following questions:

-Have you observed hazardous substances in connection with identified uses? No.
-Did you observe any storage tanks on project sites? No.
-Did you see any indication of PCBs? Any power lines crossing over to the island? No. There are some power lines crossing over to the island by the Galena Boat Ramp.
-Did you observe any Pits, Ponds, or Lagoons? No.
-Did you see any stained soil or pavement? No. She was present when soil borings were being conducted, and saw no evidence of stained soil.
-Did you observe signs of solid waste disposal, such as trash, discarded appliances, etc? No.
-Are you aware of any structures on target properties? No. The only structures she saw were the Galena Boat Ramp and houses on the island in the area.
-Are you aware of any wells or septic systems on any of the sites? No.
She has not observed any signs of fish kills or vegetation that appeared to be stressed from something other than normal conditions.
-Do you have any concerns that you recommend I address when interviewing the wildlife refuge manager and other people familiar with the project? Ask the biologist specifically about plant distress. Also ask him if there are any sensitive species in the area, which would indicate a healthy ecosystem.

ACTION REQUIRED

None.

NAME OF PERSON DOCUMENTING CONVERSATION **Troy Hythecker**	**SIGNATURE**	**DATE** **7-19-2002**

ACTION TAKEN

SIGNATURE	**TITLE**	**DATE**

	CONVERSATION RECORD	**OPTIONAL FORM 271 (12-76)** **DEPARTMENT OF DEFENSE**

CONVERSATION RECORD	TIME 10:30 A.M.	DATE 7-24-2002

TYPE			ROUTINE	
[X] VISIT [ ] CONFERENCE [ ] TELEPHONE [ ] INCOMING [ ] OUTGOING			NAME/SYMBO	INI
Location of Visit/Conference:				
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Elliott Stefanik, Biologist	ORGANIZATION (Office, dept., bureau, etc.): Corps, R.I. District	TELEPHONE NO: 309-794-5285		
SUBJECT Pool 12 HREP Environmental Site Assessment				

SUMMARY

Elliott was interviewed about his previous visits to the Pool 12 HREP site. He said that he has been on one formal site visit, but has also been to the project several other times on various occasions.

Elliott did not observe any hazardous substances or anything indicating the presence of hazardous substances. He did not observe any signs of solid waste disposal. He said that he observed no signs of stressed vegetation, and did not note any sensitive plant or animal species that would indicate a pristine environment.

ACTION REQUIRED
None.

NAME OF PERSON DOCUMENTING CONVERSATION Troy Hythecker	SIGNATURE	DATE 7-26-2002

ACTION TAKEN

SIGNATURE	TITLE	DATE

	CONVERSATION RECORD	OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

CONVERSATION RECORD	TIME 9:00 A.M.	DATE 7-26-2002

TYPE			ROUTINE	
[X] VISIT [ ] CONFERENCE [ ] TELEPHONE [ ] INCOMING [ ] OUTGOING			NAME/SYMBO	INI
Location of Visit/Conference:				
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Dave Bierl, Water Quality	ORGANIZATION (Office, dept., bureau, etc.): Corps, R.I. District	TELEPHONE NO: 309-794-5581		
SUBJECT Pool 12 HREP Environmental Site Assessment				

SUMMARY

Mr. Bierl was interviewed about his previous visits to the project site. Dave did not observe any signs of hazardous substances or any reason to suspect the presence of hazardous substances. He stated that most of his visits have been conducted during winter months when visibility is limited due to snow and ice on the ground. He is not aware of any HTRW issues from a water quality point of view, and said that dissolved oxygen and pH levels are monitored at various sites. Mr. Bierl noted that there is a lot of naturally occurring lead in the area near Galena, but has not observed elevated levels in the water near project sites.

ACTION REQUIRED
None.

NAME OF PERSON DOCUMENTING CONVERSATION Troy Hythecker	SIGNATURE	DATE 7-26-02

ACTION TAKEN

SIGNATURE	TITLE	DATE

	CONVERSATION RECORD	OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

CONVERSATION RECORD	**TIME** **11:15 A.M.**	**DATE** **8-02-02**

TYPE			**ROUTINE**	
[ ] **VISIT** [ ] **CONFERENCE** [X] **TELEPHONE**			**NAME/SYMBO**	**INI**
		[ ] **INCOMING**		
Location of Visit/Conference:		[X] **OUTGOING**		
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: **Ed Britton**	**ORGANIZATION** (Office, dept., bureau, etc.)**:** **U.S. Fish and Wildlife Service**	**TELEPHONE NO:** **(815) 273-2732**		
SUBJECT **Pool 12 HREP Environmental Site Assessment**				

SUMMARY

Mr. Ed Britton, U.S. Fish and Wildlife Service, is a refuge manager in the project area. He was interviewed about his knowledge of HTRW concerns in the project area.

He is not aware of any hazardous substances, or other toxic or radioactive waste on project sites.
He has not observed any storage tanks on refuge lands.
He stated that the animal and plant life in the area is typical riverine habitat, with nothing out of the ordinary. No species indicating a particularly healthy or polluted environment are present.

The only concern he had was that there is a bald eagle nesting site near one of the lakes (Hires Lake?), so he recommended that construction schedules be arranged to avoid the eagle nesting period.

ACTION REQUIRED

Consider bald eagle nesting when creating construction schedules.

NAME OF PERSON DOCUMENTING CONVERSATION **Troy Hythecker**	**SIGNATURE**	**DATE** **8-02-02**

ACTION TAKEN

SIGNATURE	**TITLE**	**DATE**

	CONVERSATION RECORD	**OPTIONAL FORM 271 (12-76)** **DEPARTMENT OF DEFENSE**

CONVERSATION RECORD	**TIME** **11:30 A..M.**	**DATE** **8-2-02**

TYPE			**ROUTINE**	
[ ] **VISIT** [ ] **CONFERENCE** [X] **TELEPHONE**			**NAME/SYMBO**	**INI**
		[ ] **INCOMING**		
Location of Visit/Conference:		[X] **OUTGOING**		
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: **Mike Steuck**	**ORGANIZATION** (Office, dept., bureau, etc.)**:** **Corps, R.I. District**	**TELEPHONE NO:** **563-872-5495**		
SUBJECT **Pool 12 HREP Environmental Site Assessment**				

SUMMARY

Mr. Mike Steuck, Bellevue LTRM, was interviewed regarding his knowledge of HTRW concerns on project sites. He stated that he grew up in Dubuque, Iowa and has spent a considerable amount of time fishing and boating in Pool 12, and is very familiar with the area. He said that he does fish sampling in the area about two times per year.

He is not aware of any hazardous substances in the area, and has not observed any signs of storage tanks or other HTRW concerns.

The only potential concern that he noted was the Apple River Chemical Company, which he said is a fertilizer company located on the bluff. He was aware of one report 3-4 years ago that mentioned a possible fish kill in the area. He subsequently did some sampling and observations in the area but did not notice anything indicating a release of hazardous substances.

He stated that during fish sampling, some chemically sensitive species were observed, indicating a fairly healthy ecosystem.

Another potential concern that he noted was the lead mine tailings in the Galena area, because that area was extensively mined in the 1800s.

He stated that land on both the Iowa and Illinois side of the river is used for agricultural crop production, and the only industry that he is aware of is the Apple River Chemical Company.

ACTION REQUIRED

None.

NAME OF PERSON DOCUMENTING CONVERSATION **Troy Hythecker**	**SIGNATURE**	**DATE** **8-2-02**

ACTION TAKEN

SIGNATURE	**TITLE**	**DATE**

	CONVERSATION RECORD	**OPTIONAL FORM 271 (12-76)** **DEPARTMENT OF DEFENSE**

CONVERSATION RECORD	TIME 11:00	DATE 2 Feb 2012

TYPE			ROUTINE	
[x] VISIT [ ] CONFERENCE [ ] TELEPHONE			NAME/SYMBO	INI
		[ ] INCOMING [ ] OUTGOING		
Location of Visit/Conference:				
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Dave Bierl	ORGANIZATION (Office, dept., bureau, etc.): CEMVR-EC-HQ	TELEPHONE NO: 309-794-5581		
SUBJECT Pool 12 HREP Environmental Site Assessment				

SUMMARY

-Have you observed hazardous substances in connection with identified uses? No.

-Did you observe any storage tanks on project sites? No.

-Did you see any indication of PCBs? No. Any powerlines crossing over to the island? Yes, north of Fishtrap Lake in Harris Slough and near the mouth of No Name Lake.

-Did you observe any Pits, Ponds, or Lagoons? No.

-Did you see any stained soil or pavement? No.

-Did you observe signs of solid waste disposal, such as trash, discarded appliances, etc? No, the only debris was that from recent flooding, but did not include appliances, etc.

-Are you aware of any structures on target properties? Houses on island off of Harris Slough.

-Are you aware of any wells or septic systems on any of the sites? I don't know of any.

Note: Dave visited the site on 26-Jan-2012. The purpose of this visit was to collect water quality samples in Fishtrap Lake.

ACTION REQUIRED

None.

NAME OF PERSON DOCUMENTING CONVERSATION Laura St. Louis	SIGNATURE	DATE 2 Feb 2012

ACTION TAKEN

SIGNATURE	TITLE	DATE

	CONVERSATION RECORD	OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

CONVERSATION RECORD	**TIME** **10:30**	**DATE** **2 Feb 2012**

TYPE			**ROUTINE**	
[x] **VISIT** [ ] **CONFERENCE** [ ] **TELEPHONE**			**NAME/SYMBO**	**INI**
Location of Visit/Conference:		[ ] **INCOMING** [ ] **OUTGOING**		
NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: **George Millar**	**ORGANIZATION** (Office, dept., bureau, etc.)**:** **CEMVR-EC-G**	**TELEPHONE NO:** **309-794-5714**		
SUBJECT **Pool 12 HREP Environmental Site Assessment**				

SUMMARY

-Have you observed hazardous substances in connection with identified uses? No, the landscape was snow-covered and the trees were bare. Nothing obvious jumped out. The site is frequented by fisherman and snowmobilers.

-Did you observe any storage tanks on project sites? No.

-Did you see any indication of PCBs? No. Any powerlines crossing over to the island? Yes, see interviews by Dave Bierl (2012) and Amy Moore (2002) for descriptions of the approximate locations.

-Did you observe any Pits, Ponds, or Lagoons? No.

-Did you see any stained soil or pavement? No.

-Did you observe signs of solid waste disposal, such as trash, discarded appliances, etc? No.

-Are you aware of any structures on target properties? No, there were not any temporary fishing structures, either.

-Are you aware of any wells or septic systems on any of the sites? No. The only location they may be present would be at the Galena boat ramp. There are currently overwintering boats present.

Note: George visited the site on 26 Jan 2012. The purpose of this visit was to collect water quality samples in Fishtrap Lake.

ACTION REQUIRED

None.

NAME OF PERSON DOCUMENTING CONVERSATION **Laura St. Louis**	**SIGNATURE**	**DATE** **2 Feb 2012**

ACTION TAKEN

SIGNATURE	**TITLE**	**DATE**

	CONVERSATION RECORD	**OPTIONAL FORM 271 (12-76)** **DEPARTMENT OF DEFENSE**

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX F

WATER QUALITY

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APPENDIX F

WATER QUALITY

I. PURPOSE

The purpose of this appendix is twofold: 1) to discuss the results from sediment and elutriate analyses which were performed in an effort to predict water quality impacts from potential dredging locations at six Pool 12 backwater areas, and 2) to evaluate the results from water quality monitoring performed by Corps and Iowa Department of Natural Resources (IADNR) personnel at potential habitat rehabilitation project sites in Pool 12. Sediment and elutriate sampling was performed by both the Corps and by Foth Infrastructure and Environment (Foth), Green Bay, Wisconsin, under contract to the Corps. Water quality monitoring was performed by Corps personnel in order to define pre-project baseline water quality conditions. Water quality monitoring was performed by IADNR personnel as part of the Long Term Resource Monitoring Program (LTRMP).

II. INTRODUCTION

Presently, overwintering habitat for fish and backwater habitat for both waterfowl and fish are limited in Pool 12. Sedimentation of backwater lakes and sloughs has limited their usefulness as deep-water, off-channel habitat for fish. Iowa DNR personnel reported low dissolved oxygen (DO) concentrations accompanied by winterkills in the backwaters of Pool 12 during low-water years in the late 1980s (Pitlo, personal communication).

Dredging channels is one measure under consideration for improving fish habitat in Pool 12. In order to predict dredging related water quality impacts, sediment and water samples were collected for elutriate analysis by Corps personnel on April 1, 2003 from six Pool 12 backwater areas (Stone, Tippy, No Name, Fish Trap and Sunfish Lakes and Kehough Slough). Grain size analyses were performed on all sediment samples and a background ambient water analysis was performed on a sample collected from Sunfish Lake (E-M564.3S). Evaluation of results from this initial sampling and consultation with the Illinois Environmental Protection Agency (ILEPA) regarding high elutriate zinc concentrations at four of the six backwater areas led to a series of additional sediment and elutriate samplings which were performed in an effort to better characterize the nature of the sediments and the potential for water quality impacts. The additional samplings were as follows: Sunfish Lake on January 26, 2007 for elutriate analyses; Stone, Tippy, No Name and Fish Trap Lakes and Kehough Slough on March 14, 2007 for elutriate analyses; Stone, Tippy, No Name, Fish Trap and Sunfish Lakes and Kehough Slough from July 20-22, 2011 for sediment and elutriate analyses (this sampling was performed by Foth, while the remaining samplings were performed by the Corps); and Fish Trap Lake on January 26, 2012 for sediment analyses. The Corps' samplings performed during 2007 were at the same locations as the 2003 samplings.

In order to determine pre-project water quality conditions, Corps personnel initiated a baseline monitoring program in December 2000 at site W-M567.5Y (see Plate 34) in Kehough Slough. Monitoring was performed here during the winters of 2000-2001, 2002-2003 and 2003-2004. Tippy Lake (site W-M571.4N in Plate 35) was monitored during the winters of 2001-2002, 2004-2005, 2005-2006 and during additional months from 2010 through 2012. Fish Trap Lake (site W-M566.3P in Plate 34) was monitored during the winter of 2001-2002 and during additional months in 2003 through 2005, and then again during the winters of 2007-2008 and 2008-2009. Stone Lake (site W-M571.9W in Plate 35) was monitored during the winters of 2004-2005, 2005-2006, and during additional months from 2010 through 2012. Sunfish Lake (site W-M564.7R in Plate 33) was monitored only during the winter of 2002-2003. Monitoring was accomplished through collection of discrete samples as well as deployment of multiparameter *in situ* water quality sondes.

Iowa DNR personnel have performed LTRMP water quality monitoring at site W-M563.9T (lower Sunfish Lake) essentially year round since May 1993. They also monitored site W-M564.5T (upper Sunfish Lake) during the winters of 1993-1994 through 1995-1996 and at site W-M566.2R (Fish Trap Lake) during the winters of 1993-1994 and 1994-1995. Monitoring was accomplished through collection of discrete samples only.

III. METHODS

Corps Water Quality and Sedimentation Section (EC-HQ) personnel collected samples for elutriate analyses on April 1, 2003 at Stone Lake (E-M571.9X in Plate 35), Tippy Lake (E-M570.8K in Plate 35), Kehough Slough (E-M567.7Y in Plate 34), No Name Lake (E-M566.7T in Plate 34), Fish Trap Lake (E-M566.3P in Plate 34) and Sunfish Lake (E-M564.3S in Plate 33). Sediment samples were collected with a 48-inch long, plastic-lined core sampler having a 2-inch diameter opening. Each sample was placed into a stainless steel basin and mixed until it was homogeneous. The mixture was then placed into glass sample bottles for grain size and chemical analyses. Water for the elutriate test and ambient water analyses were collected at the surface at Sunfish Lake (E-M564.3S). All sediment and water samples for chemical analyses were placed in an ice chest. Samples for elutriate and ambient water analyses were shipped the following day to EIS Analytical Services, Inc., South Bend, Indiana. The elutriate test consisted of placing 50 ml of a wet, well-mixed sediment sample and 200 ml of river water into a bottle. The mixture was shaken for 30 minutes, allowed to settle 30 minutes, and the supernatant was then drawn off and analyzed for lead, zinc, ammonia nitrogen, total suspended solids (TSS), volatile suspended solids (VSS), pH and temperature.

Similar sampling methods were used by EC-HQ personnel to procure samples from Sunfish Lake on January 26, 2007 and the remaining five backwater areas on March 14, 2007. In addition to the core sampler, a 3-inch, stainless steel, Iwan bucket auger was used by EC-HQ personnel to collect sediment samples from Fish Trap Lake on January 26, 2012.

Grain size analyses were performed in-house by Corps Geotechnical Branch personnel. Analyses were performed according to U.S. Army Corps of Engineers (1970) methods.

Sediment samples collected by Foth during the July 2011 sampling at each of the six backwater areas were obtained with a vibrocore sampler. A detailed discussion of the methods used for this sampling and analyses can be found in Foth Infrastructure and Environment (2011).

Corps Water Quality and Sedimentation Section personnel collected pre-project water quality monitoring data in an effort to determine baseline conditions. In general, sampling date, time, water depth, Secchi disk depth, water velocity, wave height, air temperature, percent cloud cover, wind speed and direction, pH, water temperature, dissolved oxygen (DO) and conductivity were recorded in the field. At each sampling site a water sample was collected just below the surface. The sample was placed on ice and shipped to EIS Analytical Services, Inc., South Bend, Indiana, or Iowa State University, Ames, Iowa for total suspended solids and chlorophyll analyses. Sample collection/preservation and field/laboratory analytical procedures were performed according to U.S. Environmental Protection Agency approved methods. Turbidity and alkalinity samples were analyzed in-house. In addition to the manually collected data, YSI and Hach multiparameter water quality

monitoring sondes were deployed on numerous occasions. Typically the sondes were placed one to three feet from the bottom and were programmed to record DO, pH, temperature, depth, specific conductance and/or turbidity every two hours.

Iowa DNR personnel performed water quality monitoring as part of the LTRMP. Field measurements were performed according to the methods outlined in the LTRMP water quality monitoring procedures manual (Soballe and Fischer, 2004). Only discrete samples were collected by the IADNR.

IV. RESULTS AND DISCUSSION

A. Grain Size (Corps). The grain size analysis results from sediment samples collected in 2003 indicated the bed material from all six Pool 12 backwater areas was fat clay. Greater than 98.0 percent material passed through a #200 sieve at all sites except for Fish Trap Lake (E-M566.3P), where 88.6 percent passed the #200 sieve (table F-1). Sediment samples collected from the six backwater areas in 2007 were also classified as fat clay. The percent material passing a #200 sieve was similar to the 2003 samples (within one percent), except for Fish Trap Lake (E-M566.3P), which had 100 percent passage.

Table F-1. Elutriate (1/2-hour settling time), Ambient Water, and Grain Size Analysis Results From Samples Collected at Six Pool 12 Backwater Sites on April 1, 2003

PARAMETER	State Standard[1]	Stone Lake E-M571.9X	Tippy Lake E-M570.8K	Kehough Slough E-M567.7Y	No Name Lake E-M566.7T	Fish Trap Lake E-M566.3P	Sunfish Lake E-M564.3S	Ambient Water[4]
Total Lead (mg/L)	0.3073	0.052	0.038	0.140	0.177	0.261	0.209	0.009
Total Zinc (mg/L)	0.2656	0.221	0.159	0.369	0.455	0.927	1.020	0.046
Ammonia-N (mg/L)	15.0[2]	6.6	4.6	6.4	2.4	6.0	7.2	<0.05
Total Suspended Solids (mg/L)	-	1400	1360	3140	2500	4240	890	53
Volatile Suspended Solids (mg/L)	-	140	260	260	160	380	93	16
pH[3]	6.5 - 9.0	7.2	7.1	6.9	6.9	7.0	7.2	-
Temperature (°C)[3]	-	19	19	19	19	19	19	-
Grain Size[5]	-	99.6	98.2	98.9	98.3	88.6	99.7	-

[1] Illinois General Use Water Quality Standard (acute standard assuming a hardness level of 250 mg/L as $CaCO_3$ is given for metals).

[2] Acute ammonia-N standard at a pH≤7.6.

[3] Temperature and pH values were measured in the laboratory immediately prior to ammonia-N analysis.

[4] Collected from Sunfish Lake (E-M564.3S).

[5] Percent material passing a #200 sieve.

B. Elutriate (Corps). Elutriate analyses were performed in order to assess the potential impacts of hydraulic dredging activities on water quality and to gather data for obtaining Section 401 Water Quality Certification. The results from the 2003 elutriate analyses are found in table F-1. Ambient water concentrations as well as state standard values are included in the table for comparative purposes. As expected for fine-grained sediments, elutriate TSS and VSS concentrations were considerably higher than ambient values. Dredging of these sediments would likely result in localized, temporary increases in suspended solids concentrations. Efforts to moderate these impacts could include utilization of silt fences, straw bales or any other technique that would be effective at filtering sediment from return water. Mechanical, as opposed to hydraulic dredging would also moderate the impacts of suspended solids on water quality.

All elutriate ammonia nitrogen concentrations were below the acute state standard (at a pH of < 7.6) of 15.0 mg/L. The maximum elutriate ammonia-nitrogen concentration determined was 7.2 mg/L at Sunfish Lake (E-M564.3S).

Elutriate total lead concentrations were all below the acute state standard (assuming a hardness level of 250 mg/L as $CaCO_3$) of 0.3073 mg/L. The maximum elutriate total lead concentration (0.261 mg/L) was found in the Fish Trap Lake (E-M566.3P) sample.

Four of the six total zinc elutriate results exceeded the acute state standard (assuming a hardness level of 250 mg/L as $CaCO_3$) of 0.2656 mg/L. The exceedances were found in the following samples: 0.369 mg/L at Kehough Slough (E-M567.7Y), 0.455 mg/L at No Name Lake (E-M566.7T), 0.927 mg/L at Fish Trap Lake (E-M566.3P) and 1.020 mg/L at Sunfish Lake (E-M564.3S). Zinc is closely associated with fine-grained sediments; therefore, the methods described previously to moderate sediment impacts would also be effective in reducing zinc concentrations.

The elutriate results from the 2003 sampling, which utilized only one settling period (30 minutes), indicated that dredging of four of the six backwater areas could potentially result in exceedances of the Illinois General Use Water Quality Standard for zinc. Typically, a settling period of 30 minutes is used in the test to simulate worst-case conditions (bank-line placement with no restriction of return flow). Longer settling periods are utilized when it is anticipated the dredged material will be placed in a confined placement site or an engineered barrier (silt fence, straw bales, etc.) will be used to slow the return flow to the receiving water body. In an effort to determine the effects of longer elutriate settling times on zinc concentrations, the Sunfish Lake site (E-M564.3S) was sampled again in January 2007 and subjected to settling periods of 0.5, 1, 2, 4, 8 and 24 hours. The Sunfish Lake site was selected because it had the highest elutriate zinc concentration in 2003 and represented a worst-case situation. Results from the 2007 Sunfish Lake elutriate analyses are as follows:

Settling Time	Zinc Concentration	Zinc Reduction (%)[1]
1/2	0.222	0
1	0.093	58.1
2	0.048	78.4
4	Lab Error	-
8	0.025	88.7
24	0.021	90.5

[1] Reduction in zinc as a percentage of the concentration present at 1/2 hr settling time.

A 58.1 percent reduction in zinc concentration occurred after one hour of settling. A 78.4 percent reduction in zinc concentration occurred after two hours of settling. The four hour settling result was unavailable due to a laboratory error. The reduction in zinc concentration continued after 8 and 24 hours of settling, although the rate of decline had slowed considerably. The maximum zinc reduction was 90.5 percent following 24 hours of settling.

Elutriate samples were collected from the remaining five Pool 12 backwater areas again in March 2007 at the request of the ILEPA in order to assist them with the 401 Water Quality Certification process. The elutriate samples were analyzed for zinc and total suspended solids and settling periods of 0, ½, 4 and 24 hours were utilized for all samples, while samples from the two lakes most likely to be dredged hydraulically (No Name and Tippy) were subjected to 48 and 168 hour settling times. A 72 hour settling period for samples from these two lakes was also requested by the ILEPA; however, there was insufficient supernatant to draw a sample at 72 hours. The elutriate and ambient water results from the March 14, 2007 sampling are given in table F-2. Total zinc and total suspended solids (TSS) concentrations decreased dramatically with settling times greater than ½ hour. Zinc concentrations fell below the state standard following ½ hour settling at No Name Lake and Kehough Slough, and 4 hours settling at Fish Trap, Stone and Tippy Lakes.

C. Bulk Sediment and Elutriate (Foth). Samples for bulk sediment and elutriate analyses were collected from the six Pool 12 backwater areas by Foth under contract to the Corps in 2011. General conclusions from this evaluation include:

"♦ Based on the characterization, semi-volatile organic compounds (SVOC), volatile organic compounds (VOC), polychlorinated biphenyls (PCB), pesticides and herbicides are not anticipated to be of concern during any dredging activities.

♦ Common elements found in soil such as aluminum and magnesium are detected in all samples.

♦ No parameters tested in the bulk sediment exceeded the TACO, Tier 1 objectives.

♦ Lead and zinc in the bulk sediment sample exceeded the US EPA Screening Level (ESL) at Fish Trap Lake.

♦ Cyanide exceeded the ESL in the bulk sediment sample at Tippy Lake.

♦ Cadmium, lead, and zinc exceeded the ESL in the bulk sediment sample at Sunfish Lake.

♦ Arsenic, barium, cadmium, chromium, copper, and nickel exceeded the ESL; iron, manganese, ammonia, and TSS exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard; and cyanide, lead, mercury, and zinc exceeded both standards in the 24-hour elutriate sample at Fish Trap Lake.

♦ In addition to Fish Trap Lake, cyanide was detected between the detection and reporting limit and exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at Tippy Lake and Sunfish Lake.

♦ In addition to Fish Trap Lake, ammonia exceeded the ILEPA Secondary Contact and Indigenous Aquatic Standard in the 24-hour elutriate sample at No Name Lake, Stone Lake, Tippy Lake, Sunfish Lake, and Kehough Slough.

♦ Lead exceeded the ESL in the 24-hour elutriate sample at Sunfish Lake and Kehough Slough.

♦ These elements are persistent in the elutriate samples due to the fine grained nature of the sediment.

♦ Based on the results of the dissolved testing at 96 hour, filtering the sample brought levels down below standards."

Table F-2. Elutriate and Ambient Water Test Results (in mg/L)
From Samples Collected on March 14, 2007 at Five Pool 12 Backwater Sites

	Site Location					
Analyte (Settling Time)	**No Name E-M566.7T**	**Fish Trap E-M566.3P**	**Duplicate E-M566.3P**	**Kehough E-M567.7Y**	**Stone E-M571.9X**	**Tippy E-M570.8K**
Total Zn (0 hr)	21.7	23.4	26.0	18.0	12.7	11.1
Total Zn (1/2 hr)*	0.175	0.799	0.546	0.134	0.453	0.230
Total Zn (4 hr)	0.034	0.167	0.154	0.024	0.110	0.065
Total Zn (24 hr)	0.017	0.023	0.012	0.013	0.014	0.010
Total Zn (48 hr)	0.012	-	-	-	-	0.015
Total Zn (168 hr)	0.008	-	-	-	-	<0.005
TSS (0 hr)	216,000	164,000	99,000	321,000	102,000	135,900
TSS (1/2 hr)*	1,390	2,820	1,760	1,220	3,400	1,320
TSS (4 hr)	290	500	500	150	590	250
TSS (24 hr)	35	31	24	25	13	7
TSS (48 hr)	18	-	-	-	-	20
TSS (168 hr)	14	-	-	-	-	22
Ambient Total Zn	0.012	0.006	0.010	0.009	0.009	0.009
Ambient TSS	18	5	4	6	7	11
Ambient Hardness (mg/L as $CaCO_3$)	168	168	-	167	123	167
State Standard for Zn*	0.1896	0.1896	-	0.1887	0.1456	0.1887

* Illinois General Use Water Quality Standard (acute standard calculated from given ambient hardness value).

The report in its entirety (Foth, 2011) is on file with the Corps and is available for review. In general, the report indicates that the greatest potential for exceeding water quality standards would occur if Fish Trap Lake was dredged. For this reason, additional bulk sediment samples were collected here by the Corps in 2012. The Foth report evaluates elutriate analysis results against ESL and ILEPA Secondary Contact and Indigenous Aquatic Life concentrations. The ESLs are guidelines; whereas, the ILEPA Secondary Contact and Indigenous Aquatic Life concentrations are regulatory state standards. Unfortunately, the ILEPA Secondary Contact and Indigenous Aquatic Life water quality standards are not applicable to the Mississippi River in the project area and therefore were applied erroneously. The appropriate standards to use for the project area are the General Use Water Quality Standards, which were provided to the District in a December 2011 correspondence from the ILEPA. The ILEPA provided the acute, chronic and 302.208(g) water quality standards for several metals, assuming a total hardness value of 170 mg/L as $CaCO_3$ which was based on data from nearby Mississippi River monitoring stations. The elutriate concentrations from the Foth report were reevaluated using these three sets of standards as shown in tables F-3 through F-8 for each of the six backwater lakes. Since return water generated from mechanically placed dredge material is short term and intermittent in nature, the acute standard is the most appropriate standard to apply.

D. Bulk Sediment (Corps). Samples for bulk sediment analysis were collected by Corps personnel in January 2012 for the purpose of determining the extent of high zinc concentrations within three potential dredge cuts in the vicinity of Fish Trap Lake. Samples were collected at 16 locations as shown in Aerial Map F-1. Bulk sediment zinc concentrations ranged from 21.4 mg/kg to 539 mg/kg. Samples from six locations exceeded the USEPA Screening Level (ESL) of 121 mg/kg. At least one sample in each of the three potential dredge cuts had a zinc concentration that exceeded the ESL. Due to the extent of high zinc concentrations in this backwater area, and elevated concentrations of additional constituents as described in Foth (2011), the alternative to dredge channels in the vicinity of Fish Trap Lake was dropped from further consideration.

Appendix F
Water Quality

Table F-3. Fishtrap Lake

Modified Elutriate Test Results
Fishtrap Lake

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	FISH TRAP LAKE	FISH TRAP LAKE	FISH TRAP LAKE	FISH TRAP LAKE	FISH TRAP LAKE
Settling Time:					1 Hour	4 Hours	8 Hours	24 Hours	96 Hours - Dissolved (Filtered)
Sample Date:					7/20/2011	7/20/2011	7/20/2011	7/20/2011	7/20/2011
Metals	Units								
Aluminum	µg/l				210000	180000	180000	160000	41 JB
Arsenic	µg/l	360	190		90	78	78	72	9.2 J
Barium	µg/l			5000	2300	1900	2000	1800	130 J
Cadmium	µg/l	17.7	1.7		11	9	8.7	7.9	<5.0 U
Chromium	µg/l	2681.7	319.6		310	260	270	240	<5.0 U
Copper	µg/l	29.2	18.6		280	230	240	220	<25 U
Cyanide	µg/l	22	5.2					9.8 J	
Iron*	µg/l			1000 (dissolved)	340000	290000	300000	270000	180
Lead	µg/l	188.1	39.4		600	530	530	490	<3.0 U
Magnesium	µg/l				60000	50000	51000	47000	21000
Manganese	µg/l			1000	9900	8600	8600	8000	2100
Mercury	µg/l	2.6	1.3		14	12	9.6	8.4	<0.20 U
Nickel	µg/l	129.3	7.8		280	240	240	230	3.7 J
Nitrogen, Ammonia	mg/l				60 B	52 B	24 B	39 B	13 B
Strontium	µg/l				250	210	210	190	130
Titanium	µg/l				2200	2000	2100	1700	< 50 U
Total Suspended Solids	mg/l				90000	140000	130000	140000	< 4.0 UH
Zinc	µg/l	191.5	34.3		2800	2500	2500	2300	15 J

Notes:
-- = not applicable
< = The analyte was not detected at or above the reporting limit.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = millligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed beyond the specifed holding time.
µg/l = micrograms per liter
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron.

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard

Appendix F
Water Quality

Table F-4. Tippy Lake

Modified Elutriate Test Results
Tippy Lake

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	TIPPY LAKE	TIPPY LAKE	TIPPY LAKE	TIPPY LAKE	TIPPY LAKE
Sample ID:					1 Hour	4 Hours	8 Hours	24 Hours	96 Hours - Dissolved (Filtered)
Sample Date:					7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011
Metals	Units								
Aluminum	µg/l				130000	1600	1600	750	42 JB
Arsenic	µg/l	360	190		42	< 10 U	< 10 U	< 10 U	4 J
Barium	µg/l			5000	1300	34 J	30 J	22 J	130 J
Cadmium	µg/l	17.7	1.7		3.7 J	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chromium	µg/l	2681.7	319.6		190	1.5 J	1.3 J	< 5.0 U	< 5.0 U
Copper	µg/l	29.2	18.6		150	< 25 U	< 25 U	< 25 U	< 25 U
Cyanide	µg/l	22	5.2					1.5 J	
Iron *	µg/l			1000 (dissolved)	190000	1300	1300	540	< 100 U
Lead	µg/l	188.1	39.4		170	< 3.0 U	< 3.0 U	< 3.0 U	< 3.0 U
Magnesium	µg/l				38000	1900 J	1600 J	1600 J	16000
Manganese	µg/l			1000	5300	190	110	120	1600
Mercury	µg/l	2.6	1.3		7.4	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U
Nickel	µg/l	129.3	7.8		180	2.5 J	3 J	< 40 U	< 40 U
Nitrogen, Ammonia	mg/l				14 B	5.4 B	5.1 B	5.3 B	5.8 B
Strontium	µg/l				150	11 J	9.4 J	9.1 J	87
Titanium	µg/l				1700	28 J	28 J	13 J	< 50 U
Total Suspended Solids	mg/l				22000	420	310	64	< 4.0 UH
Zinc	µg/l	191.5	34.3		800	7.5 J	7.1 J	5.3 J	8.1 J

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard

Notes:
-- = not applicable
< = The analyte was not detected at or above the reporting limit.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = millligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed beyond the specifed holding time.
µg/l = micrograms per liter
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron.

Appendix F
Water Quality

Table F-5. Kehough Slough

Modified Elutriate Test Results
Kehough Slough

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	KEHOUGH SLOUGH	KEHOUGH SLOUGH	KEHOUGH SLOUGH	KEHOUGH SLOUGH	KEHOUGH SLOUGH
Settling Time					1 Hour	4 Hours	8 Hours	24 Hours	96 Hours - Dissolved (Filtered)
Sample Date:					7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011
Metals	Units								
Aluminum	µg/l				29000	14000	2400	2000	50 JB
Arsenic	µg/l	360	190		8.4 J	4.2 J	< 10 U	< 10 U	< 10 U
Barium	µg/l			5000	280	140 J	38 J	33 J	150 J
Cadmium	µg/l	17.7	1.7		0.83 J	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chromium	µg/l	2681.7	319.6		33	15	2.6 J	1.7 J	< 5.0 U
Copper	µg/l	29.2	18.6		21 J	9.7 J	< 25 U	< 25 U	5.1 J
Cyanide	µg/l	22	5.2					< 10 U	
Iron*	µg/l			1000 (dissolved)	29000	12000	1900	1500	< 100 U
Lead	µg/l	188.1	39.4		33	14	2.3 J	1.7 J	< 3.0 U
Magnesium	µg/l				6300	3300 J	1600 J	1300 J	13000
Manganese	µg/l			1000	320	110	33	22	460
Mercury	µg/l	2.6	1.3		0.4	0.13 J	< 0.20 U	< 0.20 U	< 0.20 U
Nickel	µg/l	129.3	7.8		29 J	13 J	2.9 J	3.1 J	< 40 U
Nitrogen, Ammonia	mg/l				11 B	9.8 B	8.1 B	8.8 B	5.7 B
Strontium	µg/l				30 J	18 J	9.9 J	8.4 J	85
Titanium	µg/l				470	250	47 J	38 J	< 50 U
Total Suspended Solids	mg/l				7400	1800	150	19	< 4.0 UH
Zinc	µg/l	191.5	34.3		150	68	16 J	10 J	13 J

Notes:
-- = not applicable
< = The analyte was not detected at or above the reporting limit.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = millligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
µg/l = micrograms per liter
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed beyond the specifed holding time.
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron.

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard

Appendix F
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Table F-6. Stone Lake

Modified Elutriate Test Results
Stone Lake

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	STONE LAKE	STONE LAKE	STONE LAKE	STONE LAKE	STONE LAKE
Sample ID:					1 Hour	4 Hours	8 Hours	24 Hours	96 Hours - Dissolved (Filtered)
Sample Date:					7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011
Metals	Units								
Aluminum	µg/l				170000	1200	540	640	40 JB
Arsenic	µg/l	360	190		57	< 10 U	< 10 U	< 10 U	3.7 J
Barium	µg/l			5000	1700	25 J	20 J	17 J	170 J
Cadmium	µg/l	17.7	1.7		6.2	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chromium	µg/l	2681.7	319.6		270	1.1 J	0.9 J	0.73 J	< 5.0 U
Copper	µg/l	29.2	18.6		200	< 25 U	< 25 U	< 25 U	< 25 U
Cyanide	µg/l	22	5.2					< 10 U	
Iron*	µg/l			1000 (dissolved)	280000	1000	420	440	< 100 U
Lead	µg/l	188.1	39.4		220	< 3.0 U	< 3.0 U	< 3.0 U	< 3.0 U
Magnesium	µg/l				52000	1700 J	1900 J	1100 J	21000
Manganese	µg/l			1000	7000	91	120	74	1200
Mercury	µg/l	2.6	1.3		8.7	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U
Nickel	µg/l	129.3	7.8		220	2.1 J	< 40 U	1.8 J	2 J
Nitrogen, Ammonia	mg/l				12 B	7.1 B	6.5 B	7.2 B	7.9 B
Strontium	µg/l				220	9.9 J	10 J	6.5 J	120
Titanium	µg/l				2000	22 J	9.2 J	9.7 J	< 50 U
Total Suspended Solids	mg/l				110000	350	170	130	< 4.0 UH
Zinc	µg/l	191.5	34.3		1100	6.6 J	5 J	4.6 J	12 J

Notes:
– = not applicable
< = The analyte was not detected at or above the reporting limit.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = millligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed□beyond the specifed holding time.
µg/l = micrograms per liter
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron.

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard

Appendix F
Water Quality

Table F-7. Sunfish Lake

Modified Elutriate Test Results
Sunfish Lake

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	SUNFISH LAKE	SUNFISH LAKE	SUNFISH LAKE	SUNFISH LAKE	SUNFISH LAKE	SUNFISH LAKE	SUNFISH LAKE
Settling Time:					1 Hour	4 Hours - Duplicate	4 Hours	8 Hours	24 Hours	24 Hours - Duplicate	96 Hours - Dissolved (Filtered)
Sample Date:					7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011
Metals	Units										
Aluminum	µg/l				3400	1600	1500	380	980	930	37 JB
Arsenic	µg/l	360	190		< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U	< 10 U
Barium	µg/l			5000	50 J	29 J	30 J	19 J	23 J	24 J	130 J
Cadmium	µg/l	17.7	1.7		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chromium	µg/l	2681.7	319.6		3.4 J	1.5 J	1.3 J	0.77 J	0.88 J	0.76 J	< 5.0 U
Copper	µg/l	29.2	18.6		3.9 J	< 25 U	< 25 U	< 25 U	< 25 U	< 25 U	< 25 U
Cyanide	µg/l	22	5.2						1.5 J	2.4 J	
Iron*	µg/l			1000 (dissolved)	2900	1100	1100	280	760	700	< 100 U
Lead	µg/l	188.1	39.4		11	4	3.7	< 3.0 U	2.5 J	3.3	< 3.0 U
Magnesium	µg/l				1700 J	1600 J	1500 J	1700 J	1300 J	1500 J	17000
Manganese	µg/l			1000	91	69	71	68	47	51	850
Mercury	µg/l	2.6	1.3		0.088 J	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U
Nickel	µg/l	129.3	7.8		4.3 J	2.9 J	2 J	1.8 J	< 40 U	1.6 J	1.7 J
Nitrogen, Ammonia	mg/l				8.6 B	7.6 B	8.4 B	9.4 B	9.7 B	9.4 B	6.9 B
Strontium	µg/l				11 J	9.6 J	9.5 J	9.9 J	8.6 J	9.7 J	100
Titanium	µg/l				63	26 J	25 J	6.8 J	19 J	17 J	< 50 U
Total Suspended Solids	mg/l				920	360	350	78	140	130	< 4.8 UH
Zinc	µg/l	191.5	34.3		65	22	17 J	7.9 J	15 J	15 J	14 J

Notes:
-- = not applicable
< = The analyte was not detected at or above the reporting limit
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = milligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed beyond the specified holding time.
µg/l = micrograms per liter
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard

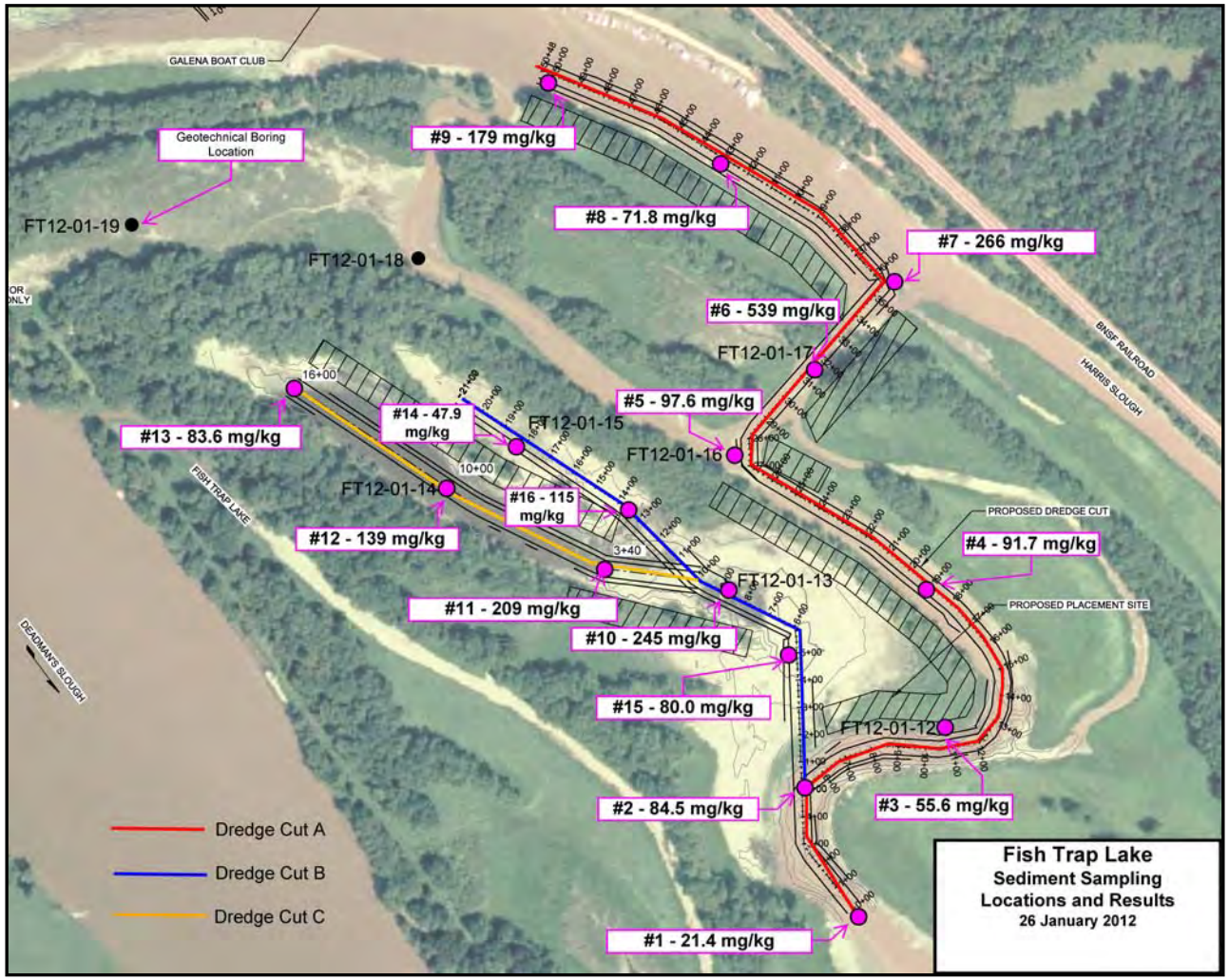
Table F-8. No Name Lake

Modified Elutriate Test Results
No Name Lake

Location:		Pool 12 Acute General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 Chronic General Use Water Quality Standards (ILEPA, Dec 2011)	Pool 12 302.208(g) Standard (ILEPA, Dec 2011)	NO NAME LAKE	NO NAME LAKE	NO NAME LAKE	NO NAME LAKE	NO NAME LAKE
Sample ID:					1 Hour	4 Hours	8 Hours	24 Hours	96 Hours - Dissolved (Filtered)
Sample Date:					7/21/2011	7/21/2011	7/21/2011	7/21/2011	7/21/2011
Metals	Units								
Aluminum	µg/l				8600	1500	2400	850	35 JB
Arsenic	µg/l	360	190		2.7 J	< 10 U	< 10 U	< 10 U	< 10 U
Barium	µg/l			5000	110 J	29 J	43 J	18 J	100 J
Cadmium	µg/l	17.7	1.7		< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U	< 5.0 U
Chromium	µg/l	2681.7	319.6		9.7	1.1 J	2.4 J	0.86 J	< 5.0 U
Copper	µg/l	29.2	18.6		5.1 J	< 25 U	< 25 U	< 25 U	< 25 U
Cyanide	µg/l	22	5.2					< 10 U	
Iron*	µg/l			1000 (dissolved)	8600	1100	1800	600	< 100 U
Lead	µg/l	188.1	39.4		14	2 J	3.1	< 3.0 U	< 3.0 U
Magnesium	µg/l				3100 J	1800 J	2100 J	1300 J	15000
Manganese	µg/l			1000	260	130	150	67	540
Mercury	µg/l	2.6	1.3		< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U
Nickel	µg/l	129.3	7.8		8.9 J	< 40 U	2.2 J	1.8 J	< 40 U
Nitrogen, Ammonia	mg/l				1.9 B	1.6 B	1.4 B	1.5 B	1.3 B
Strontium	µg/l				17 J	8.8 J	11 J	6.4 J	69
Titanium	µg/l				150	24 J	39 J	14 J	< 50 U
Total Suspended Solids	mg/l				2200	310	250	140	< 4.0 UH
Zinc	µg/l	191.5	34.3		55	8.6 J	11 J	6.4 J	12 J

Notes:
– = not applicable
< = The analyte was not detected at or above the reporting limit.
B = Method blank contamination. The associated method blank contains the target analyte at a reportable level.
D = dissolved
ft = feet
ID = identification
J = Estimated result. Result is less than the reporting limit.
JB = Estimated result. Result is less than the reporting limit. Compound was found in the blank and sample.
ILEPA = Illinois Environmental Protection Agency
mg/l = milligrams per liter
msl = mean sea level
T = total
U = The analyte was not detected at or above the method detection limit.
UH = The analyte was not detected at or above the method detection limit. Sample was prepped or analyzed beyond the specified holding time.
µg/l = micrograms per liter
µg/kg = micrograms/kilogram
USEPA = United States Environmental Protection Agency
VOC = Volatile Organic Compound
* Iron values in the data set were not evaluated for dissolved iron.

Sample result equals or exceeds the ILEPA Acute General Use Standard
Sample result equals or exceeds the ILEPA Chronic General Use Standard
Sample result equals or exceeds the ILEPA 302.208(g) Standard



Map F-1. Sediment Sampling Locations and Results – Fish Trap Lake

E. Water Quality Monitoring (Corps Discrete Samples). The results from baseline water quality monitoring performed by Corps personnel at five Pool 12 sites are found in tables F-9 through F-14. Sampling commenced in December 2000 at site W-M567.5Y in Kehough Slough. Monitoring was performed here during the winters of 2000-2001, 2002-2003 and 2003-2004. All DO concentrations exceeded 5.0 mg/L and several values were supersaturated (table F-9). Tippy Lake (site W-M571.4N) was monitored during the winters of 2001-2002, 2004-2005, 2005-2006 and during additional months from 2010 to 2012. As shown in table F-10, only one DO concentration was below 5.0 mg/L (4.97 mg/L on August 17, 2010), while supersaturated conditions were often measured during the winter. Fish Trap Lake (site W-M566.3P) was monitored during the winter of 2001-2002 and during additional months in 2003 through 2005, and then again during the winters of 2007-2008 and 2008-2009 (table F-11). Four DO concentrations were below 5.0 mg/L: 4.66 mg/L on June 14, 2005; 3.57 mg/L on July 26, 2005; 4.43 mg/L on February 1, 2008 and 1.78 mg/L on January 21, 2009. Sunfish Lake (site W-M564.7R) was monitored only during the winter of 2002-2003. All DO concentrations were above 5.0 mg/L and were supersaturated (table F-12). Stone Lake (site W-M571.9W) was monitored during the winters of 2004-2005, 2005-2006, and during additional months from 2010 to 2012. As shown in table F-13, four DO concentrations were below 5.0 mg/L: 4.36 mg/L on January 25, 2010; 3.84 mg/L on June 8, 2010; 4.00 mg/L on August 23, 2011 and 4.37 mg/L on January 25, 2012. Again, several of the winter DO measurements exhibited supersaturated conditions.

In summary, a total of nine discrete DO concentrations were below 5.0 mg/L in the five backwater areas monitored by the Corps, with five occurring during the summer months and four during the winter months. Supersaturated DO concentrations were often measured during the winter months but it was not uncommon to also see supersaturated concentrations during the summer months due to algal photosynthesis. High DO concentrations were often accompanied by high pH values, which occasionally exceeded 9.0.

F. Water Quality Monitoring (LTRMP Discrete Samples). In addition to the Pool 12 monitoring performed by the Corps, IADNR personnel have performed LTRMP water quality monitoring at site W-M563.9T (lower Sunfish Lake) since 1993; at sites W-M564.5T (upper Sunfish Lake) during the winters of 1993-1994 through 1995-1996; and at site W-M566.2R (Fish Trap Lake) during the winters of 1993-1994 and 1994-1995. Monitoring was accomplished through collection of discrete samples only. DO concentrations below 5.0 mg/L were measured on 27 occasions at site W-M563.9T (lower Sunfish Lake) over the 18-year monitoring period (table F-14). Only three of the low DO measurements were recorded during the winter months (1.7 mg/L on February 9, 1994; 1.0 mg/L on January 14, 2010; and 3.8 mg/L on March 8, 2010), with all occurring when the ice was at least 36 cm thick. The greatest frequency of low DO concentrations were measured during the summer of 2006, when four consecutive values below 5 mg/L were measured from June 29 through September 6. At site W-M564.5T (upper Sunfish Lake), the DO concentration was below 5 mg/L on February 9, 1994 (2.1 mg/L) and January 26, 1995 (3.0 mg/L); while at site W-M566.2R (Fish Trap Lake) the DO concentration was 3.9 mg/l on February 9, 1995 (tables F-15 and F-16). Nearly all of the low DO concentrations measured at the three LTRMP monitoring sites occurred when the available water depth was below the average value for the period of record and the velocity was 0 cm/sec. Increasing the available water depth by dredging channels would increase the volume of DO available and thus lessen the potential for low DO concentrations.

