UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

POOLS 17 AND 18,
MISSISSIPPI RIVER MILES 434.5 THROUGH 441.5

LOUISA COUNTY, IOWA

JUNE 2017

US Army Corps
of Engineers®
Rock Island District

UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

POOLS 17 AND 18,
MISSISSIPPI RIVER MILES 434.5 THROUGH 441.5

LOUISA COUNTY, IOWA

PREFACE

This Operation and Maintenance (O&M) manual is for the Lake Odessa Habitat Rehabilitation and Enhancement Project (HREP). The project was planned, designed and constructed using funds from the Upper Mississippi River Restoration (UMRR) program. The project lies in Louisa County, Iowa and encompasses the federally owned lands between the Iowa River on the south and Michael Creek on the north. All project lands are in Federal management and are managed by the U.S. Fish and Wildlife Service (USFWS) as part of the Port Louisa National Wildlife Refuge Complex. The USFWS has granted management of the project's southern half to the Iowa Department of Natural Resources (IADNR) through a cooperative agreement.

This O&M manual has been compiled by the U.S. Army Corps of Engineers (Corps), Rock Island District to assist local officials in complying with the requirements for operating and maintaining the project. The O&M manual provides essential operation and maintenance instructions and references to be used by personnel knowledgeable of the project. Local inspection requirements and follow-up corrective action reporting are also listed. The O&M manual serves as a reference document containing descriptions of the features involved in the original construction of the project, the construction history, a copy of the Memorandum of Agreement (MOA) between the USFWS and the Corps, and a listing of project points of contact.

Included within this O&M manual are copies of drawings, a blank annual inspection report form and other references related to the Lake Odessa HREP (Project).

The O&M manual should be periodically updated by the USFWS to incorporate best professional practices. The O&M manual will only be updated by the Corps following Federal action at the Project. All points of contact, websites and supplier information should be checked and verified on a yearly basis by the USFWS. Physical modifications and any operational changes impacting the Project must be approved and documented by Corps. A copy of the routine inspections should also be attached to the O&M manual.

UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

POOLS 17 AND 18,
MISSISSIPPI RIVER MILES 434.5 THROUGH 441.5

LOUISA COUNTY, IOWA

TABLES

FIGURES

APPENDICES

UPPER MISSISSIPPI RIVER RESTORATION

LAKE ODESSA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

OPERATION AND MAINTENANCE MANUAL

POOLS 17 AND 18,
MISSISSIPPI RIVER MILES 434.5 THROUGH 441.5

LOUISA COUNTY, IOWA

1. GENERAL

1.1. Purpose.

This Operation and Maintenance (O&M) manual describes the operation, maintenance and upkeep responsibilities for the Lake Odessa Habitat Rehabilitation and Enhancement Project (HREP). The instructions are consistent with the general procedures presented in the April 2005 Definite Project Report (DPR) with integrated environmental assessment. The project was funded through the Upper Mississippi River Restoration (UMRR) Program.

This manual serves to furnish the U.S. Fish and Wildlife Service (USFWS) and Iowa Department of Natural Resources (IADNR) officials with information and guidance to assist in the orderly and efficient use of the constructed features to meet project goals and objectives. Likewise, adequate maintenance of habitat rehabilitation and enhancement projects is required to ensure serviceability of project features. The intent of the maintenance instructions is to present preventative maintenance information consisting of systematic inspections and subsequent corrective actions, which should ensure long-term use. A timely preventative maintenance program reduces and prevents major damage to constructed features. The USFWS and IADNR must maintain the project in an acceptable condition as defined in this O&M manual and must participate in the inspection program.

This manual was written for personnel familiar with the Lake Odessa HREP (Project) and does not contain detailed information which is common to site personnel or which is presented in other existing manuals or regulations. This manual provides the general standards of maintenance and establishes a frequency of inspections that should ensure satisfactory Project performance. Although this document is intended to call out the most salient issues, additional guidance for proper operation and maintenance is present in U.S. Army Corps of Engineers (Corps) guidance and policy documents. The Code of Federal Regulations specified O&M requirements are attached in Appendix D. The Corps provides clarification of proper operation and maintenance of Project features that may require efforts that are additional to those stated in this document. The Corps encourages an active dialogue between the Corps and the sponsor to indicate Corps policy clarifications that may have O&M implications for the Project**.**

Table 1 gives a brief history of the planning and construction process of the Project. Table 2 details the goals, objectives and features of the Project.

Table 1. Summary of Planning and Construction Activities

Project Phase	Purpose	Project Milestone	Date Completed
Pre-Project	Identify and define problems and establish need of project.	Fact Sheet	December 17, 1991
Engineering and Design	Quantify project objectives, perform preliminary design, satisfy NEPA[4] and permit requirements, develop performance evaluation plan, obtain project approval for construction.	SHPO[1] Concurrence Draft DPR[2] DPR Public Review & EA[3] Obtain Section 401/404 Permits Final DPR & EA DPR approval Memorandum of Agreement with USFWS	April 2003 March 2003 August 2004 January 2005 April 2005 May 2005 May 2005
Purchase: W912EK-05-F-0058 (Pumps)	Design pump requirements, award scope of work, modifications and provide pumps to sponsors.	Award Sole Source contract Delivery of Pumps	 2006
Construction: W912EK-06-C-0054 (Stage I)	Finalize plans and specifications, advertise and award construction contracts, construct project.	Award Contract Notice to Proceed Construction Physically Complete	June 17, 2006 July 26, 2006 September 30, 2009
Construction: W912EK-09-C-0099 (Stage IB)	Finalize plans and specifications, advertise and award construction contracts, construct project.	Award Contract Notice to Proceed Construction Physically Complete	August 28, 2009 September 15, 2009 June 05, 2012
Construction: W912EK-07-C-0061 (Stage IIA)	Finalize plans and specifications, advertise and award construction contracts, construct project.	Award Contract Notice to Proceed Construction Physically Complete	September 28, 2007 October 18, 2007 October 2, 2009
Construction: Zw912EK-10-C-0018 (Stage IIB)	Finalize plans and specifications, advertise and award construction contracts, construct project.	Award Contract Notice to Proceed Construction Physically Complete	December 28, 2009 January 8, 2010 April 28, 2011
Construction: W912EK-14-C-0080 (2013 Flood Recovery)	Finalize plans and specifications, advertise and award construction contracts, construct project.	Award Contract Notice to Proceed Construction Physically Complete	August 18, 2014 September 15, 2014 September 2, 2016
Construction: W912EK-10-D-004 (Forestry Contract).	Finalize scope of work, award contract, and complete forestry work.	Award Contract Notice to Proceed Construction Complete	March 24, 2010 May 17, 2010 April 2011

[1]State Historical Preservation Office
[2] Definite Project Report (Feasibility Study)
[3]Environmental Assessment
[4]National Environmental Policy Act

Table 2: Goals, Objectives and Enhancement Features

Goals	Objectives	Enhancement Features
Restore and Protect Wetland and Terrestrial Habitat	Reduce forest fragmentation	Establish hardwood trees on existing agricultural fields and forested areas
	Increase bottomland hardwood diversity	Enhance Moist Soil Units (MSUs) with berm improvements
	Enhance migratory bird habitat	Enhance MSUs water control with dedicated water supply, pumps, and/or control structures
	Restore sand prairie	Plant native sand prairie species
	Increase habitat for overwintering fish	Dredge deep holes/channels in main lake and backwater areas
	Provide safe areas for developing fish	Construct fish nursery
Restore and Protect Aquatic Habitat	Protect habitat features	Restore existing perimeter levee, construct spillway, construct rock wing dam at inlet structure
	Protect archeological sites	Protect shoreline using riprap

1.2. Project Function

The Project was designed to restore and protect backwater and aquatic habitat by enhancing and managing USFWS Refuge wetland, conserving nesting and brooding habitat for migratory birds, enhancing floodplain functions, and reducing the impacts of sedimentation and other water quality factors.

Significant opportunities were available for preserving, enhancing, and developing habitat for migratory birds, fish, and endangered species by enhancing and developing wetlands, planting mast trees, and creating deep holes/channels in the lake and backwater areas.

The Lake Odessa HREP was recommended and supported by the Fish and Wildlife Interagency Committee (FWIC) and the River Resources Coordinating Team (RRCT) as providing significant aquatic, wetland, and terrestrial benefits with opportunities for habitat enhancement. Enhanced capability to manage the project area for migratory birds, fish, and wildlife use only would be achieved by implementing the proposed project enhancement features.

1.3. Project Features Description

This section describes the Project, as it exists at the time of the O&M manual's printing. See Section 4 for a history of the Project, and Section 5 for construction history. These features as anticipated in the Definite Project Reports are shown in Figure 1 and the features as constructed are shown in Figure 2, as well as more specifically in the attached O&M Manual plates.

1.3.1 Moist Soil Unit (MSU) Water Level Management

MSU water level management capability was enhanced in several areas, including Fields 4, 5 and 21, MSU 20, Unit 2, Fox Pond, IADNR MSU, and Swarms and Bebee Ponds. The features increased water level control, reliability, and increased the flooded areas; thereby providing moist soil habitat. Improvements created moist soil habitat, enhanced wetland vegetation diversity and growth during the summer months, and provided better, more reliable food supplies to migratory waterfowl during fall migration. In general, fields are dewatered after spring floodwaters have receded using pumps or control structures (gravity). During the drier summer months, wetland vegetation flourishes in the MSUs. Beginning in September, water is gradually added to the units, attracting migrating waterfowl by providing feeding and resting opportunities.

1.3.1.1 Fields 4 and 5, Field 21, MSU 20. Fields 4 and 5 are actually one field. Enhanced water level management capability was accomplished by providing a portable pump and pump pad near Fields 4 and 5 and at Little Goose Pond. This allows water modifications in Field 21, Fields 4 and 5, and MSU 20. Perimeter berms that delineate and contain water in Fields 4 and 5 were already in place. The existing berms will allow water impoundment to elevation 538.5. The dedicated water bay and a portable pump will be used to raise the water to this level (83 acres flooded at 538.5). The portable pump is mounted on a trailer and stored when not in use. The pump pads were constructed using an articulated concrete mat and a permanent hose hookup to reduce operation costs. The channel located on the interior of the inlet and new low water crossing was excavated to ensure adequate water feed to the Field 4 and 5 ditch. The material was mechanically excavated and side cast.

1.3.1.2 Unit 2. Enhanced water level management capability was accomplished by providing a portable pump and new water control structure. A portable pump can be used to raise interior water levels and flood 92 acres at 538.5. The portable pump is mounted on a trailer and stored when not in use. The existing berm is 2,800 feet long and requires no additional work (an existing roadbed and the project's perimeter levee are used as Unit 2's north and west berms). The new water control structure is a 36-inch CMP with slide gate that is located next to the existing 24-inch stop log structure under the road across Muscatine Slough. This structure's purpose is to assure that an adequate supply of water from Muscatine Slough reaches the portable pump.

1.3.1.3 Fox Pond. This area is one of the larger MSUs controlled by the USFWS and attracts a large number of migratory waterfowl. A stop log structure was constructed by the Corps to help control water levels in this unit. The water level management plans goal is to raise water levels from 536.0 to 537.0 in two 6-inch increments and to maintain the 537.0 elevation maintained for approximately 2 months to maximize feeding opportunities for waterfowl (336 acres flooded at 537.0). The existing 14,000-gpm pump station was left in place to facilitate draw down of Fox Pond. Portable pumps could also be used in this location in the early summer to promote drawdown. Dewatering will promote vegetation growth desired as a food source by migrating waterfowl.

1.3.1.4 IADNR MSU. Enhanced water level management capability was accomplished by providing a portable pump, constructing a new water control structure, and reducing the seepage rate. A portable pump is used to raise interior water levels 4 feet over 14 days (541.0) and then maintain that level for approximately two and a half months to maximize feeding opportunities for waterfowl (49 acres flooded at 541.0). The portable pump is mounted on a trailer and stored when not in use. A pump pad, located on Burris Ditch, was constructed using articulated concrete matting, and includes a permanent hose hookup to reduce operation costs. Due to the steep nature of this pump pad, the center of the pad was constructed lower than the surrounding sides to allow the bell of the pump to better access the water.

The existing berm is 5,925 feet long, encompasses 49 acres, and requires no additional work. A new 36-inch CMP water control structure with slide gate replaced the existing gate well structure.

The MSU had several sand seams throughout. These sand seems caused water to either drain or be introduced into the MSU at times not optimal for the water level management plan. Pumping alone could not overcome the seepage rates, and therefore these was limited successful management for waterfowl use. The seepage rate was be reduced by placing fine-grained material hydraulically dredged from the Yankee/Blackhawk Chutes deep-water fisheries project feature into the MSU to act as a liner. Less material was dredged than anticipated, so material was evenly graded throughout the MSU to ensure the IADNR can manage water levels uniformly throughout the structure. Vegetation is grown annually to provide a food source in the fall for migratory waterfowl.

1.3.1.5 Connecting Cuts. This feature consisted of mechanically dredging the access channels connecting Lake Odessa to Swarms Pond, as well as Swarms Pond to Bebee Pond. The excavated material was mechanically dredged using a floating excavator and side cast on the embankment next to the channel. The channel dredging allows both ponds to drain during drawdown periods, which promotes vegetation growth that when re-flooded can be used by migratory waterfowl.

1.3.2 Levee Restoration

The objective of levee restoration was to reduce flood damages to the Lake Odessa Project and to reduce incidences of levee failure. Historically, the area had been part of the Muscatine – Louisa Joint Drainage and Levee District Number 13 from 1913 through 1939. However, following the acquisition

of the site by the Corps in 1940 to support the 9 foot channel project, and the subsequent transfer of the General Plan Lands to the USFWS in 1945, the area was plagued with levee damages, including levee breaches in 1947, 1951, 1952, 1965, 1969, 1973, 1990, 1993, and 2001. Prior to construction completion, there were also breaches in 2008, 2011, 2013, and 2014.

The Project is intended to inundate during flood events. The survival of the 9.5 mile perimeter levee depends on the interior filling nearly as fast as the river rises, such that when the levee is overtopped, damages are minimized.

The levee was restored to have a top elevation sloping levee profile starting at the 25-year level of protection (downstream) and gradually increasing the height to the 50-year level of protection (upstream). Additionally, the interior side slopes are graded to a flat enough slope to limit overtopping damage, and allow for a gradual overtopping during flood events. Sand borrow for the side slopes was obtained from the Mississippi River, using a hydraulic dredge and low pressure equipment on site.

The top two feet of the levee was constructed using clay to allow for protection from erosion during overtopping events. This borrow was obtained from numerous off site locations, and was hauled on site using trucks. Clay, especially when covered with established vegetation, is less likely to erode and breach than a similar embankment constructed of sand.

Following final grading, the levee was seeded with a select mix able to withstand overtopping events.

Riprap armoring was also added to select areas along the levee to provide further protection during flood events. The armoring occurred near the inlet structure, the site of a 2014 breach that is located in a bend in the river with little protection from riverside trees. Armoring also occurred around the outlet structure where active erosion was observed in the 2008 event.

A low water crossing was added to the site near the inlet structure to allow for truck and vehicle access to the USFWS end of the site while preventing damage to the existing inlet structure. Temporary crossings were also added at the outlet structure, but these were removed following construction.

Three articulated concrete mat spillways were constructed by Corps, and one by the USFWS. These spillways were built to an elevation and width which will allow flooding river water to enter the system in a controlled rate, and allow the Project to fill prior to an overtopping event. By raising the interior water levels, damage to the perimeter levee is greatly reduced. Since the initial Iowa River spillway has been constructed, it has been overtopped several times (2008, 2011, 201, potentially 2014, and 2016). The newer Iowa River spillway was overtopped in 2016.

1.3.3 Ephemeral Wetlands

Areas inside and adjacent to the Mississippi and Iowa River levees are Copperbelly water snake (*Nerodia erythrogaster neglecta*) and diamondback water snake (*Nerodia rhombifer*) habitat. As part of the levee construction, several shallow pools, or ephemeral wetlands, approximately 1.5 feet deep or less, were constructed to enhance habitat for these state-listed water snakes, in more forested areas.

1.3.4 Aquatic Diversity/Fisheries Enhancement

The primary emphasis of fisheries enhancement was creating areas of deeper water and/or access to existing deeper water at the Lake Odessa Project. Sedimentation and flood damage have reduced deep-water habitat over time. Additionally, access channels to Swarms/Bebee Ponds and Yankee Chute have silted in, reducing the ability of fish to leave some areas if conditions would necessitate (low dissolved oxygen in the summer, escape from freezing water in the winter). Both of these problems

can result in localized fish kills. The deeper areas will provide oxygenated water (during summer and winter) as well as escape routes (all season) and overwintering habitat during the winter months.

1.3.4.1 Goose Pond. In Goose Pond, this feature consists of dredging a deep channel to connect Goose Pond and Sand Run. During construction, it was discovered that this material was too stiff to hydraulically dredge, and was instead mechanically excavated. An excavator, mounted on a barge, was used to construct this feature. The material was side cast, and in some locations mast trees have been planted on these elevated locations using non-UMRR Program funds.

1.3.4.2 Bebee Pond. During the 2008 flood event, a levee breach occurred near Bebee Pond at the upstream end of Goose Pond. The material from the levee breach filled the pond and reduced the connection between Goose Pond, Bebee Pond and Swarms Pond. Additional mechanical dredging occurred in this area to provide a connection for fish.

1.3.4.3 Swarms/Bebee Ponds Connections. The access channels connecting Lake Odessa to Swarms Pond and Bebee Pond were mechanically excavated using a floating excavator, with the material side cast adjacent to the cuts. These ponds are now hydraulically connected to the main lake during most water levels, whereas pre project the channels would dry up during low water conditions, isolating fish, increasing the potential for fish kills.

1.3.4.4 Blackhawk Chute/Yankee Chute Access. This deep channel was constructed to connect Blackhawk Chute to Yankee Chute. During the initial contract, the lower end of this access was hydraulically dredged, however, the channel bottoms were so stiff that the dredge efficiency was very low, and this portion of the dredging was moved to a new contract. In the new contract, the material was mechanically excavated using a barge mounted excavator, and the material was side cast adjacent to the channel. Frequent high water events in the area prior to project completion has caused significant stress to the adjoining forest, and these elevated berms will provide an area where bottomland trees are more likely to survive.

1.3.4.5 Blackhawk Chute. During levee restoration efforts, sand was placed within Blackhawk Chute cutting off access to various wetlands and backwater areas within the project. The material was removed from the Chute and used to restore the levee.

1.3.5 Floodplain Forest/Mast Tree Planting

Restoring and improving bottomland hardwood forests on portions of the Lake Odessa Project improved wetland and terrestrial habitat. Tree planting improved the quality and quantity of forest habitat in the project area by re-introducing a component of mast-producing species to a forest community increasingly dominated by silver maple and cottonwood. Mast-producing tree plantings would restore some of the historic diversity of the bottomland forest community and reduce forest fragmentation. Once mature, mast trees provide food resources for multiple migratory and resident species and increase overall habitat diversity. Mast tree species planted included: northern pecan (*Carya illinoensis*)

- swamp white oak (*Quercus bicolor*)
- bur oak (*Q. macrocarpa*)
- pin oak (*Q. palustris*)
- sycamore (*Platanus occidentalis*)
- shellbark hickory (*Carya laciniosa*)

Root Production Method™ trees were planted at a density of 40 trees per acre at all sites. These hardy containerized trees, grown from locally-collected seed, are able to survive the dynamic nature of the floodplain and herbaceous competition, and require much less maintenance. In addition, they begin bearing acorns as soon as 18 months after planting, much earlier than trees produced through traditional methods. Additional tree plantings and timber stand improvements continues at this site by the Corps, USFWS, and the IADNR using non-UMRR program funding sources.

1.3.6 Fish Nursery

The fish nursery provides a controlled environment where predatory fish can be excluded. The nursery feature allows the stocking of fry and provides a safe environment for the fish to reach a larger size, prior to release into the main lake. The USFWS Refuge Manager selects which species to stock in the nursery each year. This feature consists of utilizing an existing containment area for use as a fish nursery that is approximately 21 acres in area. The new structure allows the area to ponded approximately 3 feet deep.

1.3.7 Shoreline Protection of Historic Sites

The project area is one of the most archeological rich areas in the Upper Mississippi River region. The first extensive occupation of the floodplain occurred during the Middle Archaic period. Early and Middle Woodland sites are distributed on almost every landform in the Lake Odessa bottoms. During the Mississippian period, the bottoms were occupied by the Oneota culture, with a principal village site on the bluff top at Toolesboro. The major historic site in the area is Burris City, dating from 1855-1859. This short-lived city and National Register of Historic Places-eligible site was abandoned due to repeated flooding.

Shoreline protection of archeological sites was required to protect sites from further erosion caused by frequent water level fluctuation. In general, rock was placed on the banks being protected, or offshore to prevent wind/wave erosion. Rock placed in the water has ancillary aquatic benefits, primarily for fish, in an area with little to no rock structure.

Bankline protection using riprap was supplemented with sand to provide protection from human interaction at site 98/99. This area is a heavily used recreational area, and while the rock protection will prevent erosion, the additional layer of sand will provide protection from unauthorized removal of archeological artifacts from visitors at this location.

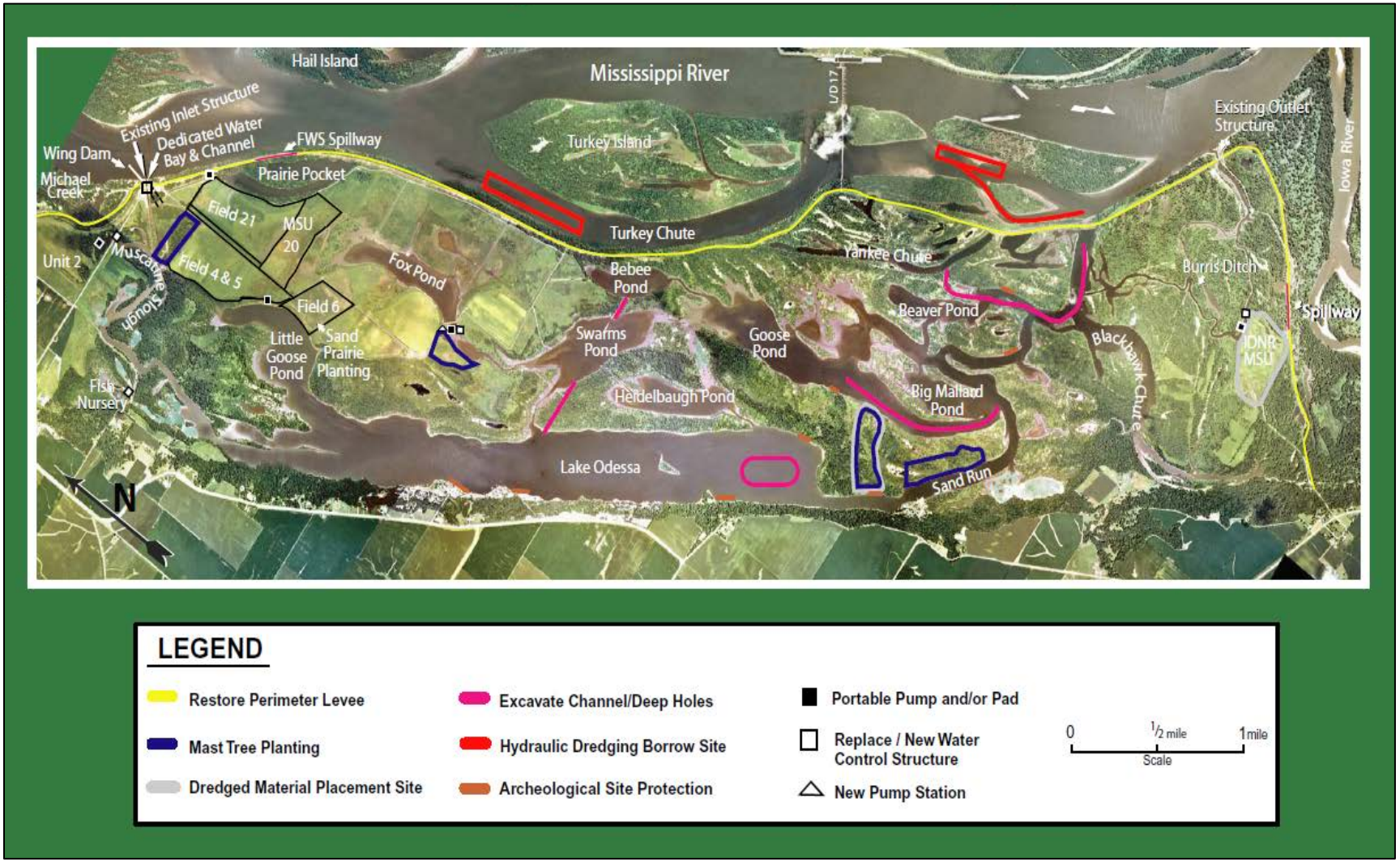

Figure 1: Project Features Map from the 2006 Definite Project Report

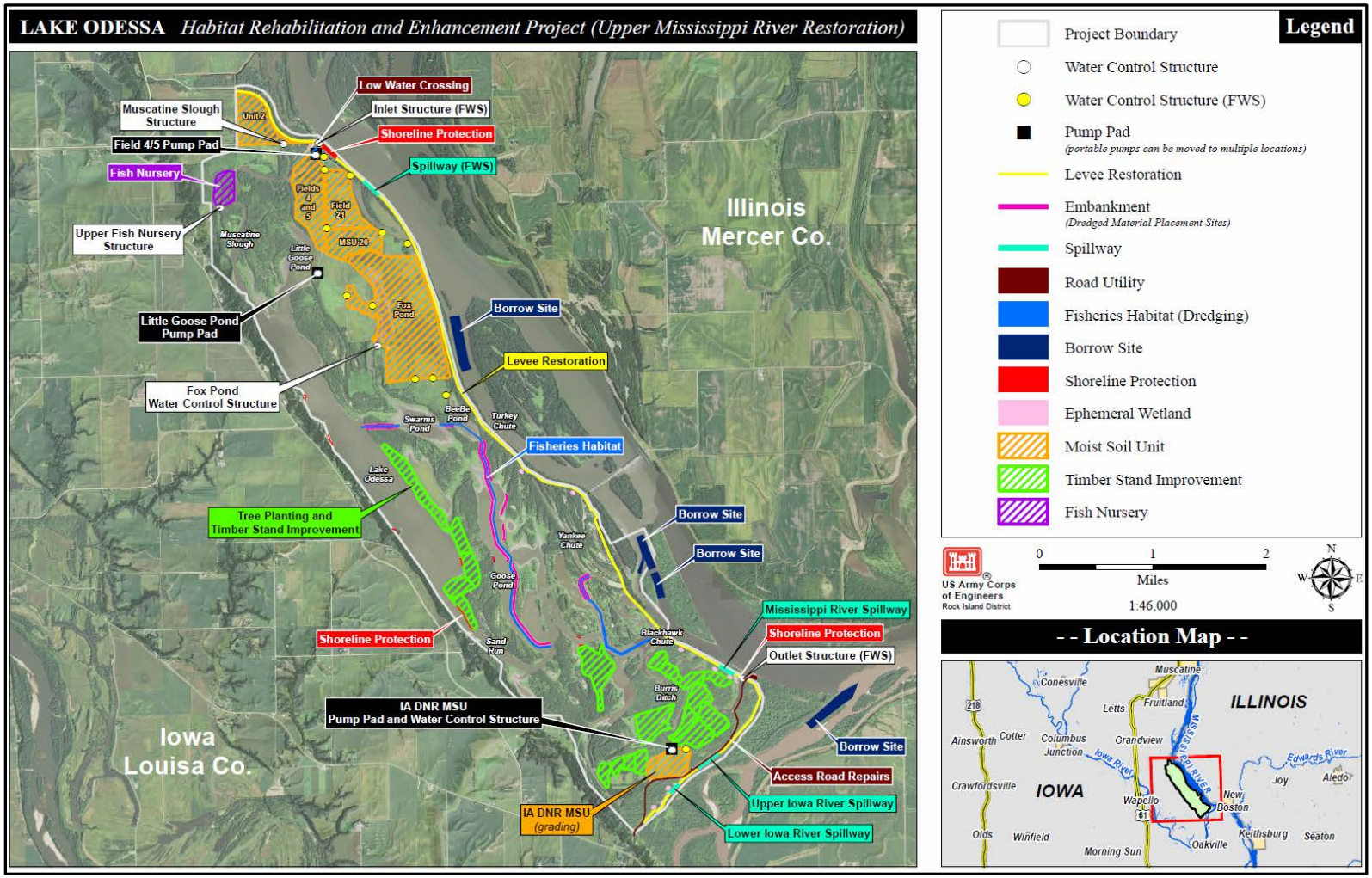

Figure 2: Project Overview Map Post Construction (2017)

2. AUTHORIZATION

This O&M manual serves to meet the Department of the Army's requirements under the 1985 Supplemental Appropriations Act (Public Law 99-88), Section 1103 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662), Section 405 of WRDA 1990 (Public Law 101-640), Section 107 of WRDA 1992 (Public Law 102-580), Section 509 of WRDA 1999 (Public Law 106-53) and Section 3177 of WRDA 2007 (Public Law 110-114). The U.S. Army Corps of Engineers, Rock Island District funded and constructed the Project under these authorizations.

All project lands are in Federal ownership and are managed by the U.S. Fish and Wildlife Service as part of the Port Louisa National Wildlife Refuge.

As set forth in the Memorandum of Agreement (MOA), included in Appendix A, the USFWS has agreed to maintain and operate, at no cost to the Corps, the Project including all the repaired or restored Project features in accordance with Section 107(b) of the WRDA of 1992, Public Law 102-580.

The USFWS has granted management of the project's southern portion to the IADNR through an Amended Cooperative Agreement and is designated as the Odessa Wildlife Management Area. A copy of the Amended Cooperative Agreement is located in Appendix B of this manual.

3. LOCATION

The 6,788 acre Lake Odessa project area is located in Louisa County, Iowa. The project is located 15 miles south of Muscatine, Iowa on the right descending bank of the Mississippi River between river miles (RM) 434.5 and 441.5, along Mississippi River Pools 17 and 18, adjacent to Lock and Dam (L/D) 17.

Sand borrow material needed for the project was dredged from within Navigational Servitude waters. Since all of the material was taken from areas that lie below the ordinary high water mark, Navigational Servitude applies as detailed in ER 405-1-12, paragraph 12-7. Clay borrow material was obtained off site by the Contractors.

The Project encompasses the federally-owned lands between the Iowa River on the south and Michael Creek on the north. The Project is located in Sections 5-9; 16-22; 27-29; and 33-36 of Township 74N, Range 2W of the 5th PM, and in Sections 1, 2, 3, and 11 of Township 73N, Range 2W of the 5th PM. The Government-owned fee simple title tracts (shown in Figure 3) are identified as Tract Numbers: A-I, Fla-IA, Fla-IB, Fla-IC, Fla-2, Fla-3, Fla-4, Fla-5, Fla-6, Fla-7, Fla-S, Fla-SA, Fla-SB, Fla-9, Fla-9A, Fla-9B, Fla-9C, Fla-9S, Fla-99, Fla-IS, FlaIOI, Fla-I02, Fla-I03, Fla-I04, Fla-I05, Fla-I06, Fla-I07, Fla-IOS, Fla-IOSA, Fla-IOSB, Fla-I09, Fla- 110. Fla-I 11, Fla-112, Fla-113, Fla-114, Fla-1I5, Fla-I I 6, Fla-117, Fla-11 S, Fla-119, Fla-I 20, Fla-121, Fla-122, Fla-123, Fla-I 24, Fla-125, Fla-126, Fla-127, Fla-l 2S, Fla-I 29, Fla-130, Fla-131, Fla-132, Fla- 133, Fla-134, Fla-135, Fla-136, Fla-137, Fla-13S, Fla-139, Fla-140, Fla-141, Fla-142, Fla-143, Fla-144, Fla-145, Fla-146, Fla-147, Fla-14S, Fla-149, Fla-150, Fla-151, Fla-152, Fla-153, Fla-154, Fla-155, Fla- 156, Fla-157, Fla-15S, Fla-159, Fla-160, Fla-161, Fla-162, Fla-163, Fla-164, Fla-165, Fla-166, Fla-167, Fla-l 6S, Fla-169, Fla-170, Fla-171, Fla-172, Fla-173, Fla-174, Fla-175, Fla-176, Fla-177, Fla-l 7S, Fla- 179, and Fla-1 SO.

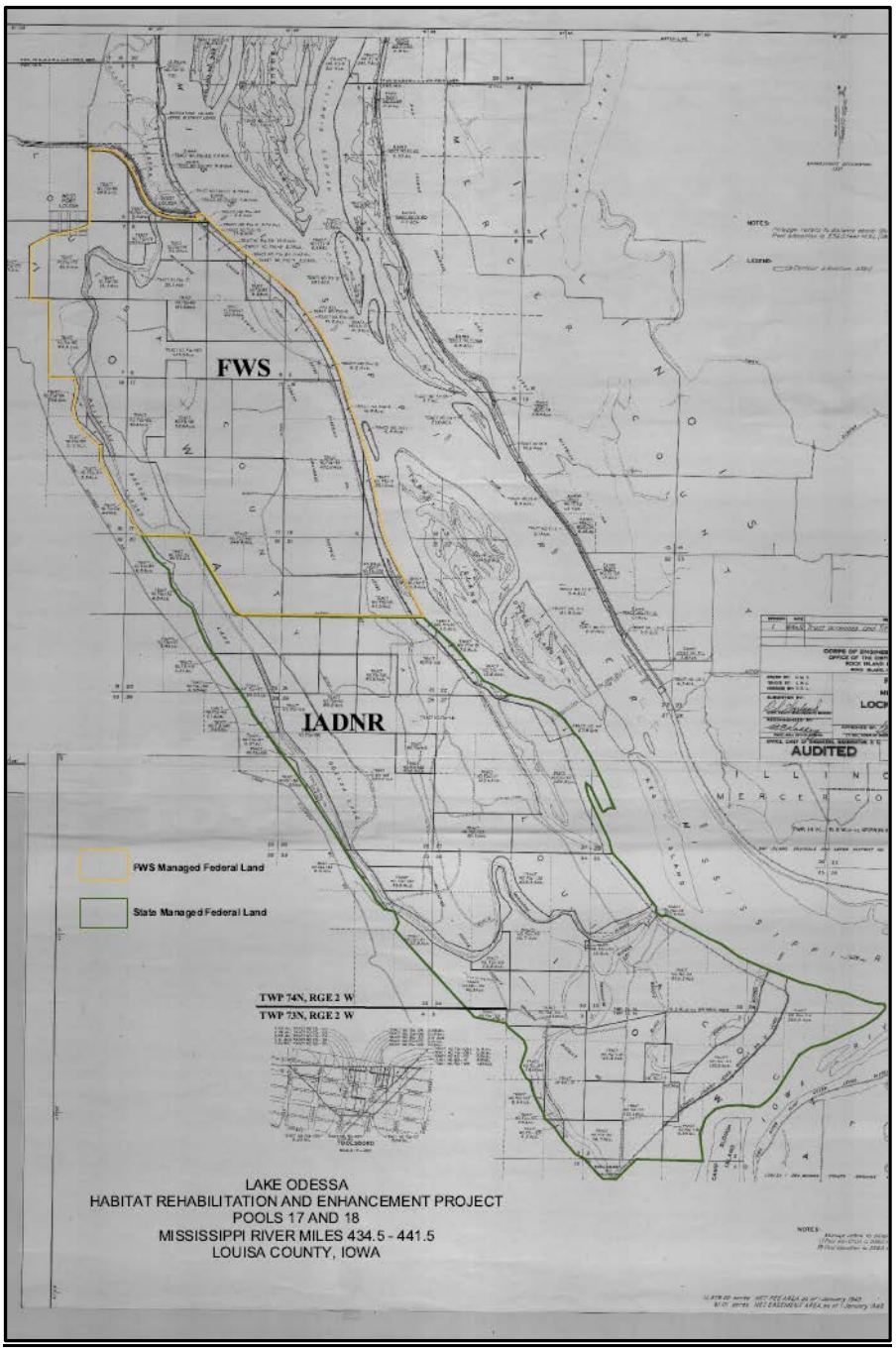

Figure 3: Real Estate Map from the Definite Project Report

4. PERTINENT INFORMATION

4.1. Project History

The Project restores and protects wetland, terrestrial, and aquatic habitat. The Project was designed by the Corps. The Corps funded 100% of the Project construction. The Project sponsor is the USFWS. IADNR is a project cooperator. All operation and maintenance is to be funded and performed by USFWS (or by the IADNR through a cooperative agreement with the USFWS). Design considerations and investigations are presented in the DPR dated April 2005. Table 1 provides a summary of planning, design, and construction activities associated with the Project. Goals and objectives were formulated during the design phase, shown in Table 2.