Table F-9. Water Quality Monitoring Results From Samples Collected at Site W-M567.5Y (Kehough Slough)

DATE	WATER DEPTH (M)	VELOCITY (CM/SEC)	WAVE HEIGHT (CM)	AIR TEMP. (°C)	CLOUD COVER (%)
12/27/2000	1.240	-	-	-9	85
1/31/2001	1.300	0.00	-	0	20
2/27/2001	1.270	-	-	-1	90
3/27/2001	1.210	0.09	0	4	10
12/12/2002	1.340	1.89	-	8	100
1/28/2003	1.320	0.47	-	1	100
4/1/2003	1.500	-	3	24	25
12/18/2003	1.150	-	-	-2	100
2/3/2004	1.250	0.36	-	-10	2
3/25/2004	1.390	-	1	17	100
MIN.	1.150	0.00	0	-10	2
MAX.	1.500	1.89	3	24	100
AVG.	1.297	0.56	1	3	63

DATE	WIND SPEED (MPH)	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)
12/27/2000	3	NW	0.1	14.03	7.90
1/31/2001	5	W	0.2	11.02	7.70
2/27/2001	6	NW	0.8	13.68	7.40
3/27/2001	2	SE	5.4	16.37	8.40
12/12/2002	1	SE	0.5	19.80	8.80
1/28/2003	3	W	0.5	24.34	8.93
4/1/2003	4	W	12.4	19.65	9.20
12/18/2003	4	NW	1.8	22.90	8.91
2/3/2004	4	NW	0.6	14.47	8.24
3/25/2004	6	S	10.3	18.00	8.80
MIN.	1	-	0.1	11.02	7.40
MAX.	6	-	12.4	24.34	9.20
AVG.	4	-	3.3	17.43	-

DATE	TOT. ALK. (MG/L as CaCO3)	SPEC. COND. (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (CM)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
12/27/2000	167	333	-	3.73	5.0
1/31/2001	152	302	-	8.46	7.0
2/27/2001	130	318	-	10.90	3.0
3/27/2001	165	417	79.0	14.70	16.0
12/12/2002	142	406	-	6.78	-
1/28/2003	174	461	-	5.25	-
4/1/2003	-	362	50.0	-	-
12/18/2003	174	438	-	11.60	-
2/3/2004	192	539	-	6.48	-
3/25/2004	145	405	42.0	16.30	-
MIN.	130	302	42.0	3.73	3.0
MAX.	192	539	79.0	16.30	16.0
AVG.	160	398	57.0	9.36	7.8

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
12/27/2000	<1	<1	<1	<1
1/31/2001	<1	<1	<1	<1
2/27/2001	1.6	<1	<1	<1
3/27/2001	0.5	<1	<1	<1
12/12/2002	-	-	-	-
1/28/2003	-	-	-	-
4/1/2003	-	-	-	-
12/18/2003	-	-	-	-
2/3/2004	-	-	-	-
3/25/2004	-	-	-	-
MIN.	1	<1	<1	<1
MAX.	2	<1	<1	<1
AVG.	1.1	0.5	0.5	0.5

Table F-10. Water Quality Monitoring Results From Samples Collected at Site W-M571.4N (Tippy Lake)

DATE	WATER DEPTH (M)	VELOCITY (CM/SEC)	WAVE HEIGHT (CM)	AIR TEMP. (°C)	CLOUD COVER (%)
1/3/2002	1.630	0.00	-	-4	10
3/1/2002	1.450	-	-	-7	100
12/29/2004	1.490	-	-	3	95
2/16/2005	2.030	-	-	4	15
3/17/2005	1.420	0.57	-	4	90
12/13/2005	1.640	0.09	-	1	90
1/19/2006	1.350	0.25	-	7	75
3/2/2006	1.570	0.11	-	2	100
12/14/2009	1.500	0.27	-	-5	100
1/25/2010	1.660	0.53	-	-2	100
3/12/2010	1.920	1.43	-	7	100
6/8/2010	1.535	1.68	1	19	98
6/23/2010	1.915	-	3	29	80
7/7/2010	2.210	-	1	27	85
7/15/2010	1.910	-	6	28	10
8/3/2010	1.980	-	1	29	55
8/17/2010	1.645	-	1	18	100
8/31/2010	1.220	-	1	25	70
9/14/2010	1.310	0.99	0	24	2
12/9/2010	1.580	-	-	-7	100
2/7/2011	1.555	0.16	-	-5	65
3/7/2011	1.710	0.47	-	0	100
6/1/2011	2.790	4.30	3	28	5
6/15/2011	2.260	6.64	5	18	80
6/28/2011	2.250	0.62	5	26	15
7/12/2011	1.760	0.77	1	29	80
7/26/2011	2.090	3.00	1	30	50
8/9/2011	2.280	0.46	10	25	30
8/23/2011	1.380	1.17	2	20	100
9/7/2011	1.430	-	5	23	2
12/13/2011	1.320	0.44	-	3	100
1/25/2012	1.340	0.24	-	-6	98
3/8/2012	1.325	0.97	-	1	10
MIN.	1.220	0.00	0	-7	2
MAX.	2.790	6.64	10	30	100
AVG.	1.711	1.14	3	12	67

DATE	WIND SPEED (MPH)	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)
1/3/2002	2	SW	2.9	18.90	7.90
3/1/2002	2	SE	3.5	23.11	8.60
12/29/2004	2	SE	2.5	>27.29	9.10
2/16/2005	7	NW	1.1	11.80	7.70
3/17/2005	2	SE	4.3	25.10	9.10
12/13/2005	7	SE	0.2	15.59	7.90
1/19/2006	3	SE	2.5	14.18	7.80
3/2/2006	4	NW	3.1	>26.85	8.90
12/14/2009	8	NW	3.5	20.45	8.90
1/25/2010	6	NW	1.0	5.83	7.20
3/12/2010	0	-	0.9	13.25	7.80
6/8/2010	2	SE	22.9	8.69	8.40
6/23/2010	3	NW	28.3	14.33	9.10
7/7/2010	0	-	27.3	13.46	8.70
7/15/2010	6	NW	29.5	11.31	8.30
8/3/2010	0	-	28.2	10.63	8.20
8/17/2010	1	SE	25.4	4.97	7.70
8/31/2010	2	SE	27.3	8.61	8.10
9/14/2010	1	SE	23.2	11.08	8.70
12/9/2010	4	SE	0.7	13.26	7.80
2/7/2011	3	W	0.1	11.60	7.20
3/7/2011	5	SE	0.0	12.39	7.60
6/1/2011	2	NW	23.1	14.57	8.90
6/15/2011	4	NW	21.9	8.17	7.70
6/28/2011	7	NW	25.7	8.27	8.00
7/12/2011	3	NW	29.7	6.85	7.90
7/26/2011	1	NW	32.8	20.29	8.90
8/9/2011	5	NW	27.2	6.68	7.80
8/23/2011	5	W	25.4	5.66	7.90
9/7/2011	2	NW	21.8	9.46	8.50
12/13/2011	0	-	2.5	10.47	8.00
1/25/2012	2	SE	0.8	15.22	8.30
3/8/2012	11	NW	3.5	21.18	8.90
MIN.	0	-	0.0	4.97	7.20
MAX.	11	-	32.8	>27.29	9.10
AVG.	3	-	13.7	13.62	-

Table F-10 (cont). Water Quality Monitoring Results From Samples Collected at Site W-M571.4N (Tippy Lake)

DATE	TOT. ALK. (MG/L as CaCO3)	SPEC. COND. (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (CM)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
1/3/2002	173	453	-	6.82	1.0
3/1/2002	132	356	70.0	9.63	13.0
12/29/2004	-	442	-	-	5
2/16/2005	-	313	-	-	7.0
3/17/2005	134	350	-	8.53	10.0
12/13/2005	-	366	-	-	-
1/19/2006	-	478	-	-	-
3/2/2006	-	472	-	-	-
12/14/2009	199	496	-	7.50	-
1/25/2010	169	395	-	6.40	-
3/12/2010	-	325	-	3.44	-
6/8/2010	195	465	39.5	26.40	28.0
6/23/2010	168	420	41.0	19.70	22.0
7/7/2010	169	432	85.5	9.80	10.0
7/15/2010	186	485	59.5	9.00	11.0
8/3/2010	171	426	60.5	10.10	11.0
8/17/2010	179	431	45.0	22.10	30.0
8/31/2010	177	399	42.0	18.40	29.0
9/14/2010	179	395	26.2	24.20	31.0
12/9/2010	183	380	-	9.20	-
2/7/2011	183	404	-	5.60	-
3/7/2011	132	282	-	4.40	-
6/1/2011	154	418	38.0	21.20	21.0
6/15/2011	181	474	37.0	28.40	24.0
6/28/2011	171	473	26.0	33.00	32.0
7/12/2011	217	508	34.8	17.90	17.0
7/26/2011	203	500	51.0	9.50	7.0
8/9/2011	192	482	29.0	18.70	31.0
8/23/2011	191	441	25.4	17.40	32.0
9/7/2011	181	418	24.0	18.30	21.0
12/13/2011	171	444	-	3.58	-
1/25/2012	216	320	-	3.70	-
3/8/2012	155	310	-	3.60	-
MIN.	132	282	24.0	3.44	1.0
MAX.	217	508	85.5	33.00	32.0
AVG.	176	417	43.2	13.45	18.7

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
1/3/2002	9.3	<1	<1	4.0
3/1/2002	69.0	<1	6.6	<1
12/29/2004	43	<1	5.3	<1
2/16/2005	<1	<1	<1	1.8
3/17/2005	43.0	<1	5.4	1.7
12/13/2005	-	-	-	-
1/19/2006	-	-	-	-
3/2/2006	-	-	-	-
12/14/2009	-	-	-	-
1/25/2010	-	-	-	-
3/12/2010	-	-	-	-
6/8/2010	134.0	5.0	9.0	21.0
6/23/2010	143.0	0.0	10.0	18.0
7/7/2010	26.0	2.0	1.0	9.0
7/15/2010	41.0	0.0	2.0	5.0
8/3/2010	42.0	4.0	2.0	5.0
8/17/2010	32.0	1.0	2.0	11.0
8/31/2010	33.0	4.0	2.0	20.0
9/14/2010	58.0	5.0	2.0	6.0
12/9/2010	-	-	-	-
2/7/2011	-	-	-	-
3/7/2011	-	-	-	-
6/1/2011	57.0	0.0	4.0	8.0
6/15/2011	30.0	0.0	3.0	13.0
6/28/2011	17.0	0.0	2.0	27.0
7/12/2011	30.0	2.0	3.0	7.0
7/26/2011	81.0	9.0	4.0	15.0
8/9/2011	27.0	2.0	2.0	8.0
8/23/2011	34.0	0.0	1.0	10.0
9/7/2011	37.0	1.0	3.0	8.0
12/13/2011	-	-	-	-
1/25/2012	-	-	-	-
3/8/2012	-	-	-	-
MIN.	<1	<1	<1	<1
MAX.	143.0	9.0	10.0	27.0
AVG.	47.0	2.0	3.3	10.0

Table F-11. Water Quality Monitoring Results From Samples Collected at Site W-M566.3P (Fish Trap Lake)

DATE	WATER DEPTH (M)	VELOCITY (CM/SEC)	WAVE HEIGHT (CM)	AIR TEMP. (°C)	CLOUD COVER (%)
1/3/2002	1.010	0.00	-	-3	5
3/19/2002	1.150	0.00	1	4	95
12/12/2002	0.900	0.18	-	7	100
1/28/2003	0.930	0.72	-	2	100
4/1/2003	1.120	-	0	24	35
6/3/2003	1.410	-	5	18	60
6/17/2003	1.370	0.82	0	29	15
7/1/2003	1.450	2.93	2	29	30
7/15/2003	1.450	-	8	27	35
7/29/2003	1.200	2.30	1	28	40
8/12/2003	1.040	1.23	1	25	65
8/26/2003	1.200	2.58	7	32	25
9/9/2003	1.050	0.57	7	28	10
12/18/2003	0.820	-	-	-2	100
2/3/2004	0.910	0.44	-	-10	2
3/25/2004	1.000	-	1	18	100
6/2/2004	2.310	-	2	21	55
6/15/2004	2.840	18.62	2	28	30
6/29/2004	1.790	1.51	1	28	15
7/13/2004	1.255	0.74	8	31	25
7/27/2004	1.015	0.34	1		5
8/10/2004	0.980	-	6	21	98
8/24/2004	0.965	2.07	6	23	75
9/8/2004	1.020	1.66	1	21	50
6/1/2005	1.250	1.34	0	27	50
6/14/2005	1.210	-	6	22	95
6/28/2005	1.300	2.79	0	28	85
7/13/2005	0.900	-	1	30	40
7/26/2005	0.870	2.19	1	22	100
8/9/2005	0.920	1.26	1	34	25
8/23/2005	0.840	-	4	25	35
9/7/2005	0.990	1.70	0	29	70
12/18/2007	1.080	-	-	-3	30
2/1/2008	1.000	0.51	-	-6	95
3/13/2008	1.080	0.20	-	8	50
12/9/2008	0.870	0.39	-	-4	100
1/21/2009	0.930	0.23	-	-6	10
3/6/2009	1.000	0.57	-	15	15
MIN.	0.820	0.00	0	-10	2
MAX.	2.840	18.62	8	34	100
AVG.	1.169	1.77	3	18	52

DATE	WIND SPEED (MPH)	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)
1/3/2002	3	S	3.8	21.35	8.20
3/19/2002	3	E	6.4	19.00	8.50
12/12/2002	0	-	3.5	16.97	8.59
1/28/2003	2	N	2.1	21.83	8.39
4/1/2003	2	S	11.3	21.90	9.50
6/3/2003	4	SE	19.0	9.74	8.00
6/17/2003	1	NW	29.5	17.93	9.00
7/1/2003	1	S	29.7	16.52	8.90
7/15/2003	7	NW	27.8	13.18	8.80
7/29/2003	1	NW	28.8	8.10	8.00
8/12/2003	2	S	26.2	7.35	-
8/26/2003	5	NW	29.4	7.89	7.90
9/9/2003	5	SE	25.2	6.02	7.70
12/18/2003	3	NW	4.5	8.64	8.32
2/3/2004	8	NW	2.5	11.27	8.20
3/25/2004	4	SE	11.3	18.90	9.00
6/2/2004	3	NW	20.3	7.00	7.40
6/15/2004	3	SE	24.1	5.70	7.00
6/29/2004	1	W	24.1	7.66	7.60
7/13/2004	7	NW	28.1	12.79	8.40
7/27/2004	3	NW	26.3	17.60	9.00
8/10/2004	7	W	22.6	7.05	8.10
8/24/2004	4	SE	24.4	6.83	7.70
9/8/2004	0	-	23.3	8.09	8.10
6/1/2005	1	NW	23.4	13.01	8.80
6/14/2005	6	NW	26.4	4.66	7.90
6/28/2005	1	SE	28.4	5.58	7.80
7/13/2005	3	NW	29.6	6.13	7.70
7/26/2005	1	N	27.4	3.57	7.40
8/9/2005	1	N	30.8	10.30	8.20
8/23/2005	7	SE	25.3	8.67	8.00
9/7/2005	1	W	25.6	8.43	8.00
12/18/2007	1	SE	2.1	5.68	7.30
2/1/2008	4	N	1.0	4.43	7.30
3/13/2008	4	NW	1.2	5.72	7.20
12/9/2008	6	N	4.0	20.05	8.80
1/21/2009	4	NW	0.8	1.78	7.30
3/6/2009	3	-	5.7	11.34	7.50
MIN.	0	-	0.8	1.78	7.00
MAX.	8	-	30.8	21.90	9.50
AVG.	3	-	18.0	10.75	-

Table F-11 (cont). Water Quality Monitoring Results From Samples Collected at Site W-M566.3P (Fish Trap Lake)

DATE	TOT. ALK. (MG/L as CaCO3)	SPEC. COND. (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (CM)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
1/3/2002	166	449	-	11.90	3.0
3/19/2002	-	351	27.0	-	-
12/12/2002	158	402	-	8.56	-
1/28/2003	211	509	-	5.41	-
4/1/2003	-	332	25.0	-	-
6/3/2003	95	374	30.0	31.50	-
6/17/2003	141	355	47.0	19.60	-
7/1/2003	-	380	39.0	-	-
7/15/2003	149	368	35.0	25.50	-
7/29/2003	173	391	31.0	29.30	-
8/12/2003	162	407	32.5	33.00	-
8/26/2003	-	424	38.0	21.10	-
9/9/2003	-	422	27.0	23.60	-
12/18/2003	183	430	-	8.26	-
2/3/2004	204	494	-	8.60	-
3/25/2004	143	370	24.0	27.30	-
6/2/2004	-	284	26.0	-	-
6/15/2004	-	320	35.0	-	-
6/29/2004	129	376	44.0	17.73	-
7/13/2004	144	422	26.0	35.20	-
7/27/2004	161	407	26.0	38.70	36.0
8/10/2004	168	418	19.0	74.10	-
8/24/2004	135	432	28.0	52.60	-
9/8/2004	175	422	20.0	49.50	-
6/1/2005	141	425	30.0	24.27	-
6/14/2005	-	472	38.0	-	-
6/28/2005	149	414	40.5	20.77	-
7/13/2005	178	453	35.0	16.37	-
7/26/2005	172	444	38.5	26.73	-
8/9/2005	194	441	41.0	20.00	-
8/23/2005	165	400	31.0	28.57	-
9/7/2005	173	424	42.0	18.60	-
12/18/2007	203	418	-	2.59	-
2/1/2008	251	446	-	8.45	-
3/13/2008	194	404	-	23.00	-
12/9/2008	200	470	-	7.82	-
1/21/2009	244	448	-	5.72	-
3/6/2009	139	373	-	43.00	-
MIN.	95	284	19.0	2.59	3.0
MAX.	251	509	47.0	74.10	36.0
AVG.	170	410	32.4	23.98	19.5

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
1/3/2002	17.0	<1	<1	<1
3/19/2002	-	-	-	-
12/12/2002	-	-	-	-
1/28/2003	-	-	-	-
4/1/2003	-	-	-	-
6/3/2003	-	-	-	-
6/17/2003	-	-	-	-
7/1/2003	-	-	-	-
7/15/2003	-	-	-	-
7/29/2003	-	-	-	-
8/12/2003	-	-	-	-
8/26/2003	-	-	-	-
9/9/2003	-	-	-	-
12/18/2003	-	-	-	-
2/3/2004	-	-	-	-
3/25/2004	-	-	-	-
6/2/2004	-	-	-	-
6/15/2004	-	-	-	-
6/29/2004	-	-	-	-
7/13/2004	-	-	-	-
7/27/2004	140.0	<1	1.7	<1
8/10/2004	-	-	-	-
8/24/2004	-	-	-	-
9/8/2004	-	-	-	-
6/1/2005	-	-	-	-
6/14/2005	-	-	-	-
6/28/2005	-	-	-	-
7/13/2005	-	-	-	-
7/26/2005	-	-	-	-
8/9/2005	-	-	-	-
8/23/2005	-	-	-	-
9/7/2005	-	-	-	-
12/18/2007	-	-	-	-
2/1/2008	-	-	-	-
3/13/2008	-	-	-	-
12/9/2008	-	-	-	-
1/21/2009	-	-	-	-
3/6/2009	-	-	-	-
MIN.	17	<1	<1	<1
MAX.	140	<1	1.7	<1
AVG.	79	0.5	1.1	0.5

Table F-12. Water Quality Monitoring Results From Samples Collected at Site W-M564.7R (Sunfish Lake)

DATE	WATER DEPTH (M)	VELOCITY (CM/SEC)	WAVE HEIGHT (CM)	AIR TEMP. (°C)	CLOUD COVER (%)
12/12/2002	0.800	0.91	-	7	100
1/28/2003	0.825	0.26	-	1	100
4/1/2003	0.865	-	1	24	25
MIN.	0.800	0.26	1	1	25
MAX.	0.865	0.91	1	24	100
AVG.	0.830	0.59	1	11	75

DATE	WIND SPEED (MPH)	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)
12/12/2002	2	S	4.2	15.21	8.39
1/28/2003	2	S	1.2	21.51	7.81
4/1/2003	2	W	13.8	20.70	9.40
MIN.	2	-	1.2	15.21	7.81
MAX.	2	-	13.8	21.51	9.40
AVG.	2	-	6.4	19.14	-

DATE	TOT. ALK. (MG/L as CaCO3)	SPEC. COND. (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (CM)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
12/12/2002	174	452	-	13.20	-
1/28/2003	264	616	-	12.90	-
4/1/2003	-	347	28.0	-	-
MIN.	174	347	28.0	12.90	-
MAX.	264	616	28.0	13.20	-
AVG.	219	472	28.0	13.05	-

Table F-13. Water Quality Monitoring Results From Samples Collected at Site W-M571.9W (Stone Lake)

DATE	WATER DEPTH (M)	VELOCITY (CM/SEC)	WAVE HEIGHT (CM)	AIR TEMP. (°C)	CLOUD COVER (%)
12/29/2004	0.700	0.33	-	3	100
2/16/2005	1.320	0.33	-	4	20
3/17/2005	0.710	0.19	-	4	90
12/13/2005	0.950	0.24	-	1	95
1/19/2006	0.750	0.39	-	7	70
3/2/2006	0.700	0.32	-	2	100
12/14/2009	0.550	0.74	-	-4	100
1/25/2010	0.830	0.61	-	-2	100
3/12/2010	1.230	0.35	-	8	98
6/8/2010	0.800	0.85	0	20	98
6/23/2010	1.340	-	0	28	80
7/7/2010	1.660	-	1	28	80
7/15/2010	1.415	-	6	28	10
8/3/2010	1.335	-	0	29	45
8/17/2010	1.410	-	1	18	100
8/31/2010	1.000	-	1	26	80
9/14/2010	0.880	2.05	0	23	0
12/9/2010	0.900	0.17	-	-8	100
2/7/2011	1.100	0.28	-	-6	65
3/7/2011	-	0.24	-	-1	100
6/1/2011	2.100	2.03	1	27	5
6/15/2011	1.610	1.40	1	19	60
6/28/2011	1.960	1.08	1	26	15
7/12/2011	1.610	0.32	2	29	90
7/26/2011	1.580	1.72	1	30	40
8/9/2011	1.520	4.19	2	25	40
8/23/2011	1.130	0.75	1	20	100
9/7/2011	0.800	-	2	23	2
12/13/2011	0.545	1.06	-	2	100
1/25/2012	0.560	0.04	-	-7	98
3/8/2012	0.625	0.75	-	0	2
MIN.	0.545	0.04	-	-8	0
MAX.	2.100	4.19	-	30	100
AVG.	1.121	0.85	-	13	67

DATE	WIND SPEED (MPH)	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)
12/29/2004	1	S	2.3	22.36	8.7
2/16/2005	4	NW	0.6	12.12	7.8
3/17/2005	7	SE	4.1	>26.10	9.3
12/13/2005	3	SE	2.2	12.18	8.3
1/19/2006	4	SE	2.2	6.41	7.6
3/2/2006	8	NW	3.4	>26.64	9.1
12/14/2009	10	NW	2.7	21.43	8.9
1/25/2010	3	W	0.9	4.36	7.3
3/12/2010	4	SE	1.1	16.32	7.9
6/8/2010	1	E	22.8	3.84	7.7
6/23/2010	0	-	28.7	12.70	8.6
7/7/2010	1	S	26.7	8.30	8.3
7/15/2010	5	NW	29.6	13.44	8.7
8/3/2010	0	-	30.0	7.80	7.9
8/17/2010	0	-	25.6	6.53	7.9
8/31/2010	0	-	26.7	8.38	8.0
9/14/2010	1	SE	24.1	18.05	9.2
12/9/2010	2	N	1.0	7.14	7.8
2/7/2011	2	W	0.5	6.24	7.1
3/7/2011	2	S	0.6	11.73	7.6
6/1/2011	2	W	22.0	14.10	8.8
6/15/2011	1	SE	20.9	8.46	7.7
6/28/2011	0	-	24.2	10.25	8.2
7/12/2011	2	NW	29.6	7.48	8.1
7/26/2011	1	E	30.1	9.83	8.4
8/9/2011	3	NW	27.5	7.61	8.0
8/23/2011	0	-	25.1	4.00	7.7
9/7/2011	0	SE	22.8	13.27	8.7
12/13/2011	0	-	3.1	10.56	7.8
1/25/2012	1	S	1.2	4.37	7.3
3/8/2012	8	NW	2.4	16.95	8.1
MIN.	0	-	0.5	3.84	7.1
MAX.	10	-	30.1	>26.64	9.3
AVG.	2	-	14.3	11.58	-

Table F-13 (cont). Water Quality Monitoring Results From Samples Collected at Site W-M571.9W (Stone Lake)

DATE	TOT. ALK. (MG/L as CaCO3)	SPEC. COND. (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (CM)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
12/29/2004	-	657	-	-	15.0
2/16/2005	129	319	-	27.70	16.0
3/17/2005	125	426	-	15.50	15.0
12/13/2005	-	553	-	-	-
1/19/2006	-	541	-	-	-
3/2/2006	-	574	-	-	-
12/14/2009	189	769	-	14.90	-
1/25/2010	189	541	-	12.70	-
3/12/2010	-	284	-	8.37	-
6/8/2010	220	635	31.5	48.30	84.0
6/23/2010	166	467	49.5	18.60	23.0
7/7/2010	167	457	62.5	9.40	14.0
7/15/2010	183	497	42.0	11.70	17.0
8/3/2010	164	433	43.0	21.50	21.0
8/17/2010	177	463	31.5	31.40	37.0
8/31/2010	175	440	40.0	19.90	35.0
9/14/2010	178	518	23.8	58.80	89.0
12/9/2010	172	425	-	12.00	-
2/7/2011	197	429	-	9.00	-
3/7/2011	167	367	-	12.40	-
6/1/2011	160	423	40.0	36.10	23.0
6/15/2011	188	481	34.0	17.60	27.0
6/28/2011	166	464	32.0	18.70	23.0
7/12/2011	208	520	34.6	18.20	21.0
7/26/2011	191	537	40.0	18.00	15.0
8/9/2011	184	486	29.0	20.80	29.0
8/23/2011	192	463	19.4	26.20	51.0
9/7/2011	193	493	27.5	26.30	56.0
12/13/2011	205	795	-	6.44	-
1/25/2012	262	674	-	7.50	-
3/8/2012	187	551	-	6.80	-
MIN.	125	284	19.4	6.44	14.0
MAX.	262	795	62.5	58.80	89.0
AVG.	182	506	36.3	19.81	32.2

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
12/29/2004	49.0	<1	1.7	14
2/16/2005	8.8	<1	<1	1
3/17/2005	94	<1	8.7	24
12/13/2005	-	-	-	-
1/19/2006	-	-	-	-
3/2/2006	-	-	-	-
12/14/2009	-	-	-	-
1/25/2010	-	-	-	-
3/12/2010	-	-	-	-
6/8/2010	62	3	3	27
6/23/2010	79	9	3	6
7/7/2010	9	2	1	6
7/15/2010	61	6	2	6
8/3/2010	39	6	2	6
8/17/2010	54	5	2	9
8/31/2010	43	3	2	22
9/14/2010	49	4	2	12
12/9/2010	-	-	-	-
2/7/2011	-	-	-	-
3/7/2011	-	-	-	-
6/1/2011	66	0	5	11
6/15/2011	23	0	2	8
6/28/2011	28	0	3	20
7/12/2011	36	2	2	7
7/26/2011	51	5	2	3
8/9/2011	35	4	3	7
8/23/2011	32	1	2	13
9/7/2011	38	2	3	9
12/13/2011	-	-	-	-
1/25/2012	-	-	-	-
3/8/2012	-	-	-	-
MIN.	9	0	<1	1
MAX.	94	9	8.7	27
AVG.	45	3	2.6	11

Table F-14. IADNR Water Quality Monitoring Results From Site W-M563.9T (Lower Sunfish Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
5/6/1993	1.60	0	0	16.6	10.2	8.9	12
5/20/1993	1.20	0	0	16.5	10.9	8.7	0
6/4/1993	0.65	0	0	16.0	8.6	6.9	9
6/17/1993	1.37	0	0	21.5	6.1	7.8	5
7/2/1993	3.70	0	0	22.2	5.3	7.4	31
7/15/1993	2.70	0	0	23.2	5.6	7.7	12
7/30/1993	1.20	0	0	24.9	6.4	7.6	2
8/12/1993	0.70	0	0	25.8	7.8	8.2	7
8/23/1993	0.90	0	0	25.0	6.8	8.0	11
9/8/1993	0.40	0	0	21.8	8.6	8.2	4
9/22/1993	0.60	0	0	16.1	8.1	8.0	6
10/5/1993	0.50	0	0	14.1	12.8	8.6	0
10/22/1993	0.40	0	0	10.1	17.6	9.1	0
11/2/1993	0.60	0	0	4.9	20.0	9.2	0
11/16/1993	0.60	0	0	4.7	13.8	7.7	0
12/3/1993	0.98	2	0	0.9	14.4	7.9	0
12/13/1993	1.17	3	0	0.6	14.6	7.9	1
1/13/1994	0.29	22	8	0.0	12.3	7.5	0
1/25/1994	0.08	22	7	0.1	9.1	7.6	0
2/9/1994	0.07	36	9	0.9	1.7	7.1	0
2/24/1994	0.59	29	7	0.6	10.4	7.6	1
3/11/1994	1.20	10	0	1.2	10.8	7.0	0
3/25/1994	0.70	0	0	8.8	15.0	8.8	4
4/7/1994	0.80	0	0	10.8	15.2	9.7	0
4/22/1994	0.80	0	0	13.2	19.2	9.4	7
5/6/1994	1.85	0	0	12.8	9.8	8.3	19
5/18/1994	1.00	0	0	19.8	13.5	8.7	8
6/2/1994	0.60	0	0	22.5	8.3	8.8	2
6/17/1994	-	0	0	31.0	5.8	8.0	0
6/30/1994	0.60	0	0	28.6	8.8	8.3	0
7/13/1994	0.74	0	0	26.0	9.0	-	5
7/29/1994	0.58	0	0	25.5	9.2	8.5	2
8/11/1994	0.52	0	0	20.5	6.7	8.3	0
8/25/1994	0.42	0	0	26.0	8.4	8.0	0
9/9/1994	0.45	0	0	24.6	9.9	8.4	0
9/22/1994	-	0	0	21.9	8.1	8.1	-
10/7/1994	-	0	0	15.8	8.5	7.9	1
10/18/1994	-	0	0	15.9	8.5	7.9	0
11/3/1994	-	0	0	10.5	10.2	8.1	4
11/17/1994	-	0	0	6.4	12.0	8.1	2
12/1/1994	-	-	-	1.2	14.2	8.1	5
12/27/1994	0.39	14	0	1.5	18.8	8.4	2
1/10/1995	0.21	19	7	0.1	13.2	7.9	0
1/26/1995	0.18	22	8	0.0	13.6	7.9	0
2/9/1995	0.13	29	7	0.0	14.0	7.9	0
2/20/1995	0.10	30	0	1.0	20.0	8.7	0
3/23/1995	-	0	0	6.5	12.9	8.2	4
4/6/1995	-	0	0	8.1	14.2	8.4	12
4/20/1995	0.82	0	0	9.8	13.1	8.6	4
5/3/1995	1.30	0	0	12.6	17.2	9.0	11
5/16/1995	0.85	0	0	19.4	12.0	8.6	8
5/31/1995	0.92	0	0	22.6	11.6	8.5	12
6/14/1995	0.74	0	0	25.3	8.4	8.3	4
6/27/1995	0.48	0	0	25.4	3.7	7.7	5
7/12/1995	0.42	0	0	29.7	9.2	8.3	1
7/24/1995	0.54	0	0	30.3	10.3	8.4	1
8/9/1995	0.52	0	0	25.7	4.8	7.8	0
8/23/1995	0.84	0	0	29.0	6.5	7.8	6
9/5/1995	0.86	0	0	24.9	6.2	7.8	0
9/19/1995	0.52	0	0	16.7	6.8	7.9	0
10/4/1995	0.57	0	0	17.2	8.8	8.2	1
10/16/1995	0.92	0	0	13.4	8.9	8.1	4
11/2/1995	0.94	0	0	7.2	10.4	7.9	4
11/14/1995	0.82	0	0	2.0	12.8	8.0	6
11/28/1995	0.60	0	0	0.7	14.1	8.1	0
12/12/1995	0.32	12	2	0.3	16.4	8.3	0
12/28/1995	0.36	28	1	0.4	15.9	8.2	1
1/25/1996	0.12	38	-	0.1	6.1	7.6	0
3/20/1996	0.76	0	0	2.5	13.5	7.9	6
4/5/1996	0.78	0	0	6.4	13.6	8.2	8
4/16/1996	0.88	0	0	8.0	13.5	8.4	4
5/1/1996	2.50	0	0	10.4	10.9	8.0	33
5/15/1996	1.30	0	0	12.4	9.3	7.9	13
5/31/1996	1.12	0	0	17.0	12.5	8.6	13
6/13/1996	0.88	0	0	26.2	11.8	8.4	8
6/27/1996	1.32	0	0	24.2	5.6	7.5	9
7/11/1996	0.76	0	0	25.6	6.1	7.8	2
7/23/1996	0.66	0	0	23.2	6.3	7.9	3
8/8/1996	0.62	0	0	27.6	8.2	8.3	1
8/19/1996	0.55	0	0	23.9	8.0	8.4	0

Table F-14 (cont). IADNR Water Quality Monitoring Results From Site W-M563.9T (Lower Sunfish Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
9/4/1996	0.60	0	0	23.7	4.7	7.8	0
9/16/1996	0.48	0	0	18.1	6.9	8.0	1
10/3/1996	0.58	0	0	15.1	10.8	8.6	0
10/16/1996	0.52	0	0	16.1	15.3	9.0	0
10/28/1996	0.62	0	0	12.5	14.5	9.0	1
11/12/1996	0.58	0	0	2.7	14.1	8.5	1
11/25/1996	1.02	0	0	0.5	12.5	8.2	11
12/17/1996	0.52	8	0	0.5	12.9	8.3	0
1/3/1997	0.34	21	0	0.4	12.6	8.0	1
1/14/1997	0.42	28	3	0.1	10.9	7.8	0
1/28/1997	0.27	32	6	0.2	10.6	7.7	0
2/14/1997	0.33	36	5	0.3	11.2	7.8	0
2/28/1997	0.50	34	0	0.2	11.0	7.7	3
3/19/1997	0.74	0	0	4.1	14.4	8.3	2
12/16/1997	0.40	6	0	0.8	15.6	8.9	0
1/16/1998	0.25	15	2	0.0	17.4	8.7	0
1/26/1998	0.10	20	4	0.0	13.5	8.4	0
2/13/1998	0.63	18	0	1.8	17.9	8.3	0
2/24/1998	0.75	-	-	5.8	16.0	8.4	0
3/12/1998	0.85	1	0	0.5	13.7	8.1	2
3/26/1998	0.48	-	-	16.4	18.1	9.2	2
4/6/1998	1.72	0	0	9.3	10.4	7.7	15
4/20/1998	1.50	0	0	12.0	10.6	8.1	5
5/5/1998	0.68	0	0	19.1	16.2	9.0	2
5/20/1998	0.58	0	0	22.6	3.8	8.0	0
6/4/1998	0.61	0	0	19.7	5.4	7.8	0
6/17/1998	0.65	0	0	24.2	6.4	7.9	0
6/29/1998	0.82	0	0	28.8	4.7	7.9	0
7/13/1998	0.78	0	0	26.7	6.2	7.6	0
7/27/1998	0.40	0	0	26.5	6.2	7.9	0
8/10/1998	0.50	0	0	26.8	2.8	7.5	0
8/25/1998	0.68	0	0	27.0	5.1	7.7	0
9/8/1998	0.50	0	0	22.0	3.7	7.5	0
9/23/1998	0.45	0	0	17.4	5.4	7.8	0
10/9/1998	0.50	0	0	16.1	9.1	8.1	0
10/23/1998	0.43	0	0	12.8	11.6	8.3	0
11/5/1998	0.40	0	0	7.1	11.3	8.2	2
11/16/1998	0.60	0	0	6.1	12.7	8.3	0
12/1/1998	0.42	-	-	7.6	13.4	8.6	1
12/14/1998	0.48	-	-	3.7	15.2	8.4	0
12/30/1998	0.37	18	0	0.5	18.2	8.3	0
1/26/1999	0.20	32	3	0.2	11.8	8.0	0
2/8/1999	0.28	20	0	0.7	15.4	8.2	0
2/22/1999	0.52	2	0	0.8	14.6	8.1	2
3/10/1999	0.64	4	0	1.0	23.2	9.1	0
3/25/1999	0.62	-	-	9.7	18.0	9.0	2
4/7/1999	0.62	0	0	14.8	14.0	9.0	2
4/19/1999	1.20	0	0	11.8	9.6	8.1	9
5/6/1999	0.60	0	0	17.7	8.5	8.1	2
5/20/1999	1.40	0	0	10.7	6.1	7.7	6
6/1/1999	1.62	0	0	21.5	5.4	7.6	10
6/15/1999	0.67	0	0	24.3	5.3	7.7	8
6/29/1999	0.58	0	0	23.6	5.2	7.8	2
7/13/1999	0.50	0	0	25.1	8.5	8.4	0
7/30/1999	0.59	0	0	33.1	8.0	8.1	0
8/9/1999	0.60	0	0	24.8	7.8	8.1	0
8/26/1999	0.70	0	0	23.1	6.1	7.8	0
9/10/1999	0.52	0	0	17.8	8.0	8.0	0
9/24/1999	0.50	0	0	18.6	9.6	8.2	0
10/4/1999	0.47	0	0	10.0	9.4	8.1	0
10/18/1999	0.50	0	0	11.2	13.0	8.6	1
11/1/1999	0.50	0	0	11.1	10.5	8.1	0
11/15/1999	0.50	0	0	7.2	12.0	8.2	0
11/29/1999	0.52	0	0	4.6	15.5	8.6	0
12/14/1999	0.40	2	0	0.9	15.8	8.2	0
1/12/2000	0.35	15	0	1.1	18.0	8.2	0
1/25/2000	0.16	25	9	0.1	12.4	8.0	0
2/10/2000	0.46	20	6	0.2	13.1	7.7	0
2/22/2000	0.16	32	8	0.2	10.0	7.5	0
3/7/2000	0.85	-	-	7.8	12.1	8.4	7
3/20/2000	0.66	-	-	4.2	12.9	8.1	12
4/6/2000	0.60	0	0	8.1	12.1	8.5	11
4/19/2000	0.50	0	0	11.0	12.5	8.9	2
5/1/2000	0.63	0	0	16.9	10.4	8.6	2
5/18/2000	0.50	0	0	17.2	6.0	7.5	0
6/2/2000	0.70	0	0	21.6	5.7	7.4	8
6/15/2000	1.14	0	0	21.1	4.7	7.4	8
6/27/2000	0.80	0	0	24.0	6.1	7.6	10
7/10/2000	0.50	0	0	28.8	7.0	7.8	5
7/25/2000	0.60	0	0	23.4	7.3	7.8	0
8/8/2000	0.58	0	0	27.2	8.6	8.2	0
8/24/2000	0.65	0	0	26.7	12.9	8.7	0
9/7/2000	0.56	0	0	21.1	6.5	7.8	0
9/21/2000	0.47	0	0	13.9	6.8	7.5	0
10/3/2000	0.44	0	0	15.6	5.6	7.7	0
10/16/2000	0.50	0	0	14.4	10.5	8.2	0

Table F-14 (cont). IADNR Water Quality Monitoring Results From Site W-M563.9T (Lower Sunfish Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
10/31/2000	0.40	0	0	14.7	10.0	8.2	0
11/15/2000	0.70	0	0	4.5	14.5	8.3	2
11/28/2000	0.49	6	0	0.6	13.0	7.7	0
12/13/2000	0.46	14	14	0.0	11.7	7.9	0
12/27/2000	0.24	28	8	0.2	13.2	7.8	0
1/11/2001	0.38	27	15	0.0	11.8	7.8	0
1/26/2001	0.40	34	7	0.1	12.9	8.0	0
2/7/2001	0.12	40	3	0.2	12.5	7.8	0
2/19/2001	0.22	44	1	0.2	12.6	7.9	0
3/22/2001	0.70	0	0	7.5	16.5	8.1	2
4/5/2001	0.64	0	0	7.6	15.6	8.3	3
4/18/2001	3.90	0	0	7.9	9.9	7.6	42
5/3/2001	3.80	0	0	16.1	8.7	7.6	41
5/15/2001	2.80	0	0	19.2	8.6	7.5	48
5/31/2001	1.16	0	0	16.8	6.7	7.8	5
6/15/2001	0.99	0	0	24.3	5.2	7.6	13
6/27/2001	1.40	0	0	24.3	5.2	7.5	17
7/11/2001	0.66	0	0	26.4	4.8	7.6	0
7/26/2001	0.42	0	0	28.4	6.2	7.9	0
8/7/2001	0.58	0	0	29.1	5.5	7.9	2
8/21/2001	0.55	0	0	24.3	9.0	8.3	0
9/4/2001	0.59	0	0	22.4	4.4	7.8	0
9/19/2001	0.50	0	0	18.7	8.4	8.0	2
10/1/2001	0.48	0	0	17.1	7.8	8.0	0
10/16/2001	0.52	0	0	10.7	11.6	8.3	2
10/29/2001	0.58	0	0	9.3	14.3	8.3	0
11/15/2001	0.52	0	0	12.6	18.4	8.8	0
11/28/2001	0.52	0	0	6.1	11.6	8.4	0
12/10/2001	0.52	-	-	3.4	12.2	8.2	0
1/8/2002	0.35	26	0	0.2	15.8	8.0	0
1/21/2002	0.39	22	3	-0.1	14.6	8.0	0
2/4/2002	0.33	21	5	0.1	17.4	8.4	0
3/7/2002	0.34	18	1	0.0	20.0	8.5	0
3/18/2002	0.56	-	-	6.3	20.0	9.1	2
4/4/2002	0.68	0	0	6.3	18.5	9.3	0
4/17/2002	0.94	0	0	19.5	14.5	8.9	6
5/3/2002	1.32	0	0	13.2	11.6	8.3	0
5/3/2002	1.32	0	0	12.8	11.2	8.2	-
5/14/2002	1.02	0	0	15.4	9.8	8.0	0
5/28/2002	0.58	0	0	23.3	11.8	8.8	0
6/12/2002	1.10	0	0	25.5	6.3	7.6	0
6/25/2002	0.62	0	0	28.9	5.0	7.5	0
7/9/2002	0.90	0	0	29.0	5.7	7.5	0
7/23/2002	0.70	0	0	29.0	8.0	8.1	0
8/6/2002	0.57	0	0	27.6	8.8	8.3	0
8/20/2002	0.58	0	0	24.6	9.1	8.2	0
9/3/2002	0.76	0	0	25.6	7.0	7.7	0
9/16/2002	0.82	0	0	22.9	6.3	7.7	0
4/23/2003	0.92	0	0	13.7	16.0	9.2	9
5/19/2003	1.80	0	0	18.1	9.7	8.1	17
6/24/2003	0.52	0	0	31.1	6.3	8.0	0
7/22/2003	0.74	0	0	26.1	8.1	7.9	0
8/18/2003	0.49	0	0	26.6	6.1	7.6	0
9/17/2003	0.40	0	0	20.4	6.6	7.7	0
10/6/2003	0.58	0	0	16.1	13.6	8.7	0
11/4/2003	0.59	0	0	9.1	9.4	7.8	0
12/2/2003	0.57	1	0	1.3	17.6	8.6	0
12/30/2003	0.35	10	0	2.5	18.4	8.2	0
1/27/2004	0.26	29	6	0.1	15.1	8.0	0
2/25/2004	0.27	27	0	0.3	9.0	7.2	0
3/25/2004	0.52	-	-	8.5	13.2	8.3	0
4/5/2004	0.99	0	0	10.7	13.1	8.3	0
4/21/2004	0.58	0	0	14.5	12.3	9.2	0
5/5/2004	0.48	0	0	18.1	15.5	9.3	0
5/18/2004	0.58	0	0	18.7	10.1	8.9	0
6/3/2004	1.44	0	0	21.0	5.8	7.5	11
6/30/2004	0.90	0	0	25.7	7.9	7.8	0
7/15/2004	0.40	0	0	27.7	8.9	8.1	0
7/26/2004	0.40	0	0	27.4	9.5	8.1	0
8/11/2004	0.50	0	0	18.3	8.4	8.2	0
8/26/2004	0.52	0	0	24.8	5.9	8.1	0
9/9/2004	0.54	0	0	21.2	7.5	8.3	0
9/23/2004	0.57	0	0	22.2	7.7	8.0	0
10/6/2004	0.53	0	0	17.1	9.9	8.2	0
11/5/2004	0.74	0	0	10.2	10.2	8.1	0
1/13/2005	0.37	22	0	0.2	13.6	7.9	0
3/11/2005	0.58	0	0	0.8	14.1	8.1	0
4/4/2005	0.80	0	0	13.0	13.1	8.5	0
4/18/2005	0.82	0	0	17.7	11.8	8.3	8
5/4/2005	0.78	0	0	10.7	13.9	8.5	6
5/16/2005	0.50	0	0	16.0	12.6	8.6	0
5/31/2005	0.59	0	0	22.8	11.2	8.5	0
6/15/2005	0.70	0	0	24.8	6.8	7.8	0
6/27/2005	0.70	0	0	29.7	6.7	7.8	0
7/14/2005	0.50	0	0	30.7	9.2	8.2	0
8/8/2005	0.50	0	0	26.0	3.2	7.8	0

Table F-14 (cont). IADNR Water Quality Monitoring Results From Site W-M563.9T (Lower Sunfish Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
9/9/2005	0.64	0	0	22.1	2.5	7.4	0
10/4/2005	0.55	0	0	23.6	7.6	7.8	0
11/7/2005	0.54	0	0	12.2	14.1	8.5	0
3/8/2006	0.45	0	0	1.4	13.5	8.2	0
4/4/2006	0.83	0	0	7.3	11.9	8.2	11
4/18/2006	1.50	0	0	13.2	8.1	7.7	12
5/2/2006	0.70	0	0	17.5	10.1	8.1	0
5/17/2006	0.70	0	0	14.8	11.0	8.1	0
6/1/2006	0.66	0	0	28.7	14.3	8.6	0
6/15/2006	0.48	0	0	23.2	12.8	8.8	0
6/29/2006	0.51	0	0	23.1	4.1	7.4	0
7/12/2006	0.58	0	0	24.5	3.8	7.5	0
8/7/2006	0.58	0	0	25.2	1.9	7.6	0
9/6/2006	0.55	0	0	22.0	3.3	7.3	0
10/2/2006	0.47	0	0	20.4	6.9	7.7	0
11/7/2006	0.55	0	0	9.1	18.4	8.9	0
4/3/2007	1.22	0	0	9.8	9.2	7.6	12
4/18/2007	0.82	0	0	11.6	14.7	8.6	0
5/16/2007	0.64	0	0	23.0	14.5	9.0	0
6/11/2007	0.74	0	0	22.9	6.2	7.8	0
6/25/2007	0.59	0	0	25.1	3.5	7.4	0
7/13/2007	0.53	0	0	23.7	4.1	7.5	0
8/8/2007	0.47	0	0	26.8	1.6	7.2	0
9/5/2007	0.42	0	0	28.0	5.7	7.6	0
10/1/2007	0.47	0	0	21.8	15.1	8.7	0
11/7/2007	0.48	0	0	7.4	11.1	8.0	0
4/2/2008	0.64	0	0	8.8	15.4	7.6	0
4/14/2008	1.22	0	0	6.3	10.9	7.9	10
5/1/2008	2.30	0	0	11.6	9.9	7.7	32
5/15/2008	1.76	0	0	14.8	8.9	7.8	15
5/28/2008	0.63	0	0	21.1	10.9	8.5	0
6/10/2008	2.10	0	0	21.7	5.4	7.5	21
6/23/2008	1.82	0	0	22.5	6.0	7.5	21
7/8/2008	0.54	0	0	26.3	6.4	7.8	0
8/5/2008	0.58	0	0	29.9	12.6	8.4	0
9/3/2008	0.59	0	0	23.3	8.4	8.2	0
10/8/2008	0.60	0	0	13.2	8.1	7.7	0
11/10/2008	0.58	0	0	7.0	13.9	8.6	0
4/9/2009	0.98	0	0	9.9	13.8	8.7	11
4/21/2009	0.72	0	0	10.6	13.1	9.0	0
5/4/2009	0.69	0	0	18.1	14.4	8.8	0
5/21/2009	0.58	0	0	24.6	10.8	8.3	0
6/4/2009	0.68	0	0	21.3	4.4	7.6	0
6/15/2009	0.58	0	0	23.0	4.9	7.5	0
7/2/2009	0.60	0	0	22.2	9.2	8.2	0
7/13/2009	0.60	0	0	27.7	11.5	8.4	0
8/11/2009	0.59	0	0	28.3	17.2	8.7	0
9/10/2009	0.58	0	0	22.5	16.7	8.9	0
10/5/2009	0.58	0	0	15.1	20.2	8.9	0
11/9/2009	0.59	0	0	12.1	16.1	8.5	0
1/14/2010	0.22	36	9	0.3	1.0	7.2	0
3/8/2010	0.18	40	0	0.1	3.8	6.8	0
4/9/2010	1.46	0	0	11.8	9.6	7.8	8
4/20/2010	0.59	0	0	17.7	20.7	9.2	0
5/3/2010	0.58	0	0	20.7	11.9	8.3	0
5/20/2010	0.59	0	0	19.9	11.7	8.3	0
6/1/2010	0.58	0	0	27.0	12.8	8.5	0
6/16/2010	0.59	0	0	23.5	8.2	7.8	0
6/29/2010	0.90	0	0	24.7	4.4	7.4	0
7/15/2010	0.59	0	0	28.4	4.9	7.6	0
8/12/2010	0.72	0	0	28.2	4.9	7.6	0
9/8/2010	0.58	0	0	22.0	8.3	8.1	0
10/5/2010	2.70	0	0	15.5	6.4	7.5	-
11/8/2010	0.80	0	0	8.5	11.2	8.0	12
3/7/2011	0.33	25	0	0.3	13.5	7.9	0
4/7/2011	2.35	0	0	7.0	10.7	7.6	34
5/2/2011	2.00	0	0	11.5	13.8	8.7	28
5/17/2011	1.40	0	0	15.3	11.1	8.7	13
6/1/2011	1.22	0	0	22.1	13.1	8.6	0
6/13/2011	0.90	0	0	23.4	6.3	7.8	0
6/29/2011	1.10	0	0	23.9	6.0	7.6	0
7/15/2011	0.80	0	0	27.9	5.5	7.8	0
8/9/2011	0.72	0	0	27.6	5.8	7.8	0
9/7/2011	0.59	0	0	19.6	5.3	7.7	0
10/3/2011	0.58	0	0	18.6	10.3	8.1	0
11/7/2011	0.58	0	0	9.3	22.4	9.0	0
MIN.	0.18	0	0	0.1	1.0	6.8	0
MAX.	2.70	40	9	29.9	22.4	9.2	34
AVG.	0.81	1	0	18.2	9.8	-	3

Table F-15. Water Quality Monitoring Results From Samples Collected By IADNR Personnel at Site W-M564.5T (Upper Sunfish Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
1/13/1994	0.72	20	6	0.6	17.1	8.3	0
1/25/1994	0.56	25	5	1.0	6.7	7.8	0
2/9/1994	0.40	28	22	1.1	2.1	7.3	0
2/24/1994	1.01	28	8	1.1	7.1	7.4	0
1/10/1995	0.60	10	8	2.3	8.8	7.4	0
1/26/1995	0.61	14	10	1.6	3.0	7.4	0
2/9/1995	0.56	22	2	2.1	11.8	7.4	0
2/20/1995	0.51	26	0	3.9	20.0	8.0	0
3/23/1995	-	-	-	8.5	20.7	9.3	0
12/12/1995	0.72	14	3	2.9	17.8	8.8	0
12/28/1995	0.78	20	1	2.3	15.4	8.2	0
1/25/1996	0.57	30	7	1.0	6.7	7.6	0
MIN.	0.40	10	0	0.6	2.1	7.3	0
MAX.	1.01	30	22	8.5	20.7	9.3	0
AVG.	0.64	22	7	2.4	11.4	-	0

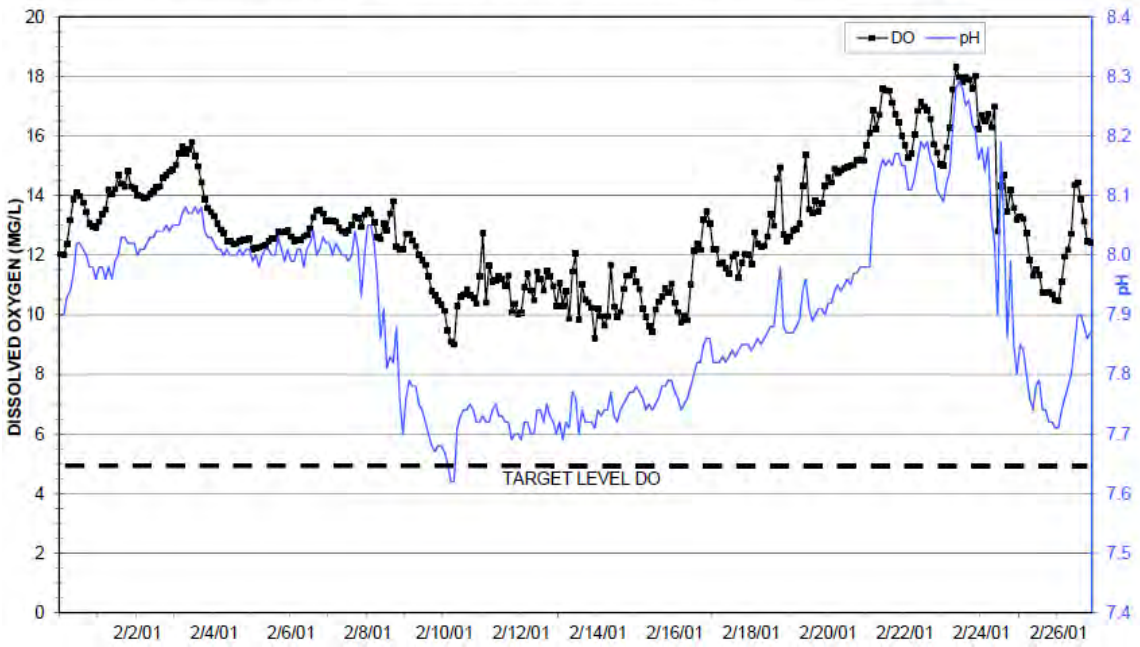
Table F-16. Water Quality Monitoring Results From Samples Collected By IADNR Personnel at Site W-M566.2R (Fish Trap Lake)

DATE	AVAILABLE WATER DEPTH (M)	ICE THICKNESS (CM)	SNOW DEPTH (CM)	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	VELOCITY (CM/SEC)
1/13/1994	1.18	18	7	0.7	13.4	7.9	0
1/25/1994	1.00	32	10	2.0	6.9	7.8	0
2/9/1994	0.89	41	12	0.8	5.2	7.5	0
2/24/1994	1.51	37	8	0.8	8.6	7.5	0
1/10/1995	1.04	16	8	1.6	11.5	7.6	0
1/26/1995	1.00	18	8	1.3	5.2	7.6	0
2/9/1995	0.96	24	2	1.4	3.9	7.3	0
2/20/1995	0.86	28	0	2.3	9.3	7.5	0
MIN.	0.86	16	0	0.7	3.9	7.3	0
MAX.	1.51	41	12	2.3	13.4	7.9	0
AVG.	1.06	27	7	1.4	8.0	-	0

G. Water Quality Monitoring (Corps Continuous Monitors). *In situ* water quality instruments were used by Corps personnel on several occasions to complement the collection of discrete samples. YSI 6000UPG, 6600, 6600V2, or Hach DS5X multiparameter water quality monitoring instruments were typically deployed one to three feet above the river bottom. For safety and security reasons, continuous measurements were taken at least 1.5 to 2.0 feet below the water surface; whereas, the discrete DO concentrations discussed previously were taken near the water surface. At times when the water column is stratified, the DO concentration at the surface can be significantly different from concentrations only a few inches deeper. For this reason, discrete samples collected at the surface may exhibit DO concentrations significantly higher than values recorded simultaneously with a continuous monitor deployed deeper in the water column.

Figure F-1 is from the continuous monitor deployment at site W-M567.5Y (Kehough Slough) from January 31 to February 27, 2001. These results were typical for the three winters that monitoring occurred at this site, in that all DO concentrations were significantly higher than the target level of 5.0 mg/L and several values were supersaturated. Also, note that pH values tend to parallel DO concentrations, with diurnal oscillations being indicative of algal photosynthesis.

FIGURE F-1. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M567.5Y (KEHOUGH SLOUGH) FROM 1/31/01-2/27/01



There were three winter deployments at site W-M571.4N (Tippy Lake). All of the DO concentrations recorded exceeded 5.0 mg/L. Figure F-2 represents the January 3 through March 1, 2002 deployment at this site in which all DO concentrations were supersaturated. Continuous monitors were deployed 14 times during the summer at this site. Results from the August 3 to 17, 2010 deployment are shown in figure F-3. It was during this deployment that the only discrete value below 5 mg/L was measured at the surface at this site (4.97 mg/L on August 17, 2010). The results from the continuous monitor suggest that DO concentrations below 5.0 mg/L may have also occurred at the surface from August 14

to 16, 2010. Although DO concentrations from several of the remaining summer deployments at Tippy Lake indicated values below 5 mg/L at depth, apparently the water column was stratified, as the corresponding surface discrete values were all above 5 mg/L.

FIGURE F-2. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M571.4N (TIPPY LAKE) FROM 1/3/02-3/1/02

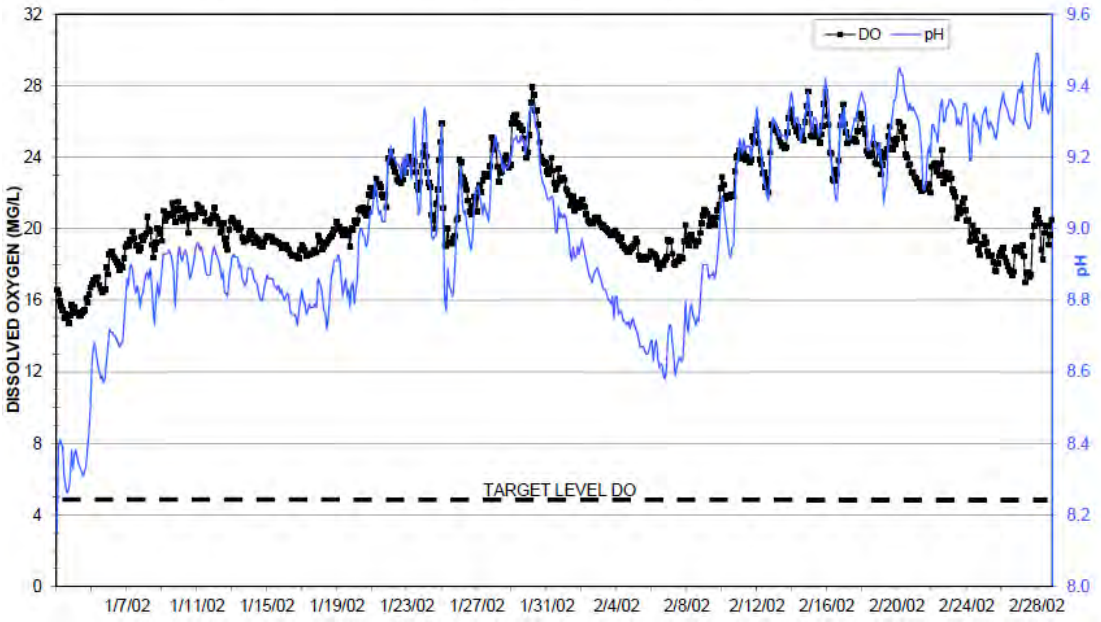
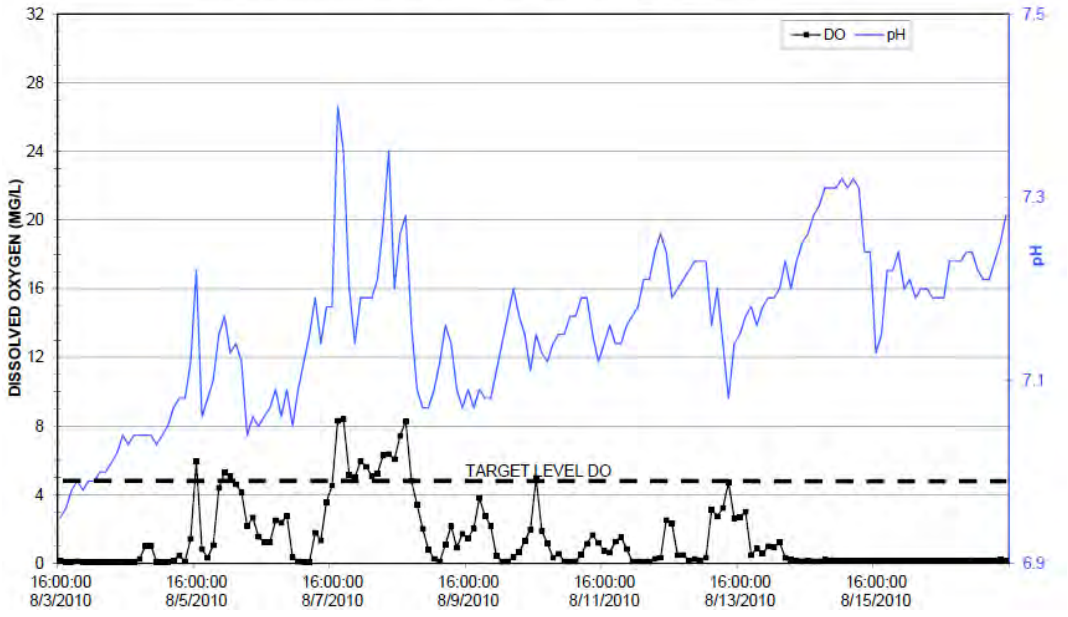
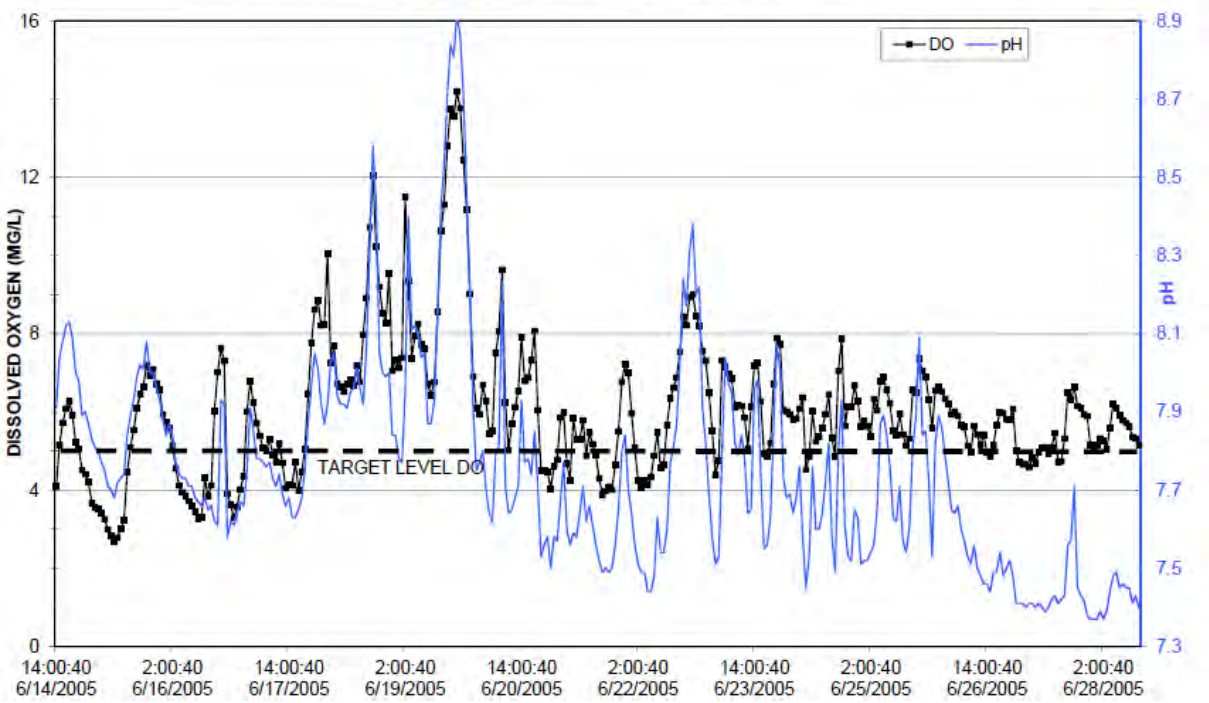


FIGURE F-3. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M571.4N (TIPPY LAKE) FROM 8/3/10-8/17/10



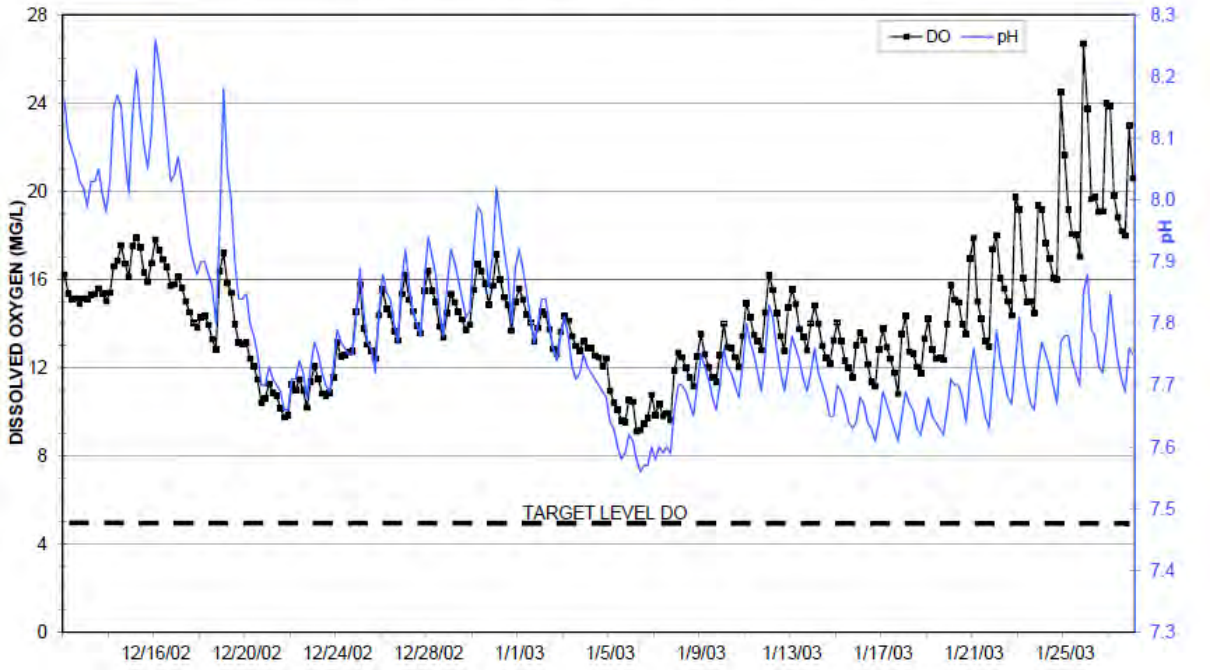
Continuous monitors were deployed on three of the four occasions when discrete samples indicated low DO concentrations at the surface at site W-M566.3P (Fish Trap Lake); however, on only one of these deployments was valid data collected. It is not uncommon for continuous monitors to record erroneous data. This could be due to several reasons: biofouling of the probes during the summer, instrument becoming frozen in the ice during the winter, battery failure, improper calibration, flotation failure, impacts with boat propellers, and so on. Only the low discrete DO concentration measured on June 14, 2005 (4.66 mg/L) had valid corresponding continuous data. As shown in figure F-4, the corresponding DO concentration at depth was approximately 4 mg/L; thus, indicating some water column stratification. The remainder of the chart shows daily oscillations in DO concentrations, with night time lows commonly falling below 5.0 mg/L, followed by recovery the next day. This pattern was common in summer deployments at Fish Trap Lake.