At the junction of the Iowa River and Mississippi River lies a piece of land that for centuries has attracted people to explore the wilderness. Toolesboro Mounds, located on the bluff overlooking the floodplain, gives visitors to the area an indication of the history and longevity of this location. In the 1800s, a short lived town of Burris City perished from typhoid, leaving the wilderness to a few hardy farmers.

The Muscatine - Louisa Joint Drainage and Levee District Number 13 constructed levees between Michael's Creek and the Iowa River. Pump Station 1 was constructed in 1914. Pump Station 2 was constructed in 1920. However, by 1928, the District was unable to pay to keep the water out or to repair the levees. By 1937, all pumping stopped. Between 1936 and 1939, the Lower Odessa Drainage Unit disbanded. These milestones and breaches are shown in Figure 4

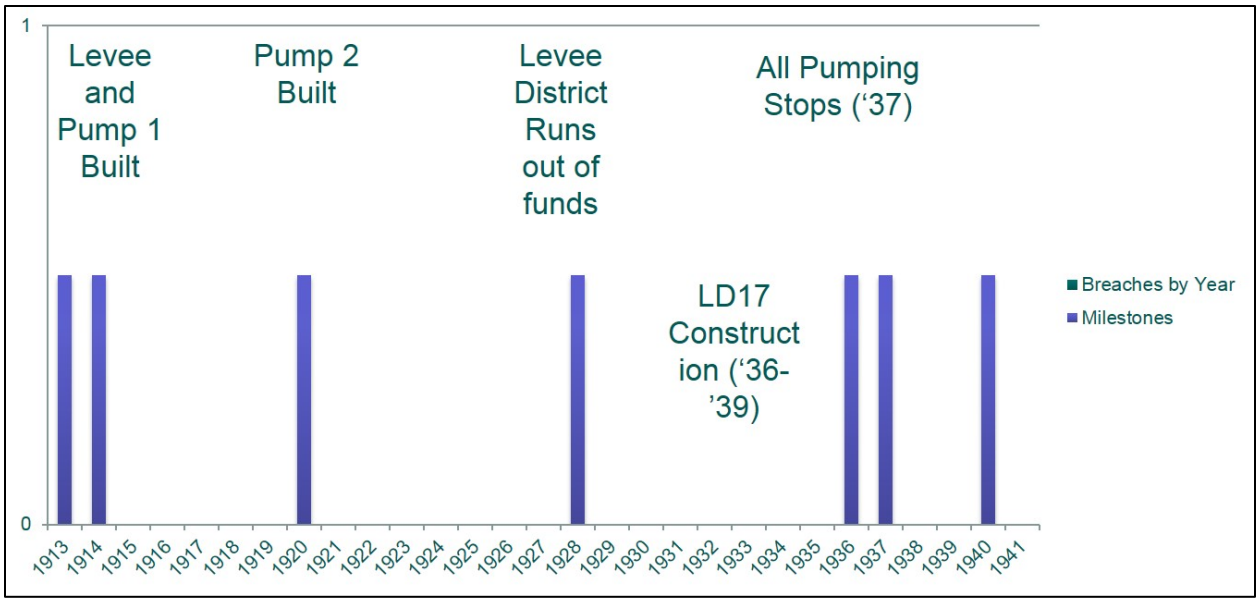

Figure 4: Milestones and Breaches Prior to 1940

6,185 acres of Odessa Bottoms was acquired by the Federal government (Corps) for the construction of the L/D system in 1940 for $246,000. At this time, the area consisted of a large lake and the only outlet was at the Number 2 Pump Station.

In 1945, much of the land purchased by the Corps, but not needed for navigation purposes was transferred to the USFWS as part of the General Plan lands. In 1946, the Iowa Conservation Commission received a license for the area. Active Wildlife management began in the 1950s, and included efforts to manipulate water levels to promote vegetative growth and to provide high quality resting and feeding areas for migratory waterfowl. The Mark Twain Refuge Complex (part of the Upper Mississippi River Refuge) was established in 1958. The name was subsequently changed to the Port Louisa Refuge.

A history of flood damages to the levee has existed, not only when the site was a functioning Levee District, but also once it was transferred to wildlife management. In 1947 Iowa River levee broke just below Toolesboro and water broke out at the Burris Outlet which was repaired in 1950. In 1951 Pumping Plant #2 washed away. The perimeter levee was breached during numerous flood events. While some sections of the levee had been improved, most sections were not resulting in a levee with numerous low spots and improper slopes. An inlet and outlet structure was built in 1954 to try to manage the interior water levels. Other breaches or levee damages occurred in 1965, 1969, 1973 and 1990.

The Lake Odessa project was among the first identified in 1986 as a proposed habitat rehabilitation and enhancement project for the UMRR. The original fact sheet is shown in the Figure 5. Scoping meetings started in 1990, with a fact sheet created by 1991 as shown in Figure 6. Project goals and objectives were developed by 1992.

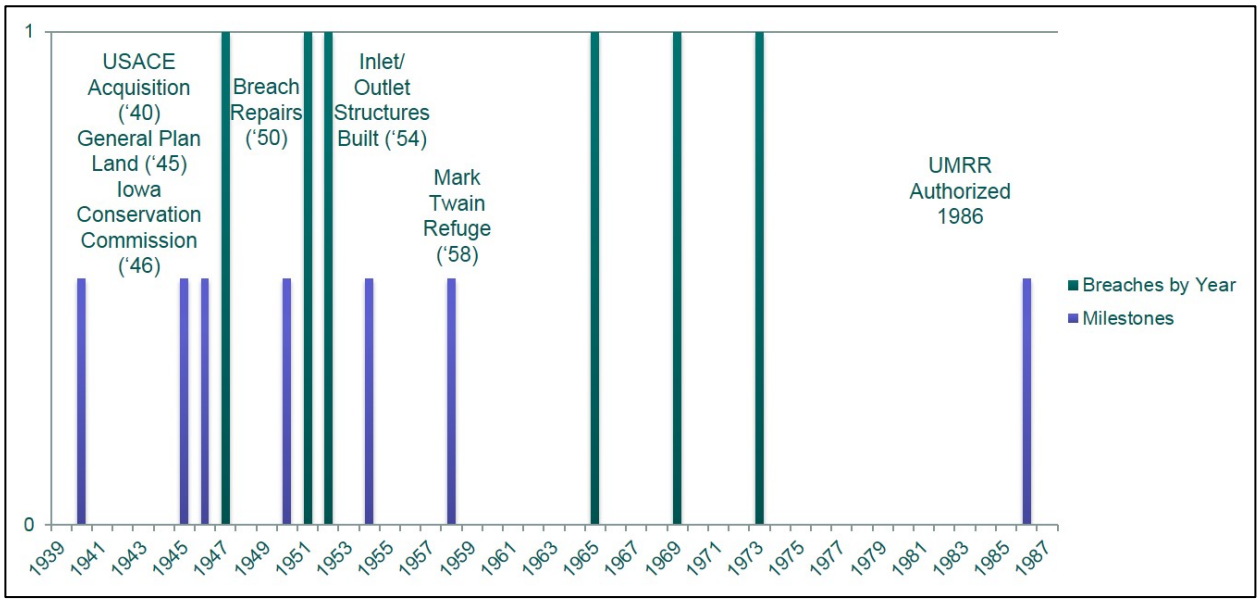

Figure 5: Milestones and Breaches Following Federal Acquisition and Before UMRR Authorization

CENCR-PD-W 6 December 1990

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM
FACT SHEET

LAKE ODESSA
POOLS 17-18, UPPER MISSISSIPPI RIVER, IOWA

LOCATION: Lake Odessa is a 6,800-acre backwater complex of open lake, marsh, timbered islands, ponds, and chutes, separated from the Mississippi River by a levee. It is located roughly half above and half below Lock and Dam 17, approximately 15 miles south of Muscatine, Iowa. The site lies on lands within the Upper Mississippi River Wildlife and Fish Refuge and on lands administered by the State of Iowa under a cooperative agreement with the U.S. Fish and Wildlife Service.

RESOURCE PROBLEM: Existing water control structures limit water level management, and breaches of the low levee have resulted in frequent losses of emergent aquatic vegetation used by migratory waterfowl. Sedimentation from the frequent levee breaks and overtopping flood events has caused a preponderance of shallow water habitat, resulting in frequent fish winterkills and reducing the circulation of well-oxygenated water.

PROPOSED PROJECT: The proposed project would involve rehabilitating the southern boundary levee which connects to the federal levee at L/D 17. Existing inlet and outlet structures would be repaired and an additional inlet structure would be constructed to improve water control. Additional project features would involve the creation of islands; deep hole dredging and the placement of rock structures to enhance the fishery; and dredging and clearing to open up areas suffering from low winter flows of well-oxygenated water.

PROJECT OUTPUTS: The proposed project would reduce sedimentation in the entire backwater complex and provide improved water level management in the area benefitting both fish and waterfowl. Other habitat betterments resulting from implementation of this project would include improved flow of well oxygenated water and creation of new habitat for waterfowl and fish.

FINANCIAL DATA: The general design and construction costs are estimated to be $295,000 and $3,026,000, respectively. The project would be located on lands of the National Wildlife Refuge System and on certain lands acquired for the navigation project that were identified in a General Plan and made available to the States, through Cooperative Agreements between the Corps of Engineers and the Department of Interior (DOI), and between the DOI and each State. The Cooperative Agreements stipulate that the areas shall be maintained "in accordance with an annual management program...submitted to the Service." Under Section 906(e) of the 1986 Water Resources Development Act, the project area is "managed as a national wildlife refuge" and qualifies for 100 percent Federal funding of general design and construction. Costs for OM&R would be 75-percent Federal/25-percent non-Federal. The non-Federal sponsor would be the Iowa Department of Natural Resources.

Figure 6: Original Fact Sheet

Unfortunately, the Great Flood of 1993 occurred, with significant impacts to the system, including:

- to levee breaches,
- inoperable inlet and outlet structures,
- sediment deposition inside levee and throughout the Project; and
- flooded area for 5 months, impacting seasonal vegetation and having long term impacts on bottomland hardwood forests.

A multiagency effort (USFWS, IADNR, Corps, and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)) worked to repair the levee. The Dredge Thompson (a Corps dredge) was used in the fall of 1994 to repair the upper levee break, including the future inlet structure, with sand dredged from the navigation channel. The USFWS used bulldozers to repair the remaining small breaks and minor overtopping damage on the upper levee. The IADNR repaired the two breaks on the Iowa River levee. New inlet and outlet structures were constructed in 1995 using USFWS funding, and with these structures, the levee surrounding the outlet structure as also repaired.

Once the system was temporarily repaired, the Project discovered numerous sites with archeological artifacts. These sites were significant enough that Phase I, II, and III investigations were required. Two sites required mitigation through excavation. Remaining sites were required to be protected from fluctuating water levels. The archeological investigations occurred between 1995 and 2003.

Site meetings for the HREP resumed in 2000 to refine project features. However, in 2001, another flood occurred. Again, significant damage was observed, including:

- USFWS Refuge:
    - 7 breaches, 1,800 feet of levee lost,
    - 2,000 feet of roads damaged,
    - 3 parking lots damaged,
    - Over 1,500 feet of ditches filled in,
    - 2-4 feet of sediment added to USFWS Refuge wetland units.
    - Wind driven waves damaged Michael Creek and Mississippi River levees.
    - Water control structures and main pump damaged.

- IADNR:
    - 2 levee breaches on Mississippi River Levee and
    - 2 breaches on the Iowa River levee,
    - Several hundred feet damaged by erosion.

At this point, it was confirmed that the varying levee elevations and steep side slopes were causing damage during overtopping events. The low spots would overtop first, leading to overtopping breaches. The inlet and outlet structures were too small to fill the interior before overtopping. Odessa is intended to inundate during flood events, and its success depends on the interior filling prior to overtopping to prevent damage. A summary of milestones and breaches observed during the planning phase is shown in Figure 7.

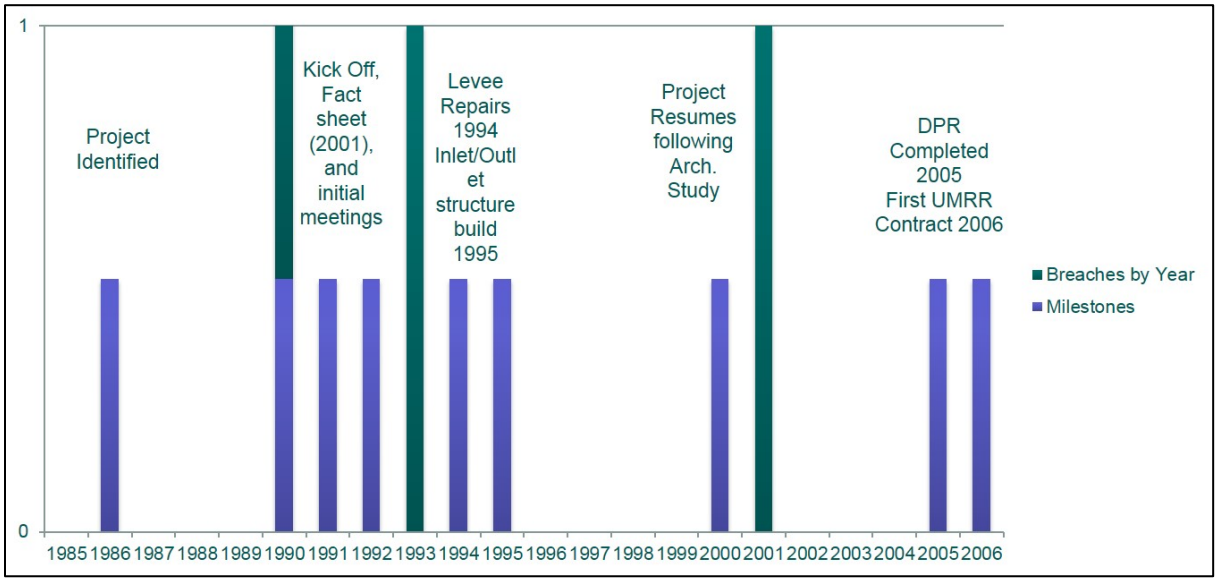

Figure 7: Milestones and Breaches During Planning Stages

The feasibility report (Definite Project Report) went for public review in 2004 and was completed in 2005 with a Recommended Plan that included:

- enhancing water level management capability,
- dredging,
- mast tree planting,
- levee restoration, and
- fish nursery construction

The feasibility level plan was to develop a levee which had uniform side slopes and a top elevation that matched the elevation of the river when overtopped. Two spillways were designed to allow additional water to enter the system. However, before the levee could be restored (construction was not yet complete), the Great Flood of 2008 occurred which caused 22 breaches, 2,750 feet of visual damage on the USFWS Refuge and 3,660 feet of damage on the IADNR levee. There were breaks near the outlet and along the Iowa River. While the system had performed better than in the 2001 event, it was apparent that additional protection would be needed to prevent damage in future events. A new contract was awarded which provided a 2 foot clay cap along the top of the levee. The operational procedure would involve flooding the interior using the inlet and outlet structures and the spillway, such that when the levee was overtopped only the clay portion would be above water. The clay would better withstand overtopping events than the previously constructed sand embankment.

In 2011, another flood occurred prior to completing the clay cap. Again, the levee continued to perform better than in previous events, although two minor breaches were observed near Michael's Creek. This area was repaired, and the remainder of the clay cap was completed and seeded.

2012 brought a year of drought. The levee had restored side slopes, and a clay cap in place, but areas that had been seeded were unable to grow and establish a cover over the levee. A well-established vegetative cover provides additional protection while overtopping. In 2012, in the IANDR-managed levee, seed was barely established prior to winter months leaving lines of seeds as opposed to a uniform carpet desired.

In 2013, more flooding occurred and a breach happened near the outlet structure in April. This was a location which had been breached numerous times, and the seed in this location had not yet established. In June 2013, a second flood surge caused another breach, along the Iowa River. The clay cap had been placed, but seed had not yet established. A more significant concern than the lack of seeding was that this was the fastest river rise observed on record for both the Iowa and the Mississippi Rivers. The rivers rose so quickly that the interiors did not have time to fill before the levees were overtopped. The historic rates of rise are shown in the Table 3. Additional spillway lengths for different rates of rise were calculated to determine if additional spillways added to the Project could prevent future damage as shown in Table 4.

Table 3: Historic Rate of Rise for the Mississippi River

Flood Event	Rate of Rise (feet/day)
1973	**1.5**
1993	.75 (typical)
2001	1.0
2008	1.0
2011	1.57
2013	2.07

Table 4: Additional Spillway Lengths for Different Rates of Rise

Rate of Rise (feet/day)	Additional Spillway Length Required (feet)
0.75	0
1	0 (original design)
1.25	100
1.5	400
1.75	750
2.0	1050
2.25	1400
2.5	1700

Observing the recent trends of river rises, it was determined adding additional spillway lengths could help prevent future damage. Since there were two new openings in the levee, both situated in areas of historic breach locations indicating that these were paths the rivers wanted to follow, two new spillways were constructed.

While it seemed that the plan was adequate and should prevent future damages, before construction to install the new spillways could be initiated, the 2014 flood occurred. This event caused a large breach near the inlet structure. This breach repair, along with additional riprap for protection, was constructed using the same contract as the spillway contract. Figure 8 shows the milestones and breaches during the Construction phase.

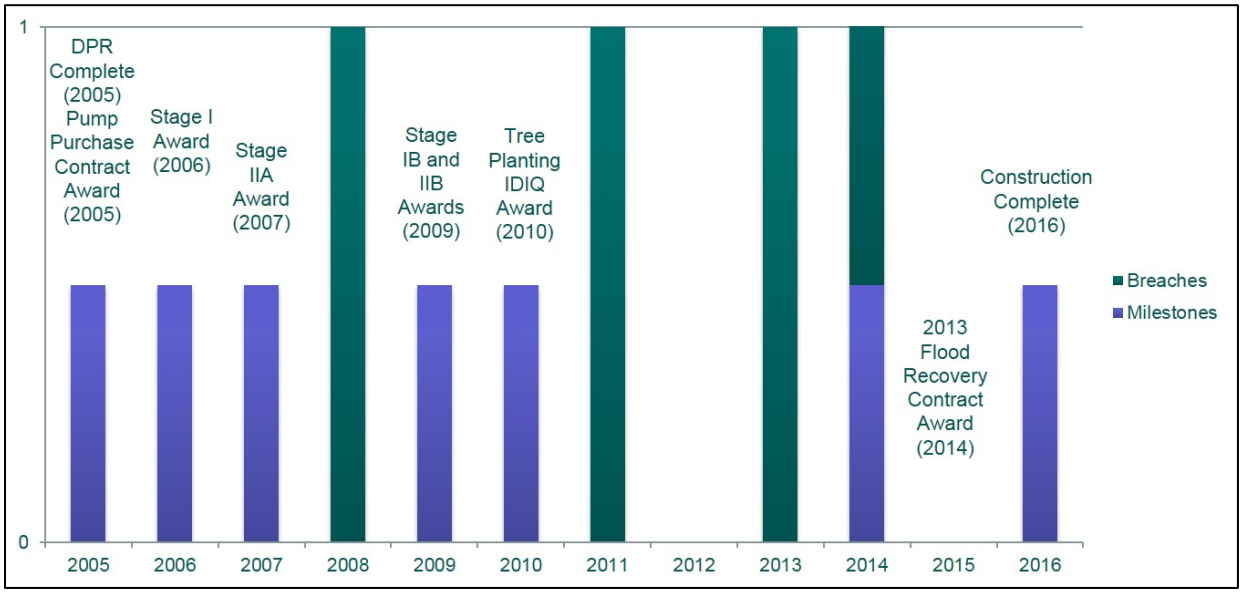

Figure 8: Milestones and Breaches During Construction

By 2016, all features had been constructed, and while generally flood events occur in the spring or summer, in late September through early October 2016 another flood event occurred. This event overtopped the spillways, but no interior damage was observe. Therefore, a ribbon cutting for the event occurred on April 6, 2017.

4.2. River Gages Information

Information can be obtained from the Corps website: http://www.rivergages.com. First select "Rock Island District" from the "Water Level By" drop down menu; then select "Mississippi River and Passes" from the "Rock Island District Basins" drop down menu; then select "Mississippi River at L/D 17 (New Boston, IL)" from the list. The gages are listed from upstream to downstream.

Mississippi River at L/D 17 (New Boston, IL) (NBOI2)[1]

- Gage Datum (zero elevation): 526.57 feet MSL 1912
- Flood Stage @ Gage: 15.0 feet
- River Mile: 437.1
- Location: Pool No. 17 extends 20.1 river miles upstream to Muscatine, IA. L/D 17 is located approximately 3 miles upstream from the mouth of the Iowa River near New Boston, IL

[1] *The water level forecast applies to the location of the gage station. The Flood Profile is sloped and has a 0.4 feet swellhead at the dam. Swellhead is the increase in water depth due to the presence of a submerged dam with its Tainter and Roller Gates fully raised and out of the water. To determine the estimated water level at a different location than the gage station, use the historic water surface profiles from www.rivergages.com or on http://rivergages.mvr.usace.army.mil/flow_freq/flow_freq.cfm

Historical Top 10 Crests

1. 25.90 feet on 07/09/1993
2. 25.20 feet on 06/17/2008
3. 23.14 feet on 04/28/1965
4. 22.46 feet on 04/25/2001
5. 22.22 feet on 04/22/2013
6. 21.83 feet on 05/01/2008
7. 21.73 feet on 04/25/1973
8. 20.96 feet on 04/24/2011
9. 19.76 feet on 04/26/1969
10. 19.70 feet on 05/08/1975

Iowa River at Oakville, IA (OKVI4). There are two spillways along the Iowa River tieback levee at Lake Odessa. The Oakville gage is located on the HWY 99 Bridge approximately 3.6 and 4.1 miles upstream of these spillways. In lieu of field observations, an estimate of water level on the river side of the spillways can be made from this gage by estimating slope and factoring in the elevation of the Mississippi River. The Corps performed two water level surveys in 2008 along the tieback levee which could also assist in water level estimation if needed. Gage data at Oakville is only available once per day at 6 AM; Oakville gage data is available at the following site: http://rivergages.mvr.usace.army.mil/WaterControl/stationinfo2.cfm?sid=OKVI4&fid=OKVI4&dt=S

Gage data is also available in 15 minute intervals at the following site: https://waterdata.usgs.gov/usa/nwis/uv?05465700

4.3. Lake Odessa Water Levels

There is a water level gauge located at Schafer's Access Point at Lake Odessa which is used by the USFWS for lake levels. The other gages (L/D17 and Iowa River at Oakville) monitor water levels outside the Project. The location of Schafer's Landing is shown on Figure 9, and the gauge information can be found online at: http://water.weather.gov/ahps2/hydrograph.php?wfo=dvn&gage=odsi4. The gage at Schafer's Access Point should be used for monitoring water levels within Lake Odessa because the gage is located within the USFWS Refuge and thus gives a more accurate picture of water levels within the USFWS Refuge as compared to gages outside the USFWS Refuge. Please note that while there is no scale or north arrow on the below drawing, referencing the online location shown above will provide more specific details of the location.

Figure 9: Schafer's Landing Gage Location Map (Gage monitors Lake Odessa water levels)

4.4. Hydrologic Data

The Mississippi River at L/D 17 (New Boston) gage is adjacent to the riverside levee of the project. This gage should be used to aid in flood forecasting and preparation. It should be noted that the Mississippi River gages are referenced to Mean Sea Level (MSL) 1912 datum and the tributary gages are referenced to National Geodetic Vertical Datum (NGVD) 1929 datum. The most accurate datum is North American Vertical Datum (NAVD) 1988. For conversions from 1912 to one of the other datums, use the values in Figure 10. Historical flow data is provided in Figure 11. The maximum, minimum and average flows are shown for the years 1986 to 2013. The National Weather Service provides an online conversion tool between 1929 and 1988 datums at the following location: http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html.

Table 5 shows how river elevation (stage) for the Lake Odessa HREP and the surrounding areas relates to the project. More details on operational actions indicated in this table is contained in Section 8 of this document.

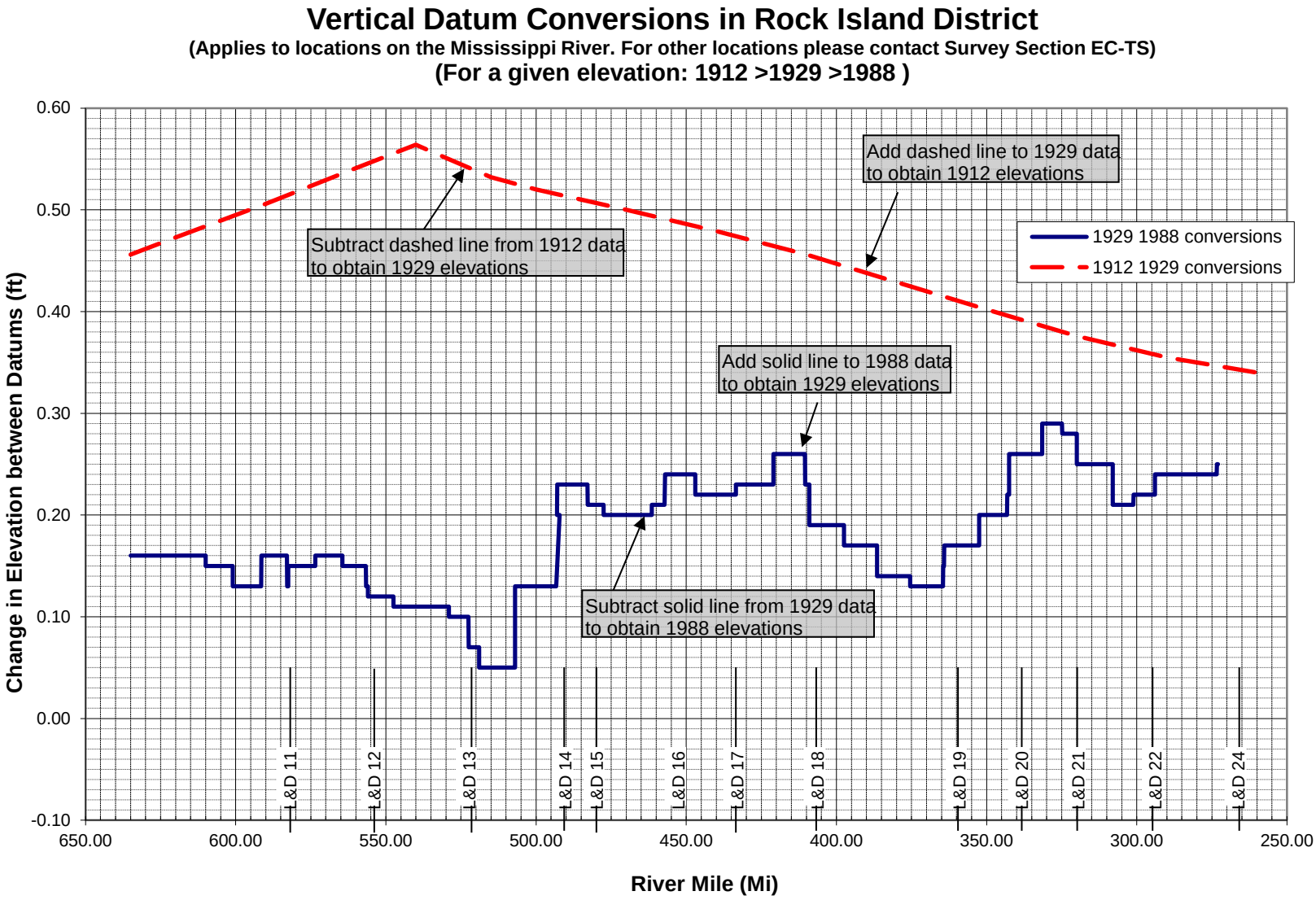

Figure 10: Vertical Datum Conversions in Rock Island District

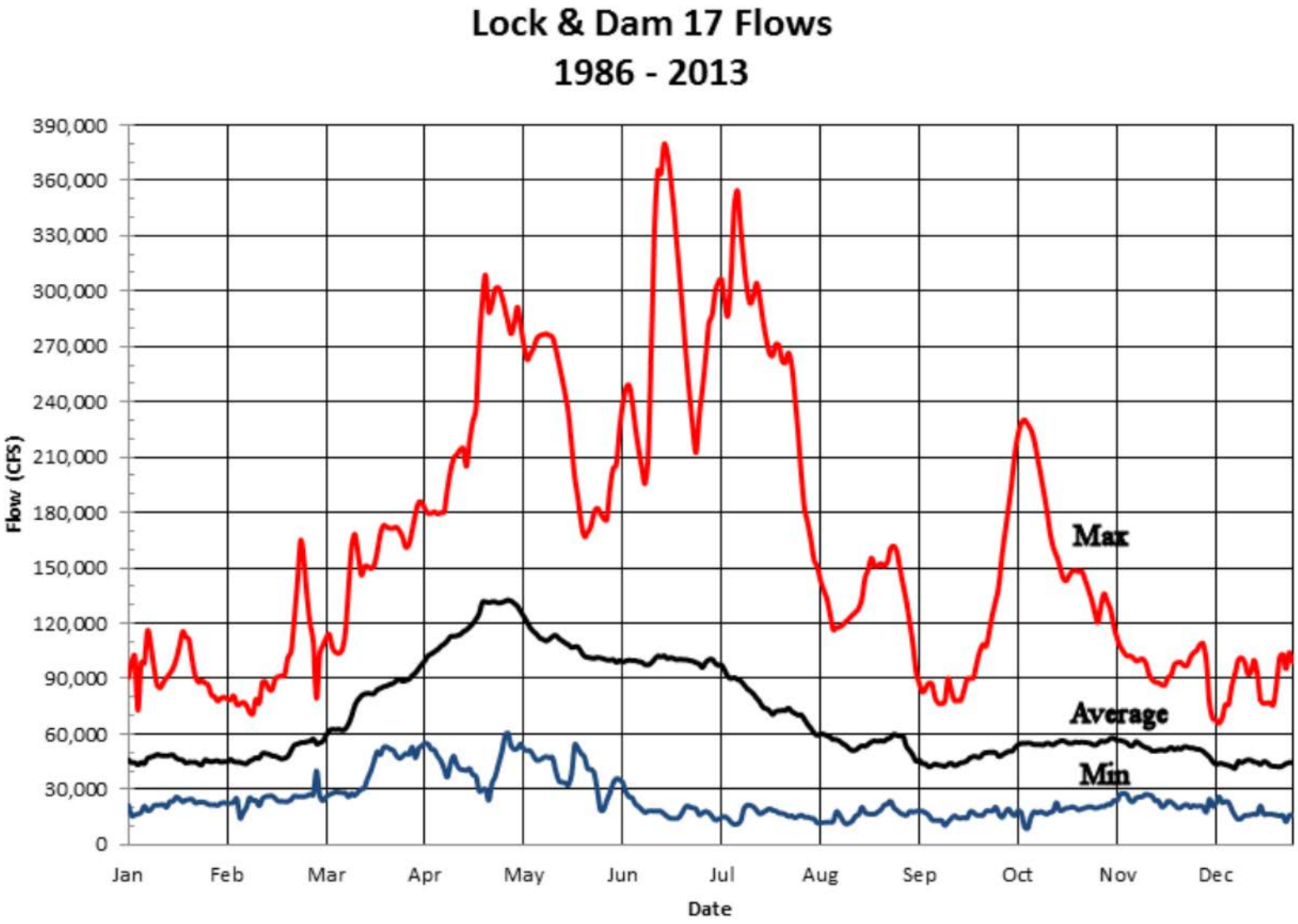

Figure 11: Lock and Dam 17 Flows (1986-2013)

Table 5: River Elevation Affects (Mississippi River at Lock and Dam 17, New Boston, IL Gage (NBOI2)[1] Tail Water Gage of L/D 17 (River Mile 437.1)

Elevation (feet) MSL 1912	Stage[1]	Affected Areas
526.57	0.00	Gage Zero
528.00	1.43	Outlet Invert
532.35	5.78	Inlet Invert
535.87	9.30	Flat Pool Stage
541.57	15.00	Flood Stage
541.57	15.00	If the Mississippi River stage is between 15 feet and 17.5 feet (at L/D17), and the Iowa River is less than 1 feet below the crest of the Iowa River Spillway (at the spillway), and the nearest upstream Iowa River Gage at Oakville (US Hwy 99 Bridge) shows a significantly rising hydrograph, it is recommended that USFWS Refuge Managers and the Corps be in communication with one another. T
543.07	16.50	Moderate Flood Stage
544.07	17.50	Open Outlet Structure Gates when Mississippi River is predicted to rise above a stage of 18.5 feet for longer than 24 hours.
544.07	17.50	During flood events, when it is anticipated that the lowest spillway will be overtopped (Stage 18.33), the IADNR water control structure associated with the IADNR MSU will be fully opened. This will allow water to backfill the IADNR MSU prior to be overtopped, equalizing water levels, and reducing scour or erosion damage to the berm.
544.90	18.33	Spillway Crest near Outlet (Downstream Spillway on Mississippi River, RM 435.1, Length 700 feet)
545.07	18.50	Major Flood Stage
545.20	18.63	Iowa River Spillway Crest (Downstream Spillway on Iowa River, Length 1100 feet)
545.50	18.93	Iowa River Spillway Crest (Upstream Spillway on Iowa River, Length 600 feet)
545.80	19.23	USFWS (or Prairie Pocket) Spillway Crest (Upstream Spillway on Mississippi River, RM 440.4, Length 700 feet)
548.15	21.58	Downstream Levee Height (Tieback along Iowa River)
548.50	21.93	Lowest Levee Elevation
551.20	24.63	Upstream Elevation of Levee along Michael's Creek
552.47	25.90	Flood of Record (7/9/1993)

[1] Based on the Mississippi River at L/D 17 (New Boston, IL) gage zero 526.57 feet MSL 1912 datum.

4.5. Feature Elevations

Elevations of features inside of the Project are indicated in Table 6. More details on the operation of these features are included in Section 8 of this document.

Table 6: Interior Elevations at the Lake Odessa HREP

Elevation MSL 1912	Affected Areas
526.50	Blackhawk Chute/Yankee Chute Channel Bottom Design
526.50	Goose Pond Channel Bottom Design
526.50	Upper Goose Pond Bottom Design
530.95	Fox Pond Water Control Structure, Outlet Flow
531.50	Bebee Pond Channel Bottom Design
531.50	Lake Odessa/Swarms Pond Channel Bottom Design
531.50	Swarms Pond/Bebee Pond Channel Bottom Design
531.63	Muscatine Slough Water Control Structure invert (Lake Odessa side)
531.68	Muscatine Slough Water Control Structure invert (Unit 2 side)
531.87	Fox Pond Water Control Structure, Well Bottom (Fox Pond side)
532.50	Minimum Managed Water Level (The IADNR and USFWS try to attain this elevation during summer draw down periods if possible based on river levels and weather conditions).
532.77	Fish nursery Water Control Structure HDPE Pipe invert (interior)
532.84	Fish nursery Water Control Structure HDPE Pipe invert (exterior)
534.00	Winter Pool Elevation (The IADNR and USFWS try to attain this elevation during the winter months to reduce ice damage to trees, and to ensure adequate overwintering depths for
535.24	IADNR Water Control Structure CMP invert (exterior)
536.09	IADNR Water Control Structure CMP invert (interior)
536.29	Fields 4 and 5 HDPE Pipe invert (north)
537.00	Fox Pond Water Impoundment
538.50	Fields 4 and 5 Maximum Water Impoundment
538.50	Unit 2 Maximum Water Impoundment
539.15	Fields 4 and 5 HDPE Pipe invert (south)
540.00	IADNR MSU HDPE Pipe invert (interior)
540.00	The outlet gate structure will be opened in order to raise the interior water levels to this elevation in order to reduce scour at the downstream spillways.
540.25	IADNR MSU HDPE Pipe invert (exterior)
541.00	IADNR MSU Water Impoundment
542.40	The outlet gate structure will be opened in order to raise the interior water levels to this elevation in order to reduce scour at the USFWS (Prairie Pocket) spillway.