FIGURE F-4. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M566.3P (FISH TRAP LAKE) FROM 6/14/05-6/28/05



There was only one deployment of a continuous monitor in Sunfish Lake (W-M564.7R). All DO concentrations significantly exceeded 5.0 mg/L and approximately half were supersaturated during this deployment from December 12, 2002 to January 28, 2003 (figure F-5).

FIGURE F-5. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M564.7R (SUNFISH LAKE) FROM 12/12/02-1/28/03



Continuous monitors were deployed on all four occasions when discrete samples indicated low DO concentrations at the surface at site W-M571.9W (Stone Lake). On January 25, 2010, a DO concentration of 4.36 mg/L was measured at the surface. As shown in figure F-6, the continuous value measured on this day was also below 5 mg/L; however for most of this deployment, DO concentrations were above 5 mg/L. On January 25, 2012, the discrete DO concentration was 4.37 mg/L. Continuous monitors deployed on December 13, 2011 and January 25, 2012 captured the low DO concentrations which were present on this day (and the preceding and following days). The results from the two deployments were combined and displayed on a single chart. As shown in figure F-7, DO concentrations below 5 mg/L extended from January 21 to February 2, 2012. Low discrete DO concentrations were also measured during the summer at Stone Lake on two occasions. On June 8, 2010, the value was 3.84 mg/L. Unfortunately, the sonde deployed on this date recorded erroneous values. The discrete DO concentration on August 23, 2011 was 4.00 mg/L. The chart shown in figure F-8 indicates that the continuous monitor deployed at this site from August 9 to 23, 2011 also recorded values below 5.0 mg/L on August 23. With the exception of two values, DO concentrations below 5 mg/L were recorded from August 16 to August 23.

In general, for most continuous monitor deployments, pH values paralleled DO concentrations and measurements that exceeded 9.0 were indicative of intense algal photosynthesis.

FIGURE F-6. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M571.9W (STONE LAKE) FROM 1/25/10-3/12/10

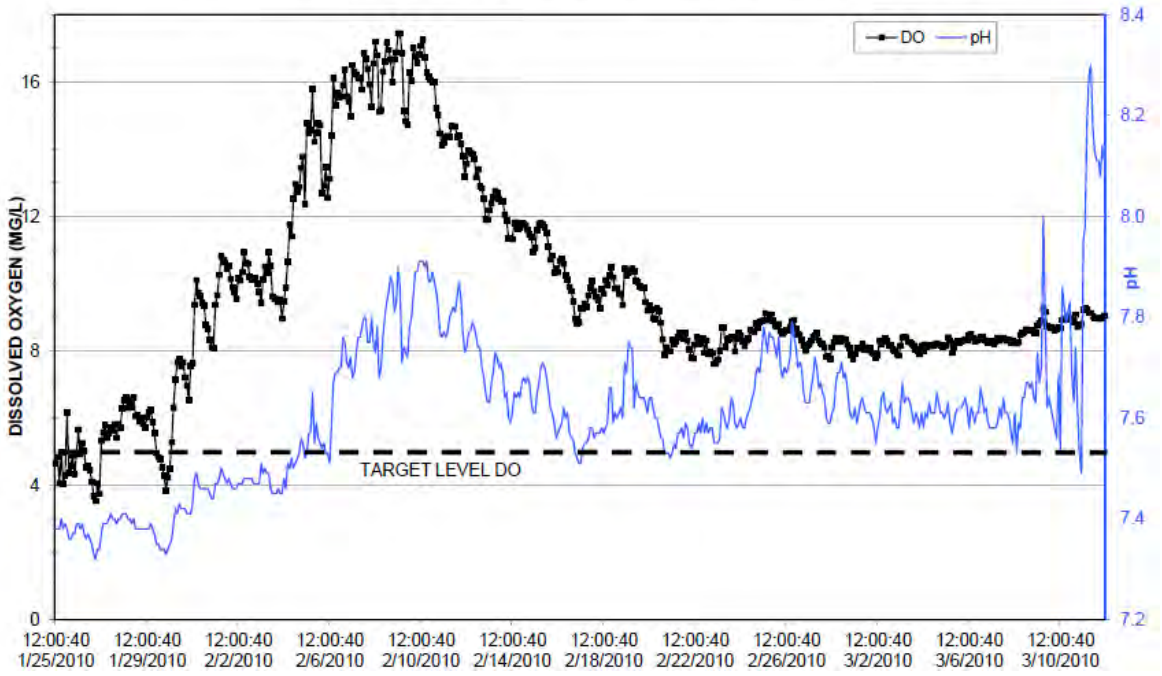


FIGURE F-7. PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M571.9W (STONE LAKE) FROM 12/13/11-2/28/12

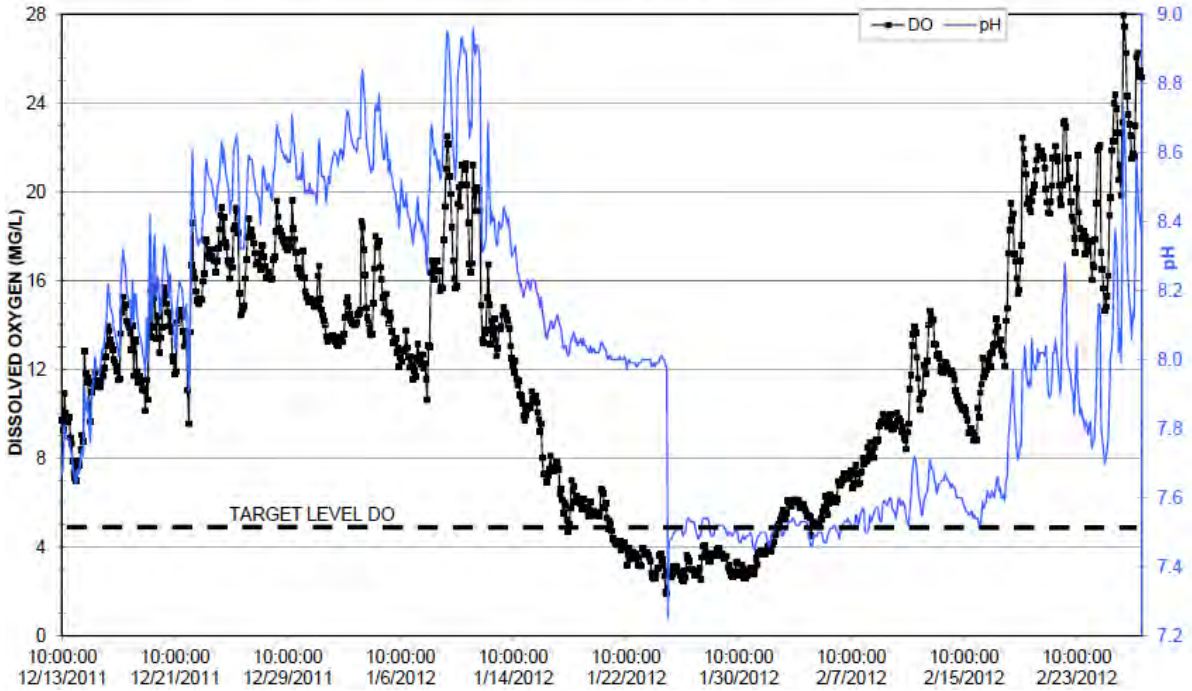
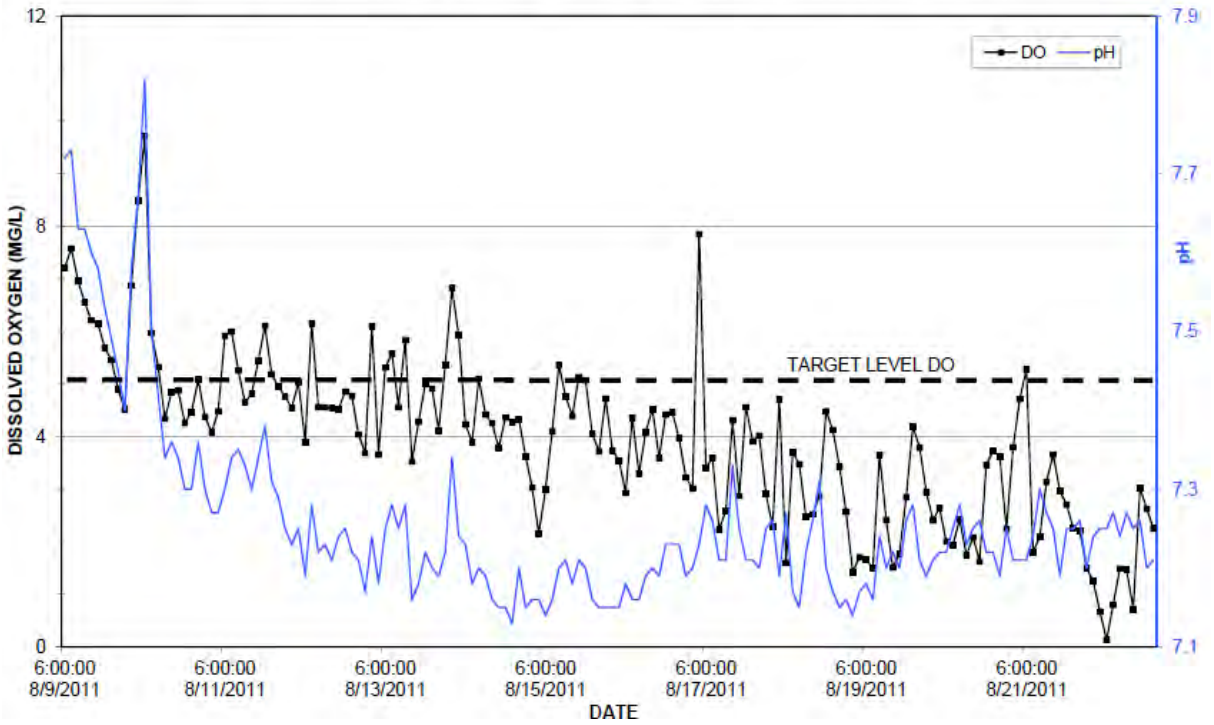


FIGURE F-8 . PRE-PROJECT DISSOLVED OXYGEN AND pH VALUES COLLECTED WITH A CONTINUOUS MONITOR AT SITE W-M571.9W (STONE LAKE) FROM 8/9/11-8/23/11



V. CONCLUSIONS

The results from grain size analyses performed on samples collected from six Pool 12 backwater areas indicate the bed material consists primarily of fine-grained sediments. The results from elutriate analyses performed by the Corps early in the project planning phase when hydraulic dredging was considered as an alternative, suggest that localized, short-term elevated TSS, VSS and zinc concentrations could occur if dredging was utilized without best management practices in place to reduce return water sediment concentrations. Upon review of these initial elutriate results and evaluation of additional elutriate and bulk sediment analyses performed by both Foth and the Corps, it was determined that all dredging would be performed mechanically. Relative to hydraulic dredging, mechanical dredging (especially with a large bucket) results in less mixing, significantly higher dredged material solids concentrations and a considerably smaller volume of return water. Therefore, dredging mechanically would result in lower contaminant concentrations in the return water; thus, minimizing the impact to the receiving water body. The elutriate test is designed to predict the water quality characteristics of return water from hydraulically dredged material. Results from the elutriate test tend to overestimate the environmental consequences from placement of material via mechanical dredging, and therefore the elutriate results reported herein represent a worst-case scenario for water quality impacts. The use of mechanical dredging in Pool 12 backwater areas would likely result in contaminant concentrations less than those predicted by the elutriate test. Further reductions in return water contaminant concentrations could be realized with the incorporation of best management practices to lower the concentration of suspended solids entering the receiving water body.

Water quality monitoring has been performed in Pool 12 backwater areas by both the Corps and LTRMP personnel. The period of record for each sampling site varies, with the longest at LTRMP site W-M563.9T in lower Sunfish Lake, which has been monitored since 1993. Monitoring has been accomplished through the collection of discrete samples, as well as by utilizing continuous monitors. The results from discrete sampling indicate that on occasion, DO concentrations below 5 mg/L were measured in Pool 12 backwater areas during both winter and summer months. Results from continuous monitors have shown that extended periods of low DO can also occur during both seasons of the year. Supersaturated DO concentrations, typically accompanied by high pH values, are common during both the summer and winter months. These conditions are typically indicative of intense algal photosynthesis.

Fish kills due to low DO concentrations were reported by IADNR personnel in Pool 12 backwater areas during low water years in the 1980's. Under certain environmental conditions (thick ice, deep snow cover, low water levels, high temperatures and/or excessive oxygen demand), DO concentrations in Pool 12 backwater areas can fall to levels that can result in fish kills. Dredging of channels and/or deep holes would allow for an increased volume of DO in Pool 12 backwaters, thus affording fish a better chance for survival. Dredging would also provide fish escape routes during the winter in areas that currently freeze to the bottom.

VI. LITERATURE CITED

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX G

GEOTECHNICAL EXPLORATION AND CONSIDERATIONS

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APPENDIX G

GEOTECHNICAL EXPLORATION AND CONSIDERATIONS

CONTENTS

FIGURES

TABLES

PLATES

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APPENDIX G

GEOTECHNICAL EXPLORATION AND CONSIDERATIONS

I. PURPOSE

The project involves providing deeper water in backwater lakes of the Mississippi River to enhance overwintering habitat for desirable fish species. The goal is to provide areas of water depth of at least 6 feet. These dredge cuts are proposed in six backwater bodies—Stone Lake, Tippy Lake, Kehough Slough, No Name Lake, Fish Trap Lake, and Sunfish Lake—between river miles 564 and 574.

II. LOCATION

The project is located on the Illinois side of the main channel of the Mississippi River between approximate river miles 564 and 574 in Jo Daviess County, Illinois.

III. PROJECT FEATURES

The main project features are dredged channels with nominal bottom widths of 60 feet. Plates 2 through 8 in the main report show the proposed channels. Ancillary features consist of side-cast island berms and shoreline berms. Some of these berms may serve to constrict flow to keep sediment from depositing. There are also some island and near-bank areas that are proposed to be raised by placement of dredged material. These areas would later be utilized to support mast tree plantings.

IV. PHYSIOGRAPHY

The Mississippi Valley was formed by glacial meltwaters eroding through older existing glacial sediments and down into bedrock. The majority of the bedrock is limestone and dolomite with an occasional shale unit. In many locations where the river impinges on the valley wall, massive vertical and near vertical bedrock bluffs exist. In areas where the river flows more towards the center of the valley, the walls have become rounded and sloped, filling the valley edges with colluvium. As the last glacial meltwater volume decreased to allow deposition, most of the glacial valley filled with outwash sands and gravels in valley trains and alluvial terraces. These glacial valley train deposits are assigned to the Mackinaw Member of the Henry Formation. At a few sites the channel bottom remains bedrock controlled. Inter-tongued with this alluvium are coarser grained upland sediments from tributary streams, which create deltaic fans along the valley wall. The normal alluvial deposits generally become increasingly coarse-grained with depth, which in some areas exceeds 100 feet. The sediments consist of a mix of igneous and metamorphic material from as far north as the Canadian Shield, and sedimentary carbonate rock material from the relative vicinity.

The present Mississippi River erodes below normal bottom in the active channels during high flood stages. This reworking of the upper portion of the glacial deposits, plus erosion of the upland till and loess, has left the upper layers of the modern valley filled with relatively fine grained sands and gravels, overlain by silts and clays, all assigned to the Cahokia Alluvium. The alluvium is dominantly silt, clay, and clayey sand, with wood and shell fragments deposit because it was derived from erosion of loess and till. Lenses of sand and gravel are locally common in the alluvium; these lenses have a high silt content. The major part of the alluvium consists of material transported down the valley and deposited in the floodplains during intervals of flooding.

V. STRATIGRAPHY

The bedrock in the project area consists of Ordovician age carbonates and sandstones with shale units. St. Peter sandstone, Galena dolomite, and Platteville limestone are a few of these formations. St. Peter Formation consists primarily of pure quartz sandstone with shales found at its base. The Galena Formation consists of uniformly bedded carbonate rocks with chert common in the lower part. The Platteville Formation deposits are carbonates and are very fossiliferous. Bedrock is believed to be 150 to 200 feet in depth. The carbonate rock units are susceptible to solution; and numerous caves, crevasses, and sinkholes have formed in the area. The ancient Mississippi River incised a valley ranging from 75 to 200 feet deep through these units. This valley has since been filled with alluvial material ranging upwards from large boulders to finer gravels and sands. The river flows in a clearly defined, fairly narrow floodplain from 1- to 2-miles wide through what is termed the Paleozoic Plateau.

The present Mississippi River bed deposits are primarily sand with lesser amounts of gravel, silt, and clay. The water elevation in the project area is normally 592.5. Floodplain alluvial deposits adjoining the river are primarily silt and clay soils 2- to 20-feet thick overlying the sand deposits. Low sandy deltas mark the entrance of tributary streams emanating from deep, narrow, V-shaped valleys. The upland terrain includes rolling hills, cliffs, and bluffs 295- to 400-feet high.

VI. SUBSURFACE EXPLORATION

Three soil boring operations were performed in March, July, and September of 2001.

The March exploration, conducted by U.S. Army Corps of Engineer, Rock Island District (District) personnel, consisted of three borings at the lower end of Sunfish Lake. The lake had approximately 1 foot of ice cover, and the site was accessed by airboat. The borings were advanced by ice auger and then by 4-inch diameter Iwan hand auger to elevations of about 580 to 583 feet.

The July soil boring operations were performed by a cooperative effort of Tremont Exploration, Newt Marine Contractors, and the District. The drilling plant was a skid-mounted Diedrich Model 25 hydraulic rig. The floating plant was a 22-foot by 46-foot barge fitted with two internal spuds operated by a power winch. The floating plant was maneuvered by two (60 & 90 hp) outboard skiffs.

All equipment was loaded on 16 July 2001, and drilling operations occurred until 19 July 2001, when all equipment was unloaded. A total of 18 soil borings to depths of approximately 10 feet below the existing streambed were performed. Borings were advanced using hollow stem augers with center

plug. Samples were obtained by Standard Penetration Testing (SPT) methods. Borings were performed in Kehough Slough, Fish Trap Lake, Sunfish Lake, No Name Lake, and Tippy Lake. Due to low water during this exploration, some proposed borings could not be performed.

The September soil boring operations were performed by District personnel in Sunfish, Fish Trap, No Name, Hires, Tippy, and Stone Lakes. A total of 17 borings was performed to a bottom elevation of about 584 feet. Borings were performed by hand using 4-inch diameter Iwan hand augers. A 2-inch diameter sand tube was used when sand was encountered. The sites were accessed by and borings were performed from johnboat and airboat.

Soil boring locations were recorded by a mobile self-contained global positioning system (GPS) unit. Samples were obtained at 2-foot intervals from each boring. Samples were sealed in 16 oz. jars and returned to the lab for testing. Complete graphical boring logs are shown on Plates G1-G7 of this appendix. Boring locations are shown on the plates of the main report.

VII. FIELD AND LABORATORY TESTING

A. Field Testing. Field testing included Standard Penetration Testing (SPT) for the borings, performed with the hydraulic rig in general accordance with ASTM D-1586. SPT was performed using a standard 2-inch O.D. split-spoon sampler with a 2-foot drive, utilizing a gravity hammer and cathead. Blow counts from SPT are shown on the boring logs.

Some of the borings performed by hand included vane shear testing. The vane shear apparatus consists of four orthogonal steel blades at the end of a steel shaft. The blades are pushed to the depth of interest and then a torque is applied to failure, and recorded. This torque can be correlated to the undrained shear strength of cohesive soil using the formula $c_u = 6T/7\pi D^3$ where c_u is the undrained shear strength, T is the torque required to shear the soil, and D is the diameter of the vane tester. For this project, the blade length was 8 inches and the diameter was 4 inches. Estimated shear strengths based on this testing are shown on the logs.

B. Laboratory Testing. Lab testing consisted of moisture content testing for all samples. In addition, selected fine-grained samples were tested for plasticity (Atterberg limits), and selected samples were tested for percent passing the #200 sieve. Results of laboratory testing are shown on the attached boring logs.

C. Material Properties. The encountered materials can generally be classified as slightly organic clay overlying a stiffer clay overlying sand. The upper, very soft organic clay and the lower, soft clay will be the focus of analysis for this discussion. Below these surficial materials, the subsurface is believed to consist of coarse-grained deposits.

Shear strength is an important property for determining bearing capacity and slope stability of soils. Shear strength can often be correlated to common material properties, such as moisture content and Atterberg limits. The materials at this site, however, exhibit such high moisture contents that the limits of common correlations are exceeded. Figure G-1 shows a relationship between moisture content and undrained shear strength for soils at these sites. The figure includes only clays which classified as CH (fat clay)— which is the majority of the near-surface clays—in the Unified Soil Classification System.

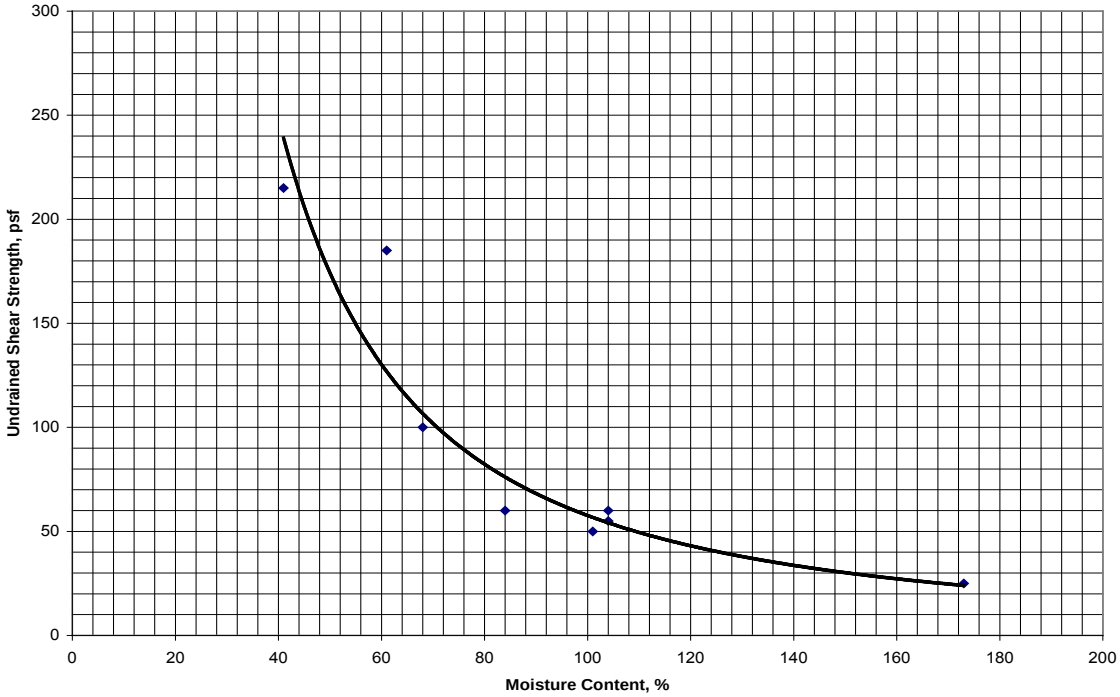
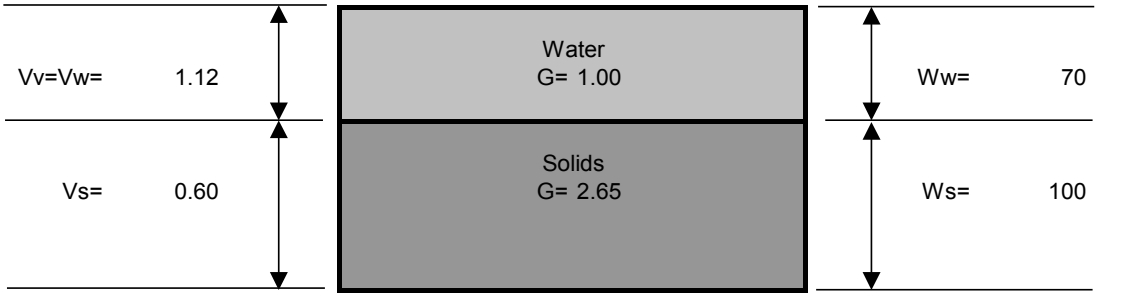


Figure G-1. Shear Strength Correlations for CH Clays

Several pertinent physical characteristics can be determined from the weight-volume relationships shown in figure G-2 below. Average moisture contents of 70 and 40 percent were estimated for the upper and lower clay layers, respectively. The actual range of moisture contents was from 27 to 173 percent, with the upper limits of the range likely influenced by organic content. Assuming a constant specific gravity of solids, the values in figure G-2 were derived. The compression index, Cc, was estimated from a moisture content correlation suggested in EM 1110-1-1904 (Cc=0.01*[LL-13]).

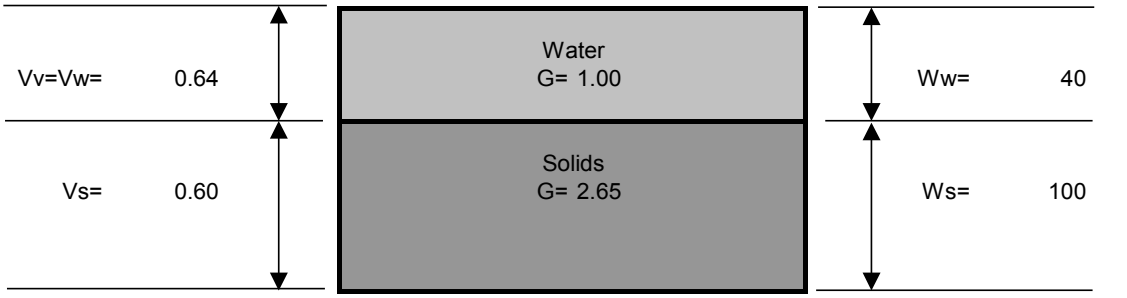
Soft, Slightly Organic Clay



V= 1.73 cubic feet W= 170 lbs

Moisture Content = Ww/Ws = 0.7
Void Ratio = Vv/Vs = 1.86
Unit Weight = W/V = 98.5 pcf

Stiffer Alluvial Clay



V= 1.25 cubic feet W= 140 lbs

Moisture Content = Ww/Ws = 0.4
Void Ratio = Vv/Vs = 1.06
Unit Weight = W/V = 112.4 pcf

Figure G-2. Weight-Volume Relationships

Table G-1 summarizes physical properties from figures G-1 and G-2. These physical properties will be utilized in the slope stability and settlement analysis, which are discussed later in this document.

Table G-1. Material Physical Properties

Soil	Moisture Content	Unit Weight	Undrained Shear Strength, psf	Initial Void Ratio	Compression Index
Very Soft, Slightly Organic Clay (Upper)	70%	99 pcf	100	1.86	0.47
Stiffer Alluvial Clay (Lower)	40%	112 pcf	300	1.06	0.27

VIII. SITE CHARACTERIZATION

Boring locations are shown on the plates of the main report and boring logs indicating material type and lab testing results are shown on the attached plates. Following is a brief summary of conditions encountered in each lake follows.

Sunfish Lake. Lower portions of this lake appeared to be moderately deep, with some very shallow areas in the central lake and moderately shallow areas in the upper lake. The borings generally encountered soft interbedded layers of lean (low-plasticity), fat (high-plasticity), and medium (moderate-plasticity) clay. Borings at the lower end encountered firmer clay deposits overlying clayey sand. Borings in the central portion of the lake encountered thick deposits of very soft clay.

Fish Trap Lake. The southeast bend of this lake appears to be fairly deep, while the northern and west-central portions were shallow. The borings generally encountered thinner soft clay layers overlying clayey sand and sand. Boring FT12-01-17, located along one of the cuts into the lake, did not encounter any clay at the streambed elevation.

No Name Lake. This lake appears to be very shallow throughout. The borings encountered a relatively thin soft clay layer overlying stiffer clay and some interbedded sand.

Kehough Slough. The lower portion of this lake is relatively deep, with the depth decreasing steadily to the shallow upper end. The borings generally encountered soft clays overlying clayey sands, with pronounced clay-sand interbedding.

Tippy Lake. The lower portion of this lake appears to be very shallow, and the upper end moderately shallow. The central portion of the lake is relatively deep; therefore no borings were performed in that area. The borings generally encountered soft clay overlying clayey sand and sand. Boring TL12-01-30, however, did not encounter any sand before termination.

Hires Lake. This lake appears to be very shallow throughout; in fact, it appears that portions of the lake would be mudflats at flat pool. The borings generally encountered interbedded soft clays, and boring HL12-01-33 terminated in sand and clayey sand. Although Hires Lake was included in the investigation, it has subsequently been dismissed from consideration for this project.

Stone Lake. The northwest portion of this lake appears to be very shallow, with the remaining portions moderately shallow. The borings generally encountered interbedded soft clays. Boring ST12-01-37 terminated in clayey sand.

IX. DESIGN FEATURES

A. Slope Stability. Slope stability analysis was performed for assumed sections of the dredge cut and island berm using the software package UTEXAS4. UTEXAS4 is capable of performing limit equilibrium slope stability computations by a variety of procedures. Spencer's method—a limit equilibrium analysis method for slope stability—was utilized for this analysis.

Analysis of every scenario was not considered appropriate at this stage of project development. Therefore, an "average" case was developed from the existing topography and subsurface stratigraphy across the six lakes. An average riverbed elevation was chosen at 590 feet, which would entail a 6-foot dredge cut to elevation 584 feet. Flat pool is approximately elevation 592 feet. Several iterations were required were estimate stable dredge cut and placement slopes. Estimation of island berm sections were also required, based on the proposed excavated volume. A dredge cut about 6 feet deep (to about elevation 584) and 60 feet wide, with backslopes of 3H:1V, would produce an island about 7 feet high (elevation 597) and 25 feet wide with foreslopes of 6H:1V. As shown on plate G8, this is the scenario analyzed. Table G-2 shows a summary of the slope stability analysis results.

Physical properties for the slope stability analysis were taken from table G-1 above. One exception was the shear strength for the placed dredged material. A remolded undrained shear strength is appropriate for this material due to its disturbed nature. Although this property was not directly measured for this project, experience with similar materials at other sites indicates that an estimate of one-half the undisturbed shear strength is reasonable.

Table G-2. Slope Stability Summary

Case	Description	Factor of Safety
1	Island Berm	1.0
2	Dredge Cut	3.4
3	Total Section	1.8

The first case analyzed was that of the island berm constructed of dredged material. Rather than a conventional analysis, which would assign a minimum factor of safety (FOS) against failure, the slope was analyzed to find what slope would result in an FOS of 1. An FOS of 1 means that the slope is on the brink of failure. As material is sidecast to create the island, Case 1 shows that a slope of about 6H:1V will result.

The second case analyzed was that of the dredge cut itself. The dredge cut will likely be made vertical, and then the vertical slopes will slough to a more stable configuration. Analysis of static water conditions, with the slope totally submerged, shows a very high FOS for a slope of 3H:1V. However, there are real world variables not considered in this analysis, so a stable dredge cut slope of 3H:1V is estimated.

The third case considered the berm and the dredge cut as a single slope. The main variable is the distance between the toe of the berm and the top of the dredge cut. (This also is a factor in the other cases.) A distance of 20 feet between these features is considered minimum for stability. This distance should be increased to the maximum allowable based on the equipment available.

Table G-3 summarizes the geometric parameters of the analyzed slope and should serve as a reasonable guide for laying out the dredge cuts and islands. There are likely some areas where the dredge cuts will be deeper or the islands higher, which may need to be reviewed prior to final design.

Table G-3. Geometric Parameters

Item	Value
Maximum Dredge Cut Depth	6 feet
Maximum Island Berm Height	7 feet
Maximum Dredge Cut Slope	3H:1V
Maximum Island Berm Slope	6H:1V
Dredge Cut Width	60 feet
Island Berm Width	25 feet
Minimum Distance between Berm and Dredge Cut	20 feet

Staging of berm construction is dependant on the desired function of the berms. If the proposed berms need to be a certain minimum elevation or need to fit within a desired template, two passes, with lifts of thickness 3 to 4 feet, would likely be required. A minimum delay of about 30 days would be necessary to allow consolidation of the placed material before the second pass. If, on the other hand, there are no definite elevation requirements for the berm, it could probably be built in one pass. The resulting berm would likely be lower and broader than that constructed in two passes. If built in one pass, it would be advisable to increase the offset between the berm and the dredge cut. Once criteria are established, a more thorough discussion will be included.

The fact that the materials encountered will be variable in consistency cannot be stressed enough. There will be numerous minor sloughing and slides as the material is removed and placed. It is understood that the resulting scalloped, hummocky surfaces will not be detrimental to the project goals. Instances where material is placed on-shore rather than as islands will be less severe than the island-building scenario. However, placement slopes of 6H:1V and offset of 20 feet should still be observed.

B. Settlement. Dredged material placed either as an island on the river bottom or on-shore will experience settlement by two main mechanisms. Consolidation of the existing river bottom and shoreline soils (foundation) will occur as dredged material placement results in increased loading. The dredged material itself will experience consolidation as a result of an increased effective stress, and will also lose volume as moisture content decreases. Additionally, the island placement may also experience some subsidence as local instability occurs during placement, resulting in a "mudwave" away from the placement area.

Figures G-3a and G-3b outline the steps necessary to estimate consolidation of foundation sediments. Figure G-3a shows the methodology for calculating the stress increase in underlying layers as a result of the loading, while figure G-3b shows the methodology for calculating consolidation based on this result and other physical properties.

STRESS INCREASE UNDER AN EMBANKMENT

Braja M. Das, Principles of Foundation Engineering Third Ed, Pg 199

INPUT

12	B_1 = Width of uniform height (ft)
42	B_2 = Width of sloped section (ft)
7	H = Height of embankment (ft)
15	z = Depth of stress increase calculation (ft)
80	γ = Unit weight of embankment soil (lb/ft^3)

INTERMEDIATE CALCULATIONS

560	$q = \gamma H$ (lb/ft^2)	
0.63	α_1 (radians) = $\tan^{-1}[(B_1 + B_2)/z] - \tan^{-1}(B_1/z)$	(Eq 3.110)
0.67	α_2 (radians) = $\tan^{-1}(B_1/z)$	(Eq 3.111)

FINAL OUTPUT

527.08	Δp = Stress Increase (lb/ft^2) = $q/\pi*[(B_1+B_2)/B_2*(\alpha_1+\alpha_2) - B_1/B_2*(\alpha_2)]*2$	(Eq 3.109)

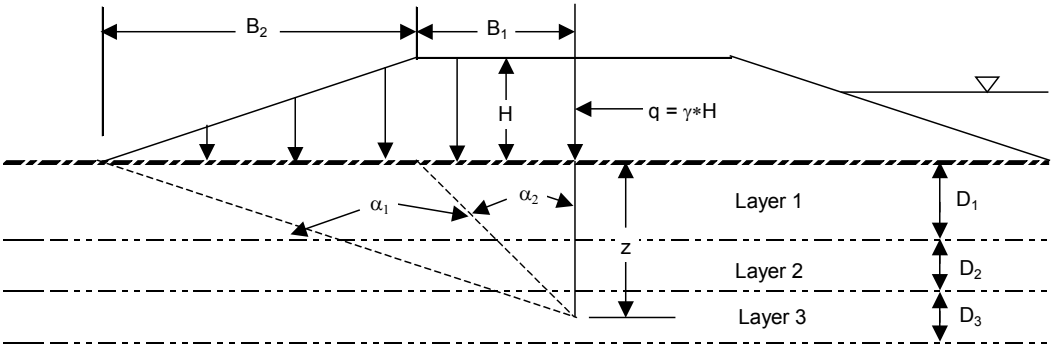


Figure G-3a. Stress Increase Under a Berm

INPUT

LAYER 1	LAYER 2	LAYER 3	DESCRIPTION
1.86	1.06	0	e_0 = Initial void ration of clay layer
0.47	0.27	0	Cc = Compression index of clay layer
36.1	50	0	γ_b = Buoyant unit weight of clay (lb/ft^3)
8	12	0	D = Thickness of clay layer (ft)

	DESCRIPTION
560	q_0 = Net stress increase (lb/ft^2)
12	B_1 = Width of uniform height (ft)
42	B_2 = Width of sloped section (ft)

INTERMEDIATE CALCULATIONS

LAYER 1	LAYER 2	LAYER 3	DESCRIPTION
144.40	588.80	N/A	P_0 = Ave. effective pressure on the clay layer prior to const. (lb/ft^2)
558.00	530.17	N/A	ΔP_{ave} = Ave. increase of pressure on the clay layer from const. (lb/ft^2)
			$\Delta P_{ave} = 1/6[\Delta P_t + 4*\Delta P_m + \Delta P_b]$
0.00	0.44	N/A	α_1 Top (radians)
0.00	0.98	N/A	α_2 Top (radians)
560.00	552.48	N/A	ΔP_{top} = Increase of pressure on the top of clay layer (lb/ft^2)
0.25	0.61	N/A	α_1 Middle (radians)
1.25	0.71	N/A	α_2 Middle (radians)
558.88	531.54	N/A	ΔP_{middle} = Increase of pressure on the middle of clay layer (lb/ft^2)
0.44	0.68	N/A	α_1 Bottom (radians)
0.98	0.54	N/A	α_2 Bottom (radians)
552.48	502.37	N/A	ΔP_{bottom} = Increase of pressure on the bottom of clay layer (lb/ft^2)

FINAL OUTPUT

LAYER 1	LAYER 2	LAYER 3	DESCRIPTION
0.90	0.44	N/A	S_c = Consolidation settlement for each layer (ft)
			$S_c = C_c*H/(1+e_o)$ Log $[(P_o + \Delta P_{ave})/P_o]$

1.34 $S_{c\ total}$ = Consolidation settlement for all layers (ft)

Figure G-3b. Consolidation Due to Berm Load

The portion of settlement due to consolidation and desiccation of the dredged material will be estimated at approximately 15 percent by volume. Subsidence due to local instability will not be considered in this analysis due to the inherent difficulty in predicting this across varying sites. The methods employed should give a reasonable estimate of total settlement, but this estimate should not be considered exact. If certain elevations are critical to maintain for achieving project goals, those should be reviewed prior to final design. Table G-4 summarizes estimated total settlement for the two mechanical placement types.

Table G-4. Summary of Estimated Settlement

Settlement Source	Island Placement	Shoreline Placement
Foundation	1.4 feet	1.0 feet
Berm	1.0 feet	1.0 feet
Local Instability	Not Significant	Not Applicable
Total	**2.4 feet**	**2.0 feet**

C. Dredging. The majority of dredging operations are expected to be mechanical (clamshell) dredging with sidecast placement as islands or along the shoreline. The total quantity of dredging has not yet been determined. This quantity will be a factor in determining the size of the clamshell available. There are also some areas in Fish Trap and No Name Lakes where hydraulic dredging is being proposed. These are locations where there are no suitable areas to sidecast. There has been discussion of constructing containment areas by staking straw bales or similar along the perimeter of the containment area. The District's Geotechnical Branch has some reservations with this alternative. The bales would have a limited height (~2 feet) and only a fraction of this height could be utilized for placement. This would be feasible only if the containment area was so large that the depth of dredge spoil was very shallow. Other alternatives include constructing conventional containment facilities with earth berms and outlet weirs, or considering forms of high-solids dredging methods. A complete discussion will require site-specific dredge spoil volumes and containment areas.

D. Island Berm Erosion. Erosion may occur as a result of direct river current or due to waves generated by wind or river traffic. Hydraulic analysis has not been performed to date. An analysis of erosion protection based on wind generated waves has also not been performed. Riprap placement along all island berm perimeters would likely be cost prohibitive. There will be certain areas, where berms are used to direct flows, which may require revetment. The berms themselves may need to be constructed of more stable materials, such as sand or stiffer clays, in these areas. Erosion protection for most of the placed dredged material will probably be in the form of vegetation, which could be part of the project or allowed to develop naturally.

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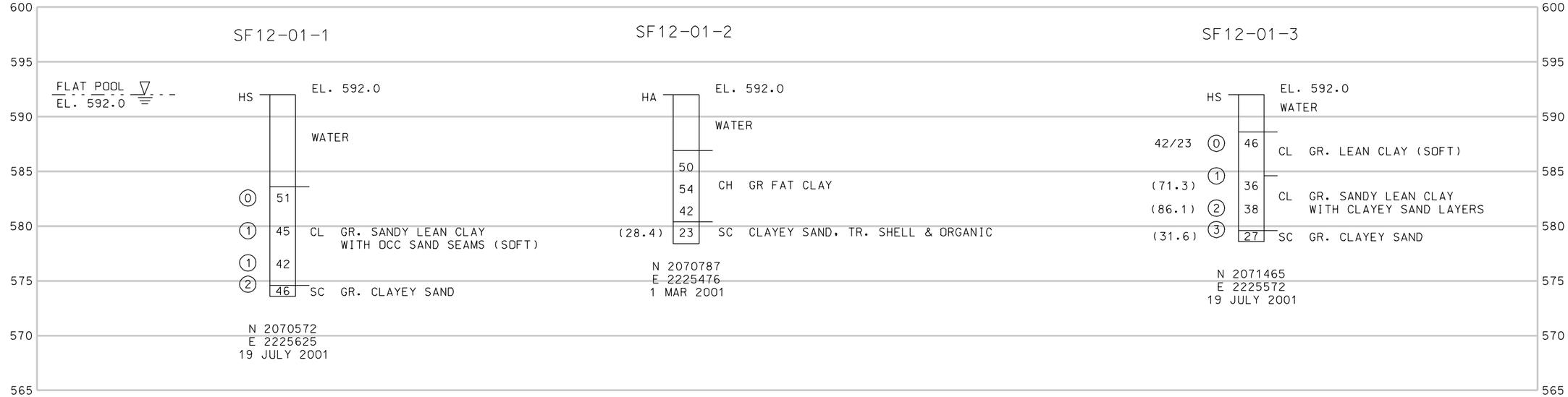

US Army Corps of Engineers
Rock Island District

Revisions			
Symbol	Description	Date	Approved

Designed By: AGB	Drawn By: GBM	Checked By: TPD	Reviewed By: GJM
Date: 9 SEPT. 2002	Scale: AS SHOWN	Project Code: ep258	Solicitation Number: DACW25-XX-B-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS I

Sheet Reference Number:
G1
Sheet 17 of 24

PLATE G1

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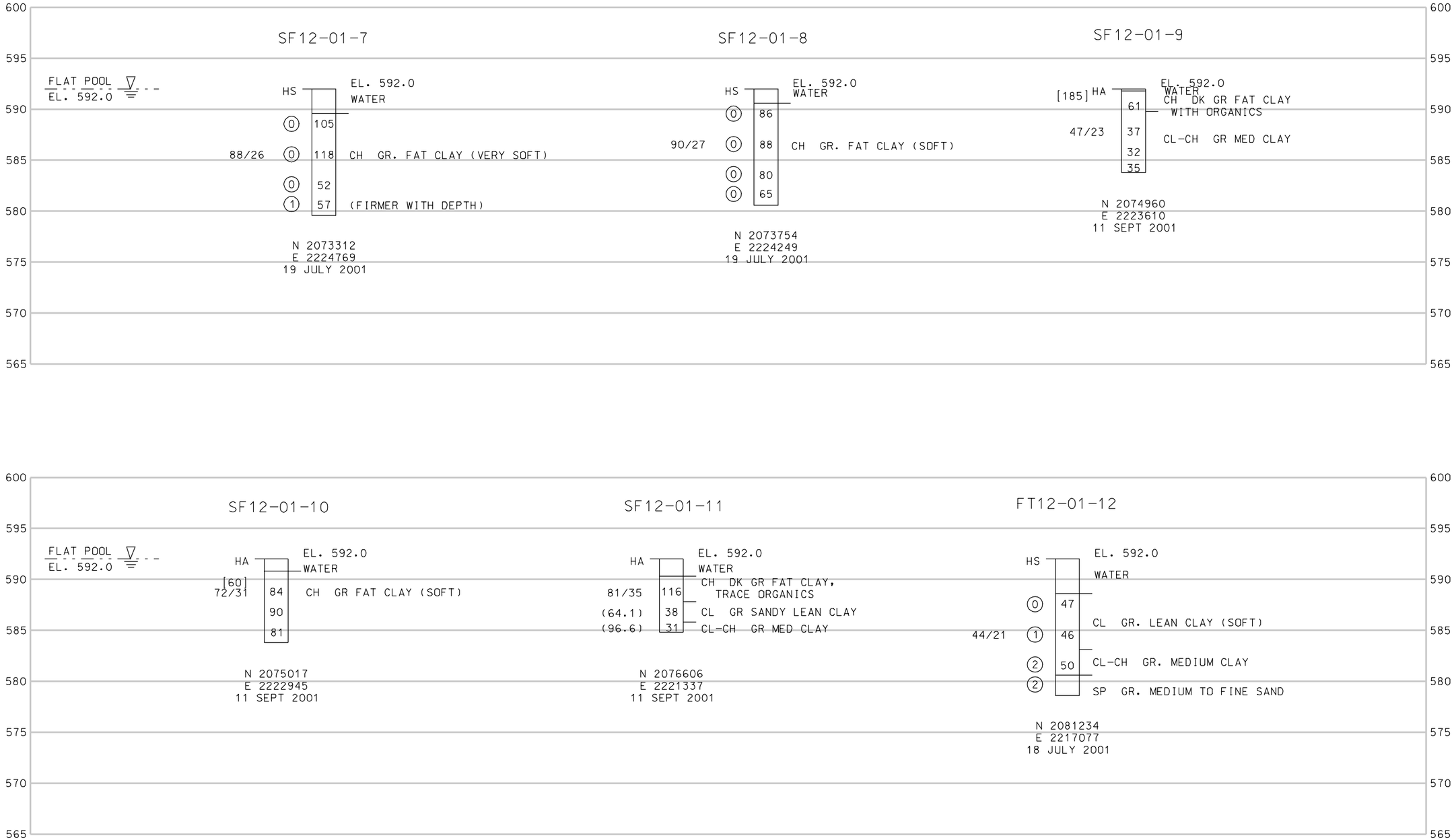

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS II

Sheet Reference Number:
G2
Sheet 18 of 24

PLATE G2

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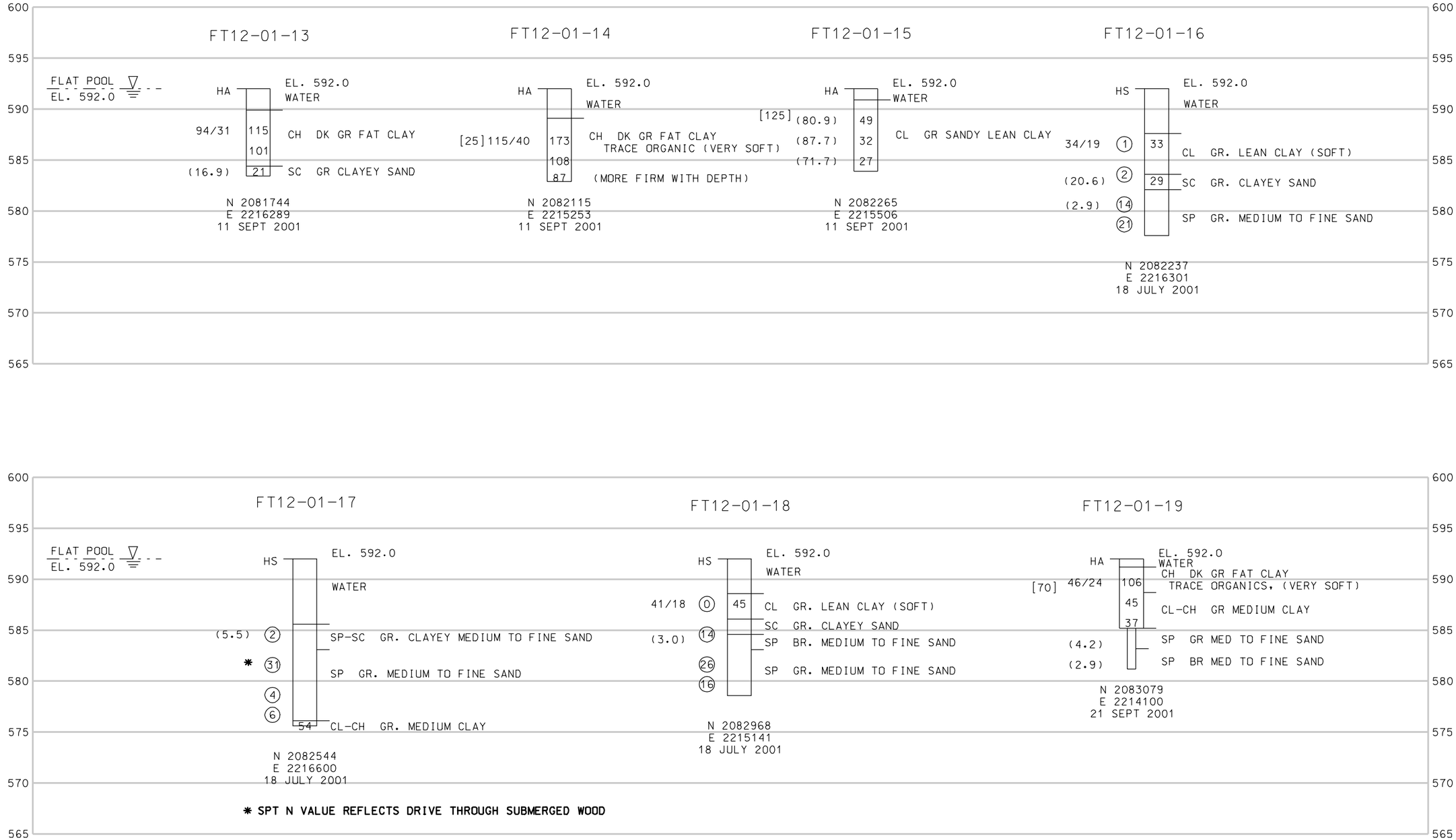

* SPT N VALUE REFLECTS DRIVE THROUGH SUBMERGED WOOD

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Rock Island District

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	Revisions		

Designed By: AGB	Drawn By: GBM	Checked By: TPD	Reviewed By: CJM
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ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS III

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G3
Sheet 19 of 24

PLATE G3

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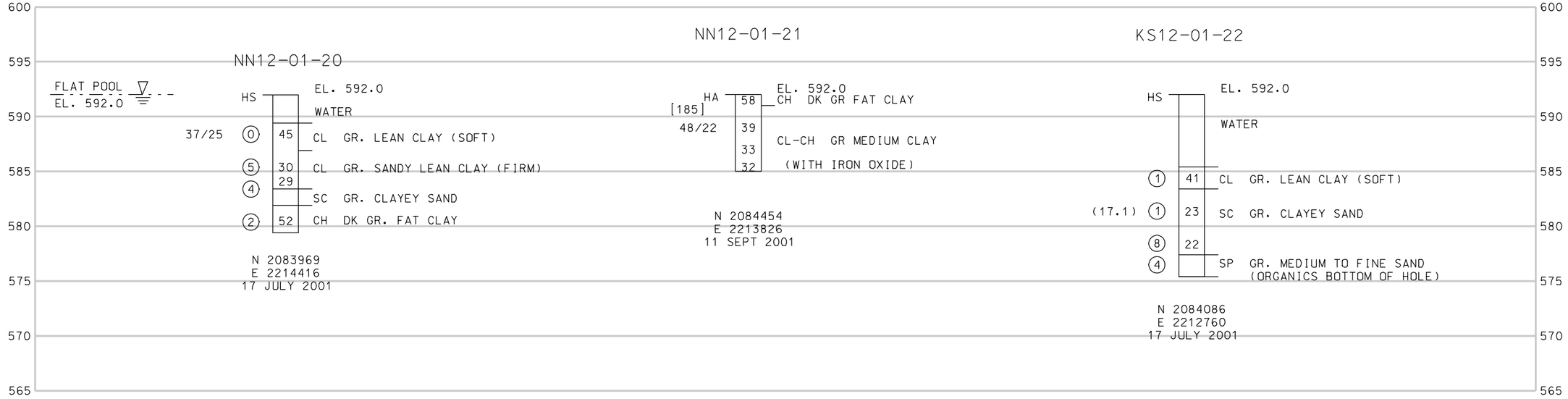

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Rock Island District

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	Revisions		

Designed By: AGB	Drawn By: GBM	Checked By: TPD	Reviewed By: GJM
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ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS IV

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G4
Sheet 20 of 24

PLATE G4

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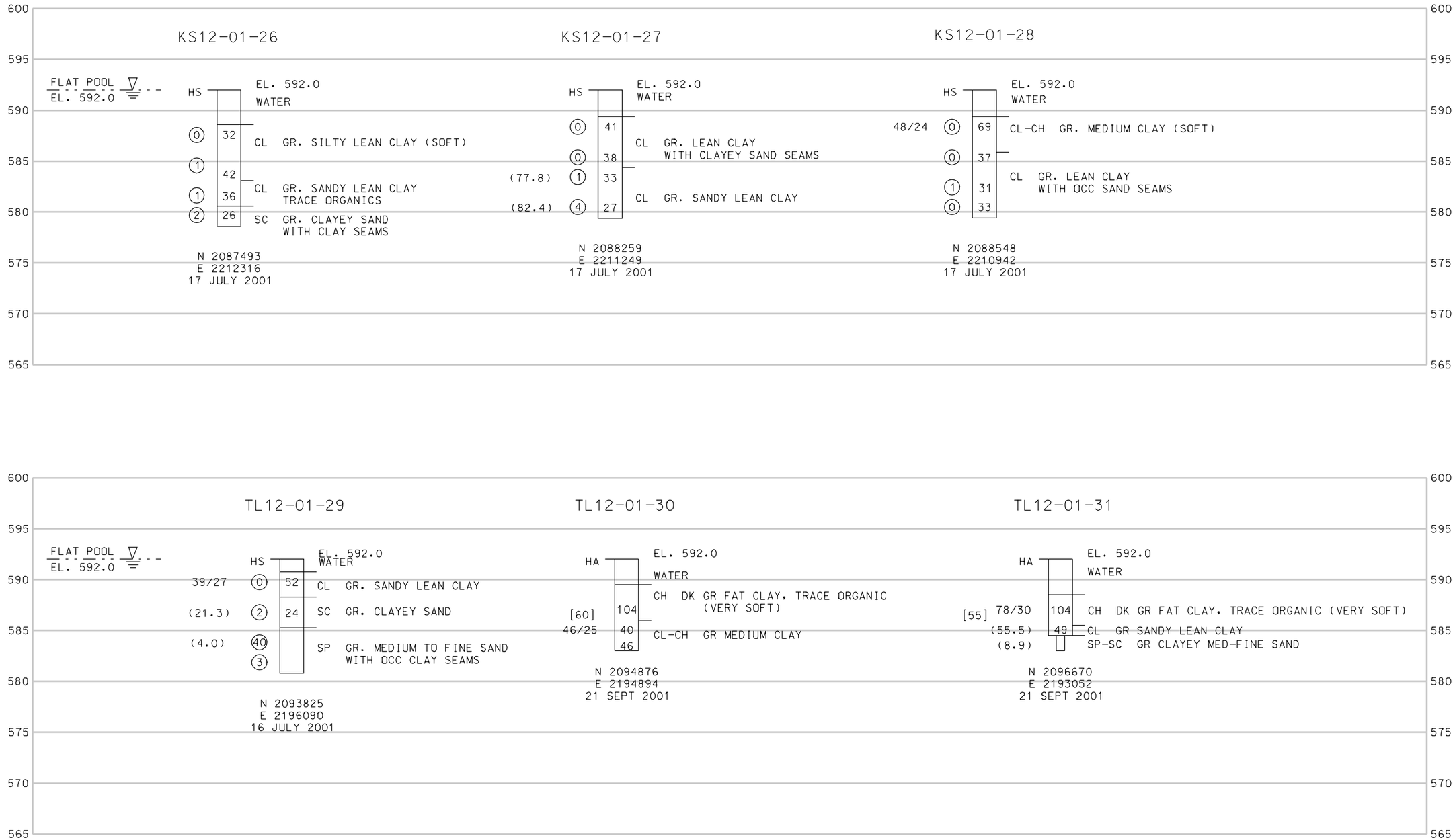

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Reviewed By: GJM
Date: 9 SEPT. 2002
Scale: AS SHOWN
Project Code: ep58
Solicitation Number: DACW25-XX-B-XXXX

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS V

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G5
Sheet 21 of 24

PLATE G5

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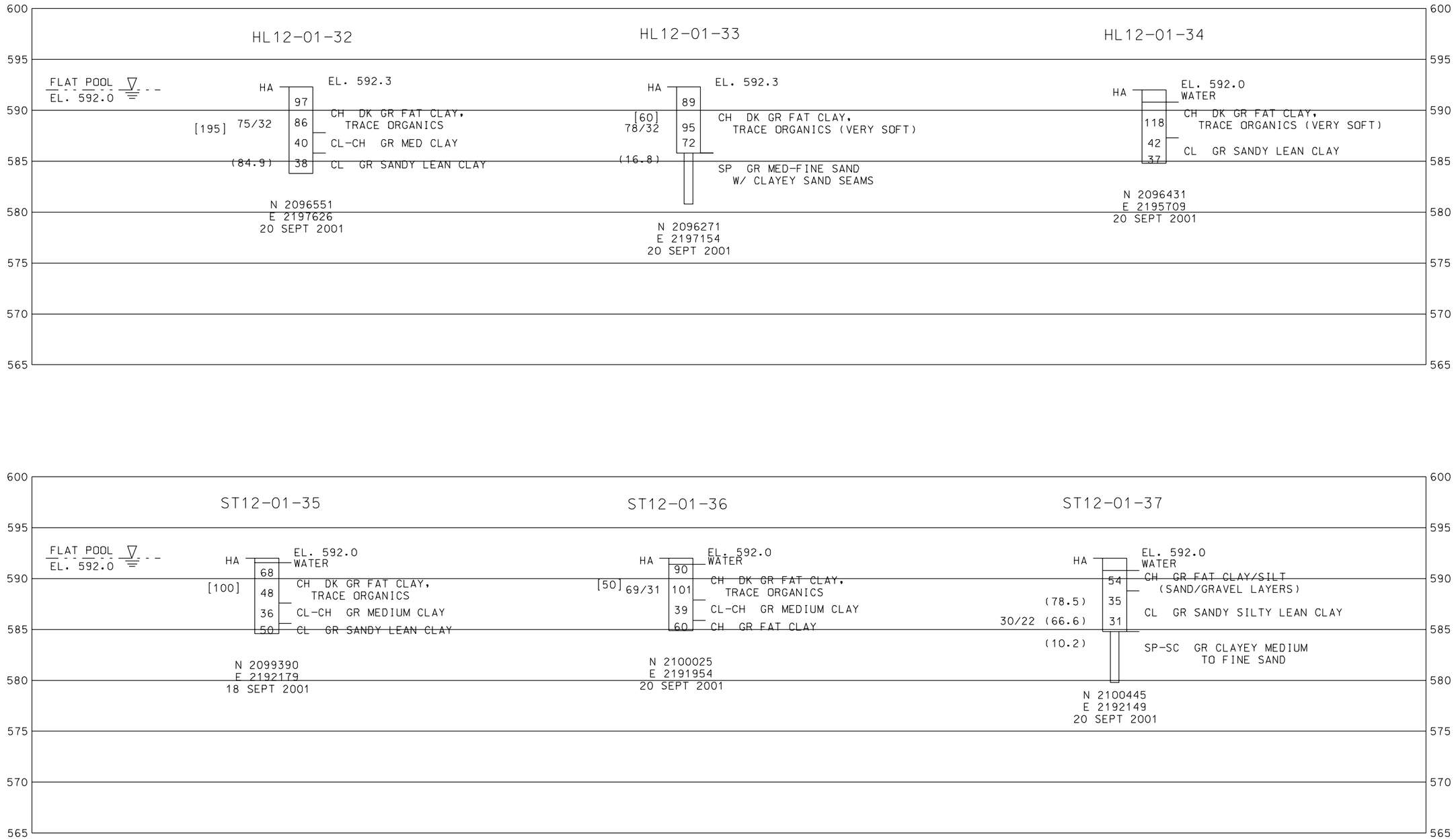

US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: AGB	Drawn By: GBM	Checked By: TPD	Reviewed By: GJM
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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS VI

Sheet Reference Number:
G6
Sheet 22 of 24

PLATE G6

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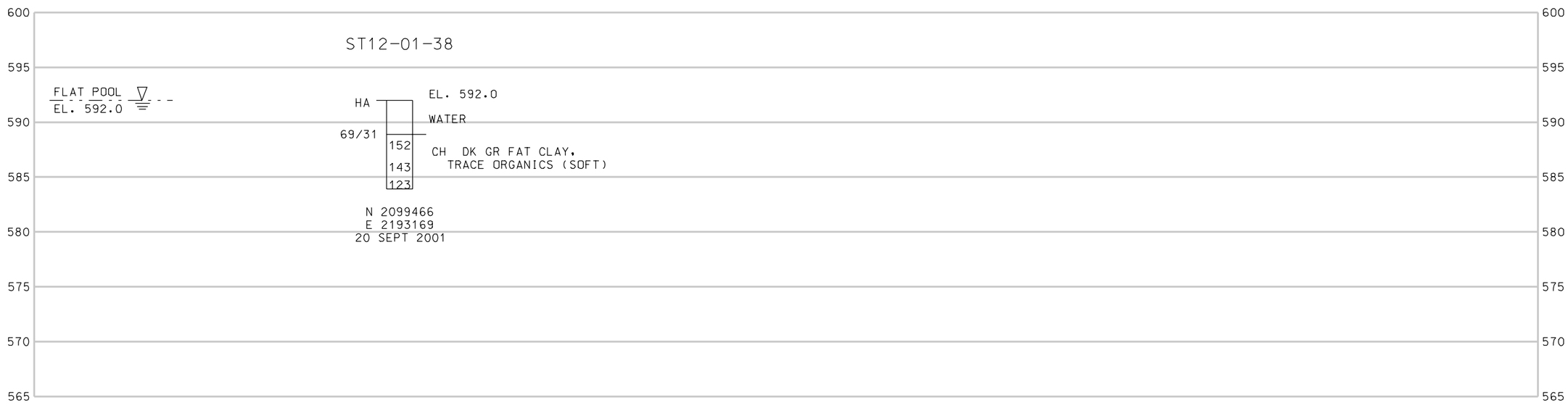

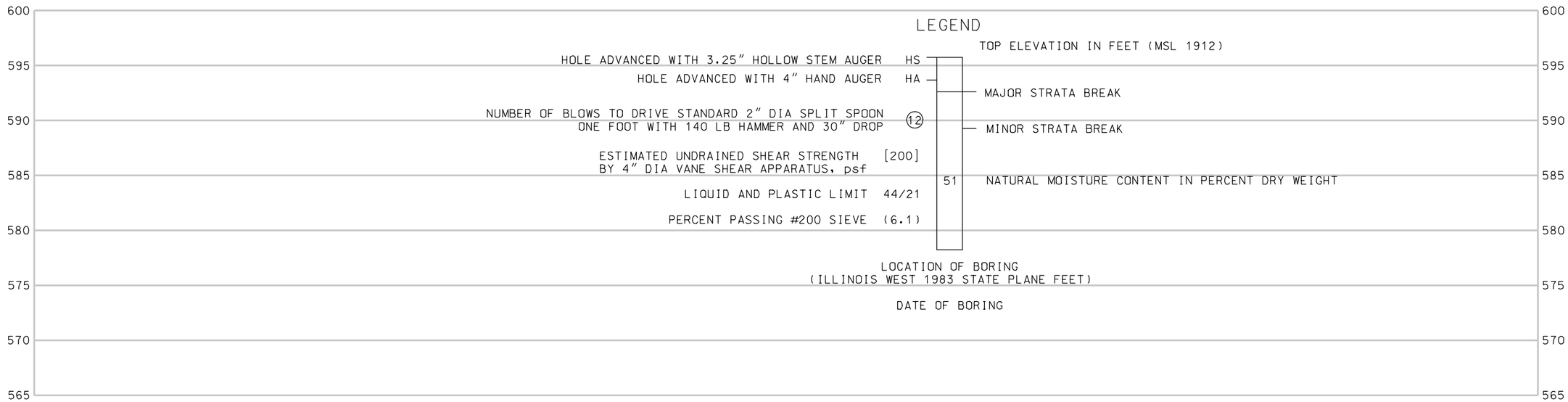

US Army Corps of Engineers
Rock Island District

Revisions

Symbol	Description	Date	Approved

Designed By: AGB	Drawn By: GBM	Checked By: TPD	Reviewed By: GJM
Date: 9 SEPT. 2002	Scale: AS SHOWN	Project Code: ep258	Solicitation Number: DACW25-XX-B-XXXX

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

BORING LOGS VII

Sheet Reference Number:
G7
Sheet 23 of 24

PLATE G7

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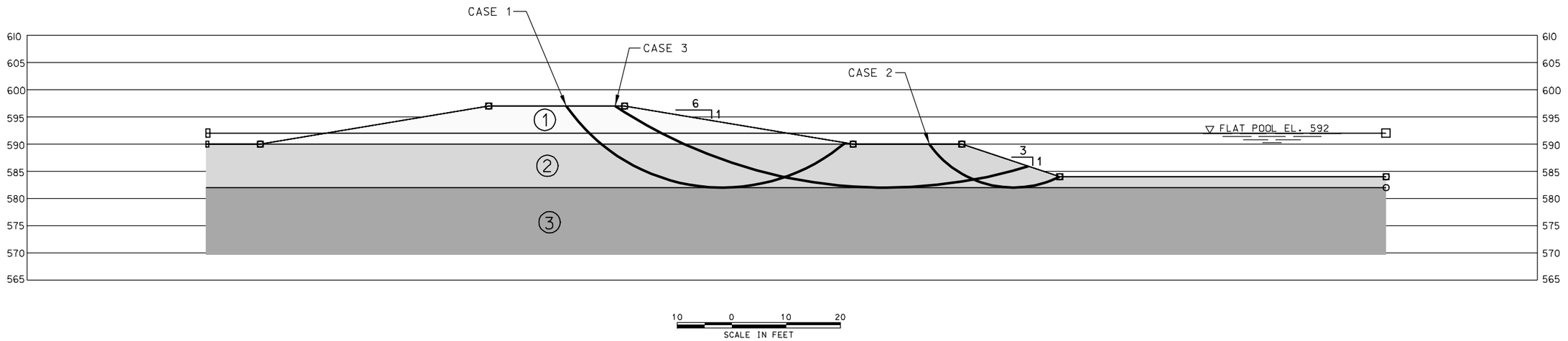
SLOPE STABILITY SUMMARY

MATERIALS				SLOPE STABILITY		
NO.	DESCRIPTION	UNDRAINED STRENGH PSF	UNIT WEIGHT PCF	CASE NO.	DESCRIPTION	FACTOR OF SAFETY
1	DREDGED CLAY	50	105	1	EMBANKMENT STABILITY	1.0
2	SOFT SLIGHTLY ORGANIC CLAY	100	99	2	DREDGE CUT STABILITY	3.4
3	STIFFER ALLUVIAL CLAY	300	112	3	TOTAL SECTION	1.8



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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
EMP. POOL 12 OVERWINTERING
CARROL COUNTY, ILLINOIS

SLOPE STABILITY

Sheet Reference Number:
G8
Sheet 24 of 24

PLATE G8

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX H

HYDROLOGY AND HYDRAULICS

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APPENDIX H

HYDROLOGY AND HYDRAULICS

FIGURES

TABLES

PLATES

APPENDIX H

HYDROLOGY AND HYDRAULICS

I. GENERAL

The proposed project is located at various sites between River Miles 563.0 and 573.0, in Pool 12, Mississippi River. Locks and Dams 11 and 12 are located at River Miles 583.0 and 556.7, respectively. This reach of Pool 12 has been degrading with the loss of adequate depth to support overwintering fish habitat. Location of each of the four feature areas that comprise the project are shown below in Figure 1. The project features include dredged channels and berms. The purpose of the berms is to store the dredged material as well as to protect the dredged channels from sediment deposition. Berm height was designed to accommodate the dredged material, while staying within the bounds allowed for by the Flood Plan Permitting activities. There are also three constructed closing structures, one at the side channel bordering Stone Lake, one at the entrance to Kehough Slough, and one at the entrance to Sunfish Lake.

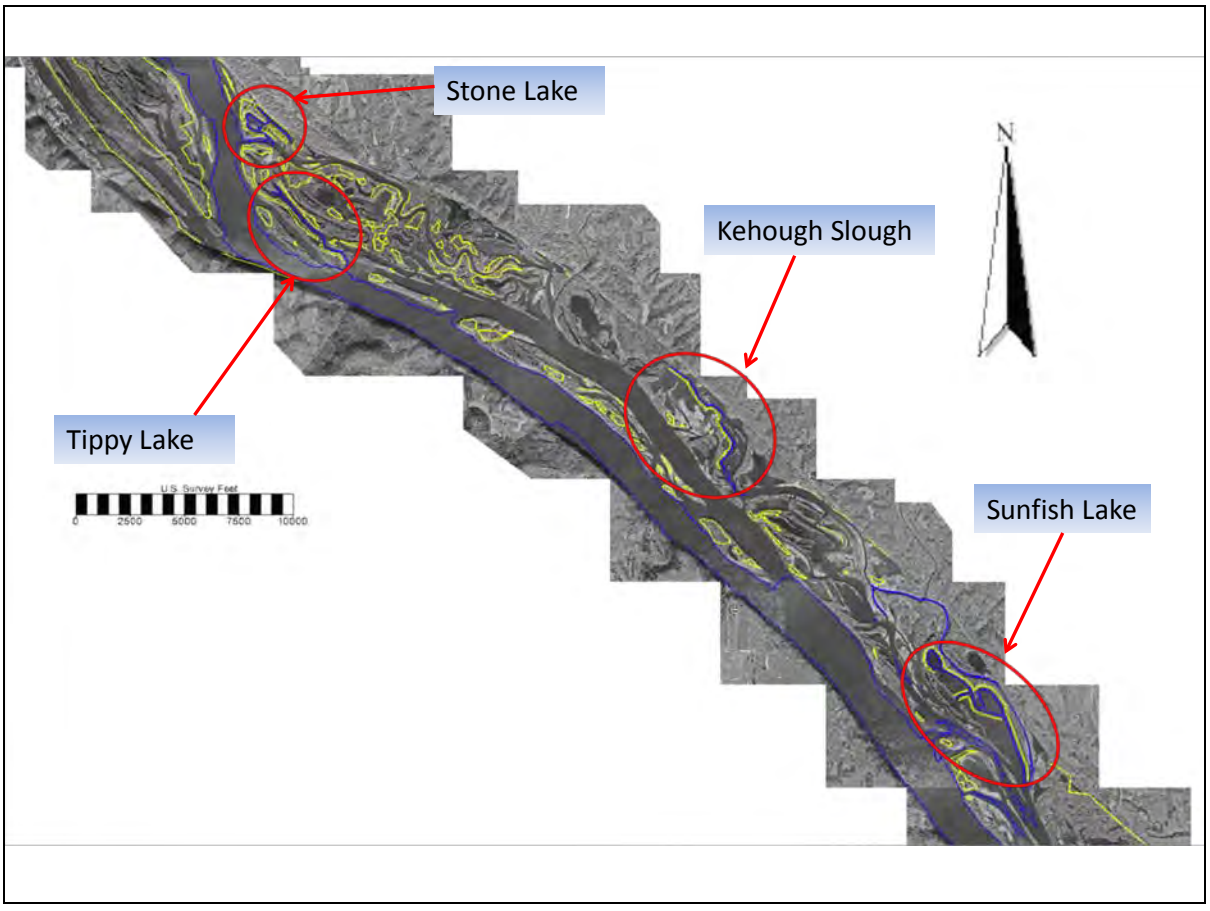

Figure H-1. Project Feature Areas of the Pool 12 Overwintering Project

The purpose of this appendix is to present the evaluation of the project features which will provide water depths throughout the life of the project that are necessary to support habitat for fisheries. The hydraulic evaluation consists of the prediction of sediment accumulation in dredged channels as well as flow velocities in dredged channels during overwintering conditions. All elevations in this appendix reference 1912 MSL datum.

II. HYDROLOGY

A. Water Resources and Flooding History. Lock and Dam 12 provides navigable channel depths by maintain a water surface elevation of 592 feet (flat pool) or higher. The water levels are highly variable.

The Rivers and Harbors Act of July 3, 1930 authorized the existing navigation project on the Mississippi River between the Missouri River and Minneapolis, Minnesota. The Project provides for a 9-foot channel of adequate width between the mouth of the Missouri River and Minneapolis by constructing a system of locks and dams, supplemented by dredging. The proposed Project features are adjacent and contiguous to the Mississippi River 9-foot channel. The proposed Project and features as described in this report would not affect navigation. Table H-1 details flood flows and elevations at Lock and Dam 12.

Table H-1. Flood Flows and Elevations at Lock and Dam 12 (Approximate RM 556.8)
Based on 2004 Flow Frequency Study

Event	Elevation (ft) [1]	Flow (cfs)
flat pool	592.0	0
2-year	594.3	127,000
5-year	597.2	169,000
10-year	598.9	196,000
25-year	600.9	228,000
50-year	602.1	252,000
100-year	603.2	275,000
200-year	604.1	298,000

[1] Elevations are based on 1912 MSL Datum

High water events at Lock and Dam 12 have occurred in 1965, 2001, 1993, 1997, 1969, 1975, 1973 and 1967 (listed in order of decreasing magnitude). The highest flood on record occurred in 4/26/1965 at river elevation of 603.71 feet MSL 1912. The 1965 event was higher than the 100-year flood event. Flood stage is 17 feet (597.20 feet MSL 1912).

B. **Flood Profiles.** Flood profiles for the Mississippi River were published in 2004 (ref. 1). The portion of these published profiles, which apply to the Pool 12 EMP project area are plotted and shown on Plate H-1.

C. Stage Hydrographs. Actual water surface elevations are recorded daily at Lock and Dam 12 (RM 556.7) and the Dubuque gage (RM 579.9). Stage hydrographs of elevation values at these two gages are shown in 10-year increments on Plates H-2 to H-11, respectively.

D. Duration. Duration profiles for Pool 12 are shown on Plate H-12. This figure depicts the percent of time that water surface elevations throughout the pool have been equaled or exceeded.

A duration curve for Lock and Dam 12 pool elevation is shown on Plate H-13. The duration curve for the Dubuque gage is shown on Plate H-14. Lock and Dam 11 tail elevation duration is shown on Plate H-15. Lock and Dam 12 flow duration information is shown on Plate H-16.

E. Overwintering Condition. Flow and water surface elevation conditions during certain times of the year are critical to the success of this project. Critical overwintering conditions as defined by field managers occur typically in January through February. Flow and elevation gages were evaluated to determine normal conditions for this time period. January – February seasonal duration curves for Lock and Dam 12 pool elevation, Dubuque gage elevation, Lock and Dam 11 tail elevation duration, and Lock and Dam 12 are shown on Plates H-17 to H-20. The 50% exceedance duration flow (35,000 cfs) from the seasonal duration analysis was chosen to characterize overwintering conditions. This discharge was used as the upstream boundary condition and the corresponding downstream boundary condition is flat pool (592 ft).

III. CLIMATE

A. Temperature. Data is based on observations recorded at the Dubuque, Iowa Airport by the National Weather Service. The average temperature for Pool 12 is 46.4 degrees Fahrenheit. Table H-1 shows average monthly temperatures based on historical data.

Table H-2. Dubuque, Iowa Airport Average Monthly Temperature (degrees F)

Month	Avg Temperature	Month	Avg Temperature
January	15.9	July	72.3
February	21.2	August	69.8
March	33.3	September	61.6
April	47.6	October	50.5
May	58.6	November	36.3
June	67.8	December	21.6

B. Precipitation. Data is based on observations recorded at the Dubuque, Iowa Airport by the National Weather Service. The average annual precipitation is 38.4 inches. Table H-2 gives average monthly precipitation based on historical data.

Table H-3. Dubuque, Iowa Airport Average Monthly Precipitation (inches)

Month	Avg Precipitation	Month	Avg Precipitation
January	1.26	July	4.02
February	1.32	August	4.69
March	2.89	September	4.67
April	3.72	October	2.73
May	4.26	November	2.71
June	4.13	December	1.96

IV. HISTORICAL DEPOSITION RATES

The Cumulative Effects Study (West Consultants, 2000) evaluated geomorphic processes on the Upper Mississippi River (ref. 2). Two time periods were examined based upon the available data. The first time period was from 1938 to the mid-1950s. The second time period was the mid-1950s to 1995. It was found that most Upper Mississippi River (UMR) pools have experienced a decreased sediment deposition rate from the first period to the second period. Some pools experienced main channel degradation in the second period.

Pool 12 is part of Geomorphic Reach 4 as defined in the Cumulative Effects Study. Reach 4 contains Pools 10, 11, 12, and 13. This reach has a thalweg profile slope of 0.323 ft/mile (based on 1995 survey data). This reach is significantly flatter than the upstream Reach 3. Reach 4 is controlled by downstream erosion-resistant bedrock (ref. 2). The study lists an estimated sediment deposition rate of 0.05 cm/yr for Pools 12-19 for the time period beginning mid-1940s to 1995.

V. SITE SPECIFIC DEPOSITION RATES

Approximate historical sediment deposition rates were determined for each backwater site project area. To make this computation, each backwater project area was divided up into different sub-areas. Figures H-2 through H-5 show each project area and the sub-areas they were divided up into. These sub-area divisions were identified based on similar flow and velocity characteristics.

Figure H-2. Stone Lake Project Feature and Sub-Areas Used for Hydraulic Calculations

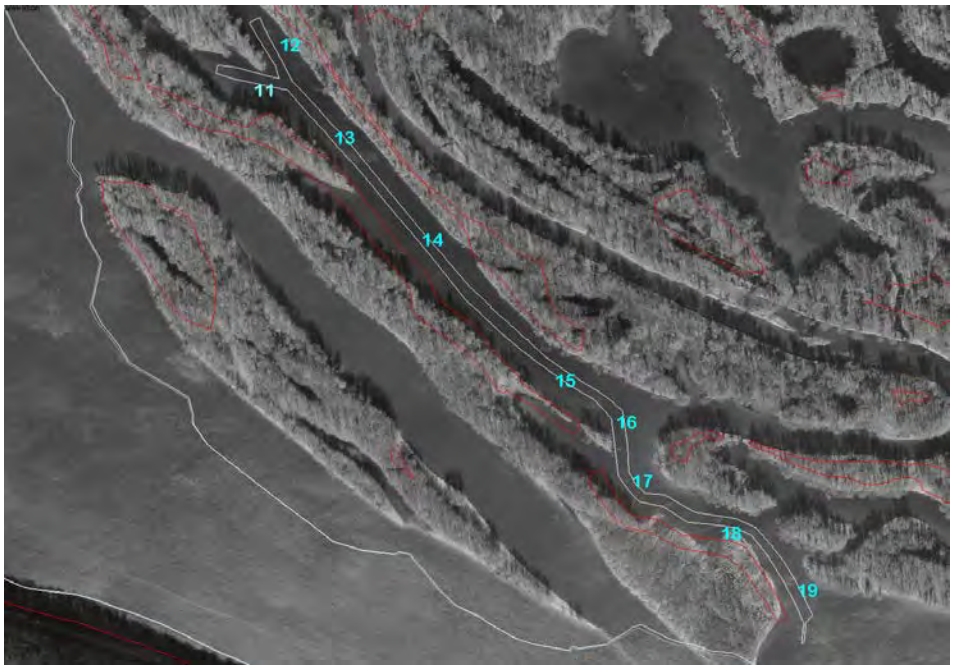

Figure H-3. Tippy Lake Project Feature and Sub-Areas Used for Hydraulic Calculations

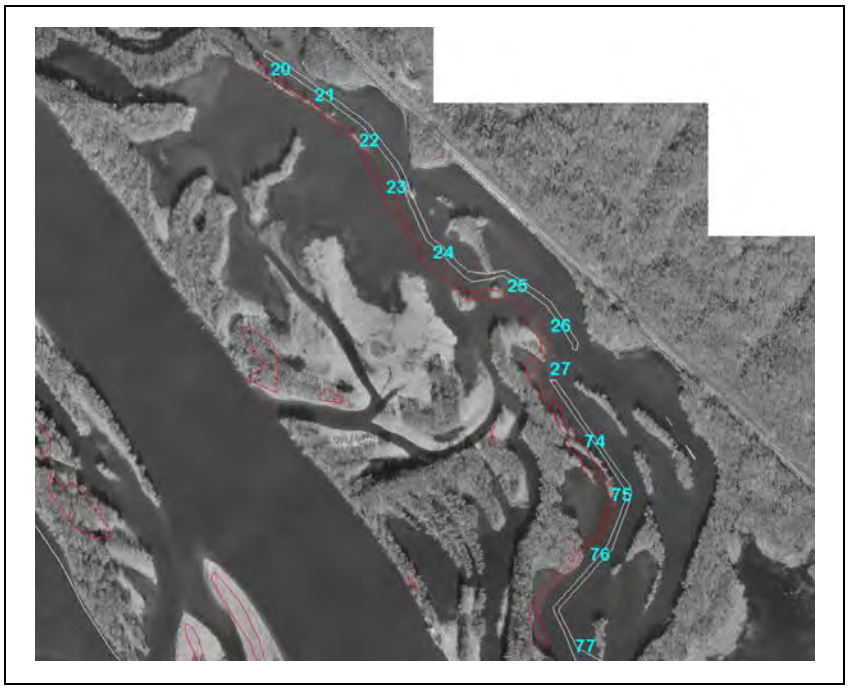

Figure H-4. Kehough Slough Project Feature and Sub-Areas Used for Hydraulic Calculations

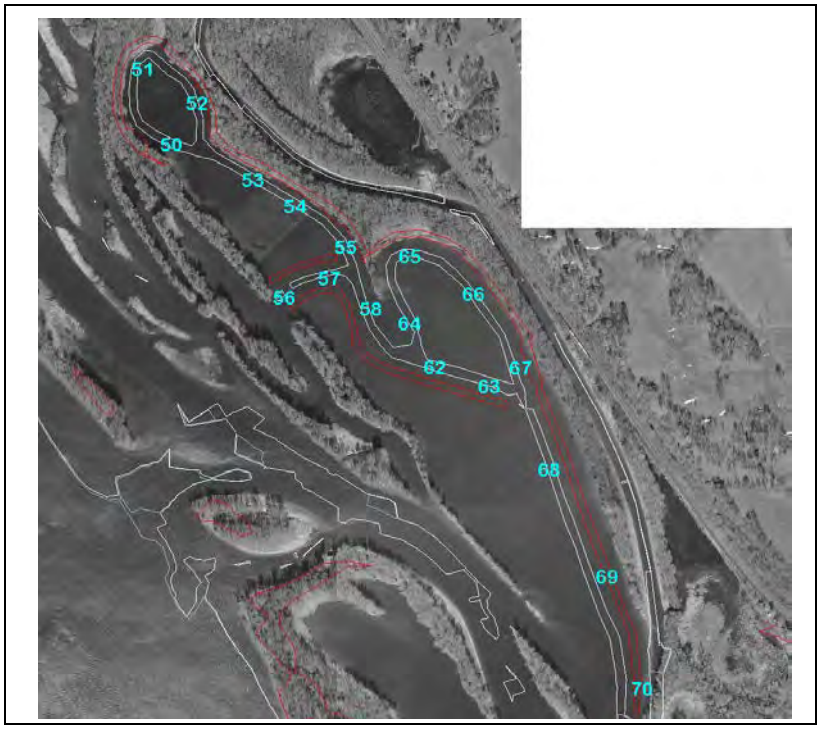

Figure H-5. Sunfish Lake Project Feature and Sub-Areas Used for Hydraulic Calculations

Historical sediment deposition rates were computed by comparing recent survey data to the Brown's Maps data from the 1930s. The difference in elevation between the two data sets was compared to get a depth of deposition. This value was divided by the time difference to get an average annual deposition rate.

Each sub-area had an average deposition rate calculated. Sub-areas that had similar deposition rates were grouped together and yielded a rate that represented a larger area. Tables H-4 to H-7 show historical rates for the sub-areas.

Table H-4. Stone Lake Historical Sediment Deposition Rates

Reach	Sediment Deposition Rate (cm/yr)
S1	0.81
S2	0.6
S3	1.03
S4	0.45
S5	0.63
S6	0.74
S7	0.45
S8	0.05

Table H-5. Tippy Lake Historical Sediment Deposition Rates

Reach	Sediment Deposition Rate (cm/yr)
T11	0.32
T12	0.38
T13	0.8
T14	0.61
T15	0.26
T16	0.95
T17	2.58
T18	0.48
T19	0.48

Table H-6. Kehough Slough Historical Sediment Deposition Rates

Reach	Sediment Deposition Rate (cm/yr)
K20	-0.75
K21	-1.28
K22	0.08
K23	0.24
K24	0.58
K25	0.06
K26	0.01
K27	-0.93
K74	Reached added in project reformulation. Historic sediment accumulation rates not computed.
K75	
K76	
K77	

Table H-7. Sunfish Lake Historical Sediment Deposition Rates

Reach	Sediment Deposition Rate (cm/yr)
SU50	2.49
SU51	0.52
SU52	0.69
SU53	0.52
SU54	0.11
SU55	0.09
SU56	3.13
SU57	1.34
SU58	0.07
SU62	1.99
SU63	3.15
SU64	0.6
SU65	1.74
SU66	0.66
SU67	0.13
SU68	1.18
SU69	0.94
SU70	0.59

VI. HYDRAULIC ANALYSIS METHODS

A. HEC-RAS Modeling. A steady state, one-dimensional model was built to evaluate the impacts of the project upon water surface profiles. The model used was the Hydrologic Engineering Center – River Analysis System (HEC-RAS), (ref. 4).

B. RMA2/Surface Water Modeling System. The computational model used for this hydraulic analysis was RMA2. RMA2 is a two-dimensional numerical model for depth-averaged flow and water levels. Model outputs include velocity magnitude, velocity direction, depth, and water surface elevation. The tool used for evaluating and visualizing the RMA2 results was the Surface Water Modeling System (SMS) (ref. 3). SMS is a pre- and post-processor for building grids, viewing solutions, and many other specialized tasks. It supports many models, such as RMA2, RMA4, ADH, ADCIRC, and others.

C. Tractive Force Analysis. Bed shear stresses are the forces imposed on the riverbed by the flow field. The RMA2 model outputs were used to compute bed shear stress via the data calculator in SMS. Hydrodynamic model outputs of velocity and depth were used in this computation along with estimates of bed roughness. The equation used to make the computation is as follows:

$$\tau = 62.4 \left\{ {}^{Vn}/_{1.486} \right\}^2 \left\{ {}^{1}/_{Y^{1/3}} \right\}$$

Where:

τ = Bed Shear Stress (lb/ft^2)
V = Velocity (ft/sec)
n = Manning's n for roughness
Y = Flow Depth (ft)

SED2D documentation states:

> *"Cohesive sediments in transport will remain in suspension as long as the bed shear stress exceeds the critical value for deposition. In general, simultaneous deposition and erosion of cohesive sediments do not occur."* (ref. 4)

Cohesive sediments are defined as silts and clays, while non-cohesive sediments are defined as sands. Geotechnical borings indicate that the material that has been deposited in Pool 12 backwaters is primarily cohesive in nature.

VII. HYDRAULIC EVALUATION OF PROJECT

A. **One-Dimensional Modeling (HEC-RAS).** Modeling of project alternatives was completed during the first feasibility study. The results were coordinated with the State of Illinois, and the project was determined to have an acceptable impact upon water surface profiles. A permit to construct was received on 26March2008. However, this project is under reformulation, and has been reduced in overall footprint (six project areas reduced to four). The exact berm and channel location, shape, and size will not be known until the Plans and Specs (P&S) phase. Floodplain impacts will be re-coordinated with the State of Illinois

during P&S, and any additional required HEC-RAS modeling performed, during the P&S phase. There will be multiple project phases as the project will be constructed over a number of years, hence several flood plain coordination efforts. Since the current reformulated project is smaller in scope than the originally formulated project, no adverse flood plain impacts are expected.

B. **Two-Dimensional Modeling.** As previously stated, the hydrodynamic analysis was performed using RMA2, and SMS was used as the pre- and post processor. The grid used in the hydrodynamic modeling was developed using SMS. The grid extends from Lock and Dam 12 (RM 556.7) upstream to RM 574. The grid superimposed on the orthophotos is shown on Plate H-21. The grid encompasses the four project areas. The grid was developed using orthophotos as a backdrop, then assigning elevations to the grid from all available data sources. All topography used in model construction was Mean Sea Level, 1912 adjustment. This was the base condition model. The bathymetry of the model was then altered to reflect project alternatives, such as dredged channels and constructed berms.

The model was simulated under steady state conditions. The modeling consisted of a series of steady state runs representing the flow range that this river reach might encounter in an average year, based on historical data. Several different flows were simulated, ranging from 35,000 cfs to 256,000 cfs. These flows represent the range of conditions this river is expected to encounter during an average year. Each steady state simulation requires a water surface elevation at the downstream boundary and incoming discharge at the upstream boundary.

The purpose of the modeling was twofold, to predict overwintering velocities as well as to predict sedimentation deposition rates. These analysis results are described below.

B.1. Overwintering Velocities. The project condition RMA2 model was simulated for an inflow (upstream boundary condition) of 35,000 cfs and a water surface elevation (downstream boundary condition) of 592.0. These are average of median (50% on duration curve) conditions for the months of January and February, which for the purposes of this analysis were defined as overwintering conditions. Plates H-22 to H-25 show contour plots of overwintering velocities. Values are also listed in Tables H-7 to H-10.

B.2. Sediment Deposition Analysis. Historical estimates of sediment deposition for each sub-area were computed as discussed previously. An estimate of average annual volume of flow passing through each sub-area was computed from the base condition RMA2 analysis. This was developed from applying the series of steady state runs to the duration analysis. Each RMA2 simulation produces outputs of velocity and depth. These were multiplied in SMS using the data calculator to yield plots of unit flow (ft^3/sec/ft) for each sub-area. The unit flow in each sub-area for each flow simulation was multiplied by the percentage year that that particular flow has occurred historically, then summed to develop an estimate of the volume of flow that has passed through each sub-area under base conditions.

The same analysis was performed for the project condition RMA2 model. This yielded a base vs. project flow volume for each sub-area. The prediction of sediment deposition for each sub-area was adjusted accordingly. That is, if flow volume through a sub-area would be increased by 50% under

project conditions, then the prediction of average annual sediment deposition would also be increased by 50% as compared to historical rates.

Tables H-7 through H-10 gives the projected sediment deposition rate for each of the project feature areas. Also included in these tables are the base and project condition velocities for each of the sub areas. These values come directly from the SMS program, depicting the RMA2 results.

The exception to this analysis is the application of the tractive force analysis. Some areas that will experience greater flow may also have significantly greater velocity and may experience scour. Tractive force plots were developed to address this. This is a trend predictor of deposition. This approach is modeled after the hydrodynamic analysis that the U.S. Army Corps of Engineers Waterways Experiment Station conducted for the Peoria Lake Environmental Management Program (EMP) Habitat Rehabilitation and Enhancement Project (HREP) (ref. 5). For fine sediments, for instance, if the tractive force imposed by the flow field is 0.02 pounds per square foot (psf) or less, deposition might be expected. If the tractive force were greater than 0.02 psf, it would be expected that the material would remain in suspension.

Tractive force was computed in SMS, based on RMA2 results for a flow of 160,000 cfs. This flow was chosen based on an analysis of an old data set of suspended sediment data at the East Dubuque, IL sediment gage. The daily sediment load versus flow relationship was applied to the flow duration curve to determine an approximate suspended sediment "dominant discharge". The five-year flow is 168,500 cfs. This relatively high flow value was used to be conservative in highlighting the high stress areas. These areas would still have relatively higher stress values at lower flows, assuming that overbank flow was still occurring. The results for the base condition, project condition, and a comparison of the two conditions for each of the four project areas are shown on Plates H-26 to H-29. The results of this analysis were used to identify areas where, although the project may increase flow and more sediment deposition, scour is anticipated due to an increase in tractive forces. These scoured areas are listed in Tables H-8 to H-11 under the heading *Projected Sediment Deposition Rates*.

If the flow analysis shows the project condition to experience less flow than the base condition, then the deposition rate should decrease. If flow would be increased under the project condition as compared to the base condition, then the deposition rate should increase. If the flow increases but the tractive forces increase from less than 0.02 psf to something greater than 0.02 psf, then the conclusion would be that although more flow (and sediment) may be passing through the flow zone, the energy is high enough that the fine sediments will not deposit, and that these reaches will convert from aggrading to degrading.

Table H-8. Stone Lake Overwintering Velocities and Sediment Deposition Rates

Sub	Velocity cm/sec		Sediment Deposition Rate cm/yr		50 years of Sedimentation (ft)
	Base Condition	Project Condition	Historical	Projected	
S1	0.0	0.0	0.81	0.40	0.7
S2	0.0	0.0	0.6	0.20	0.3
S3	0.0	0.1	1.03	0.40	0.7
S4	0.0	0.1	0.45	0.17	0.3
S5	0.0	0.0	0.63	0.56	0.9
S6	0.0	0.0	0.74	0.15	0.3
S7	0.0	0.0	0.45	0.26	0.4
S8	0.0	0.0	0.05	0.03	0.0

Table H-9. Tippy Lake Overwintering Velocities and Sediment Deposition Rates

Sub Area	Velocity cm/sec		Sediment Deposition Rate cm/yr		50 years of Sedimentation (ft)
	Base	Project	Historical	Projected	
T11	0.0	0.0	0.32	0.20	0.3
T12	0.0	0.0	0.38	0.19	0.3
T13	0.0	0.0	0.8	0.46	0.7
T14	0.1	0.0	0.61	0.32	0.5
T15	0.1	0.0	0.26	0.12	0.2
T16	3.0	1.1	0.95	0.80	1.3
T17	11.4	8.5	2.58	3.18	5.2
T18	6.9	9.0	0.48	0.92	1.5
T19	2.3	7.7	0.48	0.55	0.9

Table H-10. Kehough Slough Overwintering Velocities and Sediment Deposition Rates

Sub Area	Velocity cm/sec		Sedimentation Rate cm/yr		50 years of Sedimentation (ft)
	Base	Project Conditon	Historical	Projected	
K20	13.5	4.6	-0.75	-2.65	-4.3
K21	11.8	3.3	-1.28	-3.93	-6.5
K22	3.5	2.3	0.08	0.22	0.4
K23	2.4	2.2	0.24	0.55	0.9
K24	4.1	1.7	0.58	0.84	1.4
K25	5.1	1.6	0.06	0.11	0.2
K26	4.7	1.7	0.01	0.02	0.0
K27	4.6		-0.93	-0.28	-0.5
K74	0.1	0	0.3	0.15	0.2
K75	2.2	1.1	0.3	0.34	0.6
K76	1.7	0.6	0.3	0.18	0.3
K77	1.5	0.5	0.3	0.10	0.2

Table H-11. Sunfish Lake Overwintering Velocities and Sediment Deposition Rates

Sub Area	Velocity cm/sec		Sedimentation Rate cm/yr		50 years of Sedimentation (ft)
	Base Condition	Project Condition Raise Closing Dam to FP, Leave 20' Notch	Historical	Projected	
SU50	0.0	0.0	2.49	0.90	1.5
SU51	0.0	0.0	0.52	0.13	0.2
SU52	0.0	0.0	0.69	0.17	0.3
SU53	0.1	0.1	0.52	0.42	0.7
SU54	0.2	0.1	0.11	0.12	0.2
SU55	2.6	0.1	0.09	0.23	0.4
SU56	4.7	4.2	3.13	5.53	9.1
SU57	4.9	4.8	1.34	2.72	4.5
SU58	7.5	3.2	0.07	0.12	0.2
SU62	2.9	1.5	1.99	3.49	5.7
SU63	2.5	1.7	3.15	5.64	9.3
SU64	2.9	0.5	0.6	0.47	0.8
SU65	0.0	0.1	0.74	0.14	0.2
SU66	0.9	0.2	0.66	0.35	0.6
SU67	2.2	1.4	0.13	0.14	0.2
SU68	1.8	2.0	1.18	2.17	3.6
SU69	2.0	1.4	0.94	1.37	2.2
SU70	3.7	5.4	0.59	0.99	1.6

The above tables are predictors of future sediment deposition, and should be considered approximate. Initial trends are predicted based on project features immediately after construction and projected throughout the life of the project. For example, Sub-Area SU63 shows a sediment deposition rate of 5.64 cm/yr (up from 3.15 cm/yr) post-construction, which amounts to a cumulative depth of sediment deposited of 9.3 feet over 50 yrs. This high sediment deposition rate will change the hydrodynamics of the Sub-Area after a few years, hence also changing the predicted sediment deposition rate. Such adjustments were not made in the analysis.

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2. U. S. Army Corps of Engineers, Rock Island District, *Upper Mississippi River and Illinois Waterway Cumulative Effects Study*, Rock Island, Illinois, 2000.

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5. SED2D Users Guide, http://chl.erdc.usace.army.mil/Media/3/3/1/SED2D_Users_Guide_Draft_09-27-2011.pdf

6. U. S. Army Corps of Engineers, Rock Island District, June 2, 2003, *Peoria Lake Habitat Rehabilitation and Enhancement Project*, Rock Island, Illinois http://www.mvr.usace.army.mil/EMP/hrep/PeoriaLake.htm

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX I

COST ESTIMATE

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APPENDIX I

COST ESTIMATE

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APPENDIX I

COST ESTIMATE

I. INTRODUCTION

This appendix contains a detailed project cost estimate prepared for the Pool 12 Overwintering - HREP project. The proposed project is located in Jo Daviess County, Illinois, upstream of Bellevue, Iowa, in Pool 12 between Upper Mississippi River Miles (RM) 563 and 573. The project area is comprised primarily of a series of islands, backwater channels and backwater lakes modified or created following construction of Lock and Dam 12 in 1939.

II. PROJECT DESCRIPTION

The goals of the proposed project are to restore and protect aquatic habitat and restore floodplain forest habitat. The recommended plan would restore backwater habitat at four lakes by excavating approximately 63 acres of deep backwater channels to a depth of 8 feet below flat pool, providing overwintering and year-round habitat for fish in the surrounding 6,942 acres. Rock closure structures will be constructed to reduce overwintering water velocities while maintaining necessary levels of dissolved oxygen. The recommended plan would also establish mast-producing trees on approximately 40 acres of land berms.

A. Dredging. The project consists of the clearing of the dredging placement sites by removal of trees and brush and placing them into piles onsite. The placement site material will be contained using a silt fence to control runoff. The backwater areas will be dredged using a crane with a clamshell bucket on a floating plant. The dredged material will be side casted along the dredge cuts to create the land berm. The dredged material will be shaped after it is allowed to dry for a short period of time. In order to access the area to be dredged at Kehough Slough, a power line will need to be disconnected and reconnected to allow the barge with the crane to fit under the line.

B. Bank Stabilization. At one location, underwater wing dam removal with placement on the nearby banks will be required. There are also three locations requiring removal of trees and for the placement of rock closure structures. The A rock closure structure will be placed at these three locations using a floating plant with a skid steer dumping the rip-rap and an excavator shaping the material.

C. Tree Plantings. A number of methods for mast tree establishment were considered for this project and four methods will be implemented in this project. The four methods are container stock, container stock with advanced natural regeneration, container stock with button bush cover crop, and direct seeding. The four methods will be implemented at Sunfish Lake as it will be the first lake dredged. Planting will take place over a four year period for Sunfish Lake with ¼ of the land berm area being planted with a different method. At this point the plantings at the remaining three lakes will utilize the container stock with button bush cover crop option, but if the results from Sunfish Lake show that one of the methods performs extremely well, the design will be updated to reflect this for the later planting contracts.

D. Adaptive Management. The adaptive management for this project consists of the replanting of ¾ of the area planted at Sunfish Lake if the methods planted are insufficient in providing the desired benefits. In addition, the rock closure structures at Sunfish Lake, Stone Lake, and Kehough Slough would be notched if there were insufficient dissolved oxygen at these locations.

III. COST METHODOLOGY

A. General. This Fully Funded Estimate (FFE) has been prepared to September 2012 price levels. The costs are considered to be fair and reasonable to a well-equipped and capable contractor and include overhead and profit. The preparation of this estimate was created in accordance with "ER 1110-1-1300 – Cost Engineering Policy and General Requirements, (26 March 1993)" and "ER 1110-2-1302 – Civil Works Cost Engineering, (15 September 2008)". The Fully Funded Estimate (FFE) was completed in accordance with "EM 1110-2-1304 – Civil Works Construction Cost Index System (CWCCIS), (revised 31 March 2012)".

The estimate was developed using Micro Computer Aided Cost Estimate System (MCACES) MII v4.1 cost estimating software. Applicable crews and equipment were applied in the estimate to correspond with the work being performed. Material prices were developed using the MII Cost Book, R.S. Means references, and quotes obtained from suppliers. The midpoint of construction varies for each construction contract. The midpoints of construction were used to determine the Fully Funded Estimate. The MII report of the Work Breakdown Structure can be found in Appendix I-A.

This project is assumed to consist of ten contracts with each dredging contract likely being an invitation for bid, with them likely being an 8a competitive set aside. This was discussed and properly evaluated in the determination of contingency values. The tree planting contacts are assumed to be the same with the possibility in the future that the planting work could be placed under an IDIQ contract for planting if one exists at the time of construction.

B. Direct Costs. Direct costs are based on the anticipated material, equipment, and labor needed to construct the project based on the current scope of work. Material quotes were obtained for planting materials. Direct costs were calculated independent of the contractor assigned to perform the work. Contractor assignments were determined after the formulation of the direct costs. The majority of the work is assumed to be done by the dredging subcontractor, with the remaining work being performed by the tree planting subcontractor. It is assumed the prime contractor, an 8a contractor, will perform no construction work, but merely administer the contract.

1. Labor-Rate Determination. Labor Rates are based on 2012 Davis-Bacon Wage Rates general decision IL120001, IL120018, IL120012 and IL120019.

2. Equipment Rates. All equipment costs are from MII Equipment Region 5 2011 and MII English Cost Book 2010.

3. Fuel Rates. Rates have been updated as of Monday August 13, 2012. Current fuel prices are based on Midwest averages from http://www.eia.doe.gov/ that were adjusted to include Illinois fuel taxes. They include: gasoline, on-road diesel, and off-road diesel.

4. Overtime Considerations. Overtime was considered and deemed necessary only for the mechanical dredging work and was applied accordingly in the estimate. It is assumed that the dredging crew will work seven 12 hour days while all other construction will be accomplished by working five 8 hour days.

5. Sales Tax. The Rock Island District doesn't use sales tax in the creation of estimates as contractors are issued tax exemption numbers to use when purchasing materials.

6. Productivity. Production rates were created based on historical rates used in the Cost Engineering Section in Rock Island and also based on what was determined reasonable by the cost estimator. In addition, user crews were created using the estimator's judgment.

C. Indirect Costs

1. Prime Contractor

a. Job Office Overhead (JOOH). Overhead rate for JOOH was applied as a running percentage. In this case a value of 5.00 percent was applied for the prime contractor. It is assumed the 8A prime contractor will have minimal job office overhead as the prime is merely administering the project only and most field overhead will be incurred by the dredging subcontractor.

b. Home Office Overhead (HOOH). Overhead rate for HOOH was applied as a direct percentage. In this case, a value of 3.75 percent was applied for the prime contractor. HOOH includes such items as office rental/ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous costs. In reality, the range of home office overhead can be quite broad and depends largely on the contractor's annual volume of work and the type of work that is generally performed by the contractor.

c. Profit. Profit has been included and was applied as a direct percentage. In this case, a value of 7.00 percent was assumed for the prime contractor.

d. Bond. Bond was included based on the bond table class B. In this case, a value of values of 1.01 percent and 1.58 percent were calculated for the prime contractors (own work and subcontracted work).

2. Subcontractors

a. JOOH. Overhead rates for JOOH were applied as a running percentage. In this case, a value of 8 percent was applied to the dredging subcontractor and 0 percent for the tree planting subcontractor.

b. HOOH. Overhead rates for HOOH were applied as a direct percentage. In this case, a value of 4 percent was applied to the dredging subcontractor and 5.5 percent for the tree planting subcontractor.

c. Profit. Profit has been included and was applied as a direct percentage. In this case, a value of 7 percent was assumed for the dredging subcontractor and 8.5 percent for the tree planting subcontractor.

d. Insurance. Insurance has been included and was applied as a direct percentage. In this case, a value of 2 percent was applied to the subcontractors.

D. Escalation. The project costs have been escalated to the midpoint of construction for each construction contract. The midpoints vary for each contract depending on the start and end dates.

E. Contingency. After review of project documents and discussion with members of the project development team involved in the design of the project, an informal risk analysis was conducted resulting in the development of a contingency matrix. The contingencies were developed to reflect the uncertainty associated with the features of work. The contingency matrix is shown in Appendix I-B. This includes the development of the contingencies applied to the construction features of work as well as PED and Construction Management costs.

F. Other Assumptions

1. Mobilization. Equipment needs were identified from work items in the MII estimate. Equipment was assumed to be mobilized within 150 miles for land based equipment. Marine equipment was assumed to be mobilized within a distance upriver or downriver that included at least three biddable contractors for this type of work. Different periods for mobilization were created based on the construction schedule.

2. Government Furnished Materials. The estimate is based on no government furnished materials.

3. Site Access. It is assumed that the site can be accessible from May to November of each year, except in the event of a flood.

4. Waste Disposal. Trees and brush will be piled on-site and removed wing dams will be placed on adjacent bank lines. It is assumed that there will be no material disposed of offsite.

IV. PROJECT FEATURE ACCOUNTS

A. (01) Lands and Damages. This account contains no values as no real estate will need to be acquired for this project.

B. (06) Fish & Wildlife Facilities. Adaptive management costs are covered in the estimate. They items consisting in this account are tree replanting and the notching of rock closure structures.

C. (09) Channels & Canals. The mechanical dredging and placement site shaping are included under this account as well as other miscellaneous tasks such as silt fencing, tree and brush removal, pre and post dredging surveys and tree planting.

D. (16) Bank Stabilization. The removal of riprap wing dams and placement of rock closure structures are included under this account as well as other miscellaneous tasks such as tree and brush removal in these locations.

E. (30) Planning, Engineering, and Design. The work covered under this account includes the project management, engineering, and design costs spent to date as well as the remaining estimated

costs that will be associated with the engineering and design for this project. The percentages for PED were determined by the project engineer.

F. (31) Construction Management. The work covered under this account includes the expected costs for contract supervision, contract and construction administration, technical management activities, district office supervision, and administration costs. The percentages for Construction Management were determined by the project engineer and project manager.

V. PROJECT SCHEDULE

The estimated duration of construction is over a 7 year period, which is based on the project schedule. The schedule includes assumed periods of design with durations provided by the project engineer. The construction portion of the schedule was created using the durations for crews and equipment in the MII estimate and estimator judgment when needed. A working period of approximately 15 May – 15 November was following in the creation of the schedule, although the duration for the Kehough Slough dredging extended slightly past these dates. The tree planting contracts will occur in the two years following the final site dredging. The schedule includes all construction features except for Adaptive Management, as it is unknown when this work will occur if it does. The contracts were based on assumed funding of approximately $3M per FY. The schedule can be found in Appendix I-C.

VI. TOTAL PROJECT COST SUMMARY

The total project cost prior to being fully funded is $20,656,000.00 (First Costs). The total fully funded project cost is $23,123,000.00 at 2013 fiscal year pricing. Based on the construction schedule, work will commence in May 2014. This project is not cost shared and is expected to be fully funded by the U.S. Army Corps of Engineers. The TPCS can be found in Appendix I-D.