4.6 Levee Elevations

The levee embankment was enhanced during various project stages and following numerous flood events during construction. Pertinent elevations are shown in Table 7.

Table 7: Levee Embankment Elevations

Approximate Stations		Structure	Elevations (After 2013 Flood Recovery)	Elevations (After Stage IB)	Elevations (After Stage I)
Start	Stop				
0+00				No less than 551.2	551.2
10+00				No less than 551.2	
42+00				No less than 551.0	
43+00				No less than 551.0	
50+00					551.0
US of Inlet				552.2	
50+00	51+00	Inlet	(invert 532.35)[1]		
DS of Inlet				552.2	
55+70			551		
58+00				550.9	
58+60			551		
71+40				550.8	
US End of Spillway				555.7	
78+20	86+20	Spillway	(545.8) [1]		
DS End of Spillway				555.7	
94+40				550.6	
100+00				550.6	
150+00				550.2	
200+00				549.8	
250+00				549.4	
266+00				549.3	549.3
266+05					549.0
267+20				549.3	
268+40				549.0	
300+00			548.8	548.8	
350+00			548.4	548.4	
US End of Spillway			548.4	548.4	
372+70	380+00	Spillway	544.9		
376+80		*replaced in later stage with spillway*		*548.2*	
DS End of Spillway			548.4	548.4	
US of Outlet			No less than 548.8	No less than 548.8	
384+00	385+00	Outlet	(invert 528) [1]		
DS of Outlet				No less than 548.8	
392+20				548.0	

Table 7: Levee Embankment Elevations

Approximate Stations		Structure	Elevations (After 2013 Flood Recovery)	Elevations (After Stage IB)	Elevations (After Stage I)
397+00					548.0
400+00				548.0	
423+80				548.0	548.0
425+80				550.0	550.0
DS End of Spillway				550.0	550.0
430+80	442+00	Spillway			545.2
US End of Spillway			545.5	550.0	550.0
445+00			550.0		
447+40				550.0	
449+00			550.0		550.0
449+40				548.7	548.7
DS End of Spillway			548.7		548.7
454+00	459+00	Spillway	545.5		
US End of Spillway			548.7		548.7
472+00				549.2	549.2
479+26					548.0
483+10				549.5	549.5

[1]Inlet, outlet and USFWS spillway were constructed by the USFWS.

5. CONSTRUCTION HISTORY

5.1. Contracts

There were five construction stages, a forestry contract, and pump acquisition for this Project. Brief details of the contracts are listed below, with more details provided in later sections of this O&M Manual.

Lake Odessa Pump Acquisition
W912EK-05-F-0058
Initial Contract: 9/27/2005
Final Modification: 3/16/2006
Odessa Wildlife Unit: $44,627.00
Port Louisa National Wildlife Refuge: $82,110.00

Lake Odessa Habitat Rehab Stage I
W912EK-06-C-0054
Contract Award 6/17/2006
Notice to Proceed 7/26/2006
Beneficial Occupancy Date 9/30/2009
Contract Physically Complete 2/16/2010
Final Payment 3/29/2010
Cost: $5,597,180.87

Lake Odessa Habitat Rehab Stage IIA
W912EK-07-C-0061
Contract Award 9/28/2007
Notice to Proceed 10/18/2007
Beneficial Occupancy Date 9/25/2009
Contract Physically Complete 2/16/2010
Final Payment 3/29/2010
Cost: $3,239,485.07

Lake Odessa Habitat Rehab Stage IB
W912EK-09-C-0099
Contract Award 8/28/2009
Notice to Proceed 9/15/2009
Beneficial Occupancy Date 6/05/2012
Contract Physically Complete 6/16/2012
Final Payment 8/31/2013
Cost: $2,596,778.78

Lake Odessa Habitat Rehab Stage IIB
W912EK-10-C-0018
Contract Award 12/28/2009
Notice to Proceed 1/08/2010
Beneficial Occupancy Date 4/28/2011
Contract Physically Complete 4/28/2011
Final Payment 7/26/2013
Cost: $2,255,187.74

Lake Odessa Habitat Rehabilitation Forestry Contract
W912EK-10-D-004, Task Order 1 (IDIQ Contract)
Contract Award 3/24/2010
Notice to Proceed 5/17/2010
Beneficial Occupancy Date 5/22/2010
Contract Physically Complete 4/2011
Final Payment: Complete
Costs: $149,988.04

Lake Odessa Flood Recovery 2013
W912EK-14-C-0080
Contract Award 8/18/2014
Notice to Proceed 9/15/2014
Beneficial Occupancy Date 7/27/2016
Contract Physically Complete 9/2/2016
Final Payment: 2017
Costs: $2,610,068.09

5.2. Contract Number W912EK-05-F-0058 (Pump Acquisition).
Portable pumps were purchased and modified for water control of the interior systems throughout the Project. The vendor, Gator Pump, Inc., from Brownwood, TX, provided the sponsor with operation and maintenance manuals for the pumps at time of delivery. Contract cost information is provided in Table 8 and Table 9.

Table 8: Contract W912EK-05-F-0058 Costs
(Odessa Wildlife Unit Pump Acquisition)

Contract	Item	Cost	Invoice Date	Delivery to
Initial Contract	16" Shark Trailer Pump with 6T185 JD	$ 25,500.00	9/27/2005	Odessa Wildlife Unit
Initial Contract	16" x 50 ' Tubing with clamp	$ 1,559.00	9/27/2005	Odessa Wildlife Unit
Modification	(1) existing 10,000 GPM SHARK model 16" Trailer Pump shall be picked up for modification from the Odessa Wildlife Unit, Attn: Mr. Wayne Souer, 9726 County Road X61, Wapello, Iowa 52653 and returned to the same address as a 10,000 GPM SHARK model 16" tractor powered trailer centrifugal pump.	$ 5,856.00	3/16/2006	Odessa Wildlife Unit
Modification	(1) new 10,000 GPM TARPON model 16" Ditchrider Trailer Pump with the reinstalled John Deere 6T185 diesel engine, fuel tank, electrical system and useable accessories shall be delivered to the Odessa Wildlife Unit, Attn: Mr. Wayne Souer, 9726 County Road X61, Wapello, Iowa 52653, Tel: 319-523-3102	$ 5,856.00	3/16/2006	Odessa Wildlife Unit
Modification	(2) new 16" x 50' PVC impregnated w/ woven nylon jacket Lay-Flat discharge hoses with Stainless Steel Hose Clamps for attachment to pump discharge outlet shall be delivered to the Odessa Wildlife Unit, Attn: Mr. Wayne Souer, 9726 County Road X61, Wapello, Iowa 52653, Tel: 319-523-3102.	$ 5,856.00	3/16/2006	Odessa Wildlife Unit
	Odessa Wildlife Unit Total	**$ 44,627.00**		

Table 9: Contract W912EK-05-F-0058 Costs
(Port Louisa National Wildlife Refuge Pump Acquisition)

Contract	Item	Cost	Invoice Date	Delivery to
Initial Contract	Seal 10" Trailer Pump with JD 4T100, Serial No. 051739, Engine Serial No. JDPE4045T32580	$18,976.00	9/27/2005	Port Louisa NWR
Initial Contract	TR-10 10" x 50' Section of Industrial Tubing with Clamp	$1,123.00	9/27/2005	Port Louisa NWR
Initial Contract	16" Shark Trailer Pump with 6T185 JD	$5,500.00	9/27/2005	Port Louisa NWR
Initial Contract	16" x 50 ' Tubing with clamp	$1,559.00	9/27/2005	Port Louisa NWR
Initial Contract	16" x 50 ' Tubing with clamp	$1,559.00	9/27/2005	Port Louisa NWR
Modification	(1) existing 10,000 GPM SHARK model 16" Trailer Pump shall be picked up for modification from the Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653 and returned to the same address as a 10,000 GPM SHARK model 16" tractor powered trailer centrifugal pump .	$5,856.00	3/16/2006	Port Louisa NWR
Modification	(1) new 10,000 GPM TARPON model 16" Ditchrider Trailer Pump with the reinstalled John Deere 6T185 diesel engine, fuel tank, electrical system and useable accessories shall be delivered to Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653	$5,856.00	3/16/2006	Port Louisa NWR
Modification	(2) new 16" x 50' PVC impregnated w/ woven nylon jacket Lay-Flat discharge hoses with Stainless Steel Hose Clamps for attachment to pump discharge outlet shall be delivered to Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653	$5,856.00	3/16/2006	Port Louisa NWR
Modification	(1) existing 4,000 GPM SEAL model 10" Trailer Pump shall be picked up for modification from the Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653 and returned to the same address as a 4,000 GPM SEAL model 10" tractor powered trailer centrifugal pump .	$3,956.25	3/16/2006	Port Louisa NWR
Modification	(1) new 6,500 GPM STINGRAY model 12" Ditchrider Trailer Pump with the reinstalled John Deere 4T100 diesel engine, fuel tank, electrical system and useable accessories shall be delivered to Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653	$3,956.25	3/16/2006	Port Louisa NWR
Modification	(1) new 10" x 50' PVC impregnated w/ woven nylon jacket Lay-Flat discharge hoses with Stainless Steel Hose Clamps for attachment to pump discharge outlet shall be delivered to Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653	$3,956.25	3/16/2006	Port Louisa NWR
Modification	(1) new 12" x 50' PVC impregnated w/ woven nylon jacket Lay-Flat discharge hoses with Stainless Steel Hose Clamps for attachment to pump discharge outlet shall be delivered to Port Louisa NWR, Attn: Mr. Tom Cox, 10728 County Road X61, Wapello IA 52653	$3,956.25	3/16/2006	Port Louisa NWR
	Port Louisa NWR Total	**$82,110.00**		

5.3. Contract W912EK-06-C-0054 (Stage I)

Stage I work was covered under contract W912EK-06-C-0054. The work included the construction of a new spillway structure using degraded materials from the existing levee; enhancing the existing levee section with pervious embankment; construction (excavation) of ephemeral wetlands; and placement of compacted granular surfacing. Construction of the spillway consists of stripping, excavation, disposition of stripping and excess excavated material, foundation preparation, impervious embankment, reinforced concrete cutoff wall, backfill, sub grade preparation, geotextile fabric, compacted filter stone, articulated concrete block mat system, topsoil, choke stone, and seeding. Figure 12 shows the site plan for Stage I.

The Contract was awarded June 17, 2006 with the Mutual Understanding Conference held on August 29, 2006. Construction was completed on September 30, 2009. The contract cost was $5,597,180.87. Contract cost information is provided in the Table 10.

Stage I had 21 modifications to the contract. A summary of the modifications is in Table 11.

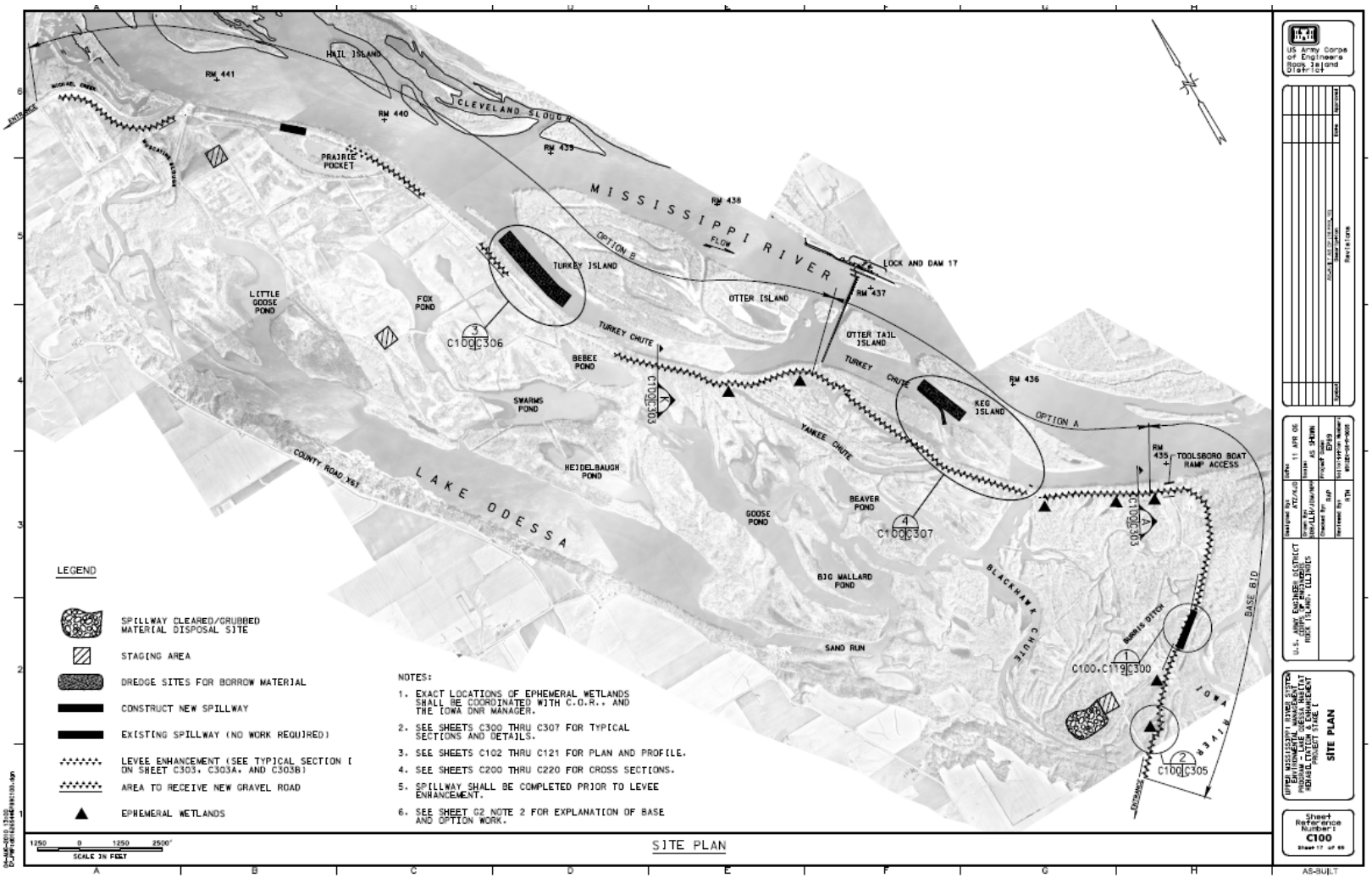

Figure 12: W912EK-06-C-0054 (Stage I) Site Plan

Table 10: W912EK-06-C-0054 (Stage I) Costs

Bid Items	Description	Quantity	Unit	Amount
0001	Temporary Field Office	1.00	LS	$80,250.00
0002	Telephone Bills Temporary Field Office			
0002AA	First $1,000	1,000.00	DL	$1,150.00
0002AB	Over $1,000	1,631.00	DL	$1,875.65
0003	Clearing and Grubbing	1.00	LS	$240,041.19
0004	Spillway, Earthwork	1.00	LS	$235,000.00
0005	Spillway, Concrete Cutoff Wall	1.00	LS	$142,000.00
0006	Spillway, Bedding Stone (Under Riprap)			
0006AA	First 2,550 Tons	2,550.00	TN	$64,948.50
0006AB	Over 2,550 Tons	312.92	TN	$7,970.07
0007	Spillway, Riprap			
0007AA	First 7,010 Tons	0.00	TN	$0.00
0007AB	Over 7,010 Tons	0.00	TN	$0.00
0008	Spillway, Drainage Stone			
0008AA	First 2,870 Tons	2,870.00	TN	$73,873.80
0008AB	Over 2,870 Tons	180.19	TN	$4,638.09
0010	Spillway, Articulated Concrete Block Mat System	1.00	LS	$785,000.00
0011	Spillway, Topsoil	1.00	LS	$53,240.00
0012	Spillway, Seeding	1.00	LS	$9,438.00
0013	Spillway, Articulated Concrete Mat Crushed Stone Along Spillway Toe For Roadway	1.00	LS	$30,500.00
0014	Levee Enhancement Embankment			
0014AA	First 45040	45,040.00	CY	$639,568.00
0014AB	Over 45040	18,245.16	CY	$259,081.27
0014AC	Mobilization and Demobilization	1.00	LS	$215,123.80
0015	Construct Ephemeral Wetlands	3.00	EA	$13,500.00
0016	Granular Surfaced Roadway			
0016AA	First 1700	1,700.00	TN	$59,500.00
0016AB	Over 1700	850.00	TN	$29,750.00
0017	Spillway Riprap			
0017AA	Spillway Riprap, First 7,010	7,010.00	TN	$323,511.50
0017AB	Spillway Riprap, Over 7,010	480.02	TN	$22,152.93
0100	Levee Enhancement Embankment			
0100AA	First 68,130 (stations 265+40 to 374+20)	68,130.00	CY	$558,666.00
0100AB	Over 68,130 (stations 265+40 to 374+20)	42,717.20	CY	$350,281.04
0100AC	First 22,285 (Stations 202+50 to 265+40)	6,745.05	CY	$74,735.15
0100AD	Over 22,285 (Stations 202+50 to 265+40)	0.00	CY	$0.00
0101	Construct Ephemeral Wetlands	2.00	EA	$9,000.00