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX I-A

MII COST ESTIMATE

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EP58ATREstimate2

Upper Mississippi River Pool 12, River Miles 563 - 573 Jo Daviess County, IL

Estimated by	CEMVR-EC-TE
Designed by	CEMVR-EC-DN
Prepared by	Chris De Pooter / Garrett Mattila
Preparation Date	8/20/2012
Effective Date of Pricing	8/20/2012
Estimated Construction Time	Days

Description	UOM	Quantity	ContractCost	ProjectCost
Project Owner Summary			14,528,803	14,528,803
Pool 12 Overwintering - HREP	LS	1	14,528,803	14,528,803
Contract 1 - Sunfish Lake Dredging	LS	1	5,163,399	5,163,399
Year 1	LS	1	2,396,233	2,396,233
Year 2	LS	1	2,767,166	2,767,166
Contract 2 - Sunfish Lake Planting	LS	1	82,720	82,720
06 Fish and Wildlife Facilities	LS	1	40,523	40,523
09 Channels and Canals	LS	1	42,198	42,198
Contract 3 - Sunfish Lake Planting Continued	LS	1	38,787	38,787
09 Channels and Canals	LS	1	38,787	38,787
Contract 4 - Stone Lake Dredging	LS	1	3,199,882	3,199,882
06 Fish and Wildlife Facilities	LS	1	14,034	14,034
09 Channels and Canals	LS	1	3,000,131	3,000,131
16 Bank Stabilization	LS	1	185,717	185,717
Contract 5 - Stone Lake Planting	LS	1	24,609	24,609
09 Channels and Canals	LS	1	24,609	24,609
Contract 6 - Kehough Slough Dredging	LS	1	3,462,586	3,462,586
06 Fish and Wildlife Facilities	LS	1	14,034	14,034
09 Channels and Canals	LS	1	3,100,533	3,100,533
16 Bank Stabilization	LS	1	348,019	348,019
Contract 7 - Sunfish Lake Planting Continued, Stone Lake Planting Continued, and Kehough Slough Planting	LS	1	60,700	60,700
09 Channels and Canals	LS	1	60,700	60,700
Contract 8 - Tippy Lake Dredging	LS	1	2,437,430	2,437,430
09 Channels and Canals	LS	1	2,394,086	2,394,086
16 Bank Stabilization	LS	1	43,343	43,343
Contract 9 - Kehough Slough Planting Continued and Tippy Lake Planting	LS	1	34,694	34,694
09 Channels and Canals	LS	1	34,694	34,694
Contract 10 -Tippy Lake Planting Continued	LS	1	23,996	23,996
09 Channels and Canals	LS	1	23,996	23,996

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
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POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX I-B

CONTINGENCY DETERMINATION

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Abbreviated Risk Analysis

Project (less than $40M): **Pool 12 Overwintering - HREP**
Project Development Stage: **Feasibility (Recommended Plan)**
Risk Category: **Low Risk: Simple Project-No Life Safety**

Total Construction Contract Cost = $ 14,528,803

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ -		0.00%	$ -	$ -
1	09 01 CHANNELS	Mechanical Dredging & Disposal Area	$ 12,751,111		21.60%	$ 2,754,129	$ 15,505,240.36
2	09 01 CHANNELS	Tree Planting	$ 224,983		16.10%	$ 36,232	$ 261,214.94
3	16 BANK STABILIZATION	Bank Stabilization	$ 929,539		13.76%	$ 127,894	$ 1,057,433.50
4	06 FISH AND WILDLIFE FACILITIES	Adaptive Management	$ 87,063		10.73%	$ 9,344	$ 96,406.96
12		Remaining Construction Items	$ 536,107	*3.8%*	13.60%	$ 72,928	$ 609,035.02
13	30 PLANNING, ENGINEERING, AND DESIGN	Planning, Engineering, & Design	$ 1,308,000		16.59%	$ 216,944	$ 1,524,944.38
14	31 CONSTRUCTION MANAGEMENT	Construction Management	$ 1,453,000		10.29%	$ 149,496	$ 1,602,496.33

Totals					
Real Estate	$ -	0.00%	$ -	$ -	
Total Construction Estimate	$ 14,528,803	20.65%	$ 3,000,528	$ 17,529,331	
Total Planning, Engineering & Design	$ 1,308,000	16.59%	$ 216,944	$ 1,524,944	
Total Construction Management	$ 1,453,000	10.29%	$ 149,496	$ 1,602,496	
Total	$ 17,289,803		$ 3,366,969	$ 20,656,772	

Pool 12 Overwintering - HREP
Feasibility (Recommended Plan)
Abbreviated Risk Analysis

Meeting Date: 20-Aug-12

Risk Level

	Negligible	Marginal	Significant	Critical	Crisis
Very Likely	2	3	4	5	6
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Element	Feature of Work	Concerns Pull Down Tab (ENABLE MACROS THRU TRUST CENTER) (Choose ALL that apply)	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Likelihood	Impact	Risk Level
Project Scope Growth							
						Max Potential Cost Growth	40%
PS-1	Mechanical Dredging & Disposal Area	• Investigations sufficient to support design assumptions?	The amount of dredged material will need to be evaluated against the actual amount of placement sites that will be available.	Currently it is assumed that the areas allocated for the placement of the dredged material will be sufficient for the amount of material planned to be dredged. Survey will need to be performed on the placement areas to determine elevations and how much material can be placed on those sites. The placement areas may need to change based on this information.	Likely	Marginal	2
PS-2	Tree Planting	• Potential for scope growth, added features and quantities?	The planting area is fairly well defined based on the assumed placement areas.	Survey will need to be performed on the placement areas to determine elevations and how much material can be placed on those sites. The placement areas may need to change based on this information. Any changes in the sizes of the placement areas will have a direct impact on how many trees can be planted in those areas.	Likely	Negligible	1
PS-3	Bank Stabilization	• Potential for scope growth, added features and quantities?	The scope of all bank stabilization is well defined, yet design/quantities will still need to be refined.	Placement sites have been determined and based on survey date, the removal sites have been defined along with quantity of material to be removed.	Unlikely	Negligible	0
PS-4	Adaptive Management	• Potential for scope growth, added features and quantities?	The scope is well defined for replanting and notching of rock closure structures.	Replanting was costed out for Sunfish Lake and notching may or may not occur depending on flows.	Possible	Marginal	1
PS-12	Remaining Construction Items	• Potential for scope growth, added features and quantities?	The scope is well defined for all the remaining construction items.	The mobilization, preparatory work and demobilization is pretty well defined based on the scope of the rest of the project.	Unlikely	Negligible	0
PS-13	Planning, Engineering, & Design	• Potential for scope growth, added features and quantities?	The design of this project is currently at 95% feasibility design and may change during plans and specs.	As the project has reached about the 95% design level, there is a potential for some design changes as it is being finalized. Field visits, new survey data and more coordination between Government entities and engineers will improve the design of this project and possibly bring about some changes.	Very LIKELY	Negligible	2
PS-14	Construction Management	• Potential for scope growth, added features and quantities?	In regards to performing construction management duties, the project scope has been well defined.	The scope of this project is fairly straight forward and does not have any significant difficult work items. This type of work has been performed many times in this District and does not bring about any special needs or circumstances.	Unlikely	Negligible	0
Acquisition Strategy							
						Max Potential Cost Growth	30%
AS-1	Mechanical Dredging & Disposal Area	• Contracting plan firmly established?	The potential of a limited amount of bidders.	Due to the location of this project, being on the Mississippi River and roughly in the middle of the country, we feel that there should be an ample amount of bidders. We have typically seen local and nonlocal bidders on recent awarded contracts of this type.	Possible	Marginal	1
AS-2	Tree Planting	• Contracting plan firmly established?	Poor quality of subcontractor.	Anticipating the project to be awarded as an 8A contract, we are expecting the subcontractors to be of better quality than regular contracts. It seems in prior awarded 8A contracts, that the Prime Contractor has pooled from a better quality of subcontractors.	Possible	Marginal	1
AS-3	Bank Stabilization	• Contracting plan firmly established?	It has been evaluated that there is no concern for the acquisition strategy in regards to the bank stabilization.	A dredging contractor should be capable of performing all rock work.	Unlikely	Negligible	0
AS-4	Adaptive Management	• Contracting plan firmly established?	It has been evaluated that there is no concern for the acquisition strategy in regards to the adaptive management.	The contractor(s) should have no trouble doing the planting or rock notching as it is similar to the work they are already completing.	Unlikely	Negligible	0
AS-12	Remaining Construction Items	• Contracting plan firmly established?	This project has the potential of having a non-local Contractor.	Mobilization and Demobilization costs could potentially be higher on this project with the likelihood of multiple non-local bidders. With the recent bidding environment many non-local bidders have bid on this type of work. Typically we plan for Mob/Demob from within a 200 mile radius area.	Possible	Marginal	1
AS-13	Planning, Engineering, & Design	• Contracting plan firmly established?	This project is on a very short schedule. The PDT has recognized the schedule constraints that we face as we move into the P&S phase. It is crucial that we remain on task and on schedule to get the project awarded. Any schedule constraints in design could affect Contracting time to initiate the proposal.	The money for this project is funded for a FY13 construction award. This project currently has the funding and personnel to move forward at a fast pace. It is just necessary that we get the report approved so that we may smoothly move into the P&S phase and stay on schedule to the award of this project.	Likely	Marginal	2
AS-14	Construction Management	• Contracting plan firmly established?	This project will most likely be an 8A project. According to FARS, if two known 8A Contractors will bid on this project, then the project must be acquisitioned as an 8A.	It is the PDT's assumption that at least two 8A Contractors will bid on this project, thus leading to an 8A acquisition. Most likely this will increase costs, yet will provide more quality control. The government estimate has been set up as an 8A contract to account for this potential acquisition strategy.	Likely	Negligible	1

Construction Elements

							Max Potential Cost Growth	15%
CE-1	Mechanical Dredging & Disposal Area	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is possible construction complexity in regards to the work of clearing trees and bruch, mechanical dredging and placement site shaping.	Mechanical dredging could be more complex in constructing underwater berms.	Possible	Marginal	1
CE-2	Tree Planting	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the work of planting trees.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0
CE-3	Bank Stabilization	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the rock removal and construction of the flow diversion berms.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0
CE-4	Adaptive Management	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the adaptive management work.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0
CE-12	Remaining Construction Items	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the work of mobilization, preparatory work and demobilization.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0
CE-13	Planning, Engineering, & Design	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the planning, engineering & design of this type of project.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0
CE-14	Construction Management	• Accelerated schedule or harsh weather schedule?	It has been evaluated that there is no construction complexity in regards to the construction management of this type of project.	This type of work has been performed in this District many times and does not present any construction complexity to the Government or the Contractor.	Unlikely	Negligible	0

Quantities for Current Scope

							Max Potential Cost Growth	20%
Q-1	Mechanical Dredging & Disposal Area	• Level of confidence based on design and assumptions?	The quantity of dredged material may change based on the placement sites capability of holding a certain amount of material. The acreage of placement sites may also change to allow for the amount of dredged material.	There will need to be an evaluation of the desired placement sites to determine if there is adequate acreage for the amount of material designed to be dredged.	Likely	Marginal	2
Q-2	Tree Planting	• Level of confidence based on design and assumptions?	The quantity of trees being planted may change based on the design and acreage of the placement sites.	As the design and acreage of the placement sites change due to quantity of dredged material, the quantity of trees will also adjust either allowing for more trees or reducing the amount being planted.	Likely	Marginal	2
Q-3	Bank Stabilization	• Level of confidence based on design and assumptions?	The survey data for the existing rock wing dams is old.	Due to the age of the survey data for the existing rock wing dams, the field conditions of the wing dams may have changed from what the survey data says. There may have been shifting of material and require either more or less of the rock to be removed. The quantities for the new flow diversion berms are rough at this time as they are based on an area and have not been fully designed based on actual field conditions.	Likely	Marginal	2
Q-4	Adaptive Management	• Level of confidence based on design and assumptions?	Quantites may vary from what was calculated.	Tree replanting was based on initial planting quantities so they should be sufficient. Rock notching may require more notching than required, thus additional cost.	Likely	Negligible	1
Q-12	Remaining Construction Items	• Level of confidence based on design and assumptions?	In regards to mobilization, preparatory work and demobilization, the quantities could change based on scheduling, staging or phasing of the project.	The quantities developed for the mobilization, preparatory work and demobilization are based on current assumptions of travel distance. The type of equipment is based on the development of the Government estimate. The number of times required for mobilization and demobilization are determined on the development of the construction schedule.	Likely	Marginal	2
Q-13	Planning, Engineering, & Design	• Level of confidence based on design and assumptions?	It has been evaluated that there is no concern with quantities in regards to the planning, engineering and design of this project.	The planning, engineering and design of this project will not change based on the quantities developed for this project.	Unlikely	Marginal	0
Q-14	Construction Management	• Level of confidence based on design and assumptions?	It has been evaluated that there is no concern with quantities in regards to the construction management of this project.	The construction management of this project will not change based on the quantities developed for this project.	Unlikely	Marginal	0

Specialty Fabrication or Equipment

							Max Potential Cost Growth	50%
FE-1	Mechanical Dredging & Disposal Area	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-2	Tree Planting	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-3	Bank Stabilization	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-4	Adaptive Management	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-12	Remaining Construction Items	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-13	Planning, Engineering, & Design	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0
FE-14	Construction Management	• Unusual parts, material or equipment manufactured or installed?	Not applicable for this project.		Unlikely	Negligible		0

Cost Estimate Assumptions

							Max Potential Cost Growth	25%
CT-1	Mechanical Dredging & Disposal Area	• Reliability and number of key quotes?	The selected equipment and production rate may not be actual for what a Contractor may use and perform.	It was assumed that a 3 cy bucket will be used for all dreding work. Base on using a 3 cy bucket a production rate was developed using the equation provided from the Dredge Estimating Prospect Course Manual, section 9 - Mechanicl Dredge Estimating. The dredge efficiency and Operating Time Factor were all based on the location of the work and type of placement of material.	Possible	Marginal		1
CT-2	Tree Planting	• Reliability and number of key quotes?	It has been assumed that hand planting of the trees will be performed. Equipment will be needed for tilling and mowing in certain years.	The planting methods, crew sizes, and crew outputs were provided by a USACE Forester CEMVR-OD-MN at the Mississippi River Project Office.	Possible	Marginal		1
CT-3	Bank Stabilization	• Reliability and number of key quotes?	A different method of placement my be used by the Contractor. He may also use different equipment than planned by the Government.	The Government estimate believes the riprap material will be hauled to the project site via barge. The Contractor will have his own tub and barge where it is assumed that a skid steer and excavator will be used for placement. The skid steer will be used for dumping the riprap over the side of the barge. The excavator will be used for movement/placement of the riprap in the water.	Likely	Marginal		2
CT-4	Adaptive Management	• Site accessibility, transport delays, congestion?	Minimial risks are associated with the adaptive management.	There are negligible risks associated with the adaptive management as either more or less stone will be placed and additional trees planted if needed.	Unlikely	Negligible		0
CT-12	Remaining Construction Items	• Reliability and number of key quotes?	The assumed mobilization and demobilization is within a 150 mile radius for equipment traveling by land and within 165 river mile distance for equipment traveling by water.	There is the possibility that a Contractor may mobilization from a greater distance than planned for by the Government. However, the distances assumed by the Government including at least three biddable Contractors for this project.	Possible	Negligible		0
CT-13	Planning, Engineering, & Design	• Reliability and number of key quotes?	It has been evaluated that there is no concern with the cost estimating method in regards to the planning, engineering and design of this project.	The engineering and design of this project has been taken into affect in the work items listed above. It is assumed that there will be no other change based on the cost estimating method developed for this project.	Unlikely	Negligible		0
CT-14	Construction Management	• Reliability and number of key quotes?	It has been evaluated that there is no concern with the cost estimating method in regards to the construction management of this project.	The construction management of this project will not change based on the cost estimating method developed for this project.	Unlikely	Negligible		0

External Project Risks

							Max Potential Cost Growth	20%
EX-1	Mechanical Dredging & Disposal Area	• Potential for severe adverse weather?	The potential of high water during a spring or early summer flood or the potential of low water during a dry summer or fall.	During an event of high water the Contractor would have to stop work requiring the Government to extend the contract, which could lead to higher construction costs. During an event of low water the Contractor may be required to dredge more material as the Contractor may need to dredge his way into the areas that are required to be dredged by the contract.	Likely	Marginal		2
EX-2	Tree Planting	• Potential for severe adverse weather?	The potential of high water during the allotted planting seasons and tree survival may be impacted by flooding or possible drought.	During an event of high water the disposal berm areas have the potential of being under water and would unaccessible to plant. The Contractor would be required to plant during the spring, so the Contractor could resort to one of a different time of year if the spring period is when a high water event is happening. According to the warranty, the Contractor will be responsible for providing on the tree planting, the Contractor will need to replant the trees if their survival is in perish due to a flood or drought.	Possible	Marginal		1
EX-3	Bank Stabilization	• Potential for severe adverse weather?	The potential of high water during a spring or early summer flood.	During an event of high water the Contractor would have to stop work requiring the Government to extend the contract, which could lead to higher construction costs.	Possible	Marginal		1
EX-4	Adaptive Management	• Potential for severe adverse weather?	The potential of high water.	During an event of high water the Contractor would have to stop work requiring the government to extend the contract, which could lead to higher construction costs.	Possible	Marginal		1
EX-12	Remaining Construction Items	• Potential for severe adverse weather?	The potential of high water during a spring or early summer flood or the potential of low water during a dry summer or fall.	During an event of high water the Contractor would have to stop work requiring the government to extend the contract, which could lead to higher construction costs. During an event of low water the Contractor may be required to dredge more material as they will need to dredge themselves into the work area.	Likely	Marginal		2
EX-13	Planning, Engineering, & Design	• Potential for severe adverse weather?	This project is on a very short schedule. The PDT has recognized the schedule constraints that we face as we move into the PDT phase. It is crucial that we remain on task and on schedule to get the project awarded. Any schedule constraints in design could affect Contracting time to initiate the proposal.	The money for this project is funded for a FY13 construction award. This project currently has the funding and personnel to move forward at a fast pace. It is just necessary that we get the report approved so that we may smoothly move into the PED phase and stay on schedule to the award of this project.	Likely	Marginal		2
EX-14	Construction Management	• Potential for severe adverse weather?	This project still requires that a 401 Water Quality permit be issued by the EPA.	The PDT will try to obtain this permit during the PED phase of this project, but it is not yet obtained. This remains a concern as it is understood that there will be no construction allowed for this project until this permit is obtained. We are confident that we will obtain the permit before solicitation and the project will remain on schedule as planned.	Unlikely	Critical		2

Abbreviated Risk Analysis

Pool 12 Overwintering - HREP
Tentatively Selected Plan

Meeting Date: 20-Aug-12

PDT Members

Project Management:	
Study Manager:	Darron Niles
Contracting:	
Real Estate:	
Relocations:	
Engineering & Design:	Julie Millhollin
Planning & Design Formulation:	Ellen Milliron
Cost Engineering:	Garrett Mattila
Construction:	
Operations:	

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX I-C

PROJECT SCHEDULE

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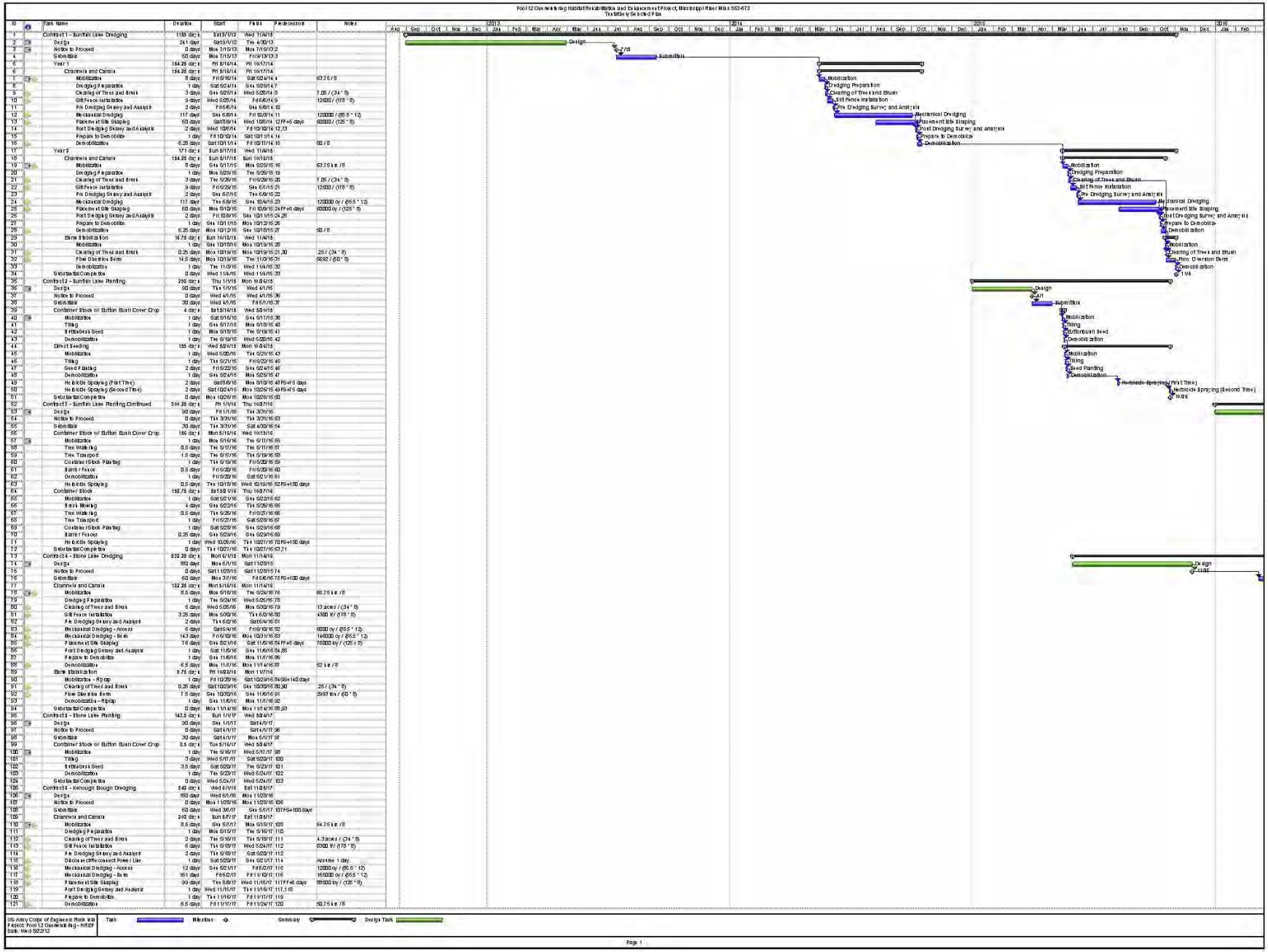
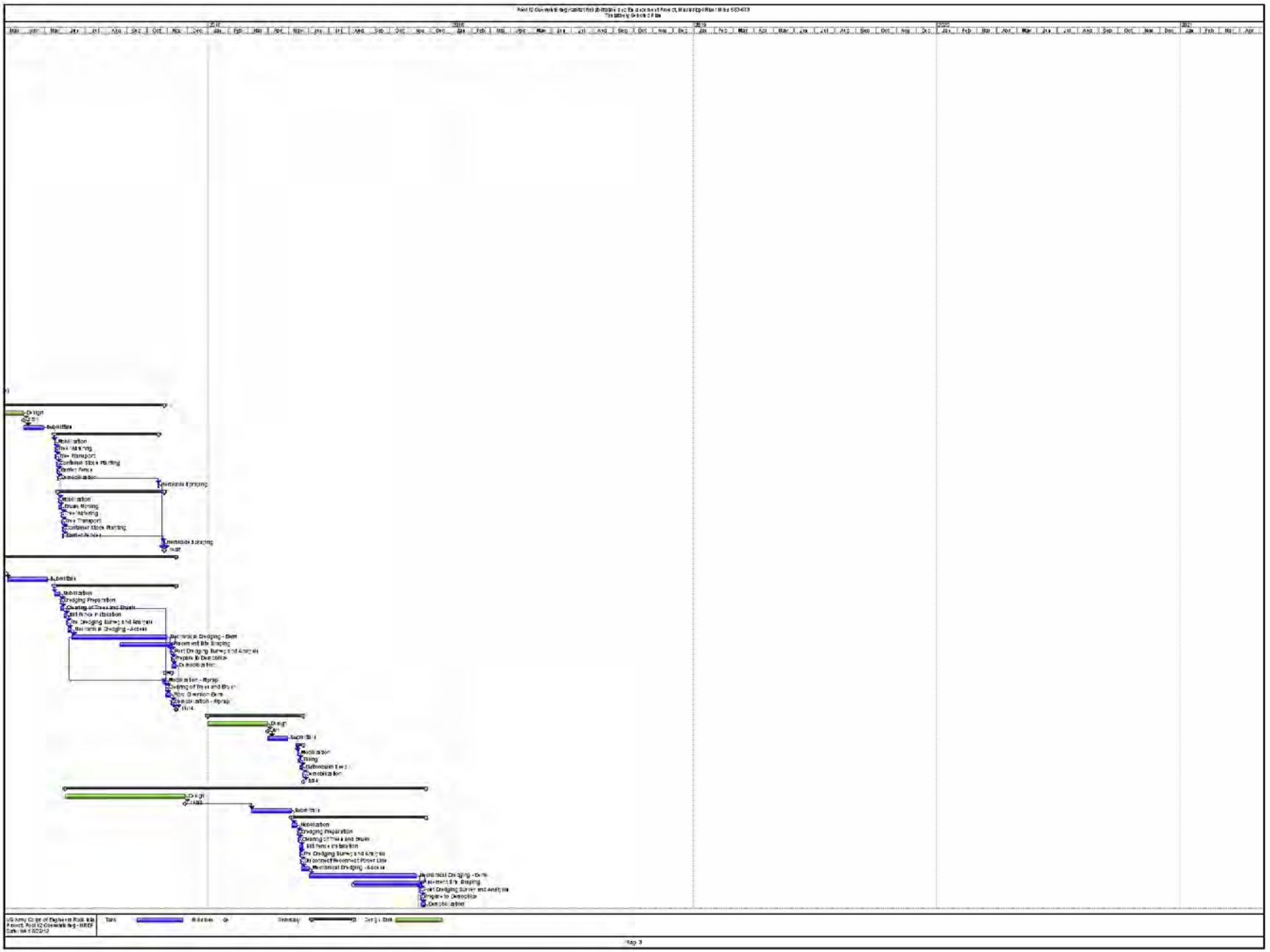

Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project, Mississippi River Mile 583-573
Tentative Schedule Plan
ID
Task Name
Duration
Start
Finish
Predecessors
Notes
Contract 1 - Sunfish Lake Dredging
Design
Notice to Proceed
Submittals
Year 1
Channels and Canals
Mobilization
Dredging Preparation
Clearing of Trees and Brush
Silt Fence Installation
Pre Dredging Survey and Analysis
Mechanical Dredging
Placement Site Shaping
Post Dredging Survey and Analysis
Prepare to Demobilize
Demobilization
Year 2
Channels and Canals
Mobilization
Dredging Preparation
Clearing of Trees and Brush
Silt Fence Installation
Pre Dredging Survey and Analysis
Mechanical Dredging
Placement Site Shaping
Post Dredging Survey and Analysis
Prepare to Demobilize
Demobilization
Berm Stabilization
Mobilization
Clearing of Trees and Brush
Flow Diversion Berm
Demobilization
Substantial Completion
Contract 2 - Sunfish Lake Planting
Design
Notice to Proceed
Submittals
Container Stock w/ Sutton Bush Cover Crop
Mobilization
Tilling
Buttonbush Seed
Demobilization
Direct Seeding
Mobilization
Tilling
Seed Planting
Demobilization
Herbicide Spraying (First Time)
Herbicide Spraying (Second Time)
Substantial Completion
Contract 3 - Sunfish Lake Planting Continued
Design
Notice to Proceed
Submittals
Container Stock w/ Sutton Bush Cover Crop
Mobilization
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Demobilization
Herbicide Spraying
Container Stock
Mobilization
Brush Mowing
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Herbicide Spraying
Substantial Completion
Contract 4 - Stone Lake Dredging
Design
Notice to Proceed
Submittals
Channels and Canals
Mobilization
Dredging Preparation
Clearing of Trees and Brush
Silt Fence Installation
Pre Dredging Survey and Analysis
Mechanical Dredging - Access
Mechanical Dredging - Berm
Placement Site Shaping
Post Dredging Survey and Analysis
Prepare to Demobilize
Demobilization
Berm Stabilization
Mobilization - Riprap
Clearing of Trees and Brush
Flow Diversion Berm
Demobilization - Riprap
Substantial Completion
Contract 5 - Stone Lake Planting
Design
Notice to Proceed
Submittals
Container Stock w/ Sutton Bush Cover Crop
Mobilization
Tilling
Buttonbush Seed
Demobilization
Substantial Completion
Contract 6 - Kenough Slough Dredging
Design
Notice to Proceed
Submittals
Channels and Canals
Mobilization
Dredging Preparation
Clearing of Trees and Brush
Silt Fence Installation
Pre Dredging Survey and Analysis
Disconnect/Reconnect Power Line
Mechanical Dredging - Access
Mechanical Dredging - Berm
Placement Site Shaping
Post Dredging Survey and Analysis
Prepare to Demobilize
Demobilization
2013
2014
2015
2016
US Army Corps of Engineers Rock Isla
Project: Pool 12 Overwinte Rep - HREP
Date: Wed 5/22/12
Task
Milestone
Summary
Design Task
Page 1

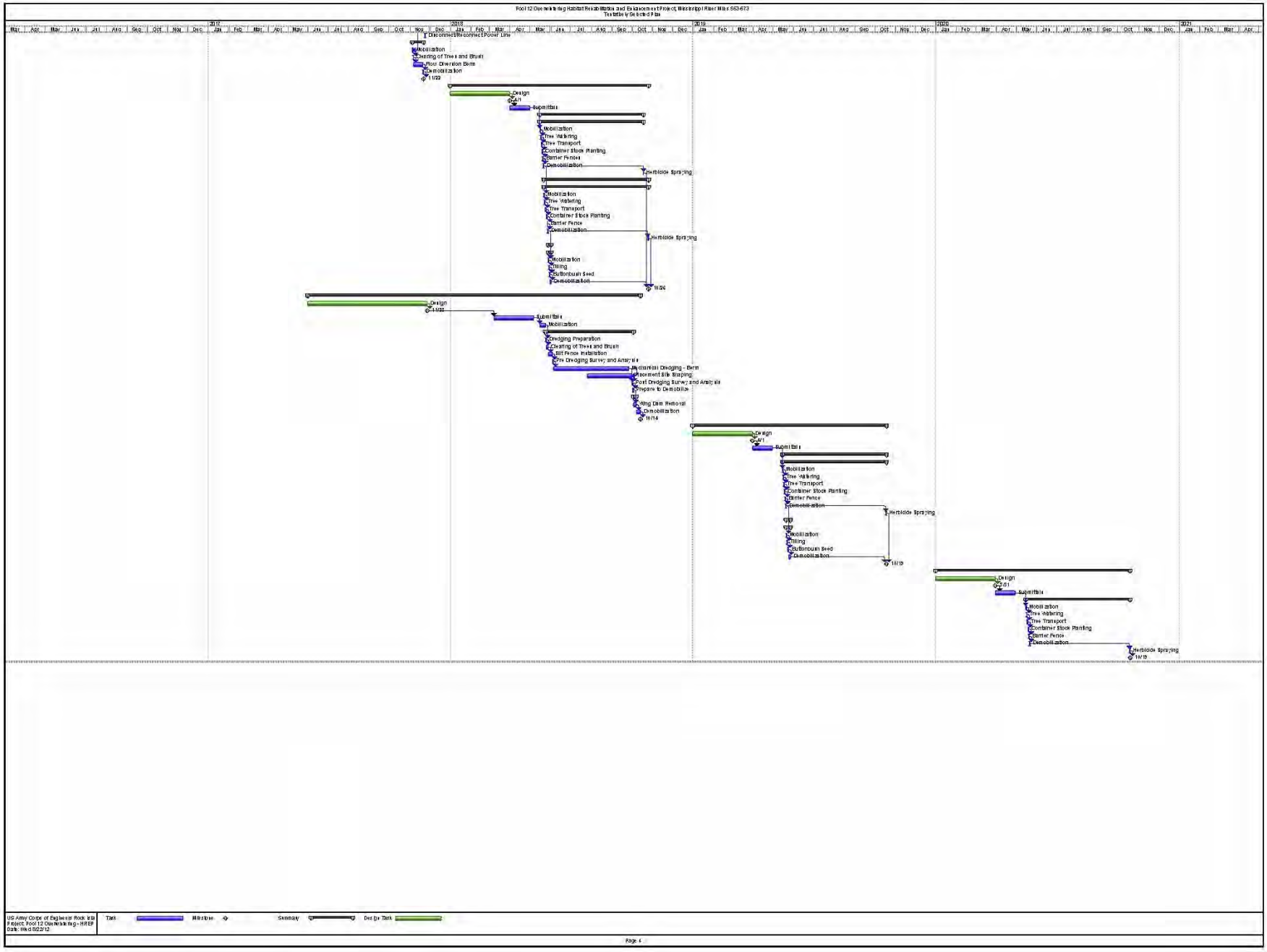
Pool 12 Dune Nesting Habitat Rehabilitation and Enhancement Project, Mississippi River Miles 563-573
Tentative Schedule Plan

ID	Task Name	Duration	Start	Finish	Predecessors	Notes
122	Disconnect/Reconnect Sewer Line	1 day	Fri 11/24/17	Sat 11/25/17	121	Assume 1 day.
123	Bank Stabilization	16.75 days	Sun 11/5/17	Wed 11/22/17		
124	Mobilization	1 day	Sun 11/5/17	Mon 11/6/17	110SS+90 days	
125	Clearing of Trees and Brush	0.25 days	Mon 11/6/17	Mon 11/6/17	124	4.3 acres / (24 * 8)
126	River Dike Rock Item	14.5 days	Mon 11/6/17	Tue 11/21/17	125	5932 ton / (50 * 8)
127	Demobilization	1 day	Tue 11/21/17	Wed 11/22/17	126	
128	Substantial Completion	0 days	Wed 11/22/17	Wed 11/22/17	127	
129	Contract7 - Sanfish Lake Planting Continued, Stoc	293.5 days	Mon 1/1/18	Fri 10/5/18		
130	Design	90 days	Mon 1/1/18	Sun 4/1/18		
131	Notice to Proceed	0 days	Sun 4/1/18	Sun 4/1/18	130	
132	Submittals	30 days	Sun 4/1/18	Tue 5/1/18	131	
133	Sanfish Lake	156 days	Wed 5/16/18	Fri 10/19/18		
134	Container Stock w/ Advanced Natural Reg	156 days	Wed 5/16/18	Fri 10/19/18		
135	Mobilization	1 day	Wed 5/16/18	Thu 5/17/18	132	
136	Tree Watering	1 day	Thu 9/27/18	Fri 9/28/18	135	
137	Tree Transport	1.5 days	Fri 9/28/18	Sat 9/29/18	136	
138	Container Stock Planting	1 day	Sat 9/29/18	Sun 9/30/18	137	
139	Barrel Fence	0.25 days	Sun 9/30/18	Sun 9/30/18	138	
140	Demobilization	1 day	Sun 9/30/18	Mon 10/1/18	139	
141	Herbicide Spraying	0.25 days	Thu 10/25/18	Fri 10/26/18	140FS+150 days	
142	Stone Lake	157.75 days	Mon 5/21/18	Fri 10/26/18		
143	Container Stock w/ Button Bush Cover Cr	157.75 days	Mon 5/21/18	Fri 10/26/18		
144	Mobilization	1 day	Mon 9/21/18	Tue 9/22/18	140	
145	Tree Watering	1 day	Tue 9/22/18	Wed 9/23/18	144	
146	Tree Transport	1.5 days	Wed 9/23/18	Fri 9/25/18	145	
147	Container Stock Planting	2 days	Fri 9/25/18	Sun 9/27/18	145	
148	Barrel Fence	0.25 days	Sun 9/27/18	Sun 9/27/18	147	
149	Demobilization	1 day	Sun 9/27/18	Mon 9/28/18	148	
150	Herbicide Spraying	1 day	Thu 10/25/18	Fri 10/26/18	149FS+150 days	
151	Kehough Slough	4.25 days	Mon 5/28/18	Fri 6/1/18		
152	Container Stock w/ Button Bush Cover Cr	4.25 days	Mon 5/28/18	Fri 6/1/18		
153	Mobilization	1 day	Mon 5/28/18	Tue 5/29/18	149	
154	Tilling	1 day	Tue 5/29/18	Wed 5/30/18	153	
155	Bird Block Seed	1 day	Wed 5/30/18	Thu 5/31/18	154	
156	Demobilization	1.25 days	Thu 5/31/18	Fri 6/1/18	155	
157	Substantial Completion	0 days	Fri 10/26/18	Fri 10/26/18	141,150,156	
158	Contract8 - Tippy Lake Dredging	599.5 days	Thu 6/1/17	Sun 10/14/18		
159	Design	180 days	Thu 6/1/17	Tue 11/28/17		
160	Notice to Proceed	0 days	Tue 11/28/17	Tue 11/28/17	159	
161	Submittals	60 days	Tue 1/30/18	Mon 5/7/18	160FS+100 days	
162	Mobilization	8.5 days	Wed 5/16/18	Thu 5/24/18	161	65.75 ton / 8
163	Channels and Canals	102.5 days	Thu 5/24/18	Thu 9/4/18		
164	Dredging Preparation	1 day	Thu 5/24/18	Fri 5/25/18	162	
165	Clearing of Trees and Brush	3.5 days	Fri 5/25/18	Tue 5/29/18	164	9 acres / (24 * 8)
166	Silt Fence Installation	6 days	Tue 5/29/18	Mon 6/4/18	165	8600 ft / (178 * 8)
167	Pre Dredging Survey and Analysis	1.5 days	Mon 6/4/18	Tue 6/5/18	166	
168	Mechanical Dredging - Item	113 days	Tue 6/5/18	Wed 9/26/18	167	120000 cy / (65.5 * 12)
169	Placement Site Shaping	67 days	Tue 7/25/18	Mon 10/1/18	163FS+5 days	60000 cy / (125 * 8)
170	Post Dredging Survey and Analysis	1.5 days	Mon 10/1/18	Wed 10/3/18	168,169	
171	Prepare to Demobilize	1 day	Wed 10/3/18	Thu 10/4/18	170	
172	Bank Stabilization	4 days	Thu 10/4/18	Mon 10/8/18		
173	Wing Dam Removal	4 days	Thu 10/4/18	Mon 10/8/18	171	
174	Demobilization	6.5 days	Mon 10/8/18	Sun 10/14/18	173	51.75 ton / 8
175	Substantial Completion	0 days	Sun 10/14/18	Sun 10/14/18	174	
176	Contract9 - Kehough Slough Planting Continued a	291.25 days	Tue 1/1/19	Sat 10/19/19		
177	Design	90 days	Tue 1/1/19	Mon 4/1/19		
178	Notice to Proceed	0 days	Mon 4/1/19	Mon 4/1/19	177	
179	Submittals	30 days	Mon 4/1/19	Wed 5/1/19	178	
180	Kehough Slough	156.25 days	Thu 5/16/19	Sat 10/19/19		
181	Container Stock w/ Button Bush Cover Cr	156.25 days	Thu 5/16/19	Sat 10/19/19		
182	Mobilization	1 day	Thu 5/16/19	Fri 5/17/19	179	
183	Tree Watering	0.5 days	Fri 9/27/19	Fri 9/27/19	182	
184	Tree Transport	1.5 days	Fri 9/27/19	Sun 9/29/19	183	
185	Container Stock Planting	1 day	Sun 9/29/19	Mon 9/30/19	184	
186	Barrel Fence	0.25 days	Mon 9/30/19	Mon 9/30/19	185	
187	Demobilization	1 day	Mon 9/30/19	Tue 10/1/19	186	
188	Herbicide Spraying	1 day	Fri 10/25/19	Sat 10/26/19	187FS+150 days	
189	Tippy Lake	5.5 days	Tue 5/21/19	Mon 5/27/19		
190	Container Stock w/ Button Bush Cover Cr	5.5 days	Tue 5/21/19	Mon 5/27/19		
191	Mobilization	1 day	Tue 5/21/19	Wed 5/22/19	187	
192	Tilling	1 day	Wed 5/22/19	Thu 5/23/19	191	
193	Bird Block Seed	2 days	Thu 5/23/19	Sat 5/25/19	192	
194	Demobilization	2.5 days	Sat 5/25/19	Mon 5/27/19	193	
195	Substantial Completion	0 days	Sat 10/19/19	Sat 10/19/19	188,194	
196	Contract 10 - Tippy Lake Planting Continued	292.75 days	Wed 1/1/20	Mon 10/19/20		
197	Design	90 days	Wed 1/1/20	Tue 3/31/20		
198	Notice to Proceed	0 days	Tue 3/31/20	Tue 3/31/20	197	
199	Submittals	30 days	Tue 3/31/20	Thu 4/30/20	198	
200	Container Stock w/ Button Bush Cover Crop	156.75 days	Sat 5/16/20	Mon 10/19/20		
201	Mobilization	1 day	Sat 5/16/20	Sun 5/17/20	199	
202	Tree Watering	0.5 days	Sun 5/17/20	Sun 5/17/20	201	
203	Tree Transport	1.5 days	Sun 5/17/20	Tue 5/19/20	202	
204	Container Stock Planting	1.5 days	Tue 5/19/20	Wed 5/20/20	203	
205	Barrel Fence	0.25 days	Wed 5/20/20	Wed 5/20/20	204	
206	Demobilization	1 day	Wed 5/20/20	Thu 5/21/20	205	
207	Herbicide Spraying	1 day	Sun 10/18/20	Mon 10/19/20	206FS+150 days	
208	Substantial Completion	0 days	Mon 10/19/20	Mon 10/19/20	207	

US Army Corps of Engineers Rock Isl
Project: Pool 12 Dune Nesting - NREP
Date: Wed 5/2/12

Task | Milestone | Summary | Design Task




Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project, Mississippi River Miles 583-673
Tentative Schedule
2017
2018
2019
2020
2021
Disconnect/Reconnect Power Line
Mobilization
Clearing of Trees and Brush
Flow Diversion Berm
Demobilization
11/22
Design
A1
Submittals
Mobilization
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Demobilization
Herbicide Spraying
Mobilization
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Demobilization
Herbicide Spraying
Mobilization
Tilling
Cutlonbuin Seed
Demobilization
11/26
Design
A1/A2
Submittals
Mobilization
Dredging Preparation
Clearing of Trees and Brush
Silt Fence Installation
Pre Dredging Survey and Analysis
Mechanical Dredging - Berm
Placement Site Staging
Post Dredging Survey and Analysis
Prepare to Demobilize
Wing Dam Removal
Demobilization
10/14
Design
A1
Submittals
Mobilization
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Demobilization
Herbicide Spraying
Mobilization
Tilling
Cutlonbuin Seed
Demobilization
10/15
Design
A1
Submittals
Mobilization
Tree Watering
Tree Transport
Container Stock Planting
Barrier Fence
Demobilization
Herbicide Spraying
10/15
US Army Corps of Engineers Rock Isl
Project: Pool 12 Overwintering - HREP
Date: Wed 8/22/12
Task
Milestone
Summary
Design Task
Page 1

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX I-D

TOTAL PROJECT COST SUMMARY (TPCS)

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**** TOTAL PROJECT COST SUMMARY ****

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
						Program Year (Budget EC): 2013								
						Effective Price Level Date: 1 OCT 12								
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-12 ($K)		COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
06	FISH & WILDLIFE FACILITIES	$87	$18	21%	$105		$87	$18	$105			$92	$19	$111
09	CHANNELS & CANALS	$13,512	$2,790	21%	$16,302		$13,512	$2,790	$16,302			$14,429	$2,980	$17,408
16	BANK STABILIZATION	$930	$192	21%	$1,121		$930	$192	$1,121			$989	$204	$1,194
	#N/A	$0	$0	0%	$0		$0	$0	$0			$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0			$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$14,529	$3,000		$17,529		$14,529	$3,000	$17,529			$15,510	$3,203	$18,713
01	LANDS AND DAMAGES	$0	$0	0%	$0	0.0%	$0	$0	$0			$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN	$1,308	$217	17%	$1,525		$1,308	$217	$1,525	$904		$1,434	$238	$2,576
31	CONSTRUCTION MANAGEMENT	$1,453	$150	10%	$1,602	0.0%	$1,453	$150	$1,602			$1,663	$171	$1,834
	PROJECT COST TOTALS:	$17,289	$3,367	19%	$20,656		$17,289	$3,367	**$20,656**	$904		$18,607	$3,612	$23,123

CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

PROJECT MANAGER, Marvin E. Hubbell

CHIEF, REAL ESTATE, Stuart P. Jackson

CHIEF, PLANNING,xxx

CHIEF, ENGINEERING, xxx

CHIEF, OPERATIONS, xxx

CHIEF, CONSTRUCTION, xxx

CHIEF, CONTRACTING,xxx

CHIEF, PM-PB, xxxx

CHIEF, DPM, xxx

ESTIMATED FEDERAL COST:	100%	**$22,219**
ESTIMATED NON-FEDERAL COST:		
PLANNING SPENT COSTS:		**$904**
ESTIMATED TOTAL PROJECT COST:		**$23,123**
O&M OUTSIDE OF TOTAL PROJECT COST:		**$944**
MONITORING OUTSIDE OF TOTAL PROJECT COST:		**$1,212**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 20-Aug-12 Effective Price Level: 1-Oct-12				Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12								
				RISK BASED										
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 1 or CONTRACT 1													
06	FISH & WILDLIFE FACILITIES	$18	$4	21%	$22		$18	$4	$22	2015Q2	3.8%	$19	$4	$23
09	CHANNELS & CANALS	$4,792	$990	21%	$5,782		$4,792	$990	$5,782	2015Q2	3.8%	$4,974	$1,027	$6,001
16	BANK STABILIZATION	$352	$73	21%	$425		$352	$73	$425	2015Q2	3.8%	$366	$76	$441
	#N/A	$0	$0	0%	$0		$0	$0	$0	2015Q2		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2015Q2		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$5,163	$1,066	21%	**$6,230**		$5,163	$1,066	$6,230			$5,359	$1,107	$6,466
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2013Q2	0.3%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2013Q2	0.4%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2013Q2	0.4%	$0	$0	$0
8.0%	Engineering & Design	$413	$69	17%	$482		$413	$69	$482	2013Q2	0.4%	$415	$69	$483
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2013Q2	0.4%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2013Q2	0.4%	$0	$0	$0
1.0%	Engineering During Construction	$52	$9	17%	$60		$52	$9	$60	2015Q2	7.9%	$56	$9	$65
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2013Q2	0.4%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$516	$53	10%	$569		$516	$53	$569	2015Q2	7.9%	$557	$57	$614
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
	CONTRACT COST TOTALS:	$6,144	$1,196		**$7,341**		$6,144	$1,196	$7,341			$6,387	$1,242	**$7,629**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 2 or CONTRACT 2													
06	FISH & WILDLIFE FACILITIES	$41	$8	21%	$49		$41	$8	$49	2015Q4	4.7%	$42	$9	$51
09	CHANNELS & CANALS	$42	$9	21%	$51		$42	$9	$51	2015Q4	4.7%	$44	$9	$53
16	BANK STABILIZATION	$0	$0	21%	$0		$0	$0	$0	2015Q4	4.7%	$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2015Q4		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2015Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$83	$17	21%	**$100**		$83	$17	$100			$87	$18	$105
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2015Q2	3.8%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
8.0%	Engineering & Design	$7	$1	17%	$8		$7	$1	$8	2015Q2	7.9%	$7	$1	$8
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
1.0%	Engineering During Construction	$1	$0	17%	$1		$1	$0	$1	2015Q4	10.0%	$1	$0	$1
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2015Q2	7.9%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$8	$1	10%	$9		$8	$1	$9	2015Q4	10.0%	$9	$1	$10
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
	CONTRACT COST TOTALS:	$98	$19		**$118**		$98	$19	$118			$104	$20	**$124**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 3 or CONTRACT 3													
06	FISH & WILDLIFE FACILITIES	$0	$0	21%	$0		$0	$0	$0	2016Q4	6.6%	$0	$0	$0
09	CHANNELS & CANALS	$39	$8	21%	$47		$39	$8	$47	2016Q4	6.6%	$41	$9	$50
16	BANK STABILIZATION	$0	$0	21%	$0		$0	$0	$0	2016Q4	6.6%	$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2016Q4		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2016Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$39	$8	21%	**$47**		$39	$8	$47			$41	$9	$50
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2016Q2	5.7%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2016Q2	12.1%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2016Q2	12.1%	$0	$0	$0
8.0%	Engineering & Design	$3	$1	17%	$4		$3	$1	$4	2016Q2	12.1%	$3	$1	$4
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2016Q2	12.1%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2016Q2	12.1%	$0	$0	$0
1.0%	Engineering During Construction	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$1
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2016Q2	12.1%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$4	$0	10%	$4		$4	$0	$4	2016Q4	14.2%	$4	$0	$5
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	CONTRACT COST TOTALS:	$46	$9		**$55**		$46	$9	$55			$50	$10	**$59**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 4													
06	FISH & WILDLIFE FACILITIES	$14	$3	21%	$17		$14	$3	$17	2016Q4	6.6%	$15	$3	$18
09	CHANNELS & CANALS	$3,000	$620	21%	$3,620		$3,000	$620	$3,620	2016Q4	6.6%	$3,199	$661	$3,859
16	BANK STABILIZATION	$186	$38	21%	$224		$186	$38	$224	2016Q4	6.6%	$198	$41	$239
	#N/A	$0	$0	0%	$0		$0	$0	$0	2016Q4		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2016Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$3,200	$661	21%	**$3,861**		$3,200	$661	$3,861			$3,412	$704	$4,116
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2015Q4	4.7%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
8.0%	Engineering & Design	$256	$42	17%	$298		$256	$42	$298	2015Q4	10.0%	$282	$47	$328
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
1.0%	Engineering During Construction	$32	$5	17%	$37		$32	$5	$37	2016Q4	14.2%	$37	$6	$43
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2015Q4	10.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$320	$33	10%	$353		$320	$33	$353	2016Q4	14.2%	$365	$38	$403
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	CONTRACT COST TOTALS:	$3,808	$741		**$4,549**		$3,808	$741	$4,549			$4,095	$795	**$4,890**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 5													
06	FISH & WILDLIFE FACILITIES	$0	$0	21%	$0		$0	$0	$0	2017Q3	8.0%	$0	$0	$0
09	CHANNELS & CANALS	$25	$5	21%	$30		$25	$5	$30	2017Q3	8.0%	$27	$5	$32
16	BANK STABILIZATION	$0	$0	21%	$0		$0	$0	$0	2017Q3	8.0%	$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2017Q3		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2017Q3		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$25	$5	21%	**$30**		$25	$5	$30			$27	$5	$32
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2017Q2	7.6%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2017Q2	16.3%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2017Q2	16.3%	$0	$0	$0
8.0%	Engineering & Design	$2	$0	17%	$2		$2	$0	$2	2017Q2	16.3%	$2	$0	$3
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2017Q2	16.3%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2017Q2	16.3%	$0	$0	$0
1.0%	Engineering During Construction	$0	$0	17%	$0		$0	$0	$0	2017Q3	17.4%	$0	$0	$0
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2017Q3	17.4%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2017Q2	16.3%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$2	$0	10%	$3		$2	$0	$3	2017Q3	17.4%	$3	$0	$3
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2017Q3	17.4%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2017Q3	17.4%	$0	$0	$0
	CONTRACT COST TOTALS:	$29	$6		**$35**		$29	$6	$35			$32	$6	**$38**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 20-Aug-12 Effective Price Level: 1-Oct-12				Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 6													
06	FISH & WILDLIFE FACILITIES	$14	$3	21%	$17		$14	$3	$17	2017Q4	8.5%	$15	$3	$18
09	CHANNELS & CANALS	$3,101	$640	21%	$3,741		$3,101	$640	$3,741	2017Q4	8.5%	$3,365	$695	$4,060
16	BANK STABILIZATION	$348	$72	21%	$420		$348	$72	$420	2017Q4	8.5%	$378	$78	$456
	#N/A	$0	$0	0%	$0		$0	$0	$0	2017Q4		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2017Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$3,463	$715	21%	**$4,178**		$3,463	$715	$4,178			$3,758	$776	$4,534
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2016Q4	6.6%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
8.0%	Engineering & Design	$277	$46	17%	$323		$277	$46	$323	2016Q4	14.2%	$316	$52	$369
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
1.0%	Engineering During Construction	$35	$6	17%	$40		$35	$6	$40	2017Q4	18.4%	$41	$7	$48
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2016Q4	14.2%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$346	$36	10%	$382		$346	$36	$382	2017Q4	18.4%	$410	$42	$452
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
		$0	$0	10%										
	CONTRACT COST TOTALS:	$4,120	$802		**$4,923**		$4,120	$802	$4,923			$4,525	$878	**$5,403**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 7													
06	FISH & WILDLIFE FACILITIES	$0	$0	21%	$0		$0	$0	$0	2018Q4	10.5%	$0	$0	$0
09	CHANNELS & CANALS	$61	$13	21%	$73		$61	$13	$73	2018Q4	10.5%	$67	$14	$81
16	BANK STABILIZATION	$0	$0	21%	$0		$0	$0	$0	2018Q4	10.5%	$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2018Q4		$0	$0	$0
	#N/A	$0	$0	0%	$0		$0	$0	$0	2018Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$61	$13	21%	**$73**		$61	$13	$73			$67	$14	$81
01	LANDS AND DAMAGES	$0	$0	0%	$0		$0	$0	$0	2018Q2	9.5%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	$0		$0	$0	$0	2018Q2	20.5%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	$0		$0	$0	$0	2018Q2	20.5%	$0	$0	$0
8.0%	Engineering & Design	$5	$1	17%	$6		$5	$1	$6	2018Q2	20.5%	$6	$1	$7
	Engineering Tech Review ITR & VE	$0	$0	17%	$0		$0	$0	$0	2018Q2	20.5%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	$0		$0	$0	$0	2018Q2	20.5%	$0	$0	$0
1.0%	Engineering During Construction	$1	$0	17%	$1		$1	$0	$1	2018Q4	22.6%	$1	$0	$1
	Planning During Construction	$0	$0	17%	$0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	Project Operations	$0	$0	17%	$0		$0	$0	$0	2018Q2	20.5%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$6	$1	10%	$7		$6	$1	$7	2018Q4	22.6%	$7	$1	$8
	Project Operation:	$0	$0	10%	$0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	Project Management	$0	$0	10%	$0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	CONTRACT COST TOTALS:	$72	$14		**$86**		$72	$14	$86			$81	$16	**$97**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 20-Aug-12 Effective Price Level: 1-Oct-12				Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 8													
06	FISH & WILDLIFE FACILITIES	$0	$0	21%	$ 0		$0	$0	$0	2018Q4	10.5%	$0	$0	$0
09	CHANNELS & CANALS	$2,394	$494	21%	$ 2,888		$2,394	$494	$2,888	2018Q4	10.5%	$2,645	$546	$3,191
16	BANK STABILIZATION	$43	$9	21%	$ 52		$43	$9	$52	2018Q4	10.5%	$48	$10	$58
	#N/A	$0	$0	0%	$ 0		$0	$0	$0	2018Q4		$0	$0	$0
	#N/A	$0	$0	0%	$ 0		$0	$0	$0	2018Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$2,437	$503	21%	**2,941**		$2,437	$503	$2,941			$2,693	$556	$3,249
01	LANDS AND DAMAGES	$0	$0	0%	$ 0		$0	$0	$0	2017Q4	8.5%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	$0	17%	0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
	Planning & Environmental Compliance	$0	$0	17%	0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
8.0%	Engineering & Design	$195	$32	17%	227		$195	$32	$227	2017Q4	18.4%	$231	$38	$269
	Engineering Tech Review ITR & VE	$0	$0	17%	0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
	Contracting & Reprographics	$0	$0	17%	0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
1.0%	Engineering During Construction	$24	$4	17%	28		$24	$4	$28	2018Q4	22.6%	$30	$5	$35
	Planning During Construction	$0	$0	17%	0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	Project Operations	$0	$0	17%	0		$0	$0	$0	2017Q4	18.4%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$244	$25	10%	269		$244	$25	$269	2018Q4	22.6%	$299	$31	$330
	Project Operation:	$0	$0	10%	0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	Project Management	$0	$0	10%	0		$0	$0	$0	2018Q4	22.6%	$0	$0	$0
	CONTRACT COST TOTALS:	$2,901	$565		**3,465**		$2,901	$565	$3,465			$3,253	$630	**$3,883**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

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LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 20-Aug-12 Effective Price Level: 1-Oct-12				Program Year (Budget EC): 2013 Effective Price Level Date: 1 OCT 12				FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 9													
06	FISH & WILDLIFE FACILITIES	$0	0	21%	$0		$0	$0	$0	2019Q4	12.5%	$0	$0	$0
09	CHANNELS & CANALS	$35	7	21%	$42		$35	$7	$42	2019Q4	12.5%	$39	$8	$47
16	BANK STABILIZATION	$0	0	21%	$0		$0	$0	$0	2019Q4	12.5%	$0	$0	$0
	#N/A	$0	0	0%	$0		$0	$0	$0	2019Q4		$0	$0	$0
	#N/A	$0	0	0%	$0		$0	$0	$0	2019Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$35	7	21%	**$42**		$35	$7	$42			$39	$8	$47
01	LANDS AND DAMAGES	$0	0	0%	$0		$0	$0	$0	2019Q2	11.5%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	0	17%	$0		$0	$0	$0	2019Q2	24.7%	$0	$0	$0
	Planning & Environmental Compliance	$0	0	17%	$0		$0	$0	$0	2019Q2	24.7%	$0	$0	$0
8.0%	Engineering & Design	$3	0	17%	$3		$3	$0	$3	2019Q2	24.7%	$3	$1	$4
	Engineering Tech Review ITR & VE	$0	0	17%	$0		$0	$0	$0	2019Q2	24.7%	$0	$0	$0
	Contracting & Reprographics	$0	0	17%	$0		$0	$0	$0	2019Q2	24.7%	$0	$0	$0
1.0%	Engineering During Construction	$0	0	17%	$0		$0	$0	$0	2019Q4	26.9%	$0	$0	$1
	Planning During Construction	$0	0	17%	$0		$0	$0	$0	2019Q4	26.9%	$0	$0	$0
	Project Operations	$0	0	17%	$0		$0	$0	$0	2019Q2	24.7%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$3	0	10%	$4		$3	$0	$4	2019Q4	26.9%	$4	$0	$5
	Project Operation:	$0	0	10%	$0		$0	$0	$0	2019Q4	26.9%	$0	$0	$0
	Project Management	$0	0	10%	$0		$0	$0	$0	2019Q4	26.9%	$0	$0	$0
	CONTRACT COST TOTALS:	41	8		**$49**		$41	$8	$49			$47	$9	**$56**

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project
LOCATION: Pool 12, Mississippi River Miles 563-573, Jo Daviess County, IL
This Estimate reflects the scope and schedule in report; Definite Project Report w/ Integrated EA October 2012

DISTRICT: MVR Rock Island PREPARED: 8/20/2012
POC: CHIEF, COST ENGINEERING, Charles R. Van Laarhoven

WBS Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: / Effective Price Level:			20-Aug-12 / 1-Oct-12	Program Year (Budget EC): / Effective Price Level Date:			2013 / 1 OCT 12	FULLY FUNDED PROJECT ESTIMATE				
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*P*	*L*	*M*	*N*	*O*
	PHASE 9													
06	FISH & WILDLIFE FACILITIES	$0	0	21%	$0		$0	$0	$0	2020Q4	14.5%	$0	$0	$0
09	CHANNELS & CANALS	$24	5	21%	$29		$24	$5	$29	2020Q4	14.5%	$27	$6	$33
16	BANK STABILIZATION	$0	0	21%	$0		$0	$0	$0	2020Q4	14.5%	$0	$0	$0
	#N/A	$0	0	0%	$0		$0	$0	$0	2020Q4		$0	$0	$0
	#N/A	$0	0	0%	$0		$0	$0	$0	2020Q4		$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$24	5	21%	**$29**		$24	$5	$29			$27	$6	$33
01	LANDS AND DAMAGES	$0	0	0%	$0		$0	$0	$0	2020Q2	13.5%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
	Project Management	$0	0	17%	$0		$0	$0	$0	2020Q2	29.0%	$0	$0	$0
	Planning & Environmental Compliance	$0	0	17%	$0		$0	$0	$0	2020Q2	29.0%	$0	$0	$0
8.0%	Engineering & Design	$2	0	17%	$2		$2	$0	$2	2020Q2	29.0%	$2	$0	$3
	Engineering Tech Review ITR & VE	$0	0	17%	$0		$0	$0	$0	2020Q2	29.0%	$0	$0	$0
	Contracting & Reprographics	$0	0	17%	$0		$0	$0	$0	2020Q2	29.0%	$0	$0	$0
1.0%	Engineering During Construction	$0	0	17%	$0		$0	$0	$0	2020Q4	31.2%	$0	$0	$0
	Planning During Construction	$0	0	17%	$0		$0	$0	$0	2020Q4	31.2%	$0	$0	$0
	Project Operations	$0	0	17%	$0		$0	$0	$0	2020Q2	29.0%	$0	$0	$0
31	CONSTRUCTION MANAGEMENT													
10.0%	Construction Management	$2	0	10%	$3		$2	$0	$3	2020Q4	31.2%	$3	$0	$3
	Project Operation:	$0	0	10%	$0		$0	$0	$0	2020Q4	31.2%	$0	$0	$0
	Project Management	$0	0	10%	$0		$0	$0	$0	2020Q4	31.2%	$0	$0	$0
	CONTRACT COST TOTALS:	29	6		**$34**		$29	$6	$34			$33	$6	**$40**

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX J

REAL ESTATE PLAN

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APPENDIX J

REAL ESTATE PLAN

CONTENTS

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APPENDIX J

REAL ESTATE PLAN

I. PURPOSE OF REAL ESTATE PLAN

This Real Estate Plan (REP) is prepared in support of the Definite Project Report (DPR) of the *Pool 12 Over-wintering Habitat Rehabilitation and Enhancement Project.* The Upper Mississippi River System – Environmental Management Program (UMRS-EMP) is a Federal-State partnership to plan, construct, and evaluate measures for fish and wildlife habitat improvement through Habitat Rehabilitation and Enhancement Projects. The original authority is in WRDA 1986 (PL 99-662) Section 1103. This is the only REP developed for this project.

II. DESCRIPTION OF FEATURES

This project is based on rehabilitating and enhancing the habitat in the Upper Mississippi River National Wildlife and Fish Refuge which is part of the Upper Mississippi River National Wildlife Refuge Complex. Key management goals are to restore and protect aquatic habitat and restore floodplain forest habitat. The project area is comprised primarily of a series of islands, backwater channels, and backwater lakes modified or created following construction of Lock and Dam 12 in 1939. I t is located downstream of Dubuque, Iowa, in the area of the Northeast corner of Dubuque County, Iowa, between RM 563.0 and 573.0. The proposed Project will cover approximately 40.4 acres the Savanna District of the U. S. Fish and Wildlife Service (USFWS) lands. Dredging will occur at four sites and the dredged material will be used to construct berms. The project is comprised of four different backwater lakes to be constructed as follows:

Sunfish Lake. The dredged material (land berm) to be located in the Sunfish Lake area would cover approximately 14.1 acres of land.

Kehough Slough. The dredged material (land berm) to be located in the Kehough Slough area would cover approximately 4.3 acres of land.

Tippy Lake. The dredged material (land berm) to be located in the Tippy Lake area would cover approximately 9.0 acres of land.

Stone Lake. The dredged material (land berm) to be located in the Stone Lake area would cover approximately 13.0 acres of land.

Three main features are identified as most beneficial:

Feature 1. Channel Dredging. The channels will be dredged to elevation 584 feet with a 60 foot bottom width. Those areas with at least 4 feet of water would be considered suitable over-wintering fish habitat.

Feature 2. Aquatic Berms. Aquatic berms would be placed in the water on the lakebed. These berms would not be high enough to support mast-producing trees. However, most of these berms would likely break the water surface and eventually support wetland vegetation.

Feature 3. Land Berms. Land berms would be placed on existing islands. They would be constructed high enough to support mast-producing trees, so trees would be planted on them.

III. SPONSOR-OWNED REAL ESTATE RIGHTS

The project lands were purchased in fee or by condemnation by the U. S. Army Corps of Engineers (USACE) for the United States during the 1930s and 1940s for the Upper Mississippi River 9 Foot Channel Project. However, the lands are managed by the Savanna District of the USFWS of the Department of the Interior as the Upper Mississippi River National Wildlife and Fish Refuge under a cooperative agreement between the USFWS and USACE.

IV. PROPOSED ESTATES AND REAL ESTATE ISSUES

In accordance with ER 405-1-12, only standard estates are proposed for the project. The fee estate is required for environmental projects and it is the estate owned by the Federal government

V. EXISTING FEDERAL PROJECT

The project is totally within two existing Federal projects—the Upper Mississippi River 9 Foot Channel Project of the Corps of Engineers and the Upper Mississippi River National Wildlife Refuge Complex managed by the USFWS.

VI. EXISTING FEDERAL LANDS

The Environmental Management Program is specifically developed for lands that are already under the ownership of the Federal government.

VII. NAVIGATIONAL SERVITUDE

Since this is not a navigation project, and because no project feature serves a purpose which is in aid of commerce, the navigational servitude is not available, nor is it needed, for the necessary real estate rights

VIII. MAPS

A map is attached as Exhibit A. Government lands currently owned by the United States that surround the project area are outlined in green.

IX. INDUCED FLOODING

Flooding is not expected to be induced outside any feature boundaries by the construction, operation, or maintenance of the project.

X. BASELINE COST ESTIMATE FOR REAL ESTATE

Baseline Cost Estimate for Real Estate was not developed because the land is owned by the Federal government and the project is not cost-shared with an agency outside of the Federal government.

XI. PUBLIC LAW (PL) 91-646 RESIDENCE/BUSINESS RELOCATIONS

There are no PL 91-646 relocations necessary for the project. No person, farms, or business will be displaced as a result of the project.

XII. TIMBER AND MINERALS

Because this is an environmental enhancement project, the intention is to avoid the removal of timber whenever possible. However, there is the possibility that some trees will be removed for the placement site preparation. If the amount appears to be significant, a timber sale will be held to recoup the value. No significant minerals are known within the project boundary.

XIII. NON-FEDERAL SPONSOR'S ACQUISITION CAPABILITY

Since all of the land is already owned in fee by the Federal government, no acquisition is expected for this project. Therefore, there is no reason for a Non-Federal Sponsor's Acquisition Capability checklist.

XIV. ZONING ORDINANCES

The land is located within the Upper Mississippi River National Wildlife and Fish Refuge. This area of the county is unzoned. Any villages or towns would have their own zoning, but since the project does not encompass any village or town, the project land is not zoned.

XV. ACQUISITION SCHEDULE

Since the land is owned in fee by the Federal government, no acquisition of land will be needed.

XVI. FACILITY/UTILITY RELOCATIONS

No facilities or utilities will be relocated for this project.

XVII. HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

No evidence of existing or potential HTRW sites was noted during an inspection of the project right-of-way. Based upon information gathered during USACE assessment, it is reasonable to assume that no
HTRW will be encountered within or near the project. There should be no impact to real estate by HTRW. This is discussed further in Appendix E, *Hazardous, Toxic, and Radioactive Waste*.

XVIII. SUPPORT OR OPPOSITION BY LANDOWNERS

Most landowners in the area support the concept of developing habitat for the over-wintering of the aquatic species.

XIX. NOTICE TO SPONSOR REGARDING RISKS

As no acquisitions are expected, notice to the sponsor regarding risks of acquisition prior to the signing of the agreement is not necessary.

XX. OTHER ISSUES

Access to the project areas is by water.

STUART P. JACKSON
Chief, Regional Real Estate Division North
U.S. Army Corps of Engineers

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX K

SYSTEM BENEFITS MONITORING PLAN

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APPENDIX K

SYSTEM BENEFITS MONITORING PLAN

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FIGURES

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APPENDIX K

SYSTEM BENEFITS MONITORING PLAN

I. INTRODUCTION

A. Purpose. This appendix documents the Systemic Benefits Monitoring Plan (also known as the Programmatic Adaptive Management Plan) as part of the feasibility-level planning effort for backwater habitat improvements in pool 12 of the Upper Mississippi River System (UMRS) as part of the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP). The purpose of the Systemic Benefits Monitoring plan is to ensure that monitoring and evaluation of this Project are conducted in order to evaluate the Project for effectiveness and test the hypothesis as described within this plan as part of an adaptive ecosystem management program for the Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP). This plan will guide monitoring activities for the Pool 12 Overwintering Habitat Rehabilitation and Enhancement Project (HREP). The Project area is between river miles 563-573 in Jo Daviess County, Illinois.

B. System Goals and Objectives. The priorities of the Nation have changed over time with the result being a complex multiple-use UMRS, which has been manipulated to enhance farming in uplands and floodplains, move commodities and people on commercial waterways, reduce flood risk, and maintain natural resource quality in the upper Midwest. The EMP was the first formal designation of a prominent water Project, the UMRS, as both "a nationally significant ecosystem and a nationally significant commercial navigation system" [Water Resources and Development Act (WRDA) of 2007]. The most recent system-level planning resulted in a set of system-wide goals and objectives coupled with more specific reach-scale objectives identified by local stakeholders (USACE 2011). An accepted set of goals and objectives allows multiple ecosystem restoration authorities, channel operations activities, other Federal programs, states management activity, and non-government organizations actions to work within their own capacity to incrementally achieve large scale goals. Incorporating monitoring and adaptive management principles should enhance learning to increase efficiency and success during execution of restoration projects. This Project was conceived as an important step toward active programmatic adaptive management where restoration features are designed to test hypotheses regarding Project performance and biological responses (Williams 2010).

C. Scope of Study. Existing conditions and anticipated future conditions were identified and Project goals and objectives were developed by an interagency planning team and the public. Restoration alternatives were formulated to address ecosystem goals and objectives consistent with system-wide plans (USACE 2000a, 2000b; DeHaan et al., 2003; USACE, 2011). Costs and benefits of the restoration alternatives were quantified and the alternative plans were compared on this basis resulting in recommendation of a single restoration plan for implementation. A detailed analysis of the recommended plan is presented and includes: design and construction considerations; operation, maintenance, and rehabilitation considerations; a detailed cost estimate; a plan for monitoring the performance of the restoration; real estate requirements; environmental effects; and a detailed schedule for implementation. This Systemic Benefits Monitoring plan is an appendix the Definite Project Report, and is consistent with USACE implementation guidance for Section 2039 of the WRDA 2007, *Monitoring Ecosystem Restoration*.

D. Adaptive Management in the Environmental Management Program. The EMP included environmental status and trend monitoring and restoration project monitoring from its conceptualization in the Upper Mississippi River Basin Commission (UMRBC 1982) Comprehensive

Master Plan for the Management of the UMRS. The EMP and partners have since invested in extensive ecosystem monitoring and assessment to understand ecosystem status and the potential for change through restoration. Several early projects were selected for expanded monitoring to better understand environmental response to common restoration measures. Backwater overwintering requirements were refined, in part due to outcomes documented in the Finger Lakes HREP (Minnesota) and Lake Onalaska Islands (Wisconsin). Partner-driven monitoring of island building projects in Wisconsin and Iowa has provided substantial information on aquatic plant and fish community responses. Backwater lake monitoring in the Illinois River investigated and documented the benefits of water level management at Lake Chautauqua and Swan Lake, Illinois.

Since 1986 when the EMP partnership developed, it has adapted its restoration planning procedures several times during periodic system-level reviews. Programmatic review is important to consolidate the most up-to-date science and stakeholder driven goals and objectives. Such input has been very important to maintain the UMRS as a national leader in large scale ecosystem restoration through a long term project-based approach based on systemic goals and objectives.

The Pool 12 overwintering HREP was conceived as an important opportunity to expand beyond the project-by-project approach to increase learning about the area of influence of ecosystem restoration projects. In this case, prior research and restoration experience demonstrated the environmental change degrading fisheries (i.e., sedimentation and loss of depth for overwintering; Bodensteiner et al. 1990, Sheehan et al. 1990, Raibley et al. 1997, Rogala and Soballe 1998) and the positive response to restoration (i.e., dredging and flow manipulation; Gent et al. 1995) at specific sites. The Project area initially under investigation as part of the planning process contained multiple backwater lakes of various physical characteristics and fisheries quality. The Iowa Department of Natural Resources (IANDR) had also experimented with restoration techniques and had extensive fisheries monitoring activity in the reach. The Pool 12 Overwintering Project was thus conceived to improve multiple lakes in a phased approach so that learning on the first set of lakes could be incorporated into the restoration design for a second set of lakes. While a phased approach for lake construction in no longer the plan, information gained through the systemic benefits monitoring at this HREP will be incorporated into the design for future HREPs, thus making this plan a Programmatic Adaptive Management approach.

In addition to improving habitat in a degraded river reach, the intent of the Pool 12 Overwintering HREP was to help answer ongoing questions regarding "how much habitat is enough?" Prior research indicated largemouth bass made annual movements up to 10 miles (Pitlo 1992) while bluegills and crappies had smaller ranges less than 3 or 5 miles (IADNR 2002 and 2003, Pitlo 2004). Theoretically then, backwater overwintering sites could be placed at similar distances to ensure all fish in a river reach had access to overwintering sites (USACE 2004) (Figure K-1). The hypothesis was that more overwintering sites, spaced closely together would maintain larger, healthier centrarchid populations. Costs, of course, affect the level of effort available for restoration, so the Pool 12 Overwintering HREP was planned to test hypotheses regarding fish community response to backwater lake restoration in a ten mile river reach by monitoring fish movement and population characteristics in response to restoration in restored lakes, in control lakes, and pool-wide. The location of the Project allows the Pool 13 Long Term Resource Monitoring (LTRM) fisheries data to serve as a pool-scale control. The cooperation of LTRM staff greatly increases programmatic learning opportunities and program efficiency.

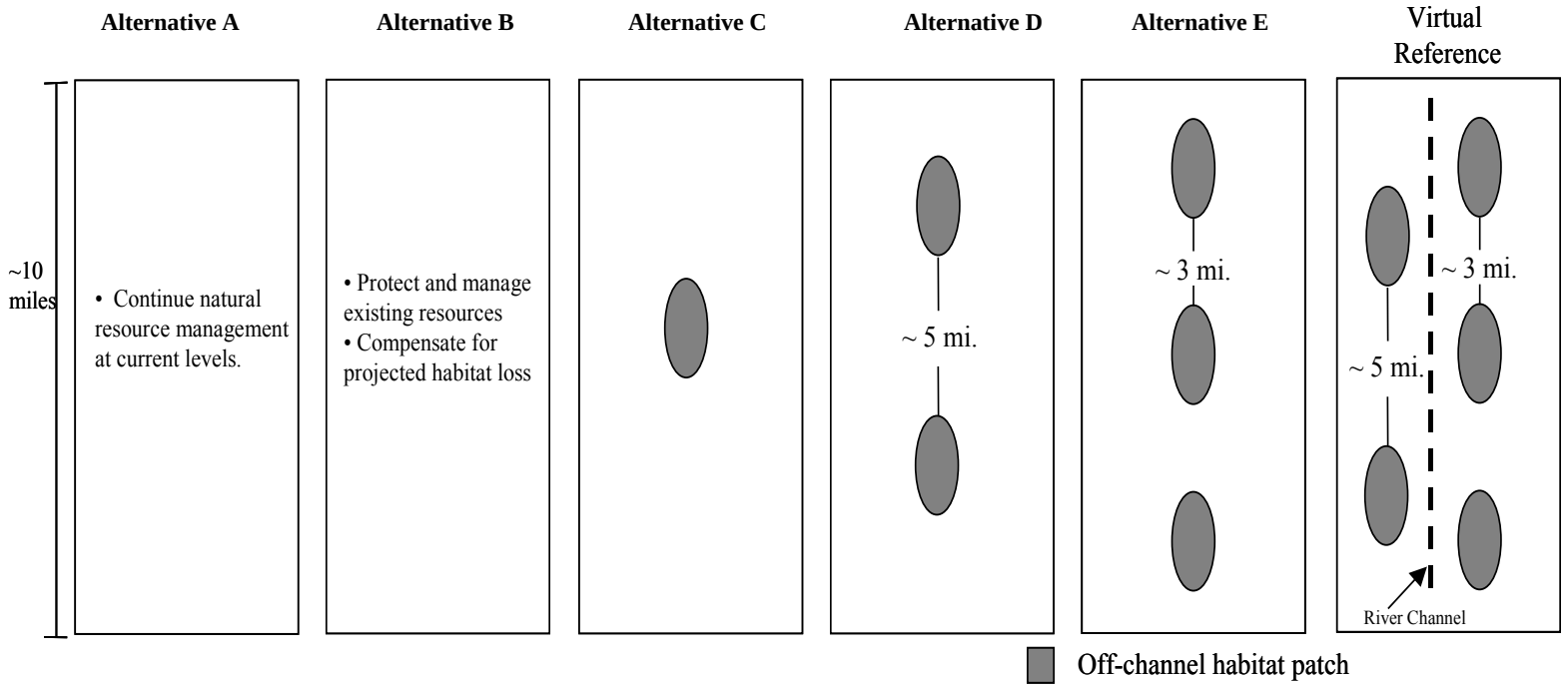

Figure K-1. Proposed Distribution of Off-Channel Habitat Patches To Meet Backwater Fish Community Objectives (i.e., off-channel habitat every 3 to 5 miles; IADNR 2000, 2003; Source USACE 2004).

E. Limitations of Large Scale Adaptive Management. Eight backwater lakes were initially evaluated for potential backwater restoration as part of the project scope. In 2005, it was determined that six lakes would be restored in a phased approach. However, site-specific constraints became more apparent as the planning process progressed, and it was determined that two of the six lakes still under evaluation would be eliminated from further consideration for restoration. The recommended plan included restoration at four backwater lakes completed in one phase, but with lake construction occurring sequentially as opposed to simultaneously. Construction at the largest of the four lakes is expected to take 2 years due to the comparatively large amount of dredging and the anticipated funding. The total construction period for the project is anticipated to last a minimum of five years. This duration makes it impractical to define clear start and stop points for restoration actions, so a less rigid monitoring program was designed to monitor fish community trends in the reach over an extended period. Fish community sampling will be continuous through construction and for 5 years beyond the last construction activity. Radio-telemetry activity will be synchronized to construction milestones.

F. Project Goals and Objectives. The primary goals identified were to

1. restore and protect off-channel aquatic habitat and
2. restore floodplain forest habitat.

The objectives included:

1. increase the amount of deep water habitat in the backwater lakes complex of Pool 12 as measured by acres to provide pool-wide overwintering habitat for fish. (Target depth is 6 to 8 feet);
2. increase depth diversity in the backwater lakes complex of Pool 12 as measured by acres to provide year round habitat for fish;
3. increase sustainability of aquatic habitat in the backwater lakes complex of Pool 12 as measured by acres by decreasing the sedimentation in the complex; and
4. increase areal coverage in acres of forest stands with hard mast-producing trees as a dominant or component species in floodplain forest areas surrounding the backwater lakes of Pool 12.

G. Areas of Uncertainty - Adaptive Management. A criticism of HREPs is that they institute change at relatively small spatial scales (i.e., specific sites within navigation pools) and therefore do not serve as remedies for fisheries issues caused by factors that operate at the navigation pool scale, reach scale, stream-network scale, or basin scale (e.g., changing land-use patterns, climate changes, changes in hydrology; Gutreuter 2004). Despite success at improving centrarchid overwintering habitat conditions and local angler harvest (Gent et al. 1995), there are no published references that document improvement in an UMRS centrarchid community or centrarchid populations at the pool-scale or larger scales due to habitat rehabilitation or restoration. Even those studies that have shown positive effects at the local scale (backwater or backwater complex) are open to criticism, due to a lack of control sites within the study designs. The assumption that the availability of overwintering habitat is a limiting factor for centrarchids in the upper impounded reach of the UMR (Pools 1-13) has been formally challenged (Gutreuter 2004), and the subject is of great importance to UMRS fisheries managers.

The Pool 12 HREP is being designed and implemented using active adaptive management principles to also assess fisheries benefits beyond individual backwaters, whereas prior HREP monitoring considered condition and behavior only within individual backwaters (Knights et al. 1995). The IADNR partners have invested substantial prior effort to understand aspects of timing and distance of fish movements to backwaters through radio-telemetry studies (Pitlo 2004; Steuck 2006, 2010). The Pool 12 HREP systemic benefits monitoring was conceived to test hypotheses for population level effects beyond the individual backwater by tracking fish dispersion from restored backwater lakes. The systemic benefits monitoring plan or programmatic adaptive management plan was developed to investigate fish response to backwater restoration (dredging) in 2006. The IADNR partners have conducted pre-Project monitoring studies since then to better understand fish use of backwaters during winter and their spring dispersal patterns to quantify preferred habitat conditions within backwaters, quantify the area of influence of restoration actions beyond restored backwaters, and determine appropriate spacing of future backwater restoration projects. Post-Project monitoring will compare fish community responses in restored and control lakes and it will compare pool-wide fish community response in Pool 12 to Pool 13 which will not have additional restoration.

H. Indicators and Units of Measurement. Fish community sampling and radio tracking individual fish will be conducted to monitor fish response to backwater lake restoration. Centrarchid abundance, biomass, condition, and growth will be evaluated from pool-wide and backwater fish community surveys. Fish dispersal will be evaluated by radio telemetry tracking fish moving out from wintering sites in the spring. Field work, analysis, and reporting have been and will continue to be completed by local partners in support of the Project.

I. Linkage Between Hypotheses and Indicators. Learning about fish use of and dispersal from overwintering sites will lead to greater efficiency and effectiveness for overwintering project design and placement both within the EMP for the UMRS and in other large-scale riverine systems. Well developed hypotheses can also help set quantitative habitat objectives for Corps HREP projects. Results of the earlier research on fish overwintering were used to allocate backwater restoration efforts among ecosystem restoration alternative plans in the UMR-IWW System Navigation Feasibility Study (USACE 2004) (figure K-1). However, fundamental questions regarding the amount, size, and spacing of deep backwater habitat still remain unanswered. The Pool 12 Backwater Overwintering HREP multiple lake project design allows hypothesis testing for pool-wide population effects, within backwater lake effects, and spring dispersal effects.

1. Hypotheses regarding pool-wide fish community response:
    a. Management intervention in Pool 12 backwaters (dredging) will increase the pool-wide relative abundance of centrarchids compared to the Pool 13 control.
    b. Management intervention in Pool 12 backwaters (dredging) will increase the pool-wide biomass of centrarchids compared to the Pool 13 control.
    c. Management intervention in Pool 12 backwaters (dredging) will increase the pool-wide condition (relative weight) of centrarchids compared to the Pool 13 control.

2. Hypotheses regarding backwater lake effects:
    a. Relative abundance of overwintering centrarchids will be greater in restored lakes compared to control lakes.

b. Biomass of overwintering centrarchids will be greater in restored lakes compared to control lakes.
c. Condition (relative weight) of overwintering centrarchids will be greater in restored lakes compared to control lakes.
d. Fish community age structure will increase in restored lakes compared to control lakes.
e. Fish habitat area, measured as Utilization Distance, will increase in restored lakes compared to control lakes.

3. Hypotheses regarding fish dispersal from backwater lakes:
    a. Fish will disperse farther from restored lakes compared to control lakes.
    b. More fish will disperse from restored lakes compared to control lakes.

The hypotheses driving this Project and the systemic benefits monitoring plan can be tested with common fisheries techniques used by the LTRM and other agencies. The Project is enhanced by the proximity of the Pool 13 LTRM trend analysis reach which provides methods, experienced staff, and a nearby pool-wide control. Robust within-Pool 12 sampling provides reach-scale assessment and Project control sites. Individual lakes provide before-after comparisons of fish population response within each site. Individual fish movement and dispersal is tracked using radio tracking to determine the areas used by fishes. Pre-Project monitoring has already indicated that fish populations are less mobile than previously suspected from tacking individuals.

II. SCOPE OF WORK

A. Fish Community Monitoring

1. Fish Abundance, Biomass, and Physical Condition in HREP Backwaters. In the original design of this HREP (circa 2005), three Pool 12 backwaters (Stone Lake, Fishtrap Lake, and Sunfish Lake) were scheduled for dredging as part of Phase 1 of the Pool 12 Overwintering HREP, and these sites were to serve as the study treatment (impact) sites. Three additional Pool 12 backwaters (Fentress Lake, Green Lake, and Wise Lake) were selected as control sites. Criteria used to select control sites included proximity to treatment sites, size, connection to channel habitats, and depth (ability to sample with collection gears). Fish community samples will be collected from randomly selected shoreline sites within the six study lakes during September 15 - October 31, 2006 - 2011. Once established, randomly-selected sampling locations were held fixed for the period of study in an effort to maximize our ability to detect change due to management intervention. Shoreline samples will be collected using Long Tern Resource Monitoring Program fyke-netting procedures. In 2006, five sites will be sampled in each of the 6 study lakes and adjustments to this effort may be made in subsequent years based upon power analysis performed on collected data. Our desired level of power will be an 80 percent probability of detecting a 20 percent annual change in relative abundance (CPUE, fish/hour) at $\alpha = 0.05$ for individual backwaters.

2. Fish Abundance, Biomass, and Physical Condition in Backwater and Pool Scale. Under this design, Pool 13 will serve as a control pool to determine if observed temporal changes in fish abundance, biomass, and physical condition within Pool 12 are due to habitat management or "natural" variation. Similarly, Pool 13 backwater aquatic area will serve as a control for Pool 12

backwater aquatic area (Table K-1). A stratified random sampling design will be used to provide pool-wide estimates of fishery parameters. Backwater contiguous aquatic areas will be assessed as part of the larger stratified random sampling design (Table K-1). Sampling sites will be randomly selected within strata and sample locations will be "re-selected" on an annual basis in an effort to maintain consistency between Pool 12 data and those collected in Pool 13 as part of standard LTRM Program (LTRMP) sampling. Fish community samples will be collected using LTRMP electrofishing procedures at randomly selected shoreline sites during September 15-October 31, in 2006-2011.

Table K-1. Proposed Reference and Control Sites at Three Spatial Scales

Spatial Scale	Treatment Group (Reference Sites)	Control Group (Control Sites)
Individual backwater (≈ 12-65 ha)	Individual Pool 12 HREP backwaters (3 sites)	Individual Pool 12 non-HREP backwaters (3 sites)
Pool-wide backwater (≈ 950 ha)	Pool 12 backwater aquatic area	Pool 13 backwater aquatic area
Navigation pool scale (≈ 4,950 ha)	Pool 12	Pool 13

3. Data Analyses. Data analyses will focus on habitat rehabilitation effects upon centrarchid total abundance, biomass, growth, and physical condition. Abundance will be indexed using catch-per-unit effort (fish/hour) and biomass will be indexed using weight-per-unit-effort (gm/hour). Growth analysis will focus on the growth response (mean-length-at-age) of bluegill in backwater aquatic areas. Bluegill was chosen as a target species because it is a centrarchid species with high recreational and ecological value in backwater areas, and bluegill are readily sampled with LTRMP fisheries sample gear. We will use graphs and a paired before-after-control-impact (BACIP) design to assess HREP impacts at the backwater aquatic area scale and navigation pool. Appropriate parametric or nonparametric statistical techniques will be used to assess the significance of differences between pre-Project and post-Project parameter estimates (e.g., ANOVA, Kruskal-Wallis test). At the individual backwater scale we will also assess HREP effects using a before-after-control-impact design, but the design will contain true spatial replicates and will follow a standard repeated measures experimental design.

B. Radio-Tracking Fish Dispersal from Backwater Lakes. The primary adaptive management feature to be evaluated is centrarchid population response relative to distance between restored sites, so radio-tracking transmitters were attached to 200 white crappie in 4 overwintering backwater lakes in Pool 12: Frentress, Green, Stone, and Fishtrap Lakes (figure K-2) to determine their spring movements out from backwaters under pre-Project conditions. Radio-tracking during the post-Project phase was planned to detect changes in movements in response to restoration actions at individual backwater lakes. It should be possible to detect the change in the size of seasonal home range usage with the expectation that winter home range area increases in restored lakes.

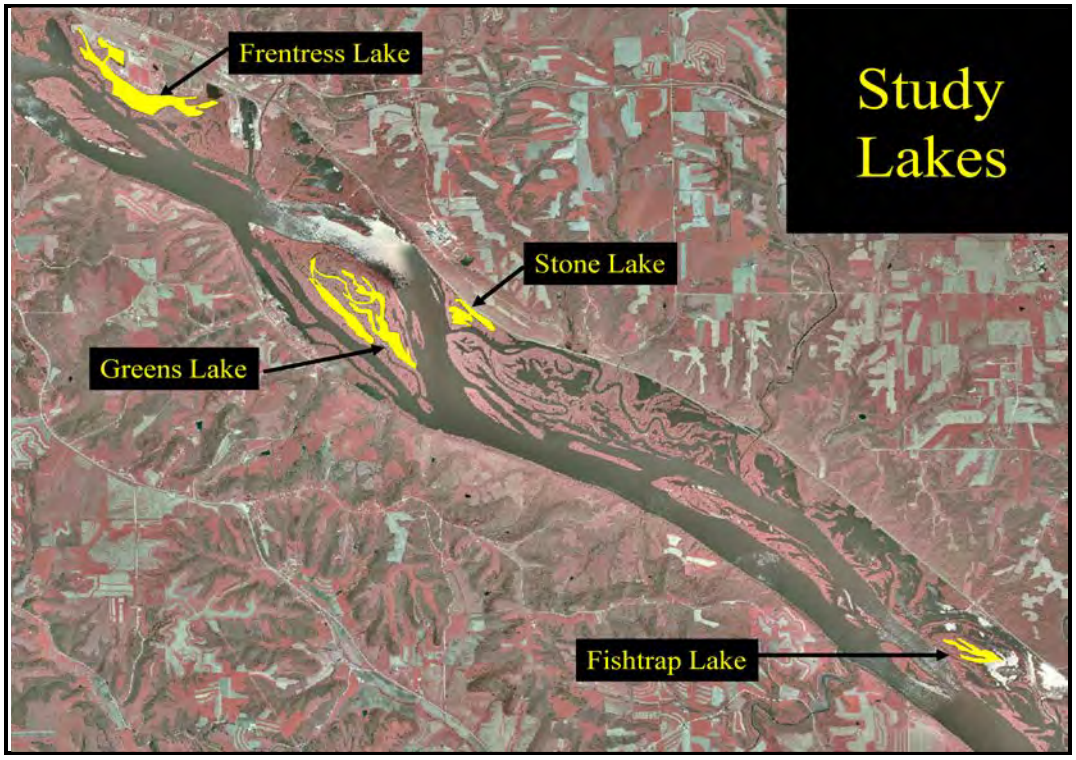

Figure K-2. Locations of Radio-Telemetry Study Lakes (Highlighted in Yellow) Within the Pool 12 Overwintering HREP

Radio-tracking individual fish was conducted for one year, with every fish located once every two weeks. Each crappie location was recorded with a GPS unit and dissolved oxygen, temperature, depth, Secchi disk transparency, and flow were recorded. This was designed to yield 50 locations per two-week sample period (1,300 annually) per backwater to achieve a minimum of 30 locations recommended for estimating home ranges using kernel methods (Seaman et al. 1999, Vokoun 2003).

Kernel methods in the Home Range Extension for ArcView were used to construct utilization distributions (UD) around individual backwaters by pooling the points from all fish tagged in that backwater (Rogers and Carr 1998). The 80 percent utilization contour for each backwater was quantified (figure K-3; table K-2). The influence of landscape features such as the proximity to the main channel, position in the pool or side channel complex, or proximity to other overwintering backwaters affects the UD were observed, but not tested. Changes in UD through the winter season or in response to other environmental factors (dissolved oxygen sags, changes in temperature, water level fluctuations, etc.) were also explored.

Pre-Project results indicate that fish communities are relatively stable and do not range far from overwintering sites. Consistent with prior findings, however, was the timing of movements and apparent relationships to environmental conditions like oxygen and flow. Important results related to lake morphology were revealed by the mass predation of tagged fish by otters in one of the smaller study lakes, ironically named Fishtrap Lake.

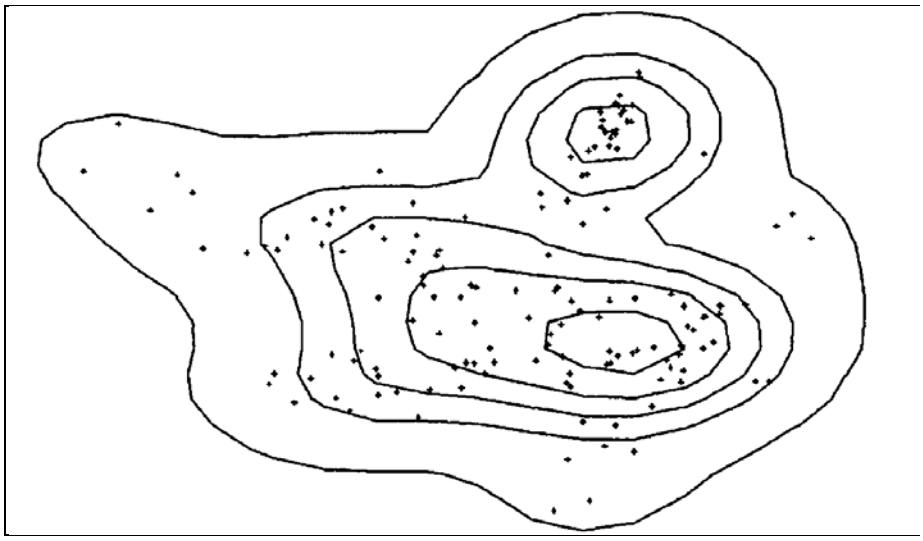

Figure K-3. Example of Density Contours Derived From Telemetry Locations and Kernel Methods Contours represent 95, 72.5, 50, 27.5, and 5% of the utilization distribution. Points represent individual locations. Adapted from Seaman and Powell (1996).

Table K-2. Area of 80% Habitat Utilization Distribution (ha), by Period and Mean Size During Ice Cover, As Determined by Telemetry and Kernel Methods at Fishtrap, Frentress, Greens, and Stone Lakes

Shaded areas denote periods with ice cover.

Period	Fishtrap Lake	Frentress Lake	Greens Lake	Stone Lake
1	19.76	9.60	8.65	5.04
2	0.21	7.17	3.22	1.23
3	0.54	3.53	6.29	1.40
4	0.27	3.59	4.45	0.52
5	0.25	3.30	9.39	2.24
6	0.65	4.52	6.08	0.46
7	-	3.48	9.06	0.98
8	-	7.30	4.04	2.01
9	-	13.42	23.18	21.39
10	-	-	14.07	20.71
11	-	-	12.86	34.03
12	-	-	11.94	41.29
13	-	-	13.57	20.73
14	-	-	9.06	6.55
15	-	-	7.02	-
16	-	-	9.88	-
17	-	-	7.54	-
18	-	-	8.03	-
19	-	-	8.55	-
Mean Ice	**0.32**	**4.70**	**6.07**	**1.26**

III. COORDINATION PLAN

Pool 12 Overwintering HREP Systemic Benefits Monitoring Plan (Programmatic Adaptive Management Plan) is coordinated with LTRM sampling in Pool 13 to maximize learning opportunities for HREP and LTRM within the UMRR-EMP. Pool 13 LTRM fisheries monitoring provides a control site to evaluate pool-wide and backwater lake scale project effects. Sharing expertise and methods optimizes implementation efficiency and data compatibility. Pre-Project sampling has demonstrated that the two pools have similar centrarchid communities that exhibit similar trends since 2006 (table K-3). Post Project monitoring will test whether improvements may be detectable in Pool 12 relative to changes in Pool 13.

Monitoring results are maintained by the Iowa Department of Natural Resources at the Bellevue Fish Research Station and the Upper Mississippi River Restoration – Environmental Management Program (UMRR-EMP) LTRM Field Station. Annual fish community sampling results are submitted to Federal Aid in Sportfish Restoration. Contracted activity, including periodic radio tracking studies, are reported to the US Army Corps of Engineers, Rock Island District (District). Annual updates to the Upper Mississippi River Conservation Committee Fisheries Technical Section, the Fish and Wildlife Interagency Committee, the EMP Coordinating Committee, and other science and natural resource managers meetings are encouraged.

IV. SCHEDULE

Fish community sampling is scheduled for each year of pre-Project planning, during construction, and for at least 5 years following construction. The amount of fish community monitoring seems high, but in the context of the cost and information gained it is a great value. Pool 12 fish community sampling replicates the third period LTRM fish sampling for 6 weeks in October and November. The additional effort increases the power of both studies by creating opportunities for comparison and confirmation of trends for nominal cost relative to the LTRM infrastructure which supports the Pool 12 work also. Pool-wide and backwater lake scale effects cannot be evaluated effectively without the Pool 13 control and the Project benefits greatly from its proximity to IADNR and LTRM field stations.

Fish radio telemetry has already been completed for one pre-Project winter. We propose another season of pre-Project tracking and tracking each lake restoration for 2 years for a total of 5 years post-Project sampling. Radio telemetry studies are more expensive because of the technology of disposable tags and labor required to track fish often. The costs for telemetry are relatively fixed whether one lake or four lakes are monitored because the same individuals can cover many sites once they are mobilized.

The study design would have a variable number of control lakes. All lakes are controls during pre-Project, and they remain controls until each Project lake is restored. When lakes get restored they convert to test lakes which increase in number over the time of construction. In the end, the first lakes will have been monitored over at least 5 years post –Project. The IADNR staff have also expressed their intent to monitor the Project area for at least 10 years after the last construction in Tippy Lake.

Table K-3. Pool 12 Overwintering HREP Monitoring Schedule

	Pre-Project								Construction					Post-Project				
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Construction (Dredging)																		
Sunfish																		
Stone																		
Kehoe																		
Tippy																		
Fish sampling																		
Pool-wide																		
Backwaters																		
HREP lake																		
Telemetry																		

V. MONITORING BUDGET

Fish Sampling and telemetry were included in the estimated total Project cost (Main Report, table 8-3). Fish sampling was estimated at $40,000 each year during the 5 years of Project construction and 5 years post-Project for a total of $400,000. Each fish telemetry tracking event was estimated at $60,000 for four lakes. A total of 5 years of fish telemetry tracking is estimated to be $300,000.

VI. MONITORING ROLES AND RESPONSIBILITIES

The Corps is responsible for determining ecological success for the ecosystem restoration projects it constructs. Cost-shared monitoring and adaptive management may extend for up to 10 years following Project completion (USACE 2009). In this case, an atypical approach to monitoring has been capitalized upon to incorporate LTRMP expertise into HREP evaluation. The UMRR-EMP LTRM Pool 13 Field Station staff cooperate with other IADNR Fisheries staff to support Pool 12 HREP, backwater, and pool-wide scale fish community sampling and analysis in an in-kind fashion. Radio-telemetry studies were supported by Federal Aid in Sportfish Restoration with support from the District for additional equipment. The District would be responsible for monitoring costs in lieu of the benefits derived from the UMRR-EMP partnership.

VII. CLOSE OUT PLAN

Section 2039 Adaptive Management monitoring authority allows for Corps supported monitoring for up to 10 years following completion of the last dredging event. Practically, however, the Corps and project sponsor are not funding the current monitoring effort. Iowa DNR fisheries personnel have been supporting monitoring through a combination of state and LTRMP resources. Iowa DNR staff is committed to supporting project monitoring indefinitely to learn more about long term fisheries responses to restoration. EMP supports this approach to monitoring because it promotes LTRMP and HREP integration and promotes reach scale evaluation of biological response to restoration.

The systemic benefits monitoring (programmatic adaptive management) design of the Pool 12 Overwintering HREP is large scale and incorporates both spatial and temporal components. The temporal component is simple, annual monitoring to assess population response in individual lakes over time. Prior project monitoring indicates there is an initial response when a local population develops in response to a project and then equilibrates at a new higher level. Monitoring over many years can detect deviations in the population response. The spatial aspect of the monitoring is designed to detect how fish populations move among restored areas. Early radio telemetry detected a range of fish movement up to three to five miles, but more recent work in Pool 12 pre-project monitoring indicates most fish stay within very small home range areas associated with a single backwater lake. The spacing of project lakes is designed to compare fish movement among restored sites to determine the optimal spacing for future EMP HREPs.

The present monitoring plan includes the radio tracking of individual fish after the completion of each backwater dredging event to detect local change. As the number of restored lakes increases, there will be an opportunity to detect movement among restored lakes. The construction sequence will allow

monitoring of widely spaced projects initially, with close spaced projects being built last. Only 2 years of radio tracking are scheduled, so the fish tracking aspect of the systemic benefits monitoring plan will end by 2020 or 2021. Backwater and reach scale fish population monitoring will continue indefinitely. The EMP will assess initial responses and use that information in subsequent backwater restoration projects.

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

APPENDIX L

LITERATURE CITED

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APPENDIX L

LITERATURE CITED

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

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EAST DUBUQUE IL 61025
1/0

LARRY & SALLY PRISKE
4700 N COUNCIL HILL
GALENA IL 61036-8304
1/0

DAVE REAM
1802 S IRISH HOLLOW RD
GALENA IL 61036
1/0

ABBIE REESE
BIG RIVER MAGAZINE
340 SPRING ST
GALENA IL 61036
1/0

WILLIAM REISTROFFER
21763 362ND AVE
BELLEVUE IA 52031-9054
1/0

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

GERRY RICHARDSON
11570 W CROSS RD
GALENA IL 61036
1/0

MARTY ROSENTHAL
218 S DIVISION ST
GALENA IL 61036
1/0

KATIE ROSS
12658 W CHETLAIN LN
GALENA IL 61036
1/0

ETHEL (MEME) SAMUELSON
1106 N FERRY LANDING RD
GALENA IL 61036-9456
1/0

ROBERT SANDMAN
1425 N 14TH ST
DE KALB IL 60115-2001
1/0

MARK SCHNORENGBERG
5609 N RIVER RD
BYRON IL 61010-9505
1/0

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

PHILLIP SCHROEDER
6598 LAURELWOOD DR
ROCKFORD IL 61108-1566
1/0

DAVE SHUEY
333 N FRANKLIN
GALENA IL 61036
1/0

RON STREIGHT
11540 W REDGATES RD
GALENA IL 61036
1/0

RICK STREIGHT
11546 W REDGATES RD
GALENA IL 61036
1/0

TIM TORPS
32021 BELLEVUE HTS
BELLEVUE IA 52031-9672
1/0

WAYNE TURNER
6032 N COUNCIL HILL
GALENA IL 61036
1/0

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

MARK V.
GALENA GAZETTE
716 S BENCH ST
GALENA IL 61036

II: 1/0

MARK VAN OSDOL
2764 S BLACKJACK
GALENA IL 61036

II: 1/0

VERONA WHITMORE
1416 LAKEWOOD
MENDOTA IL 61342-1020

II: 1/0

JOE WILLIS
7801 HILL RD
EAST DUBUQUE IL 61025

II: 1/0

1/
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

POOL 12 OVERWINTERING 10Y 18 OCT 12	I	II[1]	III	IV	V	VI [2]
INTERNAL DISTRIBUTION:						
CEMVR-CT	1	1/0	1/0	1		
CEMVR-EC	1	1/0	1/0	1	1	1
CEMVR-EC-C	1	1/0	1/0	1	1	1
CEMVR-EC-D	1	1/0	1/0	1	1	1
CEMVR-EC-TE	1	1/0	1/0	5		
CEMVR-EC-DN	3	3/3	3/3	1	1	1
CEMVR-EC-DN (MILLHOLLIN)	1	1/0	1/0	1	1	1
CEMVR-EC-DS	1	1/0	1/0	1	1	1
CEMVR-EC-G	1	1/0	1/0	1	1	1
CEMVR-EC-H	1	1/1	1/0	1	1	1
CEMVR-EC-HH	1	1/0	1/0	1	1	1
CEMVR-EC-HQ	1	1/0	1/0	1	1	1
CEMVR-EC-T	1	1/0	1/0	1	1	1
CEMVR-EM			1/0		1	
CEMVR-IM-CL	1	1/1	2/2		2	2
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CEMVR-OD	1	1/0	1/0	1	1	1
CEMVR-OD-MV (HAINSTOCK)	1	1/0	1/0			
CEMVR-OD-MV (PIPER)	1	1/0	1/0			
CEMVR-OD-MN	1	1/0	1/0	1	1	1
CEMVR-OD-MN (LUNDH)	1	0/1	1/0	1	1	1
CEMVR-OD-P	1	1/0	1/0	1	1	1
CEMVR-OD-PP (HANNEL)	1	1/0	1/0			
CEMVR-OD-T (KLINGMAN)	1	1/0	1/0	1	1	1
CEMVR-PA	1	1/0	1/0			1
CEMVP-PD-E	1	3/3	3/3	1	1	2
CEMVP-PD-E (CARMACK)	1	3/3	3/3	1	1	2
CEMVP-PD-F	1	1/0	1/0	1	1	1
CEMVP-PD-F (NILES)	3	3/3	3/3	1	2	2
CEMVP-PD-F (MILLIRON)	1	1/1	1/1	1	1	1
CEMVR-PM-M (HUBBELL)	1	1/1	1/1	1	1	1
CEMVR-PM-M (GOETZMANN)	2	2/2	2/2		2	2
CEMVR-RE	1	1/0	1/0			
CEMVR-RE-P	1	1/0	1/0			

[1] Number of copies of CD's and number of paper copies to distribute (CD/Paper)

[2]

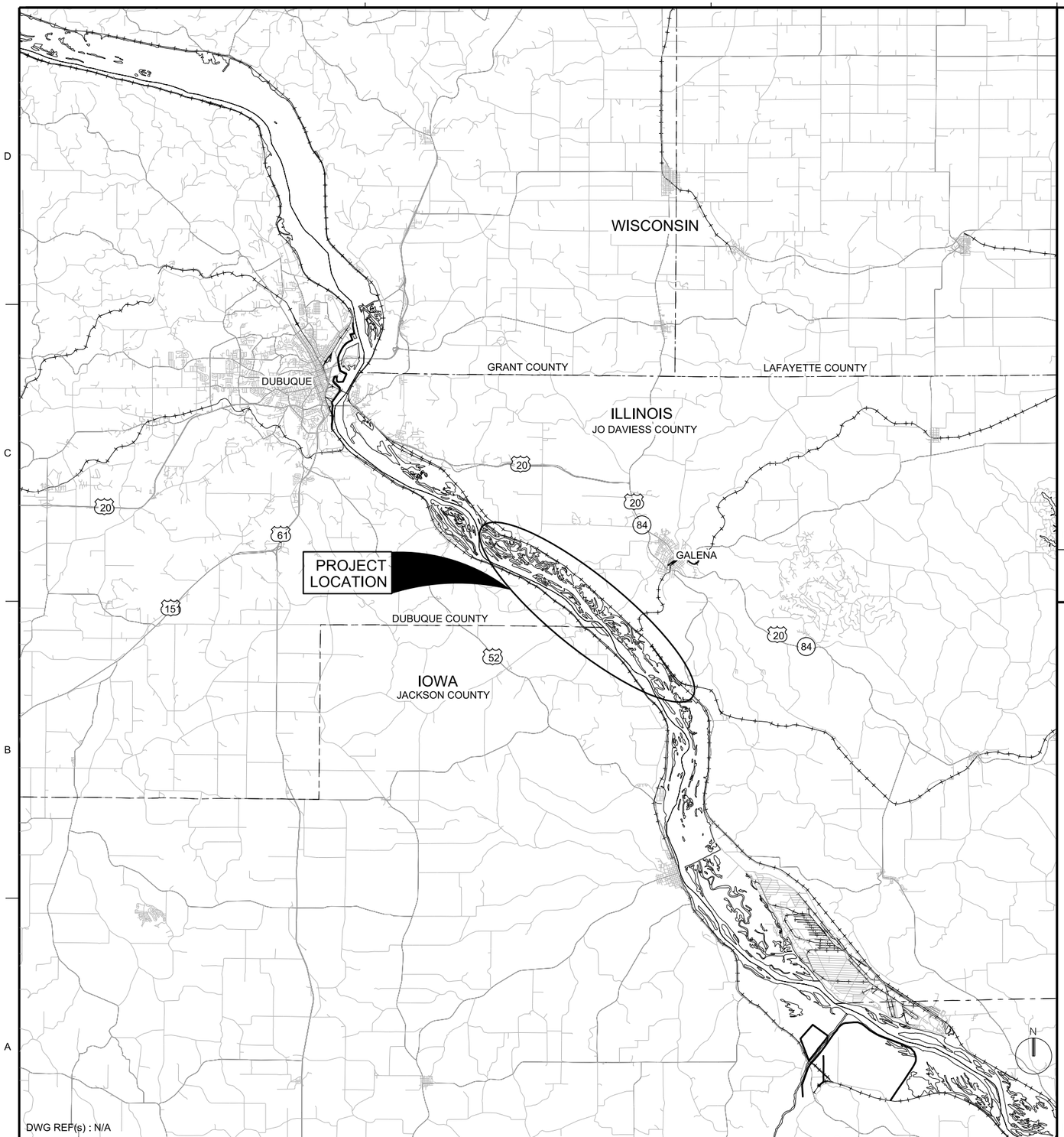
I -Draft Coordination Documents
II - Public Review Documents
III - Administration Approval Documents
IV - Construction Plans and Specifications
V - Operations and Maintenance Instructions
VI - Project Performance Evaluation Documents

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-19F)

POOL 12 OVERWINTERING
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

POOL 12, MISSISSIPPI RIVER MILES 563.0 THROUGH 573.0
JO DAVIESS COUNTY, ILLINOIS

PLATES



DWG REF(s) : N/A

A1 LOCATION PLAN

SCALE : 1"=10000'-0" 0 10000' 20000'

DWG REF(s) : N/A

C4 VICINITY MAP

SCALE : NO SCALE

- EXISTING POWERLINE
- EXISTING GROUND
- PROPOSED CHANNEL EXCAVATION
- PROPOSED LAND PLACEMENT SITE
- PROPOSED AQUATIC PLACEMENT SITE
- RIVERMILE (RM)
- FLOW ARROW
- EXISTING WINGDAM AND REVETMENT PROTECTION
- MONITORING POINTS (E=ELUTRIATE W=WATER QUALITY)
- BORING LOCATIONS
- ENVIRONMENTAL SENSITIVE AREA - DO NOT DISTURB

SF12-01-9 BORING NAME

HOLE ADVANCED WITH 3,25" HOLLOW STEM AUGER HS

HOLE ADVANCED WITH 4" HAND AUGER HA

NUMBER OF BLOWS TO DRIVE STANDARD 2" DIA SPLIT SPOON ONE FOOT WITH 140 LB HAMMER AND 30" DROP (12)

ESTIMATED UNDRAINED SHEAR STRENGTH [200] BY 4" DIA VANE SHEAR APPARATUS, psf

LIQUID AND PLASTIC LIMIT 44/21

PERCENT PASSING #200 SIEVE (6.1)

TOP ELEVATION IN FEET (MSL 1912)

MAJOR STRATA BREAK

MINOR STRATA BREAK

51 NATURAL MOISTURE CONTENT IN PERCENT DRY WEIGHT

LOCATION OF BORING
(ILLINOIS WEST 1983 STATE PLANE FEET)
DATE OF BORING

DWG REF(s) : N/A

A4 LEGEND

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY:	DATE:	SOLICITATION NO.:
JEF/KMM		
DWN BY:	CKD BY:	CONTRACT NO.:
LLH		
SUBMITTED BY:		
HLA	PLOT SCALE:	PLOT DATE:
AS SHOWN		
CERTIFIED:	FILE NAME:	PROJECT CODE:
ANSI D	EPS6 G-002xxx.dgn	EP56

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

LOCATION PLAN,
VICINITY MAP
AND LEGEND
PLATE 1

Sheet ID
G-002

INDEX

SHEET ID	SHEET REF. NO.	TITLE OF DRAWING
G-002	PLATE 01	LOCATION PLAN, VICINITY MAP AND LEGEND
G-003	PLATE 02	INDEX AND GENERAL NOTES
V-101	PLATE 03	SURVEY CONTROL DIAGRAM
B-101	PLATE 04	BORING LOCATIONS
B-301	PLATE 05	BORING LOGS
B-302	PLATE 06	BORING LOGS
B-303	PLATE 07	BORING LOGS
B-304	PLATE 08	BORING LOGS
B-305	PLATE 09	BORING LOGS
B-306	PLATE 10	BORING LOGS
C-101	PLATE 11	EXISTING CONDITIONS
C-102	PLATE 12	FEATURES EVALUATED
C-103	PLATE 13	FEATURES NOT EVALUATED
C-104	PLATE 14	RECOMMENDED PLAN
C-105	PLATE 15	SUNFISH LAKE
C-106	PLATE 16	KEHOUGH SLOUGH
C-107	PLATE 17	TIPPY LAKE
C-108	PLATE 18	STONE LAKE
C-109	PLATE 19	SUNFISH LAKE A PLAN AND PROFILE
C-110	PLATE 20	SUNFISH LAKE B PLAN AND PROFILE
C-111	PLATE 21	SUNFISH LAKE C PLAN AND PROFILE
C-112	PLATE 22	KEHOUGH SLOUGH A PLAN AND PROFILE
C-113	PLATE 23	KEHOUGH SLOUGH B PLAN AND PROFILE
C-114	PLATE 24	TIPPY LAKE A PLAN AND PROFILE
C-115	PLATE 25	TIPPY LAKE B PLAN AND PROFILE
C-116	PLATE 26	STONE LAKE A PLAN AND PROFILE
C-117	PLATE 27	STONE LAKE B PLAN AND PROFILE
C-118	PLATE 28	STONE LAKE C PLAN AND PROFILE
C-301	PLATE 29	TYPICAL SECTIONS
C-302	PLATE 30	TYPICAL SECTIONS
C-303	PLATE 31	TYPICAL SECTIONS
L-101	PLATE 32	REFORESTATION PLAN
L-501	PLATE 33	TREE PLANTING DETAILS
O-101	PLATE 34	MONITORING PLAN
O-102	PLATE 35	MONITORING PLAN
O-103	PLATE 36	MONITORING PLAN

GENERAL NOTES

1. THE PROJECT AREA IS LOCATED IN JO DAVIESS COUNTY, ILLINOIS UPSTREAM OF BELLEVUE, IOWA IN POOL 12, BETWEEN UPPER MISSISSIPPI RIVERMILES 563 AND 573.

2. ALL PROJECT LANDS ARE IN FEDERAL OWNERSHIP AND ARE MANAGED BY THE U.S. FISH AND WILDLIFE SERVICE AS PART OF THE UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE.

3. THE ENTIRE SITE IS SUSCEPTIBLE TO FLOODING.

4. FEATURES REPRESENTED ON THESE PLATES ARE CONCEPTUAL AND WILL BE OPTIMIZED DURING THE PLANS AND SPECIFICATIONS PHASE.

5. SURVEY INFORMATION:
   a. SURVEY DATUM IS IL WEST, NAD 83, SURVEY FOOT.
   b. VERTICAL DATUM IS FEET MSL 1912.
   c. SURVEY DATA IS LIMITED ON THE FEATURES EVALUATED.
   d. COMPLETE SURVEY WILL BE OBTAINED DURING PLANS AND SPECIFICATIONS STAGE.

6. FLAT POOL IS 592.0 FEET AT THE LOCK AND DAM 12 GAGE LOCATED AT RIVER MILE 556.7. FLOOD STAGE IS AT 597.2 FT MSL 1912. RECORD HIGH STAGE WAS OBSERVED ON 4/26/1965 AT 603.71 FT MSL 1912.

7. ORTHO PHOTOGRAPHY FLOWN 2011.

DWG REF(s) : N/A

A1 INDEX

US Army Corps of Engineers®

MARK | DESCRIPTION | DATE | APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

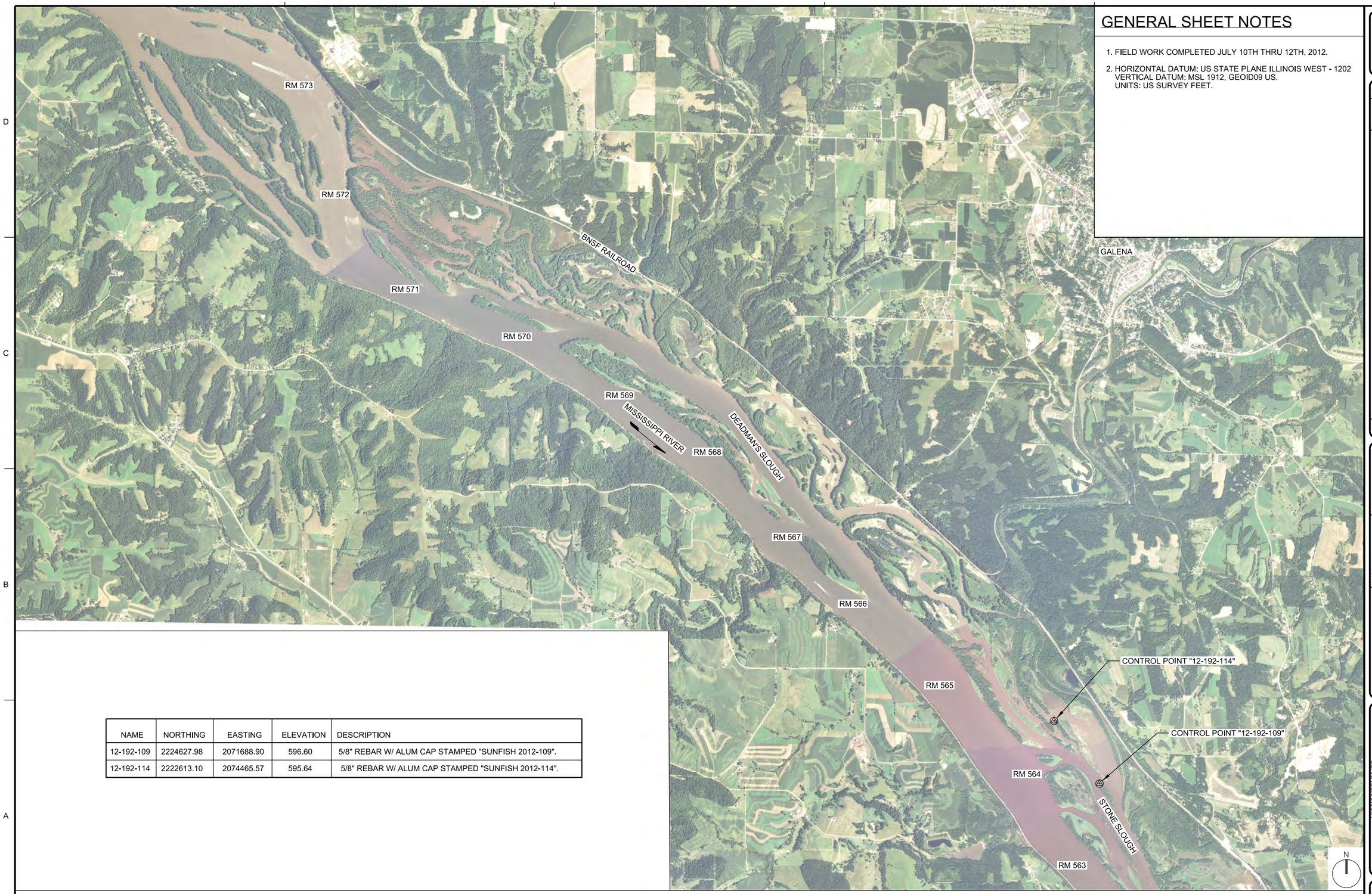
DESIGNED BY: JEFKNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
PLOT SCALE:
PLOT DATE:
N.T.S.
SIZE: ANSI D
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
FILE NAME: EP56_G-003xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
INDEX AND
GENERAL NOTES
PLATE 2

Sheet ID
G-003

GENERAL SHEET NOTES

1. FIELD WORK COMPLETED JULY 10TH THRU 12TH, 2012.
2. HORIZONTAL DATUM: US STATE PLANE ILLINOIS WEST - 1202
   VERTICAL DATUM: MSL 1912, GEOID09 US.
   UNITS: US SURVEY FEET.



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12-192-114	2222613.10	2074465.57	595.64	5/8" REBAR W/ ALUM CAP STAMPED "SUNFISH 2012-114".