Table 10: W912EK-06-C-0054 (Stage I) Costs

Bid Items	Description	Quantity	Unit	Amount
0200	Levee Enhancement Embankment			
0200AA	First 32,475	32,475.00	CY	$359,823.00
0200AB	Over 32,475	4,793.95	CY	$53,116.97
0201	Construct Ephemeral Wetlands	2.00	EA	$9,000.00
0202	Granular Surfaced Roadway			
0202AA	First 1,090	1,090.00	TN	$38,150.00
0202AB	Over 1,090	185.43	TN	$6,490.05
0203	Depression Fill Station 275+00, 465+00	1.00	LS	$213,385.61
0204	Additional Borrow Area	1.00	LS	$17,541.00
0205	Emergency Levee Breach Repair	50.00	HR	$9,886.50
0206	Recover Sand Fill - Part 1	1.00	LS	$30,000.00
0207	Levee Breach Hydraulic Fill - Part 1	1.00	LS	$100,000.00
0208	Recover Sand Fill - Part 2	1.00	LS	$16,643.04
0209	Levee Breach Hydraulic Fill - Part 2	1.00	LS	$238,075.23
0210AA	CA014 Post Flood Survey Stations 280 to 410	1.00	LS	$17,816.54
0210AB	CA017 Option B Levee Re-survey	1.00	LS	$22,496.33
0211	Beebe Breach Final Repairs	1.00	LS	$16,613.83
0212	Winterization 2008-09	1.00	LS	$18,917.20
0301	Spillway Seeding	1.91	AC	$34,425.76
0302	Granular Surfaced Roadway	789.00	TN	$45,651.54
0303AA	First 200 Tons	200.00	TN	$11,942.00
0303AB	Over 200 Tons	45.39	TN	$1,949.05
0304	Lower WCS Riprap	0.00	TN	$0.00
0305	Temporary Field Office	3.00	MO	$7,517.07
0306	20' Culvert	1.00	LS	$2,449.88
0307	Lower WCS 400 lb. Riprap	655.41	TN	$35,483.90
0308	Field Office Extension (Oct. and Nov. 2009)	2.00	MO	$5,011.38

JA - Job
MO – Month
DL – Dollars
TN – Tons
CY - Cubic Yards
AC – Acres
LS – Lump Sum

Table 11: W912EK-06-C-0054 (Stage I) Contract Modifications

Modification Number	Description	Mod/ Sign Date	Mod Amount
P00002	Award Option A	9/25/2006	$ 955,362.60
A00001	Riprap Variation Credit and Submittal Review Time	10/19/2006	$ (4,125.00)
A00002	Credit to Burn Clear and Grub Material	11/16/2005	$ (4,958.81)
P00004	Award Option B	3/28/2007	$ 478,330.20
A00003	Depression Fill of Scour Areas at Station 275+00, 465+00	6/20/2007	$ 213,385.61
A00004	Increase in Embankment Quantity and Associated Adjustment Based on Field Surveys. Embankment tolerances were changed to 2 inches below the levee design line. The dredge cut depths were increased to an unlimited depth while remaining within the limits detailed in the dredge location shown. The dredge limits were increased starting at point 1 for a distance of 1,050 feet north and 50 additional feet east.	9/17/2007	$ 422,544.33
A00005	Quantity variation modifications for finalizing riprap quantity for the spillway and estimating the granular surface roadway and levee enhancement embankment.	10/31/2007	$ (442.92)
A00006	Additional levee enhancement embankment work from Station 344+00 to 347+00	11/17/2007	$ 7,380.00
A00007	Additional Borrow Area and Time Extension. Due to lack of suitable materials, the Contractor shall not use the borrow areas approximately delineated by points 1, 2, 3 in Hydraulic Dredge Borrow Site II, shown on Contract drawing sheet C-307. Minimum depths and width requirements in this area are waived. To supplement hydraulic levee embankment operations, additional bottom areas shall be used. Contract to maintain the same minimum distance from shorelines as previously specified by contract and field directions by COR, there are no limitations on borrow depth, and in the Turkey Chute Area (Hydraulic Dredge Borrow Site I), if dredged area used in the existing Borrow Site I area is not contiguous with the dredged areas in the extended area shown, then a channel shall be dredged to connect them. Minimum dimension of the channel are a 30 foot bottom width and 6 foot below flat pool. Dredged material to create this channel shall be placed within the levee embankment corridor.	5/29/2008	$ 17,541.00
A00008	Emergency Levee Breach Repair	5/30/2008	$ 9,886.50
A00009	Recover Sand Fill - Part 1. Work will consist of recovering sand that was displaced from the levee by floodwaters and placing the sand back in the levee section. Sand placed in water in existing scour holes will not require compaction or testing. Work may include final grading and shaping.	9/8/2008	$ 30,000.00
A00010	Levee Breach Hydraulic Fill - Part 1. Hydraulically dredge sand fill into levee breach as directed by the COR. Recover displaced sand.	9/10/2008	$ 100,000.00
A00011	Recover Sand Fill - Part 2. This mod establishes the final negotiated price and time adjustments for the change described in Part 1	11/24/2997	$ 16,643.04
A00012	Levee Breach Hydraulic Fill - Part 2. This mod establishes the final negotiated price and time adjustments for the change described in Part 1	12/1/2008	$ 238,075.23
A00013	Option B Levee Design Template Change. A revised cross section is issued with this modification showing no sand placement on top of the levee between stations 5_00 to 46+00, 100+00 to 127+00, 150+00 to 162+00 and 203+00 to 265+00.	4/7/2009	$ -
A00014	Post Flood Levee Surveying. Survey the top of the levee from station 410+00 to 470+00 in areas requiring work under Option B of the Contract.	4/29/2009	$ 40,312.87
A00015	Beebe Breach Final Repairs. Restore the levee to its original design cross section between Stations 201+00 to 210+00.	7/14/2009	$ 16,613.83

Table 11: W912EK-06-C-0054 (Stage I) Contract Modifications

Modification Number	Description	Mod/ Sign Date	Mod Amount
A00016	Winterization 2009-2009	7/15/2009	$ 18,917.20
A00017	Levee Repairs South Portion of System. Commercial clay will be used instead of dredged sand to enhance the levee from station 472+00 to 483+10) IADNR gate). This work will be performed under a different contract. Use of dredged sand to enhance the levee in the lower portion of the system will be removed from the Contract. Due to moving the access road off of the spillway apron, the apron needs to have topsoil spread on it and seeded. The access road will be moved off the toe of the spillway and placed to its previous location. The road will be crushed aggregate. A 19 inch CMP was placed under the entrance to the Contractors staging area. Riprap to be placed on the side slopes of the lower water control structure with a 2 foot thickness. Temporary field office was extended, and calendar days were added to the contract.	8/21/2009	$ 62,453.65
A00018	Riprap Credit and Field Office Extension. Riprap grade had been changed from 650 pound top size to 400 pound top size for the protection around the water control structure. Toolesboro road repair.	9/23/2009	$ (11,609.42)
	Final Variation in Quantities	2/16/2010	$ (144,121.74)

5.4. Contract W912EK-07-C-0061 (Stage IIA)

Stage IIA work was covered under contract W912EK-07-C-0061. The work included hydraulic and mechanical dredging for overwintering habitat, construction of new water control structures, placement of riprap, and construction of articulated concrete mat pump pads. Construction of the articulated concrete mat pump pads consists of clearing and grubbing, disposal of cleared and grubbed materials, foundation preparation, geotextile fabric, compacted aggregate stone, articulated concrete block mat system, and choke stone. Dredged material placement site consists of clearing and grubbing, disposal of cleared and grubbed material, and installation and removal of a temporary water control structure. Figure 13 shows the site plan for Stage IIA.

The Contract was awarded September 28, 2007 with the Mutual Understanding Conference held on November 13, 2007. Construction was completed on September 25, 2009. The contract cost was $3,239,485.07. Contract cost information is provided in the Table 12.

Stage IIA had 9 modifications to the contract. A summary of the modifications is in Table 13.

Stage I and Stage IIA work was significantly impacted by the Great Flood of 2008, causing delays to the project and significant levee damages.

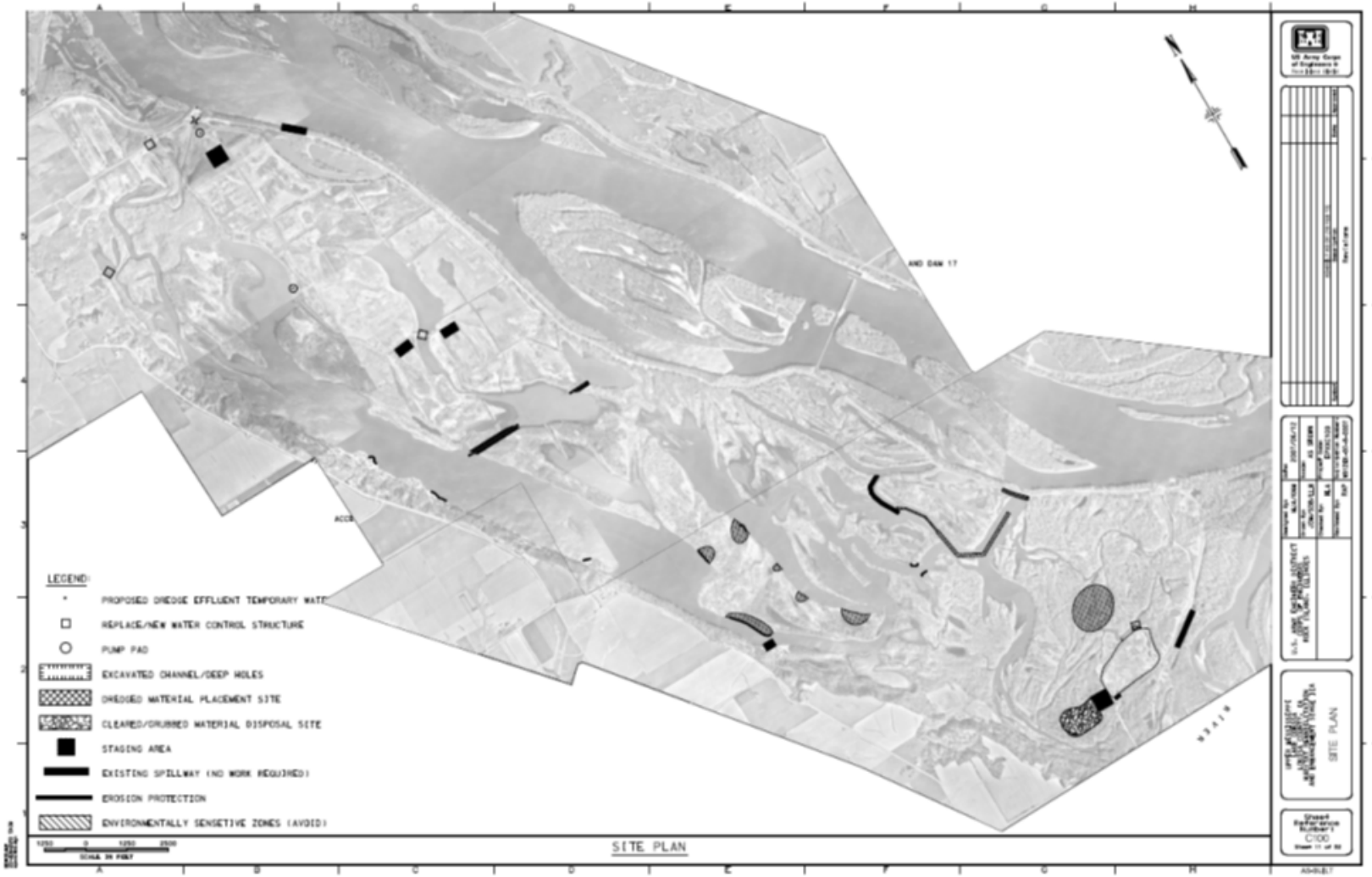

Figure 13: W912EK-07-C-0061 (Stage IIA) Site Plan

Table 12: W912EK-07-C-0061 (Stage IIA) Costs

Bid Items	Description	Quantity	Units	Amount
0001	Mobilization and Demobilization	1.00	LS	$389,793.73
0002	Temporary Field Office	1.00	LS	$37,973.12
0003	Telephone Bills Temporary Field Office			
0003AA	First $2000.00	2,000.00	DL	$2,420.00
0003AB	Over $2000.00	1.68	DL	$2.03
0004	Clearing and Grubbing IADNR MSU Site			
0004AA	First 40.0	40.00	AC	$114,854.40
0004AB	Over 40.0	9.00	AC	$16,827.48
0005	Dredging Yankee/Blackhawk Chute			
0005AA	First 65,000	53,679.53	CY	$686,561.19
0005AB	Over 65,000	0.00	CY	$0.00
0006	Riprap for Environmentally Sensitive Zones Erosion Protection			
0006AA	First 5,000	5,000.00	TN	$459,750.00
0006AB	Over 5,000	144.19	TN	$10,942.58
0007	Erosion Protection Site 424	1.00	LS	$7,000.00
0100	Mechanical Dredging Lake Odessa/Swarms/Bebee Pond			
0100AA	First 5,500	5,500.00	CY	$208,065.00
0100AB	Over 5,500	388.41	CY	$9,566.54
0200AA	Fish Nursery	1.00	LS	$136,344.64
0200AB	Muscatine Slough	1.00	LS	$164,383.12
0200AC	IADNR MSU	1.00	LS	$37,115.34
0201	CA001 Mobilization & Demobilization	1.00	LS	$3,995.49
0202	CA001 Riprap	61.68	TN	$3,897.80
0203	CA001 Coarse Aggregate	695.21	TN	$13,837.49
0204	CA001 Sand Fill	2,218.22	TN	$22,565.35
0205	CA001 Road Stone	850.00	TN	$18,949.22
0300	Fox Pond Water Control Structure	1.00	LS	$386,798.94
0400AA	Upper End	1.00	LS	$48,062.76
0400AB	Teal/Little Goose Pond	1.00	LS	$48,428.92
0400AC	IADNR	1.00	LS	$48,469.61
0401	Differing Site Conditions - Bricks	1.00	LS	$82,485.81
0402	Differing Site Conditions - Clay	1.00	LS	$268,028.19
0403	Extension of the field offices	1.00	LS	$10,022.76
0404	IADNR MSU Pump Pad Changes	1.00	LS	$2,343.56

JA - Job
MO – Month
DL – Dollars
TN – Tons
CY - Cubic Yards
AC – Acres
LS – Lump Sum

Table 13: W912EK-07-C-0061 (Stage IIA) Contract Modifications

Modification Number	Description	Mod/Sign Date	Mod Amount
A00001	Work provided erosion protection in the form of riprap and other stone at Sites 98 and 99.	4/7/2008	$79,686.32
A00002	Work was to reduce the length of bank line being protected to an area where active erosion is observed. Riprap was added to the top of bank and toe at the base of the erosion protection.	5/7/2008	$ (15,767.00)
A00003	Contract was extended by 47 days due to flooding of the project site.	10/8/2008	$ -
A00004	Work was changed from use of hydraulic dredging to mechanical dredging due to bricks and tree stumps in the dredge area.	1/16/2009	$82,485.81
A00005	Work was changed from use of hydraulic dredging to mechanical dredging due to clay in the dredge area.	2/16/2009	$268,028.19
A00006	Change was to extend the field office for the project due to time extensions to the contract as a result of differing site conditions.	3/23/2009	$10,022.76
A00007	Item 1: Change was to delete dredging of Blackhawk Chute points 1-6 from the contract. Item 2: Contract was extended 115 days.	5/7/2009	$ -
A00008	Item 1: Work included removing the HDPE pump pad pipe and reinstall at a higher elevation. Item 2: ACB was modified such that the pump did not scrape against the concrete blocks when the pump was being backed down the pad to the water. Item 3: Work included moving the remaining ACB left over from the IADNR MSU pump pad construction to the IADNR storage yard. Item 4: Time extension of 49 days to the contract.	9/23/2009	$2,343.56
	Final Variation in Estimated Quantities	2/16/2010	$(360,350.63)

5.5. Contract W912EK-09-C-0099 (Stage IB)

Stage IB work was awarded under contract W912EK-09-C-0099. The work included modification of perimeter levee design grade to allow for uniform overtopping, removal of unsatisfactory existing levee material, enhancing the existing levee section with impervious materials, granular surfacing, and seeding. Impervious materials for levee enhancement shall be contractor-furnished layered construction placement. Figure 14 shows the site plan for Stage IB.

The Contract was awarded August 28, 2009 with the Mutual Understanding Conference held on May 11, 2010. During the 2010 and 2011 construction seasons, the contractor's access to the project site was limited. There were numerous weather related delays in addition to the Winter Exclusion period which extended from December 1 through February 28 (this exclusion period was required since the clay levee could not be built in frozen conditions). In 2010 and 2011, the Mississippi River frequently reached flood stage. The contractor was not allowed to work on or degrade the levee during these flooded conditions to ensure the integrity of the levee was not compromised. Additionally, in 2010 and 2011, the interior water level was high, either from seep water under the levee, by opening water control structures (required to reduce damage to the levee), by water overtopping the spillways, or by water overtopping the levees. When the interior is flooded, the Contractor cannot access the levee to perform work. Another significant weather delay was related to precipitation. Numerous heavy rainfalls occurred in 2010 and 2011, causing the borrow area and levee area to become too wet to perform construction. Figure 15 indicates the high water levels and the delays.

The Contractor worked a total of 27 days in the field in 2010 and remobilized on July 20, 2011. Of the available days to work between the Mutual Understanding Meeting in May 2010 and July 2011, there were 90 days associated with the winter weather exclusion, 68 days where the river was in flood stage, 372 days when the access roads were inundated or difficult to cross, and 125 days of precipitation.

Based on the adverse weather conditions in 2010, a time extension was issued in October 2010 (Modification Number A00004) which added 365 days to the contract, thereby extending it for an entire construction period. The time extension covered the high water events starting in April 2010 and extending through September 2010. However, in 2011, high water again impacted the area continuing through July 2011. Additional extensions were granted to allow the Contractor to remobilization to the jobsite and repair damage to the upper levee due to spring flooding.

Construction was physically completed on June 16, 2012. The Contract cost was $2,596,778.78. Contract cost information is provided in the Table 14.

Stage IB had 16 modifications to the contract. A summary of the modifications is in Table 15.