A1 SURVEY CONTROL DIAGRAM

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

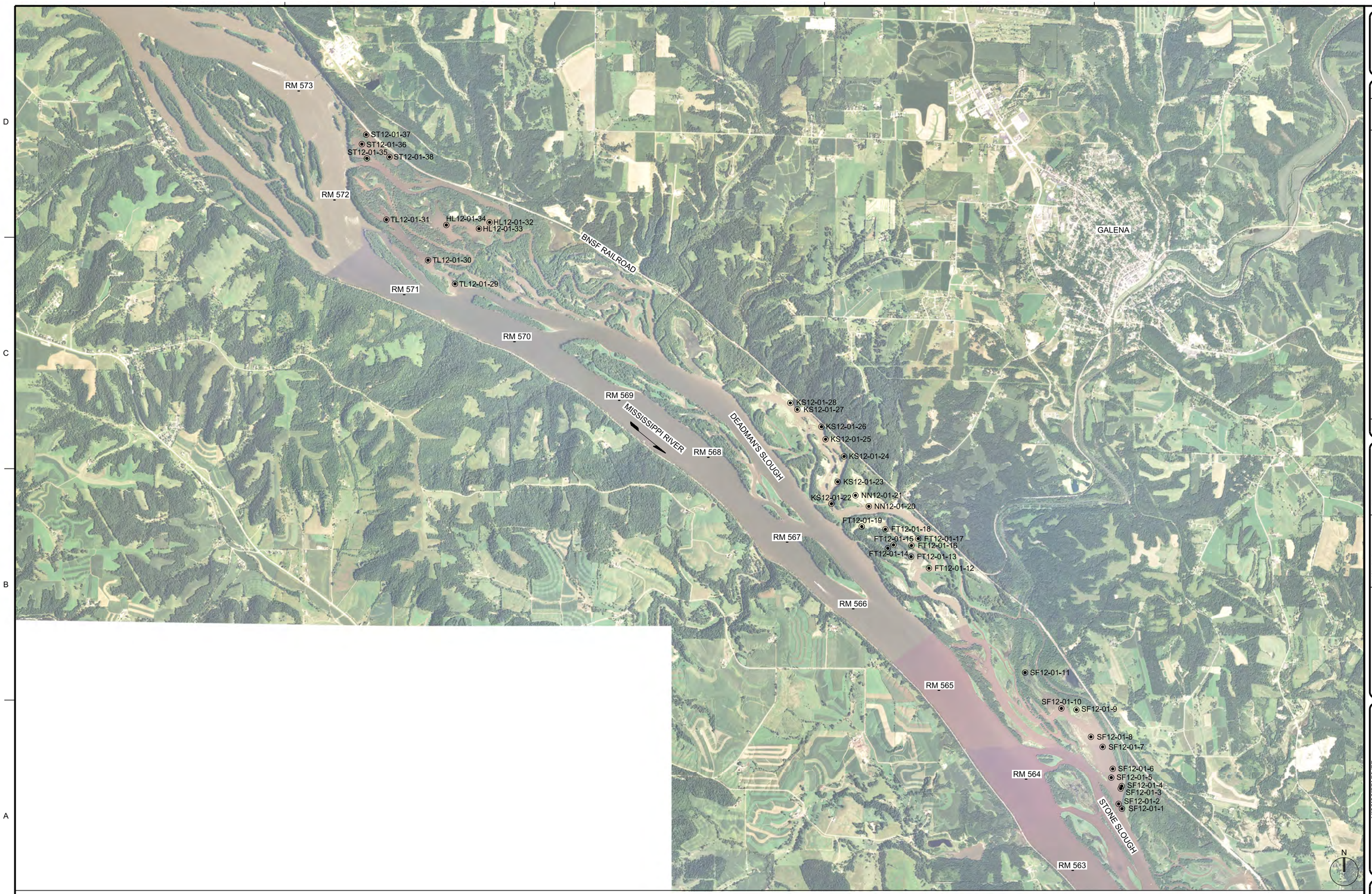
MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLFINKM
DRWN BY: LLH
SUBMITTED BY: HLA
DATE:
CKD BY:
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
FILE NAME: EP56_V-101xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
SURVEY CONTROL DIAGRAM
PLATE 3

Sheet ID
V-101



A1 BORING LOCATIONS

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

MARK	DATE	DESCRIPTION	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

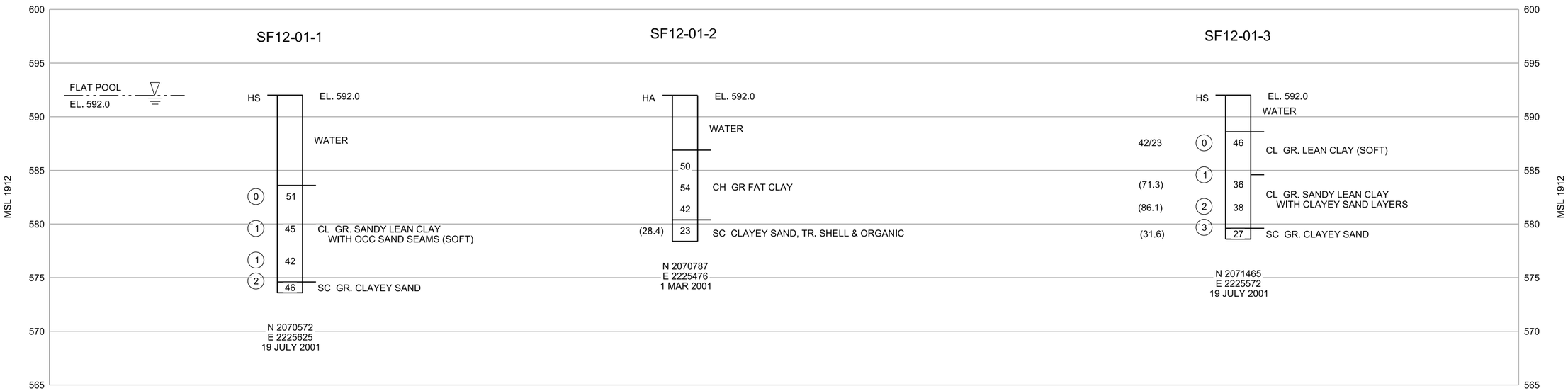
DESIGNED BY: | DATE:
DWN BY: | CKD BY: | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
PLOT SCALE: 1 | PLOT DATE: | PROJECT CODE: EP56
ASSOCIATION: ANSI D | FILE NAME: EP56_B-101xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

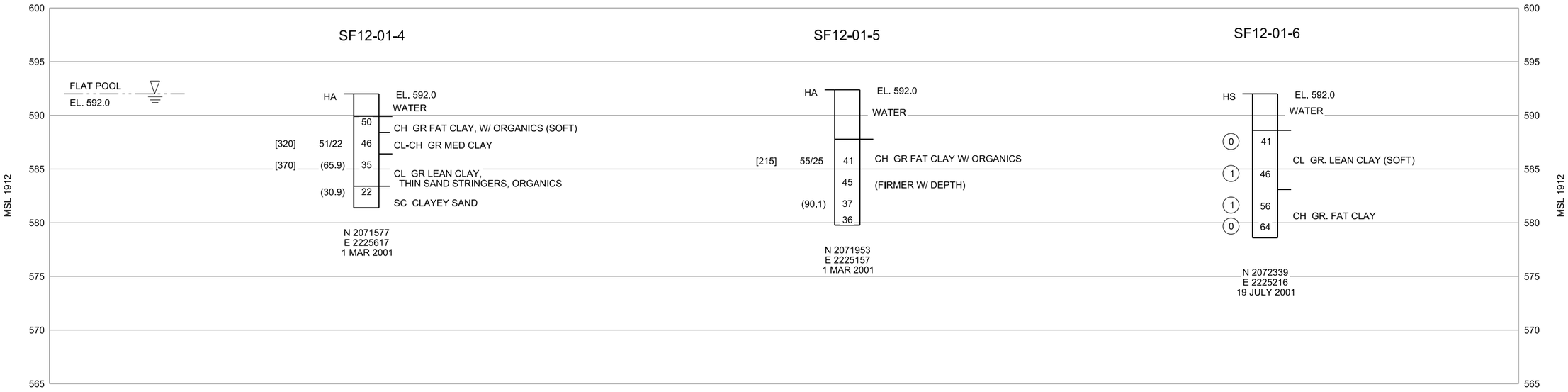
BORING LOCATIONS

PLATE 4

Sheet ID
B-101



STATE PLANE NAD 1983 ILLINOIS WEST U.S. SURVEY FEET



A1 BORING LOGS
SCALE : 1"=5'-0" 0 5' 10'

US Army Corps of Engineers®

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DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
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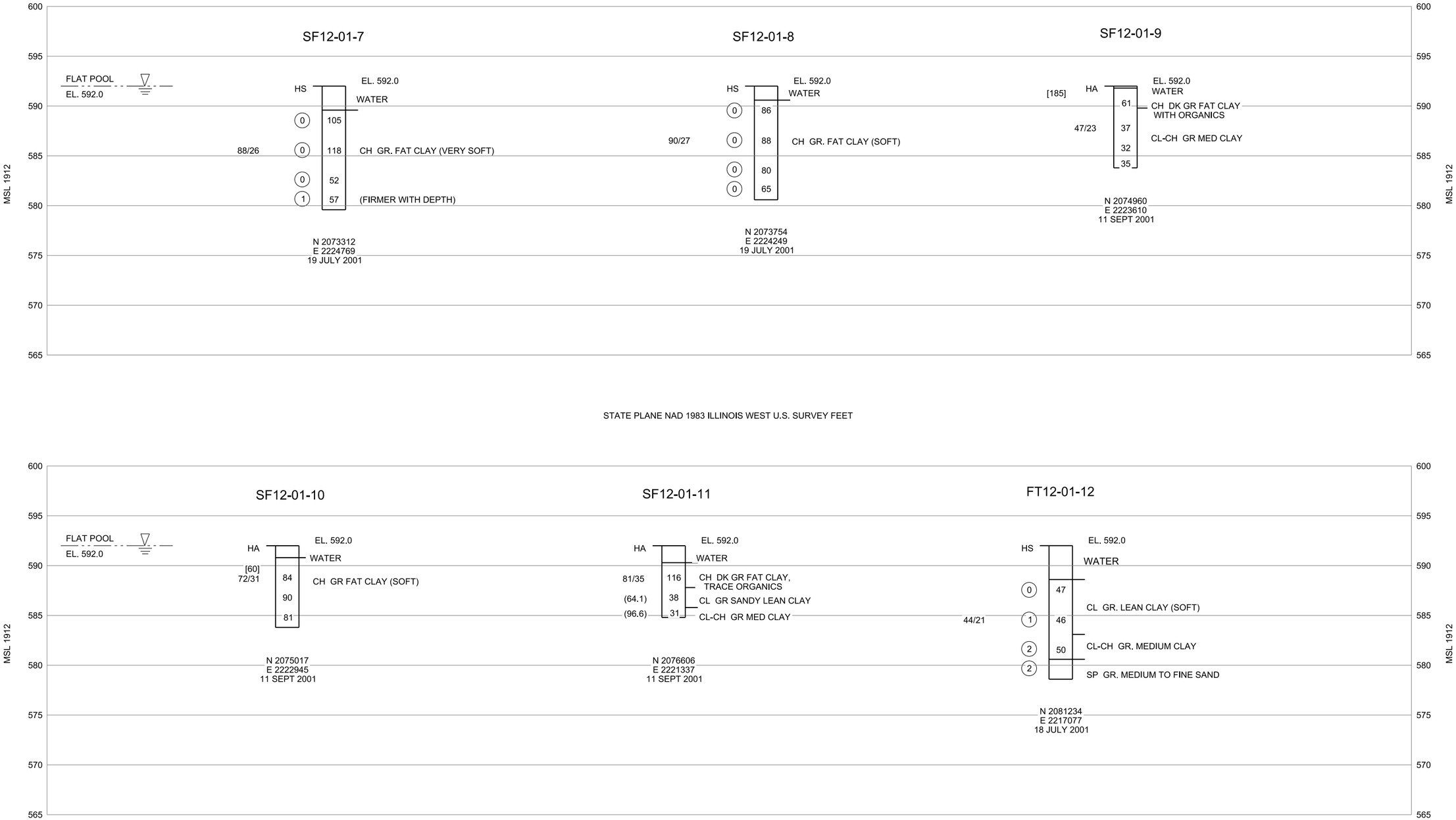
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS
PLATE 5

Sheet ID
B-301



A1 BORING LOGS
SCALE : 1"=5'-0"
0 5' 10'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

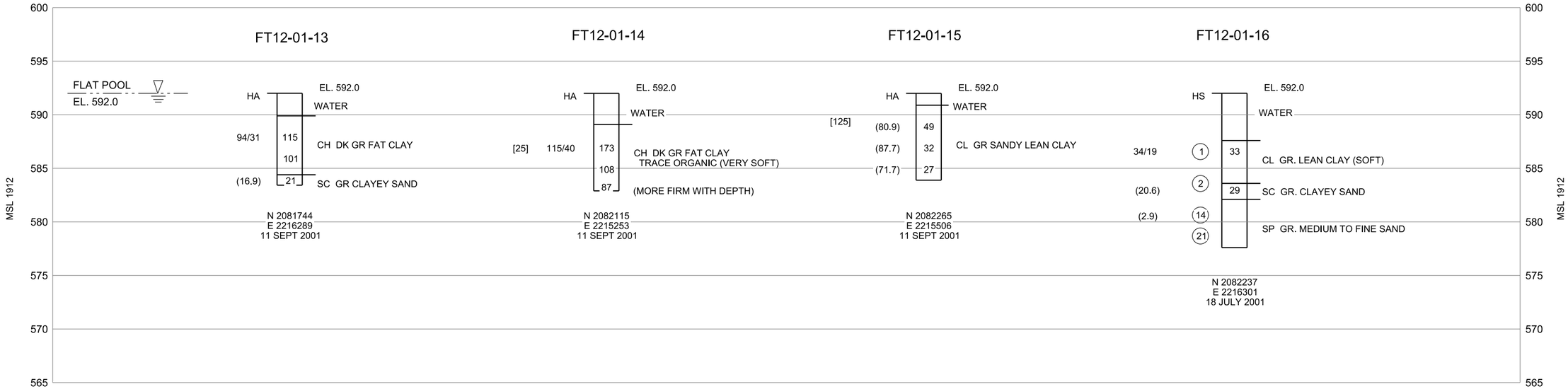
DESIGNED BY:
DWN BY:
SUBMITTED BY:
CKD BY:
APPROVED:
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PLOT SCALE: 1.0000
PLOT DATE:
SIZE: ANSI D
PROJECT CODE: EP56
FILE NAME: EP56_B-302xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS

PLATE 6

Sheet ID
B-302



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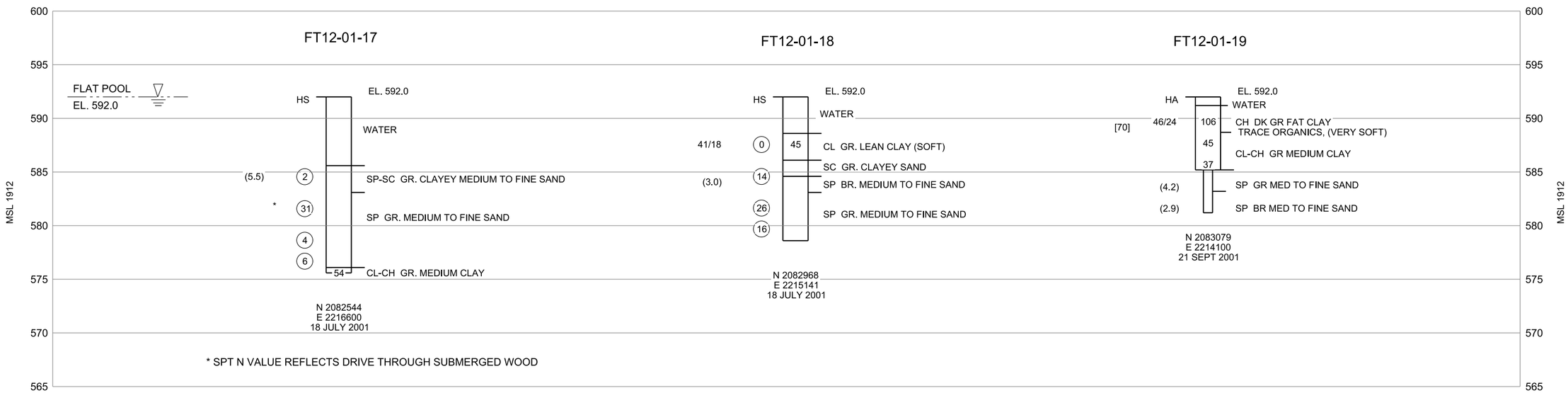


* SPT N VALUE REFLECTS DRIVE THROUGH SUBMERGED WOOD

A1 BORING LOGS

SCALE : 1"=5'-0"

0 5' 10'

US Army Corps of Engineers®

APPR.	DATE	DESCRIPTION	MARK

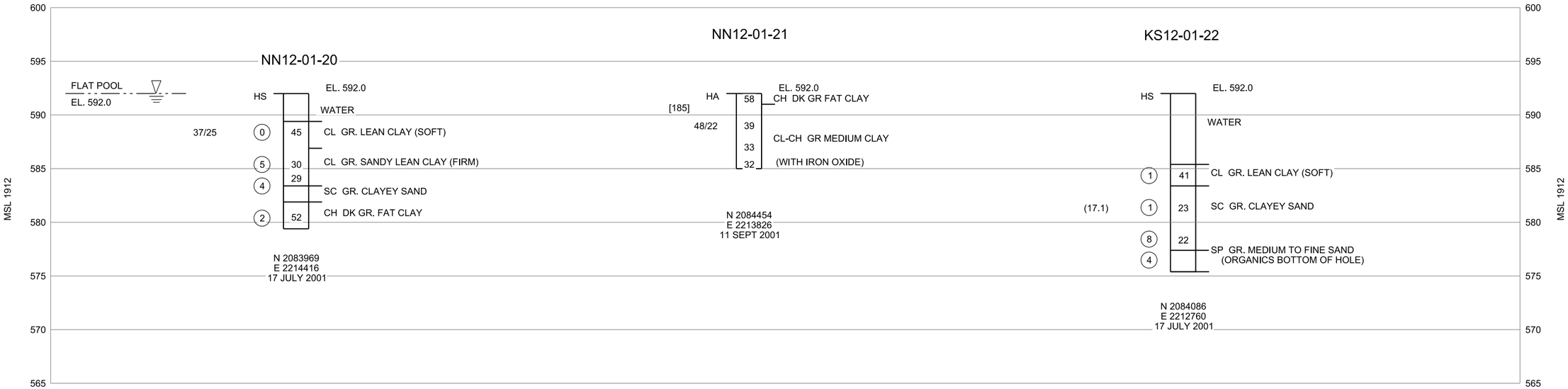
DESIGNED BY: DATE:
DWN BY: CKD BY: SOLICITATION NO.:
SUBMITTED BY: CONTRACT NO.:
PLOT SCALE: PLOT DATE: PROJECT CODE: EP56
AS SHOWN
SIZE: ANSI D
FILE NAME: EP56_B-303xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS

PLATE 7

Sheet ID
B-303



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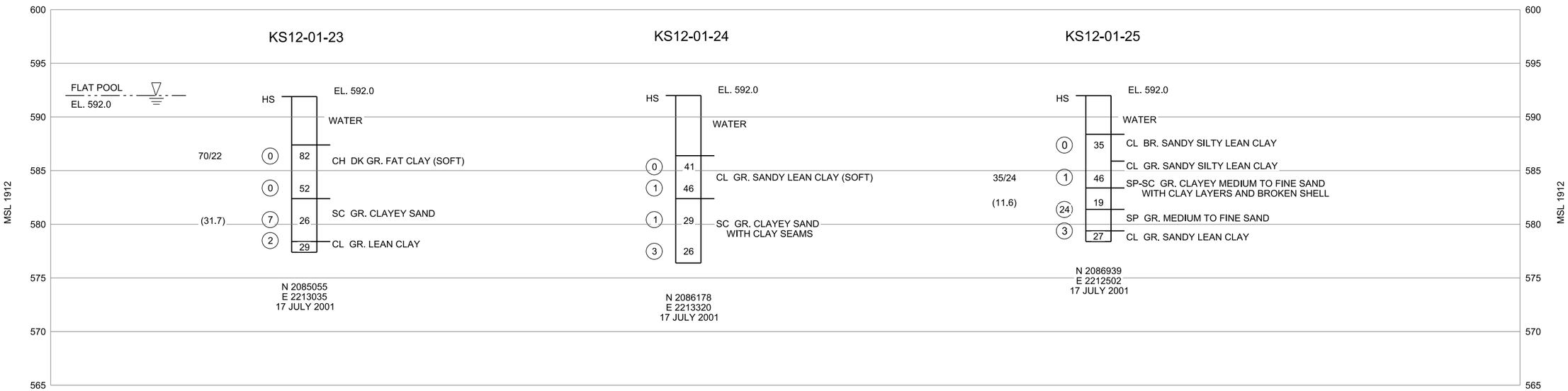

A1 BORING LOGS

SCALE : 1"=5'-0" 0 5' 10'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
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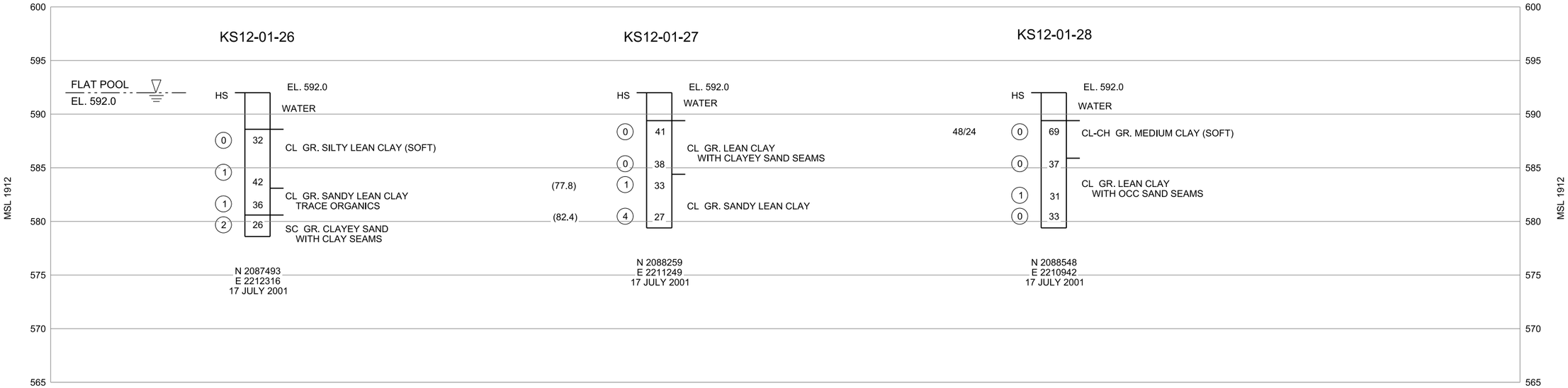
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS

PLATE 8

Sheet ID
B-304



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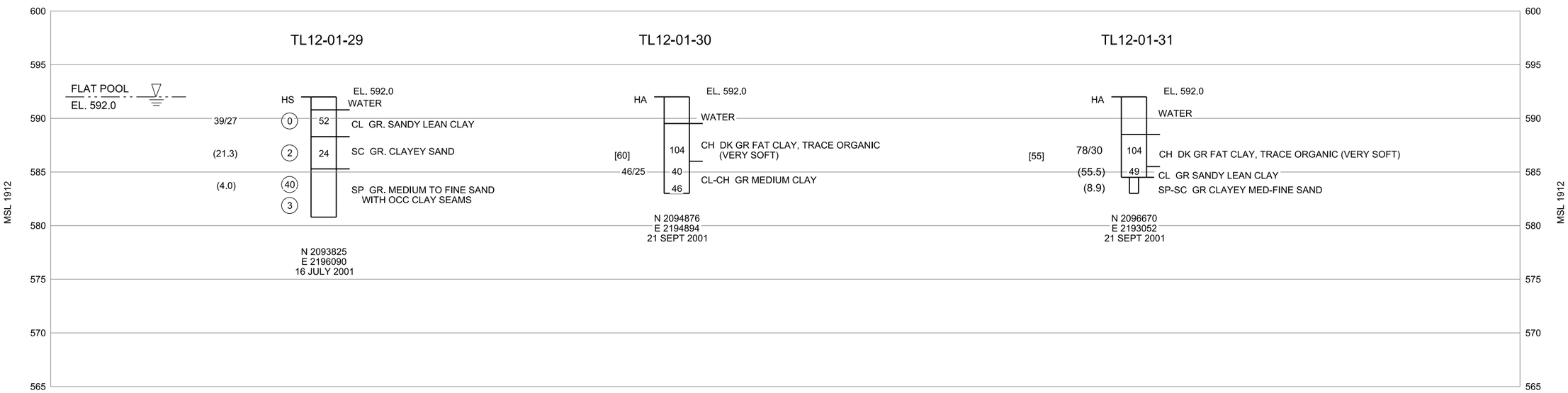


A1 BORING LOGS
SCALE : 1"=5'-0" 0 5' 10'

US Army Corps of Engineers®

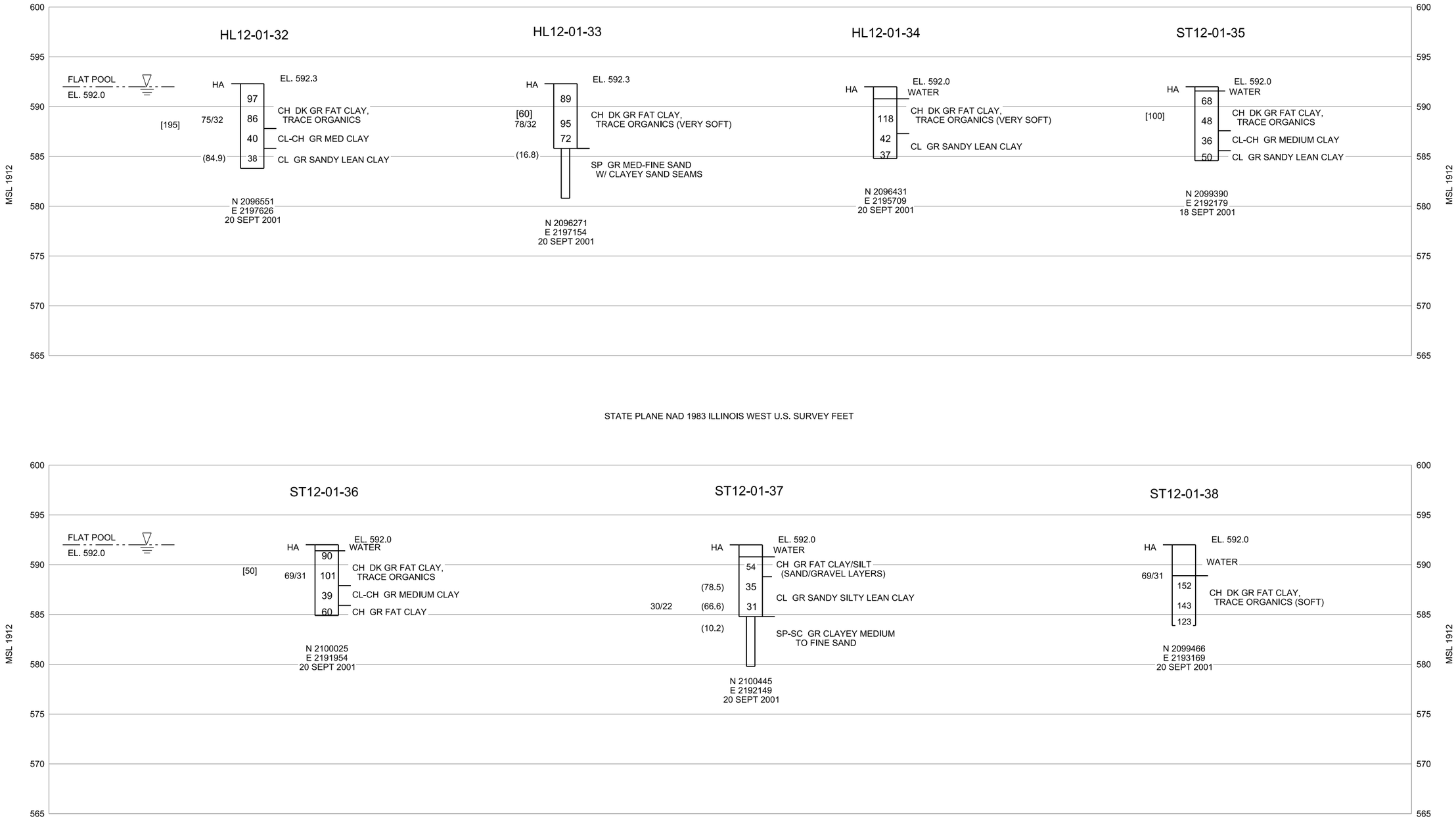
MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
FILE NAME: EP56_B-305xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS
PLATE 9

Sheet ID
B-305



A1 BORING LOGS
SCALE : 1"=5'-0"
0 5' 10'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

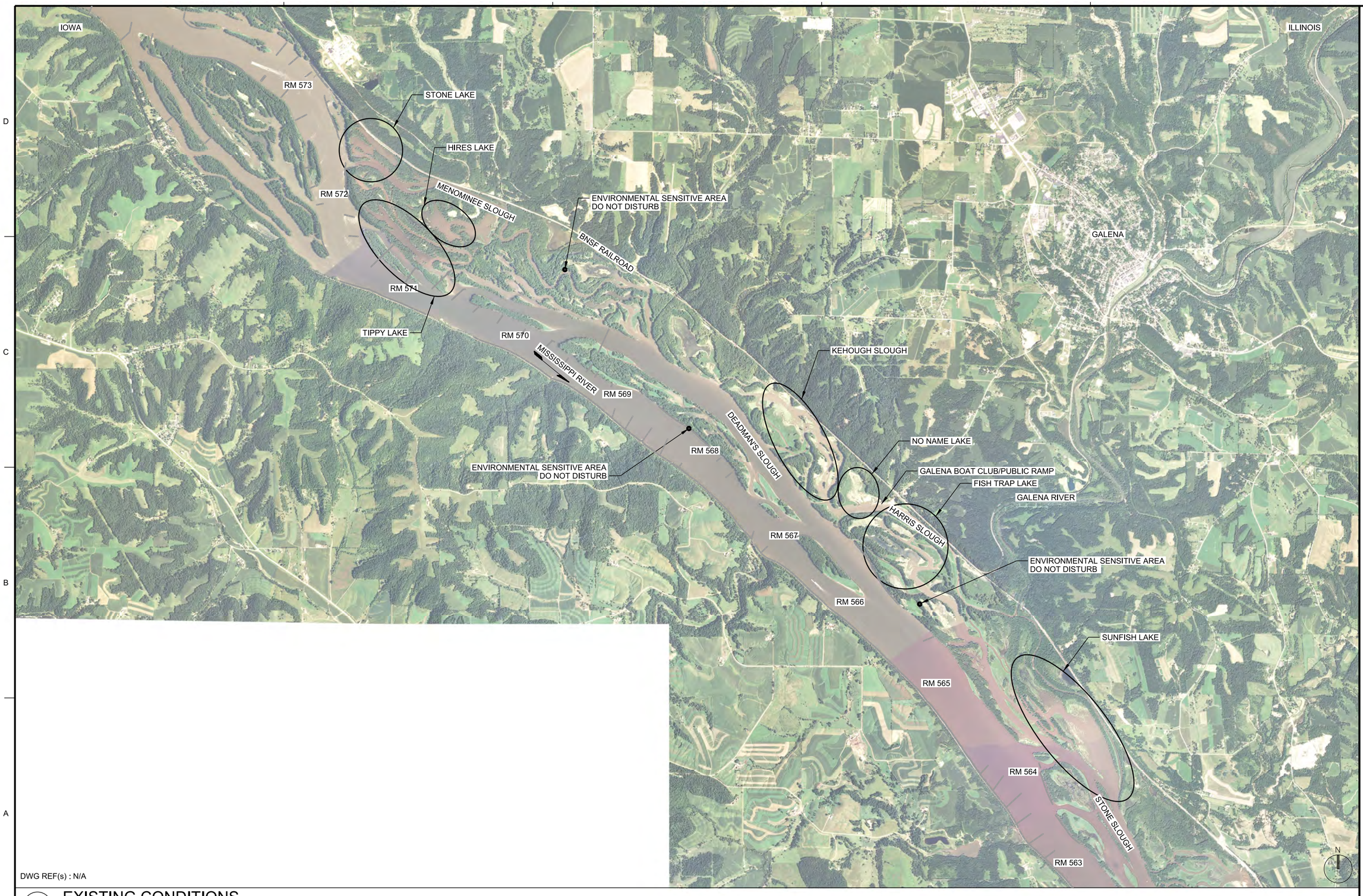
DESIGNED BY:
DWN BY:
CKD BY:
SUBMITTED BY:
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
FILE NAME: EP56_B-306xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
BORING LOGS

PLATE 10

Sheet ID
B-306



DWG REF(s) : N/A

A1 EXISTING CONDITIONS

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

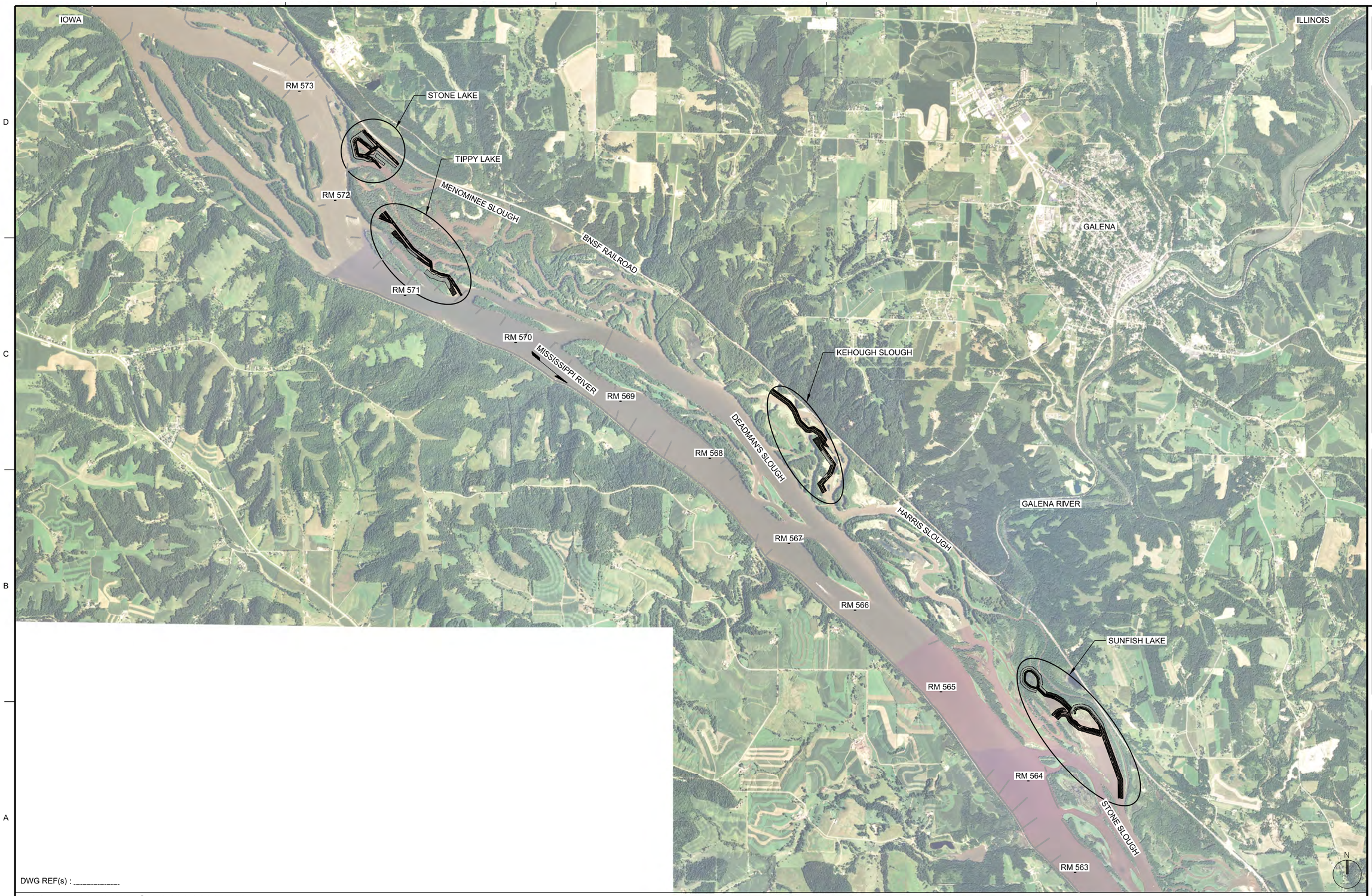
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM
DWN BY: LLH
SUBMITTED BY: HLA
CKD BY:
PLOT SCALE: 1:2000
SUBMITTED: ANSI D
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT DATE:
FILE NAME: EP56_C-101xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
EXISTING CONDITIONS

PLATE 11

Sheet ID
C-101



DWG REF(s) : _____

A1 FEATURES EVALUATED

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLFINKM
DRN BY: LLH
SUBMITTED BY: HLA
PLOT SCALE: AS SHOWN
SIZE: ANSI D
DATE:
CKD BY:
PLOT DATE:
FILE NAME: EPS6_C-102xx.dgn
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
FEATURES EVALUATED
PLATE 12

Sheet ID
C-102

IOWA

ILLINOIS

RM 573

UPLAND PLACEMENT SITES

HIRES LAKE

RM 572

MENOMINEE SLOUGH

BNSF RAILROAD

HYDRAULIC CONTAINMENT SITE

RM 571

GALENA

RM 570

MISSISSIPPI RIVER

RM 569

DEADMAN'S SLOUGH

RM 568

HYDRAULIC CONTAINMENT SITE

NO NAME LAKE

FISH TRAP LAKE

GALENA RIVER

HARRIS SLOUGH

RM 567

HYDRAULIC CONTAINMENT SITE

RM 566

RM 565

STONE SLOUGH

RM 564

RM 563

N

DWG REF(s) : _____

A1 FEATURES NOT EVALUATED

SCALE : 1"=2000'-0" 0 2000' 4000'

GENERAL SHEET NOTES

1. FEATURES CONSIDERED BUT ELIMINATED FROM FURTHER EVALUATION INCLUDE:
   A. UPLAND PLACEMENT OF DREDGED MATERIAL
   B. HYDRAULIC CONTAINMENT WITHIN THE FLOODPLAIN

US Army Corps of Engineers®

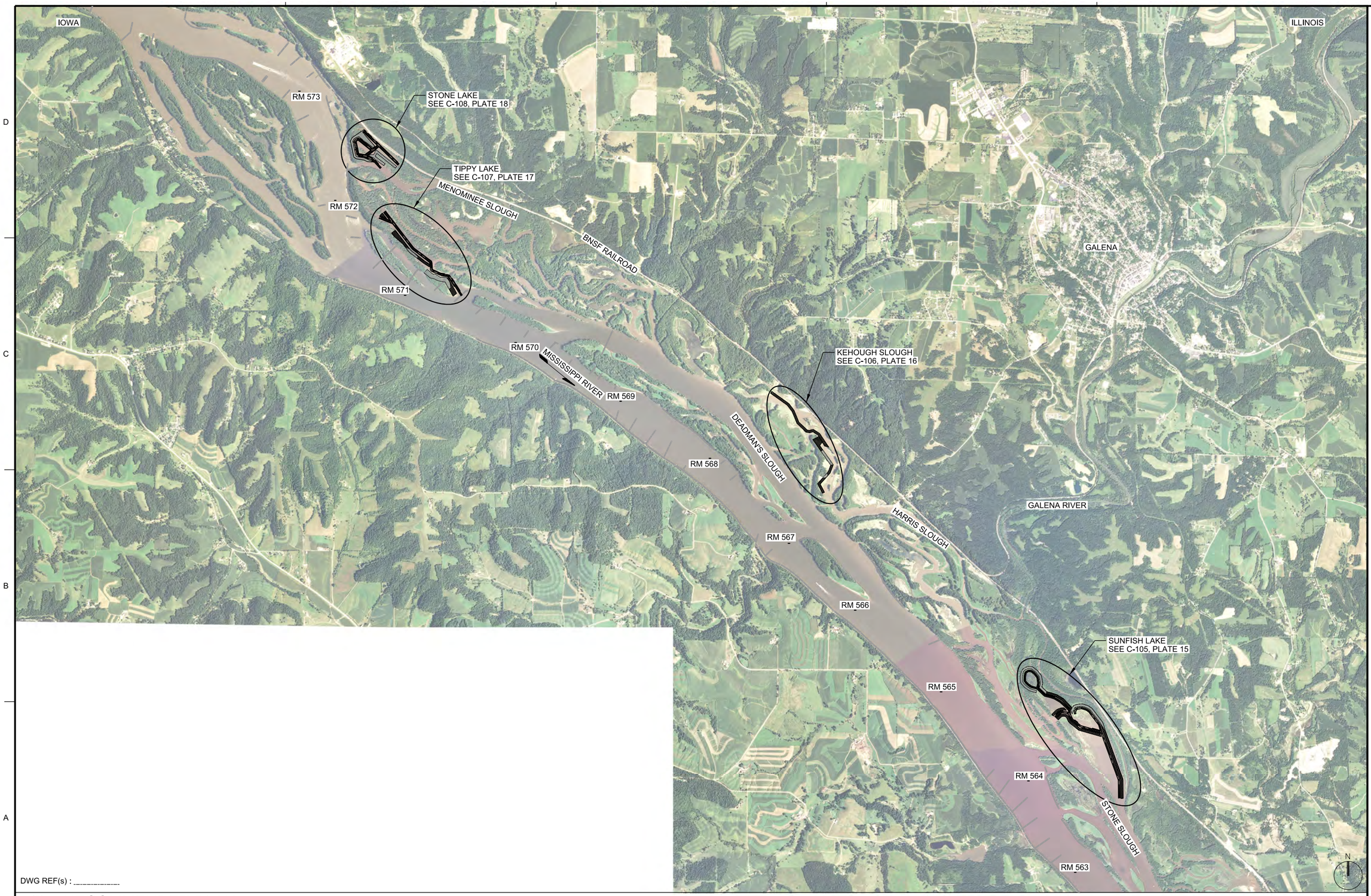
MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM
DWN BY: LLH
SUBMITTED BY: HLA
PLOT SCALE: 1:1
SUBMITTED: ANSI D
DATE:
CKD BY:
PLOT DATE:
FILE NAME: EPS8_C-103xxx.dgn
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
FEATURES NOT EVALUATED
PLATE 13

Sheet ID
C-103



DWG REF(s) : _____

A1 RECOMMENDED PLAN

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

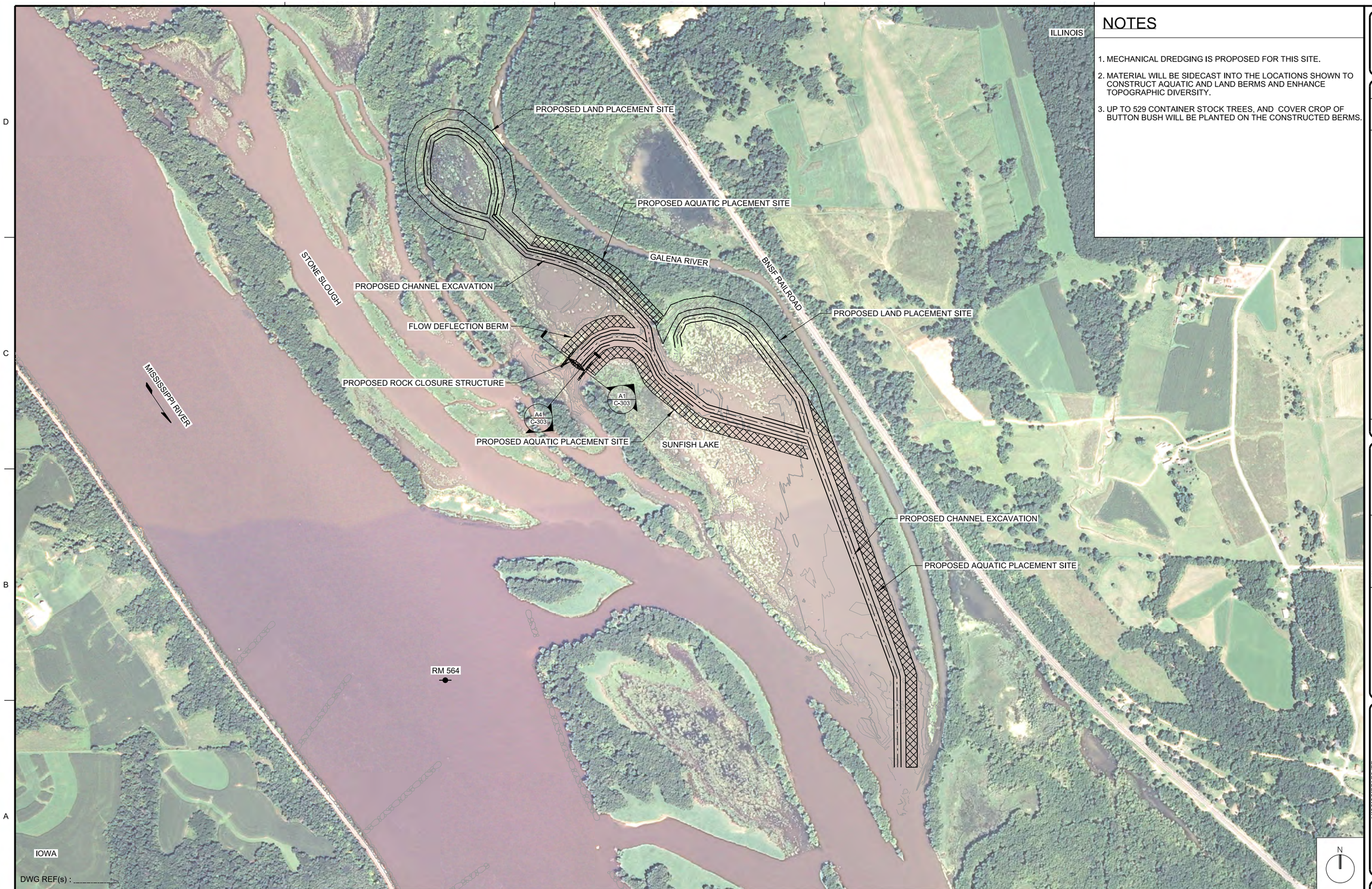
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM		DATE:	
DWN BY: LLH	CKD BY:	SOLICITATION NO.:	
SUBMITTED BY: HLA		CONTRACT NO.:	
PLOT SCALE: AS SHOWN	PLOT DATE:	PROJECT CODE: EP56	
SIZE: ANSI D	FILE NAME: EP56_C-104xx.dgn		

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
RECOMMENDED PLAN

PLATE 14

Sheet ID
C-104



DWG REF(s) : _____

NOTES

1. MECHANICAL DREDGING IS PROPOSED FOR THIS SITE.
2. MATERIAL WILL BE SIDECAST INTO THE LOCATIONS SHOWN TO CONSTRUCT AQUATIC AND LAND BERMS AND ENHANCE TOPOGRAPHIC DIVERSITY.
3. UP TO 529 CONTAINER STOCK TREES, AND COVER CROP OF BUTTON BUSH WILL BE PLANTED ON THE CONSTRUCTED BERMS.

A1 SUNFISH LAKE

SCALE : 1"=400'-0" 0 400' 800'

US Army Corps of Engineers®

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U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KMM		DATE:	
DWN BY: LLH	CKD BY:	SOLICITATION NO.:	
SUBMITTED BY: HLA		CONTRACT NO.:	
PLOT SCALE: 1.0000 PLOT/INCH	PLOT DATE:	PROJECT CODE: EP58	
ARCHIVED IN: ANSI D	FILE NAME: EP58_C-105xxx.dgn		

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
SUNFISH LAKE

PLATE 15

Sheet ID
C-105

NOTES

1. MECHANICAL DREDGING IS PROPOSED FOR THIS SITE.
2. MATERIAL WILL BE SIDECAST INTO THE LOCATIONS SHOWN TO CONSTRUCT AQUATIC AND LAND BERMS AND ENHANCE TOPOGRAPHIC DIVERSITY.
3. UP TO 215 CONTAINER STOCK TREES AND A COVER CROP OF BUTTON BUSH WILL BE PLANTED ON THE CONSTRUCTED BERMS.
4. BACKFILL DREDGED CHANNEL FROM PREVIOUS SIDE CASTED MATERIAL TO MAKE SURE THE MAIN CHANNEL DOES NOT MOVE.

ILLINOIS

A4 C-303

A1 C-303

ROCK CLOSURE STRUCTURE

PROPOSED CHANNEL EXCAVATION

PROPOSED AQUATIC PLACEMENT SITE

BNSF RAILROAD

BACKFILL CHANNEL

PROPOSED AQUATIC PLACEMENT SITE

KEHOUGH SLOUGH

DEADMAN'S SLOUGH

RM 568

PROPOSED LAND PLACEMENT SITE

595'

PROPOSED LAND PLACEMENT AREA

PROPOSED ACCESS EXCAVATION

NO NAME LAKE

GALENA BOAT CLUB/PUBLIC RAMP

APPROXIMATE EXISTING OVERHEAD POWER LINE

MISSISSIPPI RIVER

HARRIS SLOUGH

PROPOSED ACCESS EXCAVATION

FISH TRAP LAKE

IOWA

N

DWG REF(s) : _____

A1 KEHOUGH SLOUGH

SCALE : 1"=400'-0" 0 400' 800'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLFINKM
DRWN BY: LLH
SUBMITTED BY: HLA
PLOT SCALE: AS SHOWN
SIZE: ANSI D
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT DATE:
FILE NAME: EP56_C-106xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
KEHOUGH SLOUGH

PLATE 16

Sheet ID
C-106

NOTES

1. MECHANICAL DREDGING IS PROPOSED FOR THIS SITE.
2. MATERIAL WILL BE SIDECAST INTO THE LOCATIONS SHOWN TO CONSTRUCT AQUATIC AND LAND BERMS AND ENHANCE TOPOGRAPHIC DIVERSITY.
3. UP TO 450 CONTAINER STOCK TREES AND A COVER CROP OF BUTTON BUSH WILL BE PLANTED ON THE CONSTRUCTED BERMS.
4. THE CHANNEL WILL BE CONSTRUCTED THROUGH THE TWO EXISTING WINGDAMS SHOWN. THE ROCK REMOVED WILL BE PLACED ALONG THE BANKLINE.
5. EXCESS MATERIAL WILL BE PLACED AT THE ENTRANCE LAND PLACEMENT SITE. SOME DOUBLE HANDLING MAY BE REQUIRED.

DWG REF(s) : _____

A1 TIPPY LAKE

SCALE : 1"=200'-0" 0 200' 400'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: JLF/KNM	DATE:		
DWN BY: LLH	CKD BY:	SOLICITATION NO.:	
SUBMITTED BY: HLA		CONTRACT NO.:	
PLOT SCALE: ASSIGNED	PLOT DATE:	PROJECT CODE: EP56	
SIZE: ANSI D	FILE NAME: EP56_C-107xxx.dgn		

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
TIPPY LAKE

PLATE 17

Sheet ID C-107

NOTES

1. MECHANICAL DREDGING IS PROPOSED FOR THIS SITE.
2. MATERIAL WILL BE SIDECAST INTO THE LOCATIONS SHOWN TO CONSTRUCT LAND BERMS AND ENHANCE TOPOGRAPHIC DIVERSITY.
3. UP TO 650 CONTAINER STOCK TREES AND A COVER CROP OF BUTTON BUSH WILL BE PLANTED ON THE CONSTRUCTED BERMS.
4. A ROCK DEFLECTION STRUCTURE WILL BE CONSTRUCTED AT THE EXISTING WINGDAM.
5. IF ACCESS DREDGING TO STONE LAKE IS REQUIRED FOR EQUIPMENT, THE ADJACENT PLACEMENT AREA WILL BE USED FOR EXCAVATED MATERIALS.

DWG REF(s) : _____

A1 STONE LAKE

SCALE : 1"=200'-0" 0 200' 400'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

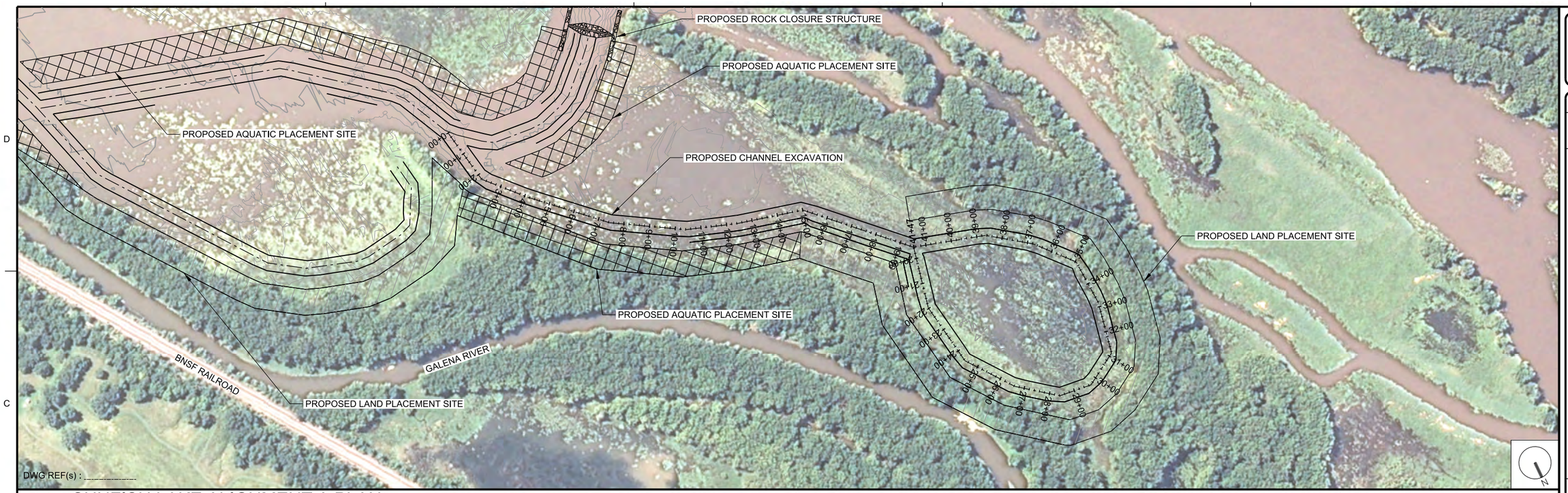
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM		DATE:	
DWN BY: LLH	CKD BY:	SOLICITATION NO.:	
SUBMITTED BY: HLA		CONTRACT NO.:	
PLOT SCALE: AS SHOWN	PLOT DATE:	PROJECT CODE: EP56	
SIZE: ANSI D	FILE NAME: EP56_C-108xxx.dgn		

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
STONE LAKE

PLATE 18

Sheet ID
C-108

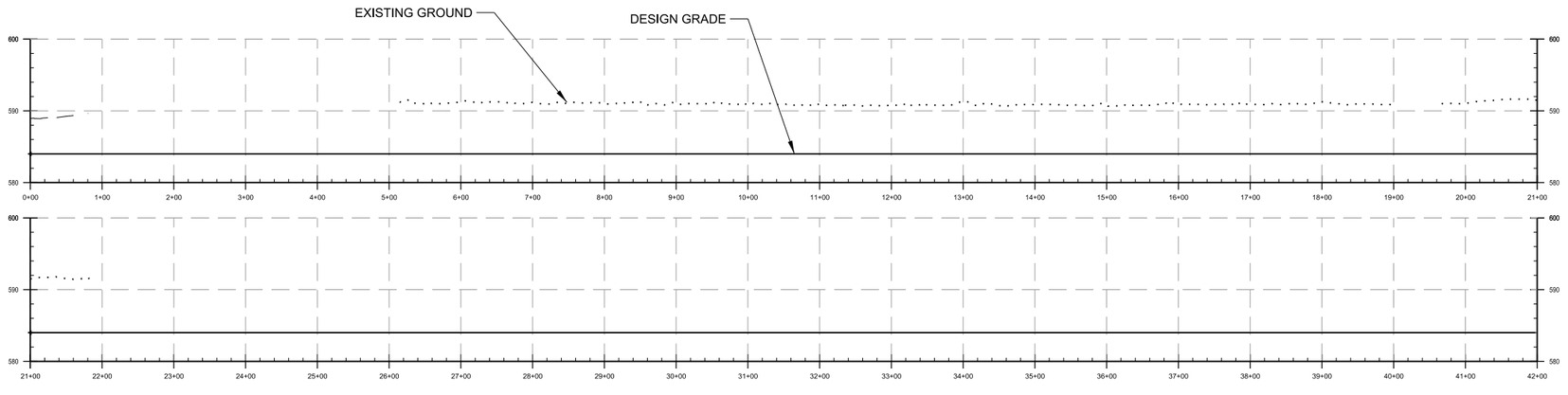


DWG REF(s) : _____

C1 SUNFISH LAKE ALIGNMENT A PLAN

SCALE : 1"=200'-0"

0 200' 400'



DWG REF(s) : _____

A1 SUNFISH LAKE ALIGNMENT A PROFILE

SCALE : 1"=100'-0"

0 100' 200'

US Army Corps of Engineers®

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U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

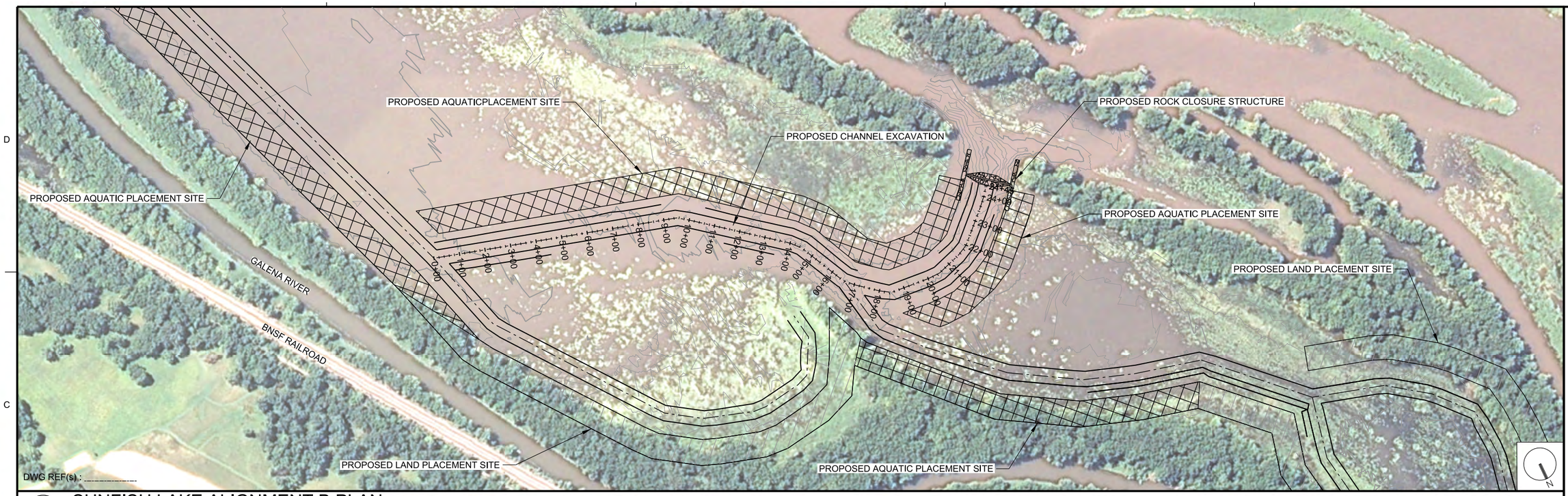
DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PLOT SCALE: AS SHOWN
PLOT DATE:
PROJECT CODE: EP58
SIZE: ANSI D
FILE NAME: EP58_C-109xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

SUNFISH LAKE A
PLAN AND PROFILE

PLATE 19

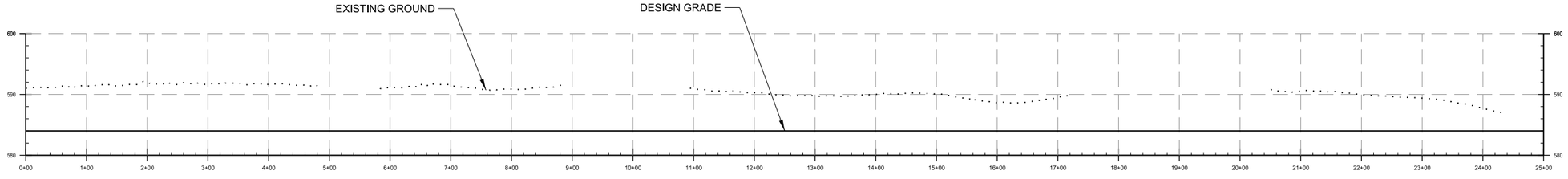
Sheet ID
C-109



DWG REF(s) : _____

C1 SUNFISH LAKE ALIGNMENT B PLAN

SCALE : 1"=200'-0" 0 200' 400'



DWG REF(s) : _____

A1 SUNFISH LAKE ALIGNMENT B PROFILE

SCALE : 1"=100'-0" 0 100' 200'

US Army Corps of Engineers®

MARK	DATE	DESCRIPTION	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

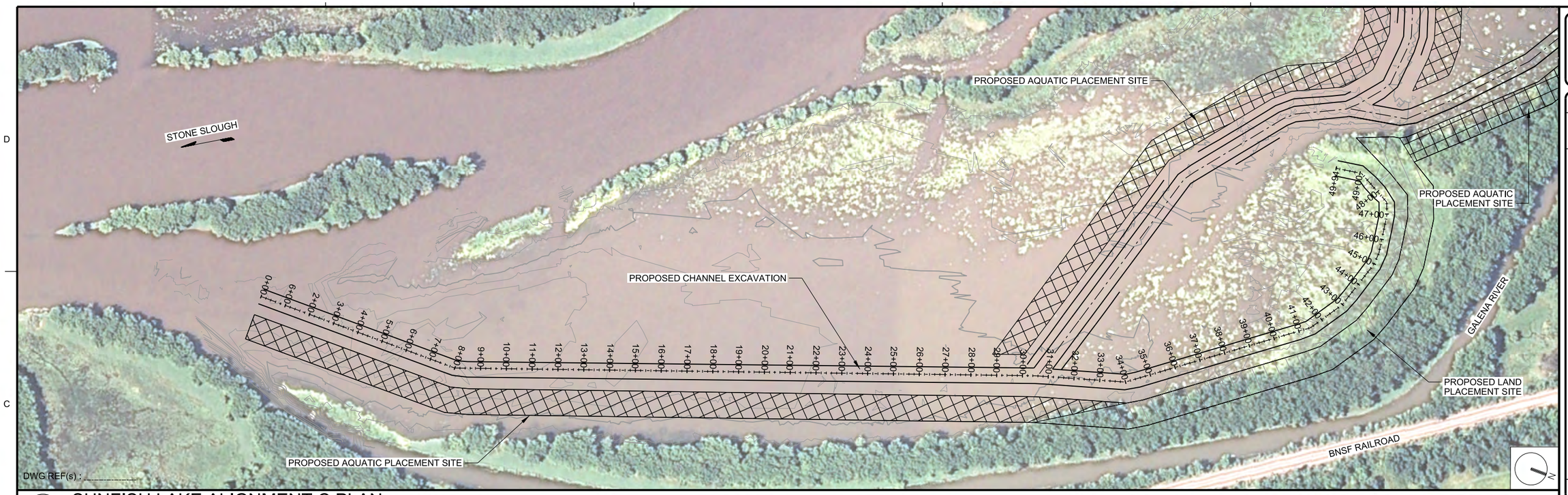
DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
FILE NAME: EP56_C-110xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

SUNFISH LAKE B
PLAN AND PROFILE

PLATE 20

Sheet ID
C-110

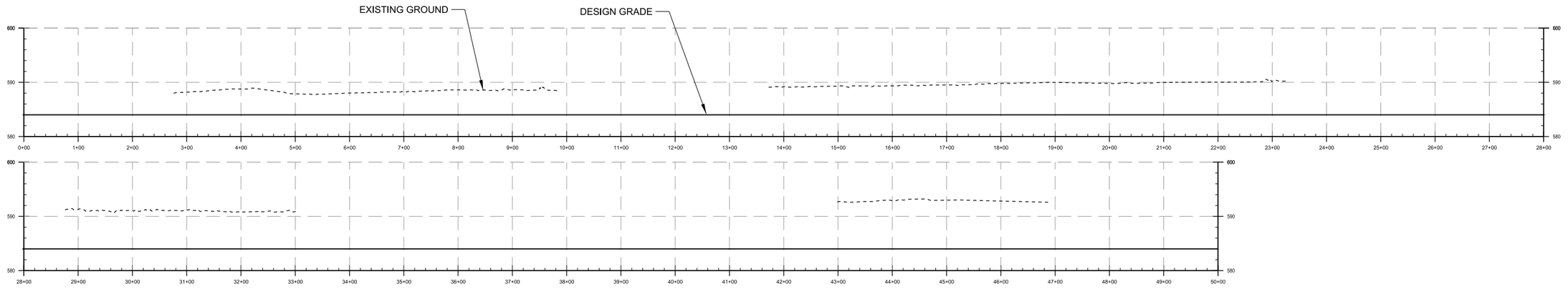


DWG REF(s) : _____

C1 SUNFISH LAKE ALIGNMENT C PLAN

SCALE : 1"=200'-0"

0 200' 400'



DWG REF(s) : _____

A1 SUNFISH LAKE ALIGNMENT C PROFILE

SCALE : 1"=100'-0"

0 100' 200'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

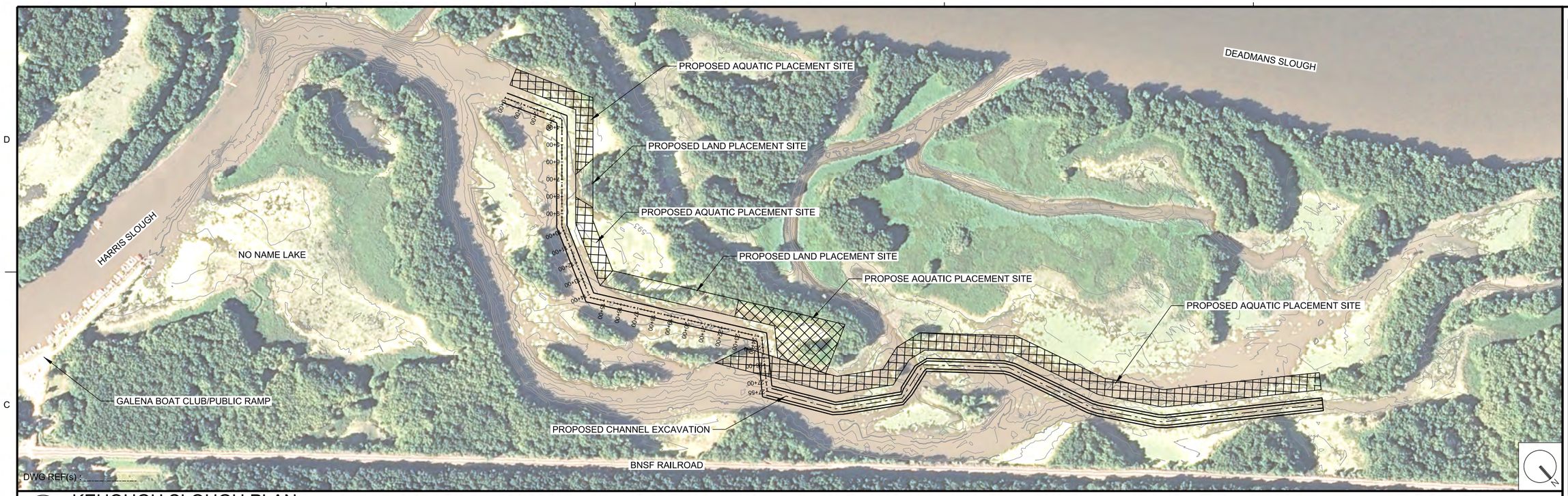
DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PLOT SCALE: AS SHOWN
PLOT DATE:
PROJECT CODE: EP58
SIZE: ANSI D
FILE NAME: EP58_C-111xx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

SUNFISH LAKE C
PLAN AND PROFILE

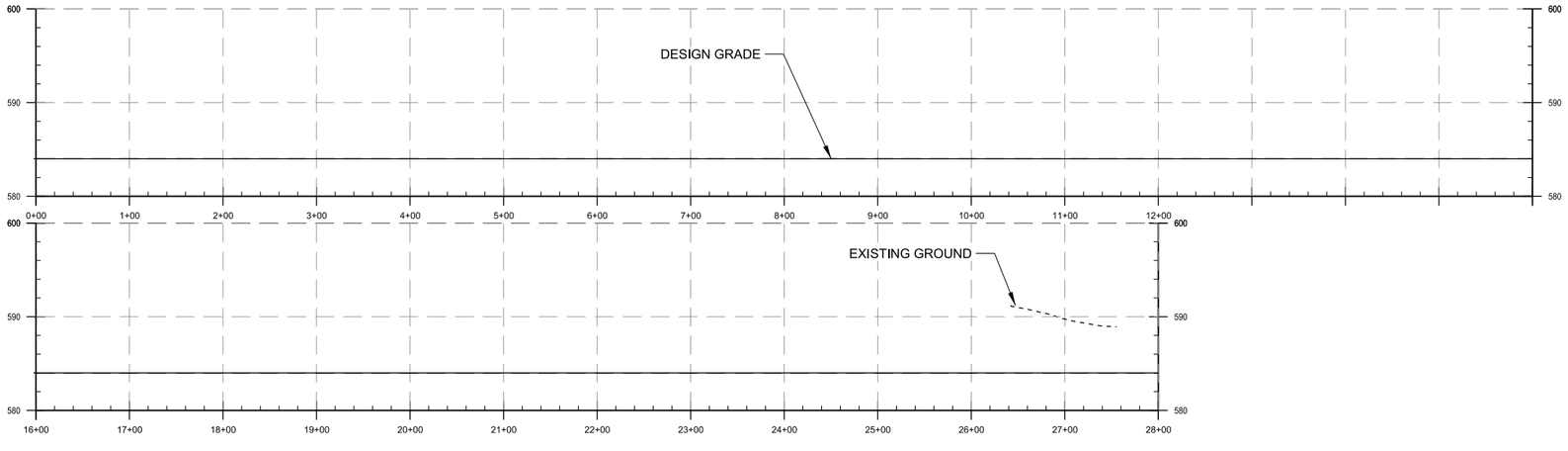
PLATE 21

Sheet ID
C-111



C1 KEHOUGH SLOUGH PLAN

SCALE : 1"=300'-0" 0 300' 600'



DWG REF(s) :

A1 KEHOUGH SLOUGH PROFILE

SCALE : 1"=80'-0" 0 80' 160'

US Army Corps of Engineers®

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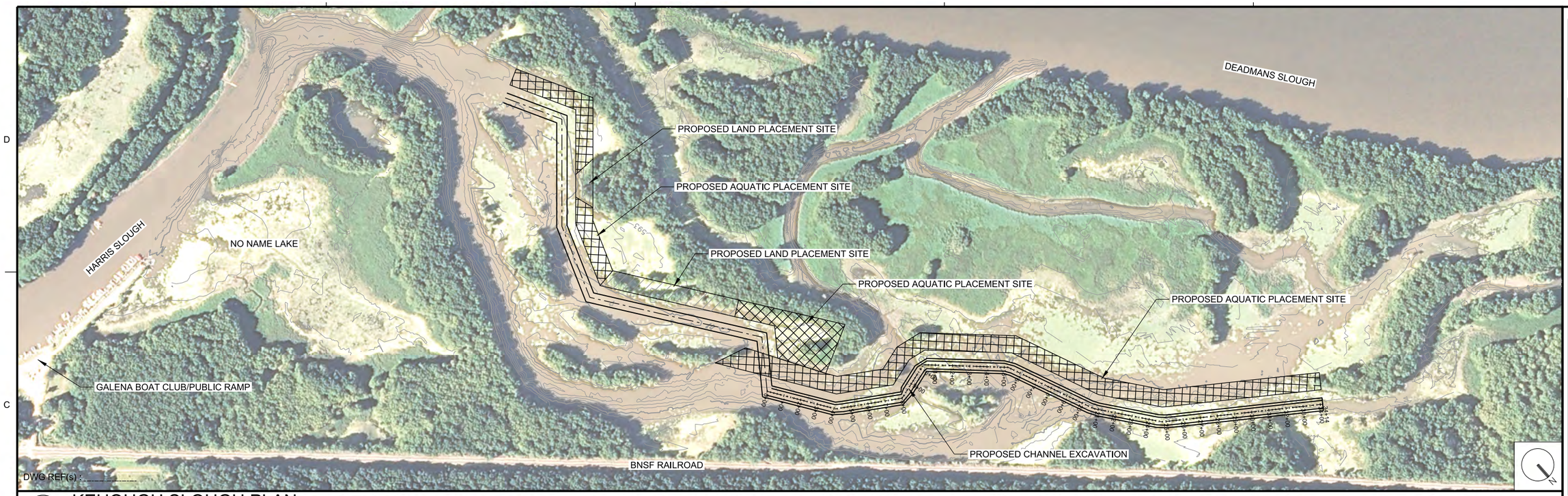
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
PLOT DATE:
PLOT SCALE: AS SHOWN
FILE NAME: EP58_C-112xxx.dgn
SIZE: ANSI D
PROJECT CODE: EP58
SOLICITATION NO.:
CONTRACT NO.:

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
KEHOUGH SLOUGH A
PLAN AND PROFILE
PLATE 22

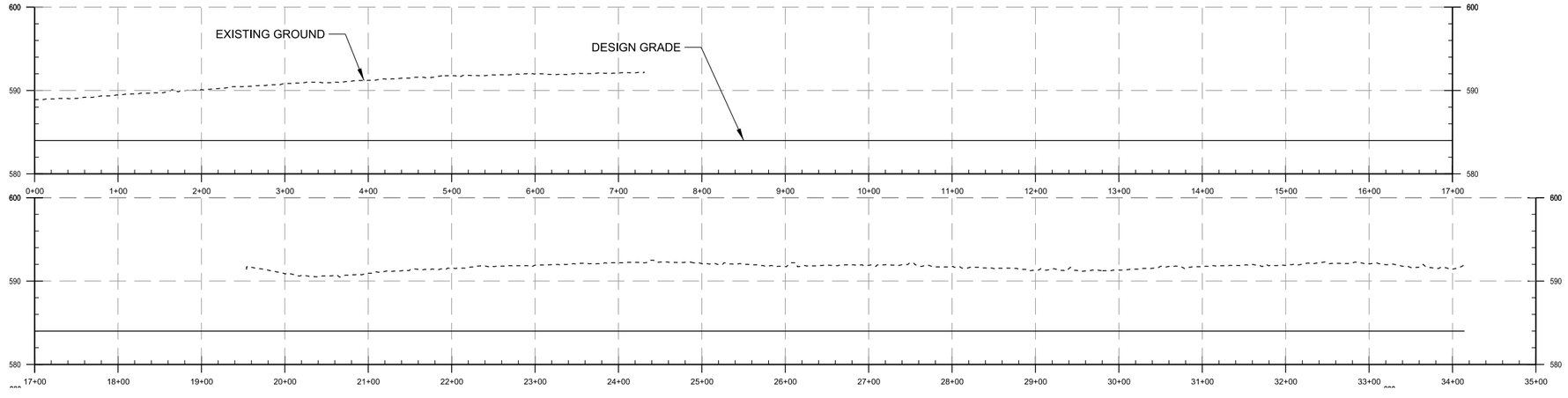
Sheet ID
C-112



DWG REF(s) : _____

C1 KEHOUGH SLOUGH PLAN

SCALE : 1"=300'-0" 0 300' 600'



DWG REF(s) : _____

A1 KEHOUGH SLOUGH PROFILE

SCALE : 1"=80'-0" 0 80' 160'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

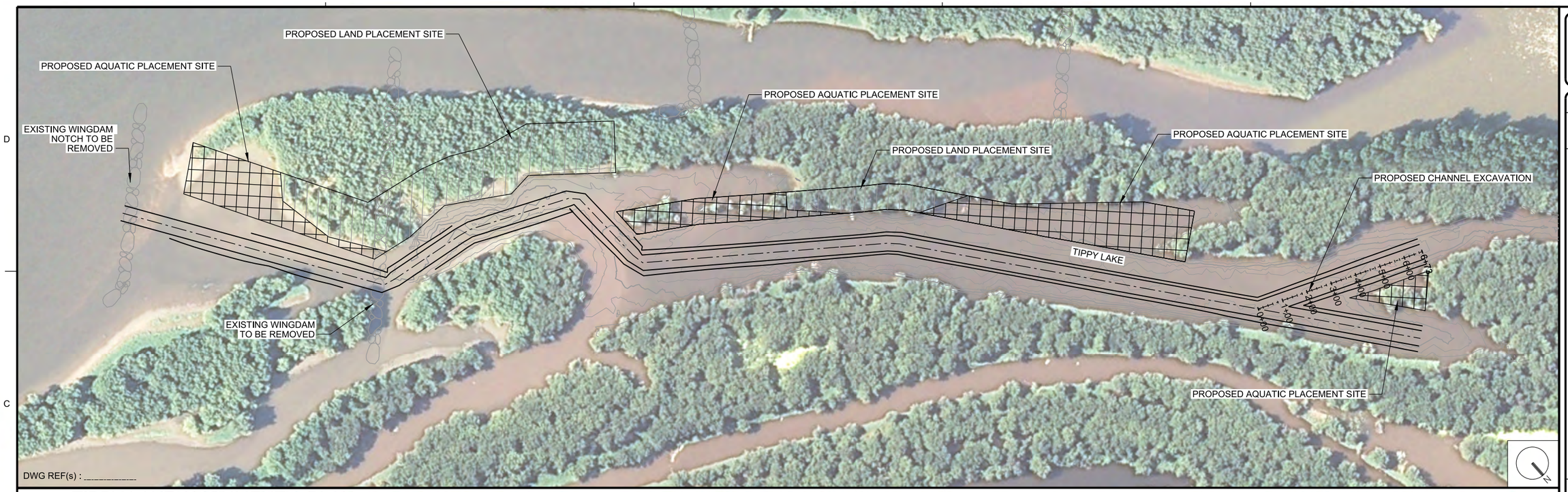
DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PLOT SCALE: As shown
PLOT DATE:
SIZE: ANSI D
PROJECT CODE: EP58
FILE NAME: EP58_C-113xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

KEHOUGH SLOUGH B
PLAN AND PROFILE

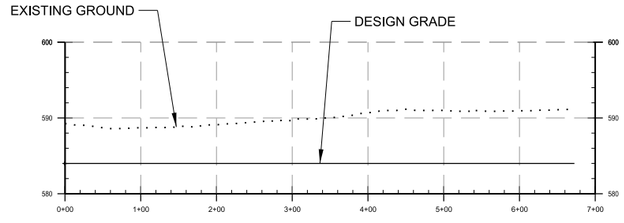
PLATE 23

Sheet ID
C-113



C1 TIPPY LAKE ALIGNMENT A PLAN

SCALE : 1"=200'-0" 0 200' 400'



DWG REF(s) : _____

A1 TIPPY LAKE ALIGNMENT A PROFILE

SCALE : 1"=100'-0" 0 100' 200'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

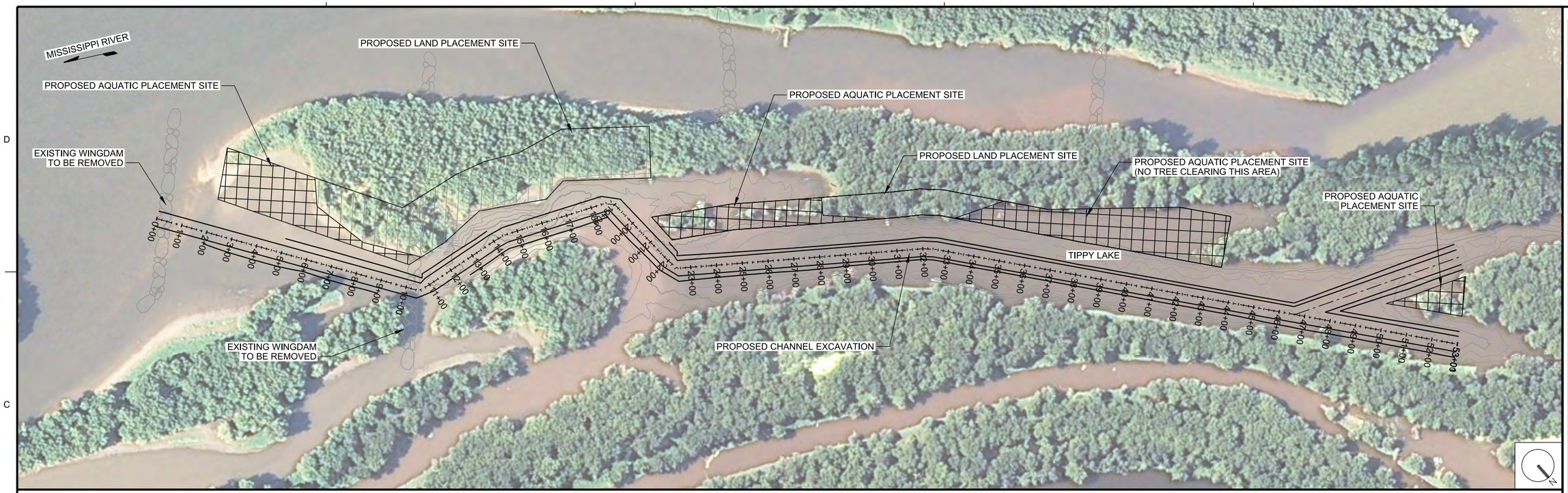
DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PLOT SCALE: AS SHOWN
PLOT DATE:
PROJECT CODE: EP56
SIZE: ANSI D
FILE NAME: EP56_C-114xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

TIPPY LAKE A
PLAN AND PROFILE

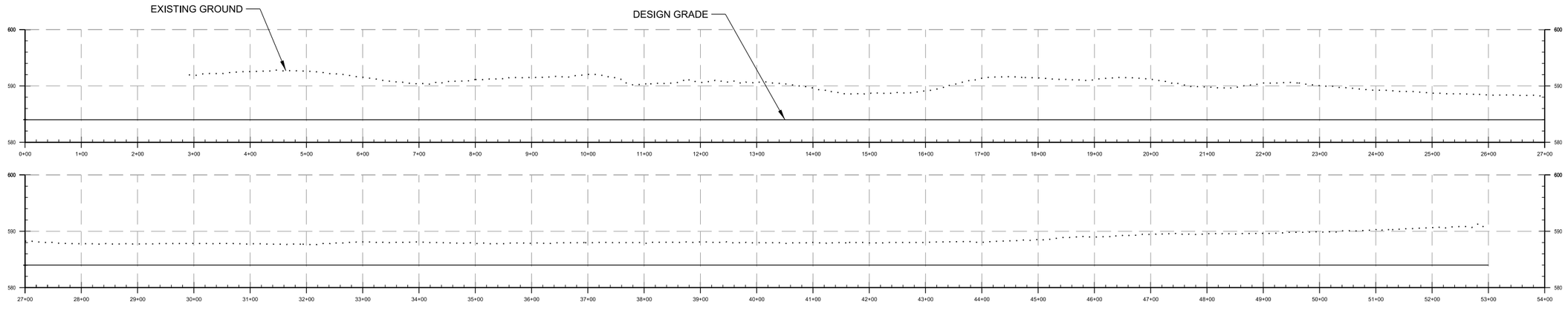
PLATE 24

Sheet ID
C-114



C1 TIPPY LAKE ALIGNMENT B PLAN

SCALE : 1"=200'-0" 0 200' 400'



A1 TIPPY LAKE ALIGNMENT B PROFILE

HORIZONTAL SCALE : 1"=100'-0" 0 100' 200'

US Army Corps of Engineers®

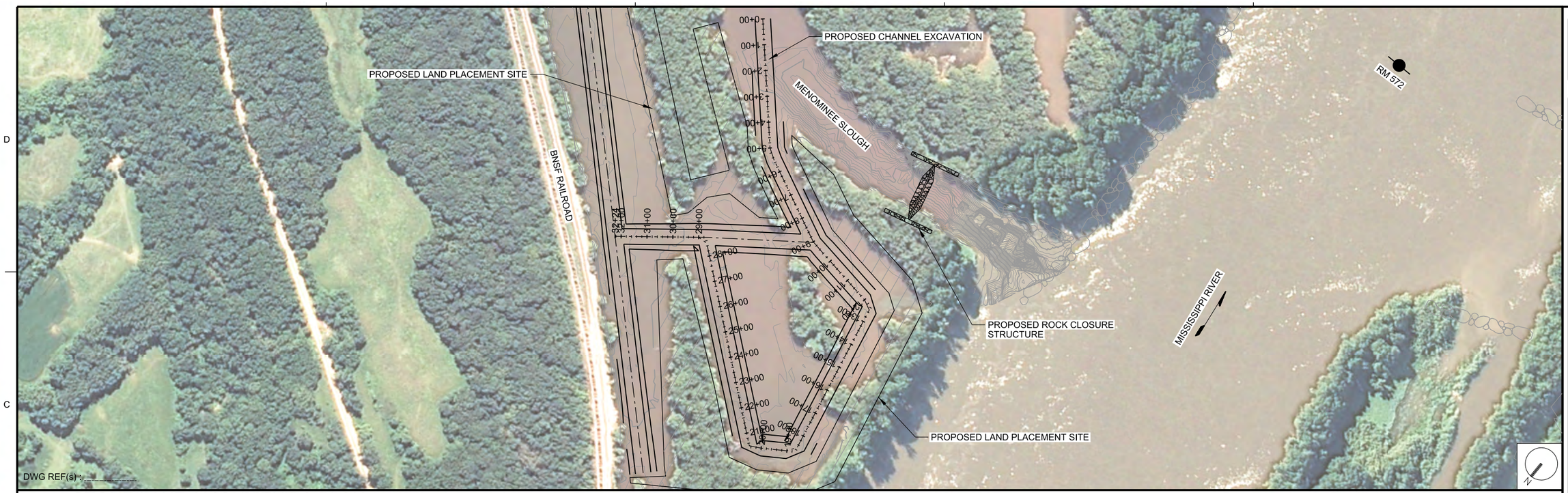
MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP56
PLOT SCALE: As shown
PLOT DATE:
SIZE: ANSI D
FILE NAME: EP56_C-115xxx.dgn

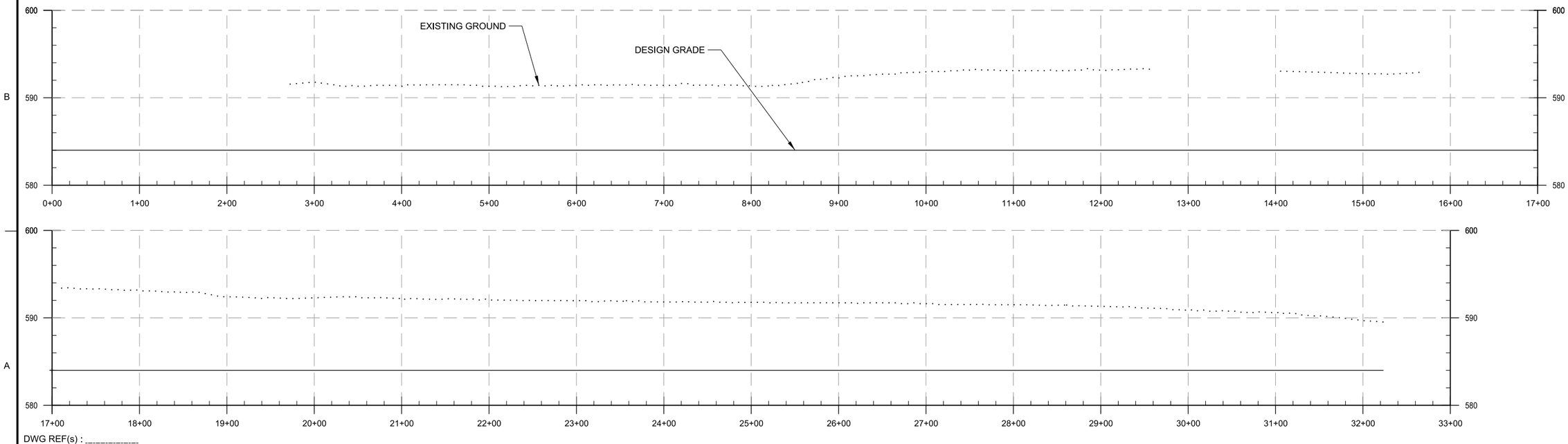
MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
TIPPY LAKE B
PLAN AND PROFILE
PLATE 25

Sheet ID
C-115



C1 STONE LAKE ALIGNMENT A PLAN

SCALE : 1"=200'-0" 0 200' 400'



A1 STONE LAKE ALIGNMENT A PROFILE

SCALE : 1"=60'-0" 0 60' 120'

US Army Corps of Engineers®

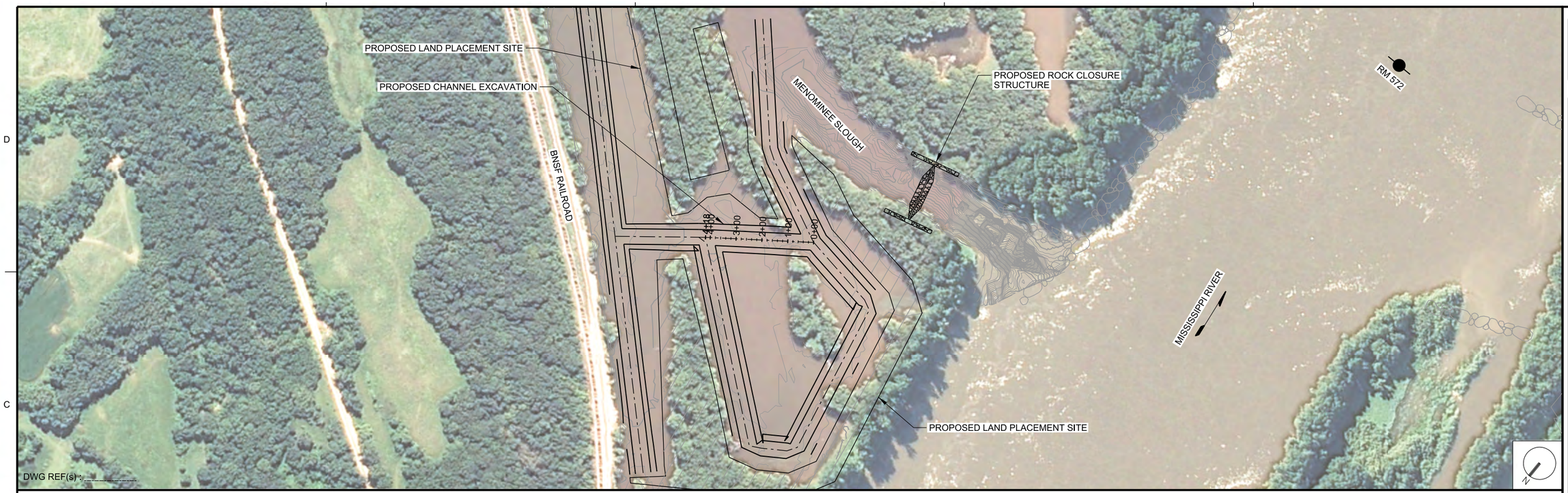
MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

DESIGNED BY: JLF/KNM
DWN BY: LLH
CKD BY:
SUBMITTED BY: HLA
DATE:
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP58
PLOT SCALE: AS SHOWN
PLOT DATE:
SIZE: ANSI D
FILE NAME: EP58_C-116xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
STONE LAKE A
PLAN AND PROFILE
PLATE 26

Sheet ID
C-116

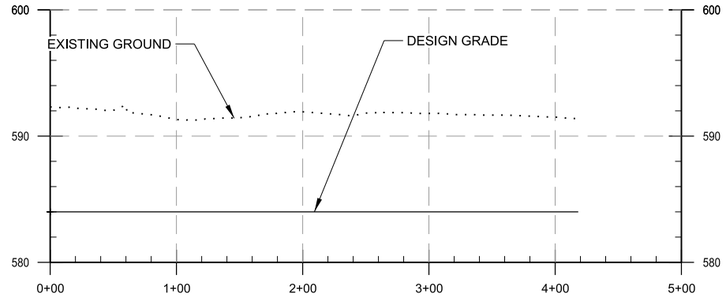


DWG REF(s) : _____

C1 STONE LAKE ALIGNMENT B PLAN

SCALE : 1"=200'-0"

0 200' 400'



DWG REF(s) : _____

A1 STONE LAKE ALIGNMENT B PROFILE

SCALE : 1"=60'-0"

0 60' 120'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

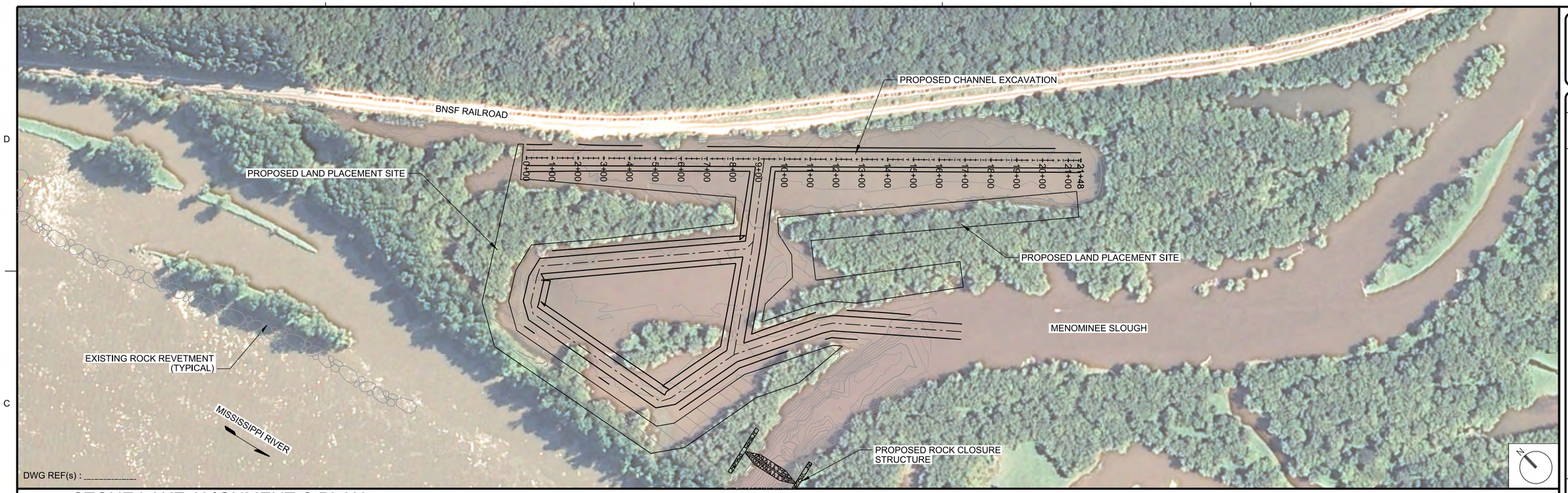
DESIGNED BY: JLF/KNM
DWN BY: LLH
SUBMITTED BY: HLA
PLOT SCALE: AS SHOWN
SIZE: ANSI D
DATE:
CKD BY:
PLOT DATE:
FILE NAME: EPS6_C-117xxx.dgn
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EPS6

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

STONE LAKE B
PLAN AND PROFILE

PLATE 27

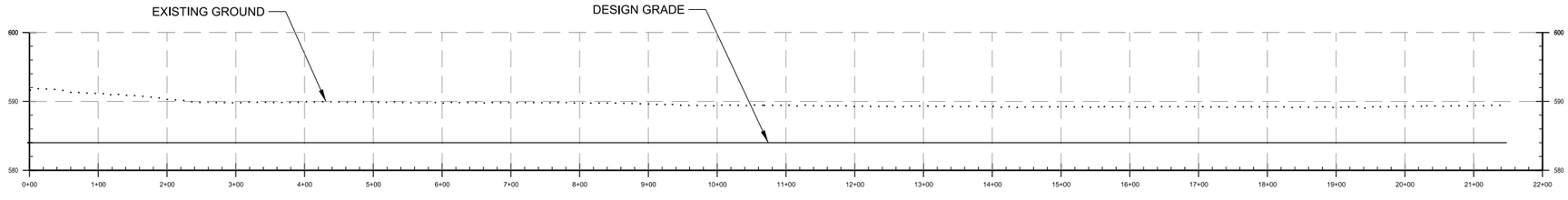
Sheet ID
C-117



DWG REF(s) : _____

C1 STONE LAKE ALIGNMENT C PLAN

SCALE : 1"=200'-0" 0 200' 400'



DWG REF(s) : _____

A1 STONE LAKE ALIGNMENT C PROFILE

SCALE : 1"=100'-0" 0 100' 200'

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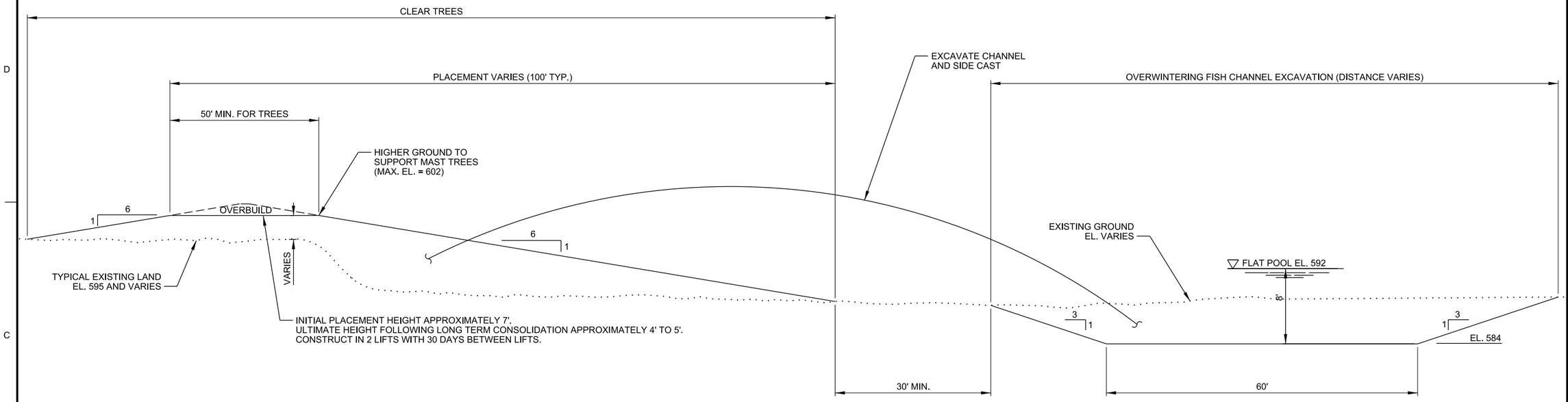
PLOT SCALE: AS SHOWN	PLOT DATE:	PROJECT CODE: EP58	
SIZE: ANSI D	FILE NAME: EP58_C-118xxx.dgn		

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

STONE LAKE C
PLAN AND PROFILE

PLATE 28

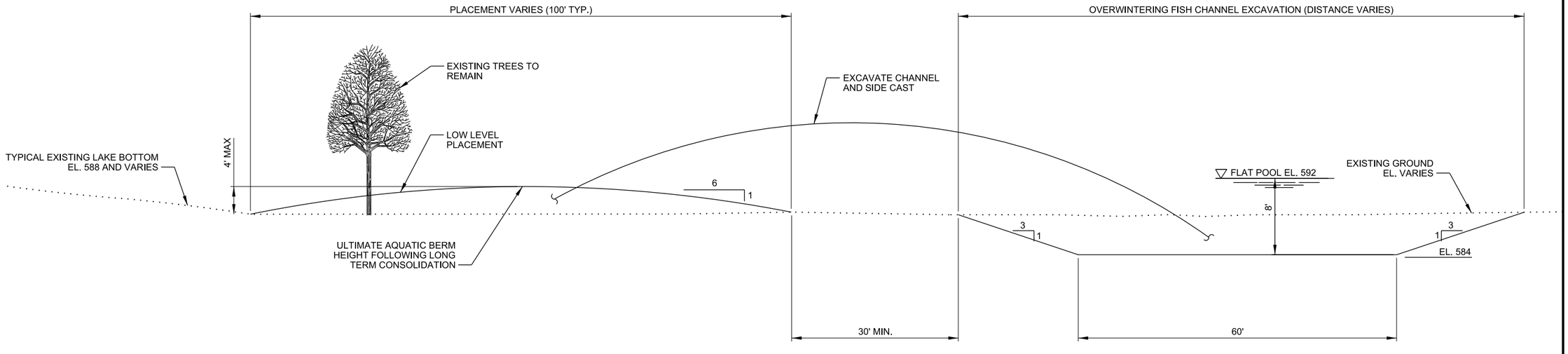
Sheet ID
C-118



DWG REF(s) : _____

C1 TYPICAL LAND BASED BERM SECTION

SCALE : 1"=10'-0" 0 10' 20'



DWG REF(s) : _____

NOTE:

1. AQUATIC BERMS WILL BE CREATED IN TIPPY, KEHOUGH AND SUNFISH LAKES.

A1 TYPICAL AQUATIC BERM SECTION

SCALE : 1"=10'-0" 0 10' 20'

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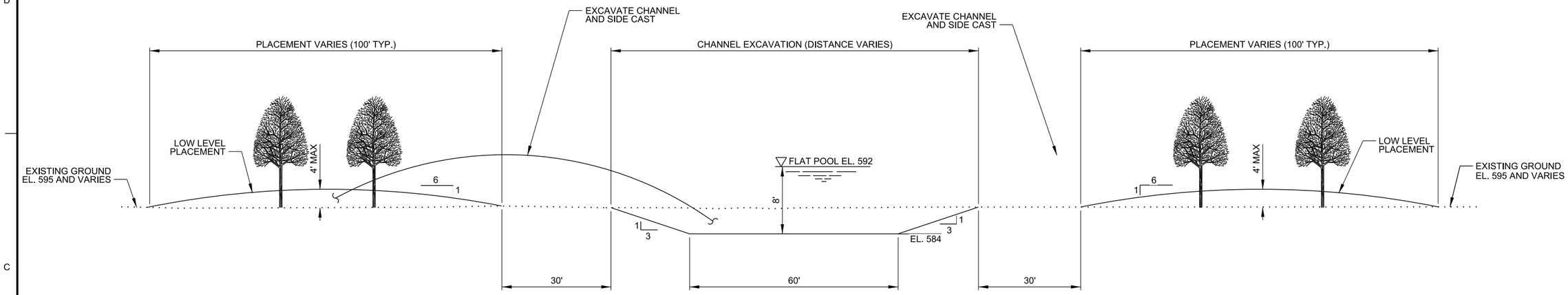
PLOT SCALE: AS SHOWN	PLOT DATE:	CONTRACT NO.:	
SIZE: ANSI D	FILE NAME: EP58_C-301xxx.dgn	PROJECT CODE: EP58	

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
TYPICAL SECTIONS

PLATE 29

Sheet ID
C-301

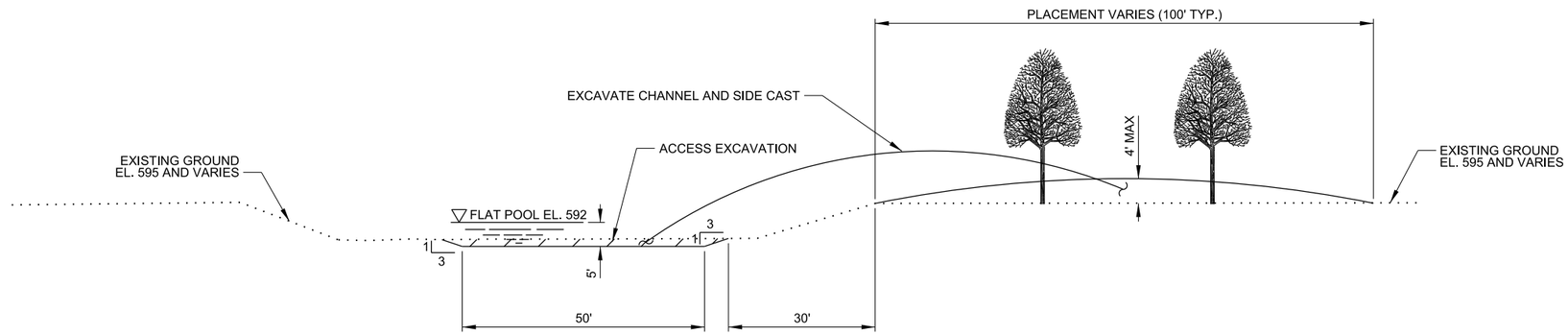


DWG REF(s) : _____

C1 TYPICAL SECTION SUNFISH LAKE

SCALE : 1"=15'-0"

0 15' 30'



DWG REF(s) : _____

A1 TYPICAL SECTION ACCESS DREDGING

SCALE : 1"=15'-0"

0 15' 30'

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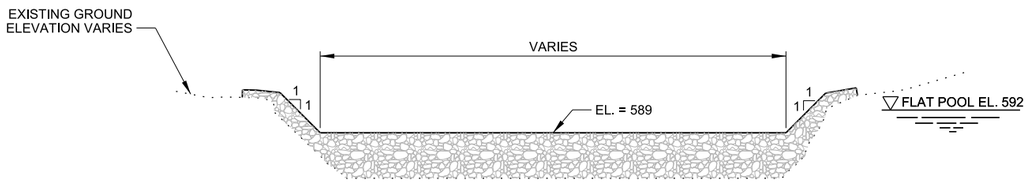
CONTRACT NO.:
PROJECT CODE: EP56
PLOT DATE:
FILE NAME: EP56_C-302xxx.dgn

ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
TYPICAL SECTIONS

PLATE 30

Sheet ID
C-302

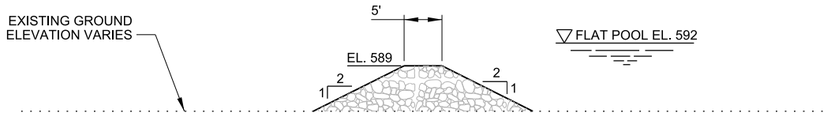


DWG REF(s) : C-108

C1 ROCK CLOSURE STRUCTURE SECTION STONE LAKE

SCALE : 1"=10'-0"

0 10' 20'

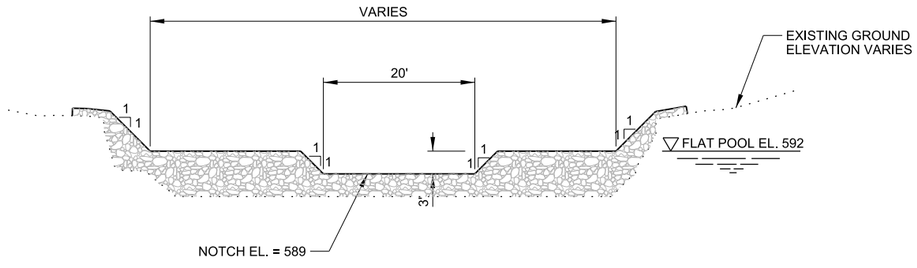


DWG REF(s) : C-108

C4 ROCK CLOSURE STRUCTURE STONE LAKE

SCALE : 1"=10'-0"

0 10' 20'

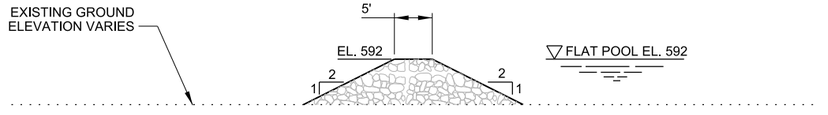


DWG REF(s) : C-105, C-106

A1 ROCK CLOSURE STRUCTURE SECTION KEHOUGH & SUNFISH LAKES

SCALE : 1"=10'-0"

0 10' 20'



DWG REF(s) : C-105, C-106

A4 ROCK CLOSURE STRUCTURE KEHOUGH & SUNFISH LAKES

SCALE : 1"=10'-0"

0 10' 20'

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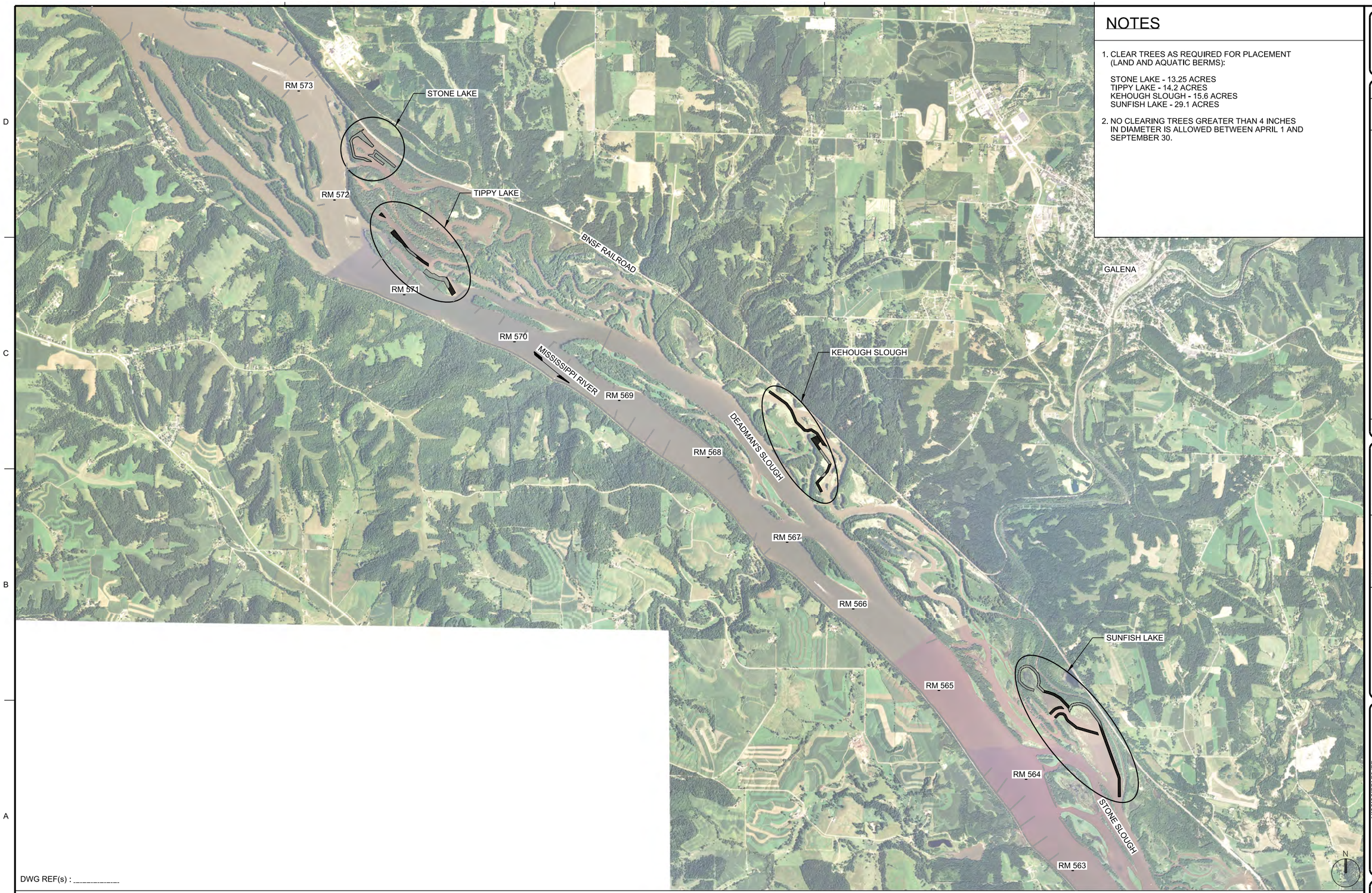
PLOT DATE:
PROJECT CODE: EP58
SIZE: ANSI D
FILE NAME: EP58_C-303xxx.dgn

ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
ROCK CLOSURE SECTIONS

PLATE 31

Sheet ID
C-303



NOTES

1. CLEAR TREES AS REQUIRED FOR PLACEMENT (LAND AND AQUATIC BERMS):

   STONE LAKE - 13.25 ACRES
   TIPPY LAKE - 14.2 ACRES
   KEHOUGH SLOUGH - 15.6 ACRES
   SUNFISH LAKE - 29.1 ACRES

2. NO CLEARING TREES GREATER THAN 4 INCHES IN DIAMETER IS ALLOWED BETWEEN APRIL 1 AND SEPTEMBER 30.

DWG REF(s) : _____

A1 REFORESTATION PLAN

SCALE : 1"=2000'-0" 0 2000' 4000'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

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SUBMITTED BY: HLA
CKD BY:
PLOT SCALE: AS SHOWN
SIZE: ANSI D
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SOLICITATION NO.:
CONTRACT NO.:
PLOT DATE:
PROJECT CODE: EP56
FILE NAME: EP56_L-101xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT

REFORESTATION PLAN

PLATE 32

Sheet ID
L-101

SUNFISH LAKE PLACEMENT AREA PLANTING SCHEDULE			
YEAR 1 - START OF CONSTRUCTION			
AREA 1	AREA 2	AREA 3	AREA 4
NO TREE WORK - AREA NOT DREDGED	NO TREE WORK - AREA NOT DREDGED	NO TREE WORK - AREA NOT DREDGED	NO TREE WORK - AREA NOT DREDGED
YEAR 2 - 1ST YEAR OF TREE PLANTING			
DIRECT SEEDING	PLANT BUTTONBUSH (COVER CROP)	NO TREE WORK - AREA NOT DREDGED	NO TREE WORK - AREA NOT DREDGED
YEAR 3			
NO TREE WORK	PLANT CONTAINER STOCK TREES	ADVANCE NATURAL REGENERATION	PLANT CONTAINER STOCK WITH FENCING
YEAR 4			
NO TREE WORK	NO TREE WORK	ADVANCE NATURAL REGENERATION	NO TREE WORK
YEAR 5			
NO TREE WORK	NO TREE WORK	PLANT CONTAINER STOCK TREES	NO TREE WORK
YEAR 1		YEAR 2	

CONTAINER STOCK TREE PLANTING		
PLANTING 4' TO 6' IN HEIGHT WITH 3' SPIRAL PLASTIC WRAP ON THE TRUNK. TREES WILL BE PLANTED AT A RATE OF 50 TREES PER ACRE.		
COMMON NAME	SCIENTIFIC NAME	PERCENT PER ACRE
KENTUCKY COFFEE TREE	GYMNOCLADUS DIOICUS	20%
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	20%
PIN OAK	QUERCUS PALUSTRIS	20%
NORTHERN PECAN	CARYA ILLINOENSIS	20%
SWAMP WHITE OAK	QUERCUS BICOLOR	20%

DIRECT SEEDING	
TOTAL SEEDING RATE OF THE OVERALL MIXTURE SHALL BE 10,000 SEEDS PER ACRE	
COMMON NAME	SCIENTIFIC NAME
KENTUCKY COFFEE TREE	GYMNOCLADUS DIOICUS
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS
PIN OAK	QUERCUS PALUSTRIS
NORTHERN PECAN	CARYA ILLINOENSIS
SWAMP WHITE OAK	QUERCUS BICOLOR
BUR OAK	QUERCUS MACROCARPA
GREEN ASH	FRAXINUS PENNSYLVANICA

BUTTONBUSH PLANTING	
4LBS PER ACRE	
COMMON NAME	SCIENTIFIC NAME
BUTTONBUSH	CEPHALANTHUS OCCIDENTALIS

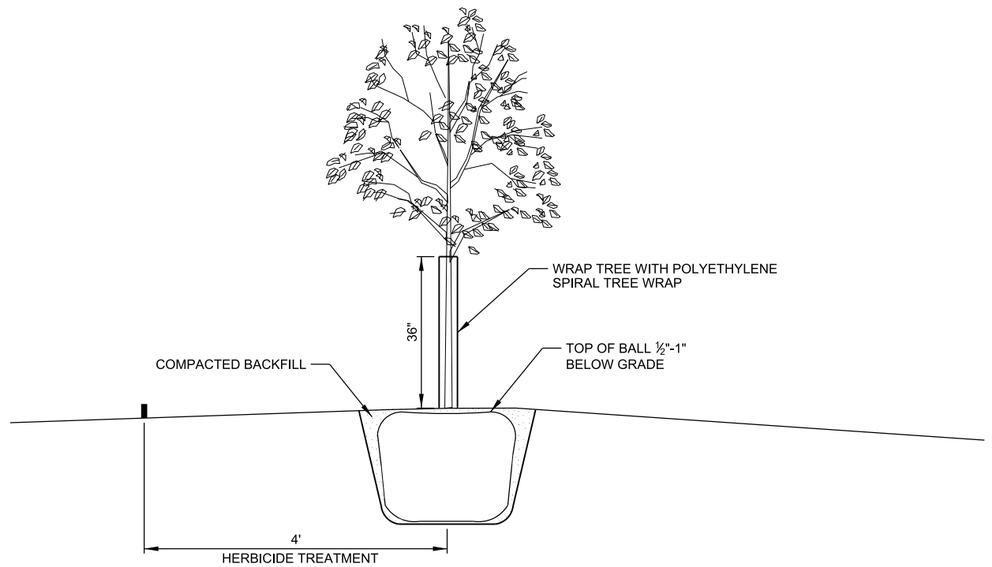
DWG REF(s) :

A1 TREE PLANTING SCHEDULE

SCALE : NO SCALE

GENERAL CONTAINERIZED TREE PLANTING NOTES

1. TREES CONFORMING TO THE SPECIES AND NUMBER SPECIFIED SHALL BE PLANTED IN THE AREAS INDICATED:
   A. TREES SHALL BE SPACED AT A RATE OF 50 TREES PER ACRE.
   B. THE TREES SHALL ALL BE CONTAINERIZED STOCK IN #3 POTS.
2. ENSURE TREES ARE SPACED APPROXIMATELY 30' X 30'.
3. PRIOR TO EXCAVATION OF TREE PITS, A PLANTING SITE SHALL BE PREPARED BY CUTTING ALL VEGETATION TO A HEIGHT OF 2 INCHES OR LESS AND REMOVING DEBRIS WITHIN A 4 FOOT SQUARE CENTERED ON THE POINT DESIGNATED AS THE CENTER POINT FOR THE PLANTED TREE.
4. TREE PITS MAY BE DUG BY ANY METHOD. THE SIZE OF THE TREE PITS SHALL BE APPROXIMATELY THE SAME SIZE AS THE CONTAINER OR SLIGHTLY LARGER.
5. TREES SHALL BE PLANTED BETWEEN OCTOBER 25 AND DECEMBER 10 DURING SUITABLE CONDITIONS AS SPECIFIED.
6. TREES SHALL BE PLANTED PLUMB (WITHIN 10 DEGREES OF VERTICAL) AND HELD IN POSITION UNTIL SUFFICIENT SOIL HAS BEEN PLACED AROUND THE ROOTS.
7. TREES SHALL BE SET IN RELATION TO SURROUNDING GRADE SO THAT THEY ARE 1/2 INCH TO 1 INCH DEEPER THAN THE DEPTH AT WHICH THEY WERE GROWN IN THE CONTAINER.
8. INSTALLED TREES SHALL BE MAINTAINED IN A HEALTHY GROWING CONDITION.
9. TREES SHALL BE WRAPPED WITH A SPIRAL TREE WRAP MADE OF LOW DENSITY POLYETHYLENE, 36 INCHES IN LENGTH, WITH A 6MM THICKNESS. THE TREE WRAP WILL BE PLACED ON EACH TREE STEM TO REDUCE HERBIVORY.
10. ERECT TEMPORARY ENCLOSURE AROUND THE TREE, WHERE SPECIFIED.



DWG REF(s) :

A3 TYPICAL CONTAINER TREE PLANTING DETAIL

SCALE : 1"=1'-0"

0 1' 2'

MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

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SUBMITTED BY: HLA
PLOT SCALE: AS SHOWN
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DATE:
CKD BY:
PLOT DATE: EP58
FILE NAME: EP58_L-501xxx.dgn
SOLICITATION NO.:
CONTRACT NO.:
PROJECT CODE: EP58

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
TREE PLANTING DETAILS
PLATE 33

Sheet ID
L-501

NOTE

1. FUTURE MONITORING INCLUDES:

   A. WATER QUALITY
   B. FISH MONITORING
   C. BATHYMETRY OVER EXCAVATED CHANNEL
   D. TREE SURVEYS

DWG REF(s) : _____

A1 MONITORING PLAN

SCALE : 1"=400'-0" 0 400' 800'

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ROCK ISLAND, ILLINOIS

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DATE:
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CONTRACT NO.:
PROJECT CODE: EP56
FILE NAME: EP56_O-101xxx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
MONITORING PLAN

PLATE 34

Sheet ID
O-101

NOTE

1. FUTURE MONITORING INCLUDES:

   A. WATER QUALITY
   B. FISH MONITORING
   C. BATHYMETRY OVER EXCAVATED CHANNEL
   D. TREE SURVEYS

DWG REF(s):

A1 MONITORING PLAN
SCALE : 1"=400'-0" 0 400' 800'

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PROJECT CODE: EP56
PLOT SCALE: As shown
PLOT DATE:
FILE NAME: EP56_O-102xxx.dgn
SIZE: ANSI D

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
MONITORING PLAN

PLATE 35

Sheet ID
O-102

NOTE

1. FUTURE MONITORING INCLUDES:

   A. WATER QUALITY
   B. FISH MONITORING
   C. BATHYMETRY OVER EXCAVATED CHANNEL
   D. TREE SURVEYS

DWG REF(S) : _____

A1 MONITORING PLAN

SCALE : 1"=400'-0" 0 400' 800'

US Army Corps of Engineers®

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ROCK ISLAND, ILLINOIS

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SUBMITTED BY: HLA
DATE:
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CONTRACT NO.:
PLOT SCALE: As shown
PLOT DATE:
PROJECT CODE: EP96
SIZE: ANSI D
FILE NAME: EP96_O-103xx.dgn

MISSISSIPPI RIVER
POOL 12 ISLANDS
JO DAVIESS COUNTY
POOL 12 OVERWINTERING HREP
DEFINITE PROJECT REPORT
MONITORING PLAN

PLATE 36

Sheet ID
O-103