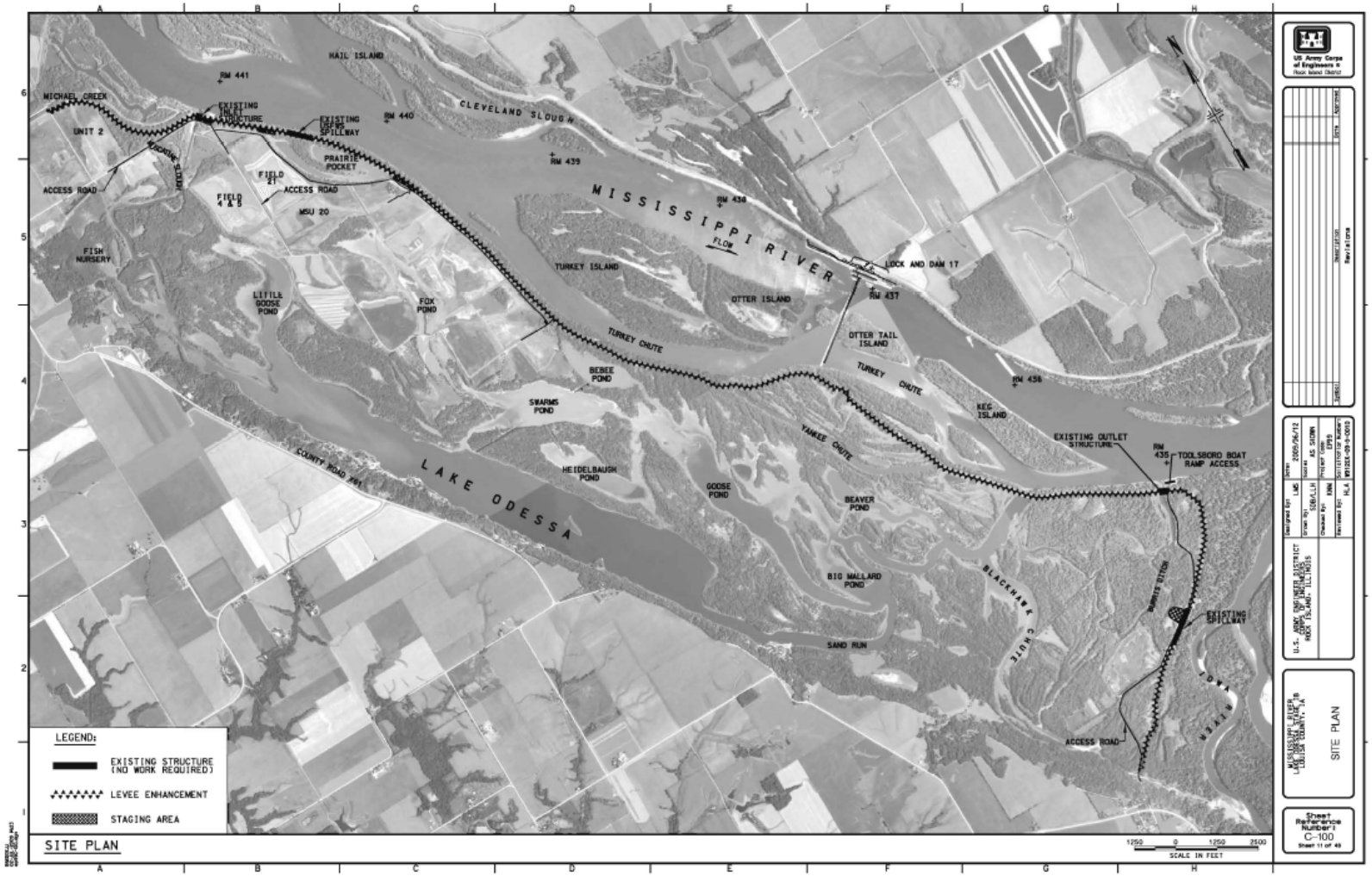

Figure 14: W912EK-09-C-0099 (Stage IB) Site Plan

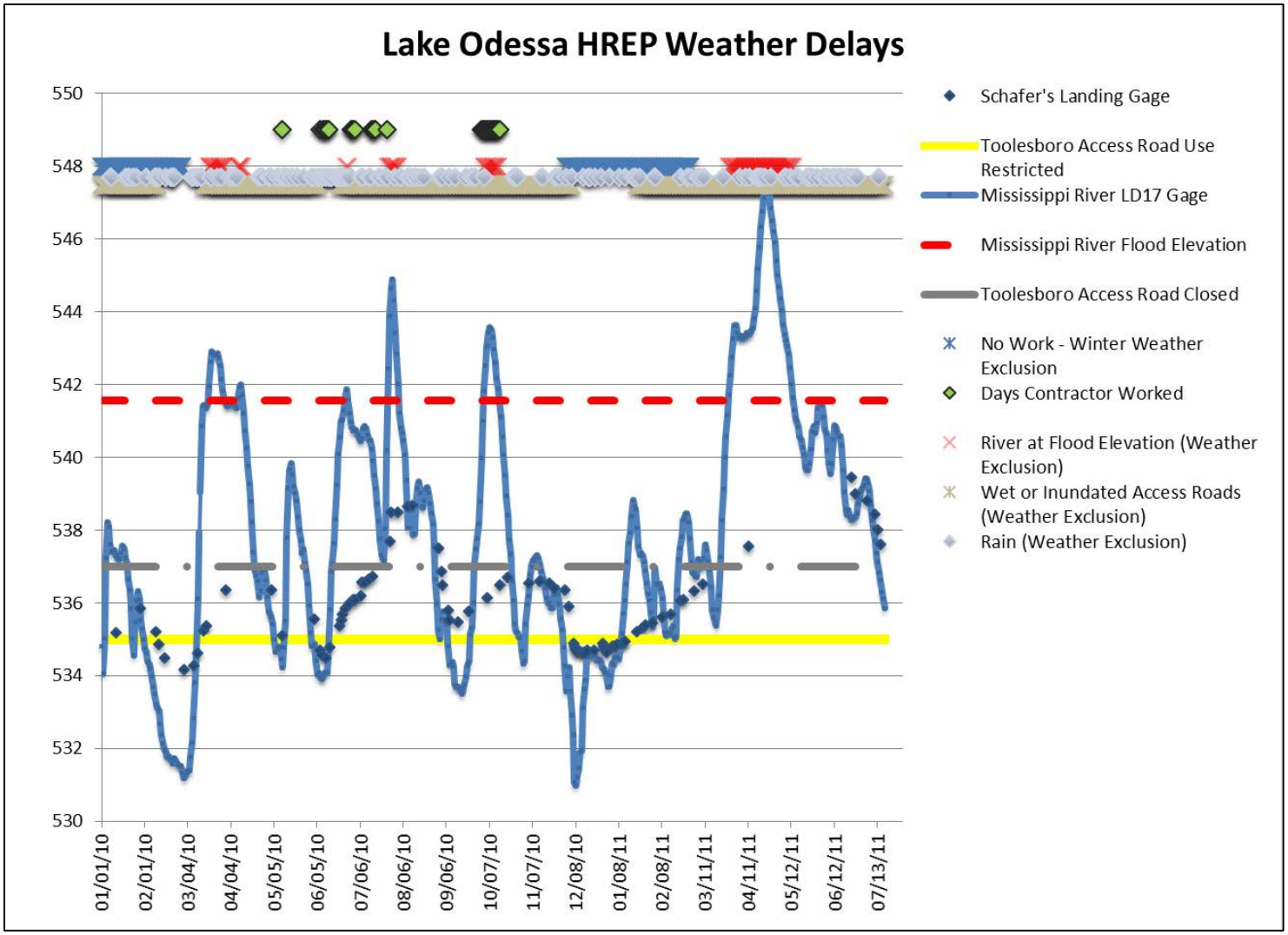

Figure 15: W912EK-09-C-0099 (Stage IB) Contract Delays

Table 14: W912EK-09-C-0099 (Stage IB) Costs

Bid Items	Description	Quantity	Unit	Amount
0001	Temporary Field Office			
0001AA	First 13 Months	13.00	MO	$13,000.00
0001AB	Over 13 Months	20.00	MO	$20,000.00
0002	Utility Bills for Temporary Field Office			
0002AA	First 5,200 Dollars	13.00	MO	$5,200.00
0002AB	Over 5,200 Dollars	0.00	MO	$0.00
0003	Levee Excavation			
0003AA	First 73,418 Cubic Yards	63,521.50	CY	$222,325.25
0003AB	Over 73,418 Cubic Yards	0.00	CY	$0.00
0004	Levee Enhancement			
0004AA	First 78,345 Cubic Yards	79,095.00	CY	$1,660,995.00
0004AB	Over 78,345 Cubic Yards	12,555.00	CY	$175,770.00
0005	Granular Surfacing			
0005AA	First 330 Tons	380.00	TN	$13,300.00
0005AB	Over 330 Tons	61.95	TN	$1,548.75
0006	Seeding	484.00	SY	$99,220.00
0007	Low Water Crossing	1.00	LS	$119,890.00
0008	Office Utilities			
0008AA	First 5,000 Dollars	5,000.00	DL	$5,000.00
0008AB	Over 5,000 Dollars	4,504.64	DL	$4,504.64
0009	Temp. Levee Raise - Sta. 280+00 to 380+00	1.00	LS	$10,000.00
0010	Time Extension Due to High Water	1.00	LS	$0.00
0011	Temp. Levee Raise - Sta. 280 to 380 Part II	1.00	LS	$14,523.60
0012	D6 Dozer	110.00	HR	$19,250.00
0013	Restore Sand Run Boat Ramp	1.00	LS	$9,900.00
0014	Inlet Channel Silt Removal	1.00	LS	$11,500.00
0015	Additional Labor & Operating Costs	1.00	LS	$46,491.00
0016	D6 Wide Track, Low Pressure Dozer with Operator	220.00	HR	$38,500.00
0017	Challenger Tractor with Tracks with Pan Scraper and Operator	220.00	HR	$44,000.00
0018	Jobsite Superintendent/Forman	203.00	HR	$17,458.00
0019	Final Levee Shaping	1.00	LS	$9,975.00
0020	Remove/Replace Guardrail	1.00	LS	$6,000.00
0021	Additional Seeding	1.00	LS	$28,427.54

JA - Job
MO – Month
DL – Dollars
TN – Tons
CY - Cubic Yards
LS – Lump Sum
HR - Hours

Table 15: W912EK-09-C-0099 (Stage IB) Contract Modifications

Modification Number	Description	Mod/Sign Date	Mod Amount
A00001	Item 1: Constructed a low water crossing at the inlet channel, including demolition of the existing road and culvert and replacing with new concrete box culverts and stone. Rock debris downstream of road was removed. Item 2: Construct approximately 525 linear feet of roadway shoulder on the lower road near the spillway (near levee station 435+00)	5/12/2010	$137,390.00
A00002	Office Utilities	6/18/2010	$ 5,500.00
A00003	Temporary Levee Raise, Station 280+00 to 380+00. In the area of the levee that has received compacted clay lifts, sand that degraded from this area shall be placed on top of the clay lifts to a depth of approximately 2 feet. In the areas approximately 500 LF north and south of the clay lifts that have been degrade but have not received clay lifts	7/25/2010	$ 10,000.00
A0004	Time extension due to high water	10/25/2010	$ -
A00005	Temporary levee raise Station 280+00 to 380+00 Part II. This work includes temporarily raising the levee and to degrade the levee back to existing condition prior to the temporary raise.	11/1/2010	$14,523.60
A00007	Variation in estimated quantities for temporary construction facility.	8/24/2011	$18,000.00
A00006	Levee Flood Damage Repairs. Place additional embankment on areas shown, while maintaining levee design grade.	9/18/2011	$140,000.00
A00008	Dozer Rental to Move Excess Sand. After clay placement is completed and sand has been shaped to restore the landside and riverside slopes, additional sand may be moved by a D6 dozer to an area along the levee to a location with either less excess sand on the side slopes or with trees located further from the levee toe.	9/9/2011	$9,250.00
A00009	Restore Sand Run Boat Ramp. Contractor shall remove rock from the existing staging area, deliver and spread 16 truckloads of sand obtained from excess sand on north levee, and spread sand along water blending into existing sand bench in water and extending out of the water a minimum of 20 feet for the entire length of the staging area.	9/9/2011	$9,900.00
A00010	Inlet Channel Silt Removal. The area is the inlet channel from the new box culverts to the existing stop log structure, approximately 400 LF. Work include dewatering the channel, placing 50 tons of riprap in the channel between the inlet structure and the box culvert, excavate 2 feet of the bottom of the channel, remove trees as required for access, remove and reinstall parking lot barriers and desirable trees.	9/16/2011	$11,500.00
A00011	Additional Labor and Operating Costs. Due to the unusual high water events that took place during the entire construction season of 2010, a time extension was required to perform the contract work to the extent that the contractor incurred significant increases in labor, fuel and equipment costs. This modification compensates the contractor for the additional costs incurred for the delay only	9/16/2011	$46,491.00
A00012	IADNR MSU Grading. Grade the existing MSU to a final elevation which does not vary greater than 6 inches. The area should be worked in drier conditions and/or with low pressure equipment. Surveys of the final grading shall be obtained to show that throughout the MSU, grade does not vary more than 6 inches. No seeding is required.	9/23/2011	$99,958.00
A00013	Variation in Estimated Quantities. Temporary Construction facility time was lengthened.	11/8/2011	$10,000.00

Table 15: W912EK-09-C-0099 (Stage IB) Contract Modifications

Modification Number	Description	Mod/Sign Date	Mod Amount
A00014	Final Levee Shaping. Item 1: The contractor shall reshape the levee slope to provide a smooth transition between slopes on the landside of the levee near stations 273+00 to 279+00, around 260+00, around 225+00 and around 71+00. Item 2: The contractor shall survey the levee once the work is complete.	6/6/2012	$9,975.00
A00015	Remove/Replace Guardrail. The work includes removal of the guardrails and posts associated with the guardrails. Design details for guard rail steep posts and wood posts were included. The guardrail sections shall be removed and reused. Warning/caution signs shall be removed, reused, and reinstalled. Up for four guardrail wood posts per structure to be removed. New posts may have to be supplied if the existing posts cannot be reused. The new wood posts shall be reinstalled into the levee to a depth matching the previous. Guardrail sections shall be reinstalled to	6/26/2012	$6,000.00
A00016	Final Variations in Estimated Quantities. Due to unusual high water events that took place during the entire construction season of 2010, a time extension was required to perform the contract work.	2/20/2013	$(393,032.82)

5.6. Contract W912EK-10-C-0018 (Stage IIB).
Stage IIB work was covered under contract W912EK-10-C-0018. The work included mechanical dredging, tree removal, clearing and grubbing, and placement site preparation for overwintering habitat. Figure 16 shows the Stage IIB Site Plan.

The Contract was awarded December 28, 2009 with the Mutual Understanding Conference held on February 24, 2010. The Contractor anticipated being completed in September 2010, but once the Corps reviewed the survey data, it was determined that the Contractor had not dredged to the appropriate depth or width in many areas. The Contractor returned and completed work in the spring of 2011. Construction was completed on April 28, 2011. The contract cost was $2,225,187.74. Contract cost information is provided in Table 16.

Stage IIB had 7 modifications to the contract. A summary of the modifications is in Table 17.

Figure 16: W912EK-10-C-0018 (Stage IIB) Site Plan

Table 16: W912EK-10-C-0018 (Stage IIB) Costs

Bid Items	Description	Quantity	Units	Amount
0001	Mobilization and Demobilization	1.00	LS	$225,000.00
0002	Excavation by Mechanical Dredging and Placement			
0002AA	First 72,750	99,000.00	CY	$1,435,500.00
0002AB	Over 72,750	33,000.00	CY	$288,750.00
0003	Additional Survey Bebee & Goose Pond	1.00	LS	$2,248.00
0004	Dredging-Bebee	2,273.44	CY	$64,793.04
0005	Additional Dredging	1.00	LS	$238,896.70
0006	Time Extension-Additional Dredging	1.00	LS	$0.00

LS – Lump Sum
CY - Cubic Yards

Table 17: W912EK-10-C-0018 (Stage IIB) Contract Modifications

Modification Number	Description	Mod/ Sign Date	Mod Amount
A00001	Additional survey for Bebee & Goose Pond	7/1/2010	$2,248.00
A00002	Additional dredging of a 30 feet channel at Upper Goose Pond. Dredge cut ties deeper water in the Bebee/Goose Connection Channel to the Goose Pond dredge cut.	8/20/2010	$457,187.50
A00003	Additional dredging of a 30 feet channel at Bebee Pond. Dredge cut ties deeper water in the Swarms/Bebee Pond connection channel and the Bebee/Goose Connection Channel	9/20/2010	$85,500.00
A00004	Contract was extended by 83 calendar days due to ice conditions on Lake Odessa which limited contractor's access to project site.	4/27/2011	$ -
A00006	Dredging quantities at Goose Pond increased from the original contract quantity	7/7/2011	$ 238,896.70
A00005	Contract was extended by 60 calendar days due to additional mechanical dredging required at Goose Pond and Yankee Chute.	5/22/2013	$ -
A00007	Final Variations in Estimated Quantity	7/8/2013	$ (20,706.96)

5.7. Contract W912EK-10-D-004 (Forestry Contract).

The Forestry contract was awarded under Contract W912EK-10-D-004, Task Order 1 (IDIQ Contract). The work included tree planting of 1,020 trees for timber stand improvement work at Odessa over 403 acres. Work was completed in April 2011. Figure 17 shows the site plan for the Tree Planting Contract.

The Contract was awarded on March 24, 2010 and cost $149,959.28. This was funded using American Recovery and Reinvestment Act (ARRA) funds.

The Contract had no modifications.

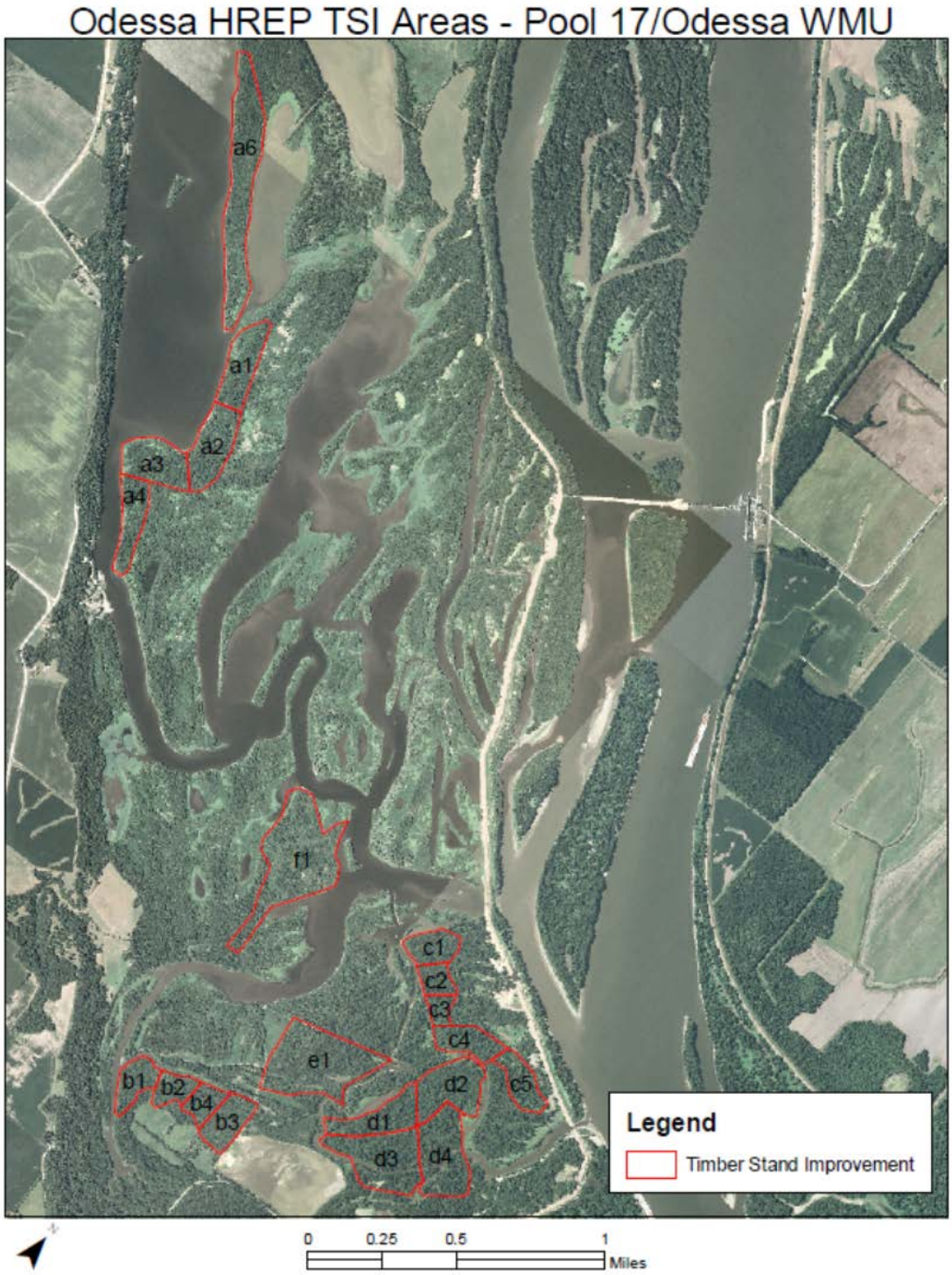

Figure 17: W912EK-10-D-004 I (Forestry Contract) Site Plan

5.8. Contract W912EK-14-C-0080 (2013 Flood Recovery)

The 2013 flood recovery repair work was awarded under contract W912EK-14-C-0080. Due to drought conditions in 2012, the seeding from the Stage IB contract had not been able to establish. During overtopping events in 2013 and 2014, damage to the levee including two breaches was observed. In 2014, a third breach occurred. The rate of rise of both the Iowa and Mississippi Rivers were higher than had been recorded, not allowing the interior to fill at a fast enough rate to protect the embankment during overtopping. Prior to construction, the highest river rate of rise had been noted in 1973 at 1.5 feet per day. The average rate of rise, which had been observed in 1993, was 0.7 feet per day. The project had been designed to accommodate a 1.0 feet per day rate of rise. In 2011, the river saw 1.5 feet per day, and in 2013, the river saw 2.07 feet per day. The faster rates of rise, in addition to poor seed establishment, had resulted in the damages. To reduce these impacts in future events, two additional spillways were constructed to accommodate up to a 2 foot per day rate of rise, damaged embankment areas were repaired, and the third breach was repaired by the USFWS in a separate contract, with grading, a clay cap, and riprap protection being included in the Corps contract.

Figure 18 shows the site plan for the 2013 Flood Recovery contract.

The Contract was awarded on August 19, 2014 with the Mutual Understanding Conference held on November 19, 2014. The Contract was physically completed on September 2, 2016. The Contract cost was $2,610,068.09. Contract cost information is provided in the Table 18.

The 2013 Flood Recovery contract had 8 modifications to the contract. A summary of the modifications is in Table 19.

Figure 18: W912EK-14-C-0080 (2013 Flood Recovery) Site Plan

Table 18: W912EK-14-C-0080 (2013 Flood Recovery) Costs

Bid Items	Description	Quantity	Units	Amount
0001	Mobilization and Demobilization	1.00	JA	$80,000.00
0002	Temporary Field Office			
0002AA	First 13 Months	2.60	MO	3,250.00
0002AB	Over 13 Months	0	MO	$0.00
0003	Utility Bills for Temporary Field Office			
0003AA	First 2,210 Dollars	442.00	DL	$884.00
0003AB	Over 2,210 Dollars	0.00	DL	$0.00
0004	Road Repairs			
0004AA	First 240 Ton	240.00	TN	$9,600.00
0004AB	Over 240 Ton	159.06	TN	$6,362.40
0005	Seeding	1.00	JA	$45,000.00
0006	Excavating and Grading			
0006AA	First 7,700 Cubic Yard	7,700.00	CY	$61,600.00
0006AB	Over 7,700 Cubic Yard	1,000.00	CY	$8,000.00
0007	Fill Material			
0007AA	First 3,640 Cubic Yard	3,640.00	CY	$61,880.00
0007AB	Over 3,640 Cubic Yard	590	CY	$10,030.00
0008	Bedding Stone			
0008AA	First 1,500 Ton	1,432.51	TN	$45,840.32
0008AB	Over 1,500 Ton	0	TN	$0.00
0009	Articulated Concrete Block	1.00	JA	$585,000.00
0010	Geotextile			
0010AA	First 10,920 Square Yard	6,577.12	SY	$9,865.68
0010AB	Over 10,920 Square Yard	0	SY	$0.00
0011	Drainage Stone			
0011AA	First 1,950 Ton	1,950.00	TN	$62,400.00
0011AB	Over 1,950 Ton	650.00	TN	$20,800.00
0012	Riprap			
0012AA	First 5,025 Ton	5,025.00	TN	$276,375.00
0012AB	Over 5,025 Ton	718.97	TN	$39,543.35
0013	Excavating and Grading			
0013AA	First 2,030 Cubic Yard	2,030.00	CY	$24,360.00
0013AB	Over 2,030 Cubic Yard	433	CY	$5,196.00
0014	Fill Material			
0014AA	First 6,720 Cubic Yard	6,720.00	CY	$114,240.00
0014AB	Over 6,720 Cubic Yard	0	CY	$0.00
0015	Bedding Stone			
0015AA	First 1,125 Ton	1,125.00	TN	$36,000.00
0015AB	Over 1,125 Ton	56.75	TN	$1,816.00
0016	Articulated Concrete Block	1.00	JA	$463,000.00
0017	Geotextile			
0017AA	First 8,050 Square Yard	8,050.00	SY	$12,075.00
0017AB	Over 8,050 Square Yard	1,950	SY	$2,925.00
0018	Drainage Stone			
0018AA	First 1,425 Ton	1,425.00	TN	$45,600.00
0018AB	Over 1,425 Ton	455.81	TN	$14,585.92
0019	Riprap			

Table 18: W912EK-14-C-0080 (2013 Flood Recovery) Costs

Bid Items	Description	Quantity	Units	Amount
0019AA	First 3,825 Ton	3,825.00	TN	$210,375.00
0019AB	Over 3,825 Ton	904.66	TN	$49,756.30
0020	Levee Repairs			
0020AA	First 480 Cubic Yards	480.00	CY	$19,200.00
0020AB	Over 480 Cubic Yards	120.00	CY	$4,800.00
0021	Mobilization-USFWS Breach	1.00	LS	$4,163.09
0022	Seeding-USFWS Breach	4.00	AC	$22,868.00
0023	Bedding Stone-USFWS Breach	612.03	TN	$20,184.75
0024	Riprap-USFWS Breach	1,679.21	TN	$93,783.88
0025	Levee Repairs-USFWS Breach	1,535.58	CY	$61,407.84
0026AA	Levee Repairs, First 1,000 CY	1,000.00	CY	$24,000.00
0026AB	Levee Repairs, Over 1,000 CY	97.55	CY	$2,341.20
0027AA	Seeding, First 1 Acre	1.00	AC	$6,800.00
0027AB	Seeding, Over 1 Acre (to nearest 1/10 Acre)	0.00	AC	$0.00
0028	Mobilization	1.00	LS	$3,500.00
0029	Weather Delay through July 2015	1.00	JA	$0.00
0030	Clay Embankment - Cessford Quarry CY	160.00	CY	$7,360.00
0031	Sand Removal - USFWS Breach CY	3,127.42	CY	$25,019.36
0032	Clearing and Grubbing – USFWS Breach	1.00	LS	$8,280.00

JA - Job
MO – Month
DL – Dollars
TN – Tons
CY - Cubic Yards
AC – Acres
LS – Lump Sum

Table 19: W912EK-14-C-0080 (2013 Flood Recovery) Contract Modifications

Modification Number	Description	Mod/ Sign Date	Mod Amount
P00001	W912EK-14-C-0080 P00001	9/16/2014	$ -
A00001	Levee repairs requiring clay cap and face, as well as riprap protection on the riverside of the levee.	7/14/2015	$ 200,149.19
P00002	Changes to Sections 00 73 05 & 01 33 00 submittal register.	8/20/2015	$ -
A00002	Levee repairs from 345+00 to the spillway. Includes impervious fill and seeding.	11/9/2015	$ 40,060.00
A00003	Contract was extended by 57 calendar days due to high water on the Mississippi River which prevented the contractor from working on critical path contract work.	5/17/2016	$ -
A00004	USFWS completed temporary repairs following a breach in the Odessa Levee. Initial surveys showed that quantities for the repair changed. Contractor made final repairs which included grading, clay cap and face, seeding, and riprap protection.	7/5/2016	$ 85,740.96
P00003	Update of the Administration Office address which changed.	9/27/2016	$ -
A00005	Final VEQ	6/5/2017	-$280,652.06

6. PROJECT PERFORMANCE MONITORING

The purpose of this section is to summarize monitoring and data collection aspects of the Project. Table 20 presents the principle types, purposes, and responsibility of monitoring and data collection. Table 21 summarizes actual monitoring and data parameters grouped by Project phase, responsible agency, and data collection intervals, as well as the post-construction monitoring plan. Table 22 provides a summary of resource monitoring and data collection.

Monitoring includes both quantitative and qualitative data from Federal and state agencies, research organizations, and the USFWS Refuge Manager. The monitoring parameters were developed to measure the effectiveness of the stated goals and objectives. Monitoring data, including annual field observations by the USFWS Refuge Manager, are used to evaluate the performance of the Project. Drawings of the monitoring plan that has been established in the Project can be found in the attached Plates. Changes to the monitoring plan should be coordinated with the USFWS, IADNR, and the Corps.

The USFWS Refuge Manager should refer to Section 8, Project Operation, and the inspection checklist in Appendix E for a more complete description of the requested field observations.

.

Table 20: Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Sedimentation Problem Analysis	System-wide problem definition. Evaluate planning assumptions.	USFWS	USGS[1] (UMESC[2])	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	--
Design	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	--
Construction	Construction Monitoring	Assess construction impacts; assures 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 21 for the complete monitoring plan.

[1]US Geological Survey
[2]Upper Mississippi Environmental Sciences Center

Table 21: Post Construction Monitoring Plan
Goal – Enhance and Protect Aquatic and Backwater Habitat

Goal	Objective	Enhancement Feature	Unit	Year 0 w/out Alt	Year 1 w/ Alt	Year 25 w/ Alt	Year 50 Target w/ Alt	Feature Measurement	Annual Field Observations by Site Manager
Enhance Wetland & Terrestrial Habitat	Increase bottomland hardwood diversity and reduce forest fragmentation	Establish hardwood trees in existing areas, old fields, on dredge placement area	Mast tree survival and regeneration	N/A	6 species	> 5 species	> 5 species	Tree Plots	Estimate wildlife use, and the presence or absence of mast trees
	Enhance migratory bird habitat	Enhance moist soil management units with reliable water control	Acres of reliably flooded wetlands	199	380	380	380	aerial photo measurements	Effective water level control, waterfowl usage, and observation of vegetation growth
Enhance Aquatic Habitat	Provide safe area for developing fish	Fish nursery (operate 1 yr in 5)	Fish nursery	0	Use of Control Structure for Operation of Nursery	Use of Control Structure for Operation of Nursery	N/A	Visual survey	Survival and growth of fish, ease of release into main lake
	Increase habitat for over-wintering fish	Channel Excavation	Presence of Channels Excavated	0	Presence of channels through bathymetry surveys	Presence of channels through bathymetry surveys	Presence of channels through bathymetry surveys	Bathymetry	
	Increase habitat for over-wintering fish	Channel excavation	Fish Presence	Fish kills and trapping reported pre-project	Fish present w/ limited # of reported fish kills	Fish present w/ limited # of reported fish kills	Fish present w/ limited # of reported fish kills		Fish presence or absence; reports of kills
	Increase habitat for over-wintering fish	Channel excavation	D.O. (Mg/l)	< 5.0 during critical periods	> 5.0	> 5.0	> 5.0	Perform water quality measurements	

Table 21: Post Construction Monitoring Plan
Goal – Enhance and Protect Aquatic and Backwater Habitat

Goal	Objective	Enhancement Feature	Unit	Year 0 w/out Alt	Year 1 w/ Alt	Year 25 w/ Alt	Year 50 Target w/ Alt	Feature Measurement	Annual Field Observations by Site Manager
Enhance Wetland, Terrestrial and Aquatic Habitat	Protect habitat features	Restore perimeter levee height and slopes	Level of protection	10-year	25-year	25-year	25-year		Visual inspection to note defects (i.e., sloughs, rodent holes, etc.)
	Protect habitat features	Reduce flood damage by constructing spillway	Reduce levee breaching, Spillway levee of protection	N/A	10-year	10-year	10-year		Visual inspection to note defects. Recording of any breaches or flood damage, including estimated repair amounts.

Table 22: Resource Monitoring and Data Collection Summary

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE				
	Pre-Project Phase		Design Phase		Post-Construction Phase[3]		Pre-Project Phase	Design Phase	Post-Construction Phase	Pre-Project Phase	Design Phase	Post-Construction Phase		
Type Measurement	**Jun-Sep**	**Dec-Mar**	**Jun-Sep**	**Dec-Mar**	**Jun-Sep**	**Dec-Mar**							**Agency**	**Remarks**
Point Measurements														
Water Quality Stations													Corps	
Air Temperature	2W	6W	2W	6W	2W	6W								
Wind Direction	2W	6W	2W	6W	2W	6W								
Wind Velocity	2W	6W	2W	6W	2W	6W								
Percent Cloud Cover	2W	6W	2W	6W	2W	6W								
Wave Height	2W	6W	2W	6W	2W	6W								
Water Depth	2W	6W	2W	6W	2W	6W								
Velocity	2W	6W	2W	6W	2W	6W								
DO	2W	6W	2W	6W	2W	6W								
Water Temperature	2W	6W	2W	6W	2W	6W								
pH	2W	6W	2W	6W	2W	6W								
Specific Conductance	2W	6W	2W	6W	2W	6W								
Total Alkalinity	2W	6W	2W	6W	2W	6W								
Secchi Disk Depth	2W	6W	2W	6W	2W	6W								
Turbidity	2W	6W	2W	6W	2W	6W								
Suspended Solids	2W		2W		2W									
Chlorophyll	2W		2W		2W									
Ice Thickness		6W		6W		6W								
Snow Depth		6W		6W		6W								
Boring Stations														
Geotechnical Borings							1	1					Corps	
Plot Measurements														
Forest												10Y	Corps	
Sediment (Bathymetry) Transects/Bathymetry									5Y				Corps	
Mapping														
Aerial Imagery							1		5Y				Corps	

Pre project geotechnical borings are included in the O&M Manual plates.

Post construction water quality monitoring stations are shown in Table 23. These are also shown on the plates. Winter sampling has occurred in the winters of 2010-2011, 2012-2013, 2013-2014, 2014-2015, and 2015-2016 to date.

Table 23: Water Quality Monitoring Stations

Site Name	Northing	Easting	Note
W-M438.6M	4562324.0679	660353.0998	In Bebee Pond
W-M436.3O	4560198.9351	662149.3817	Located at the north end of the dredge cut that connects Yankee Chute to Blackhawk Chute
W-M436.2F	4559559.4447	661047.2463	In the Goose Pond dredge cut

Post construction bathymetric surveys were completed in 2016 at all areas excavated for overwintering habitat. Routine bathymetric surveys are scheduled for the same locations. These cuts are shown in the O&M Manual plates.

The Project has plot locations within the complex to monitor detailed tree dynamics at Permanent Plot locations. These plots are to be re-inventoried in 2025 and then every ten years by the U.S. Army Corps of Engineers Mississippi River Project Office. These sites are designed to determine long term growth and mortality to forest community stand types. Monitoring plots were initiated around 2006. The Upper Mississippi River Regional Forestry Standard Protocol will be used to collect data for determining stand dynamics and condition to forest health and stability.

7. MEMORANDUM OF AGREEMENT AND COOPERATIVE AGREEMENT

The Regional Director of the USFWS and the Corps, Rock Island District Engineer entered into a MOA on 22 March 2006, as required by Public Law 99-62. A copy of the MOA is included as Appendix A of the O&M manual.

The purpose of the MOA is to establish the relationships, arrangements, and general procedures under which the USFWS and the Department of the Army (DA) will operate in constructing, operating, maintaining, and rehabilitating the Lake Odessa, Louisa County, Iowa, Habitat Rehabilitation and Enhancement Project, separable element of the UMRR Program, previously referred to as the Upper Mississippi River System - Environmental Management Program.

As set forth in the MOA with the USFWS, the USFWS has agreed to:

Operate, maintain and repair the Project as defined in the Definite Project Report with Integrated Environmental Assessment, Lake Odessa Habitat Rehabilitation and Enhancement Project, dated April 2005, in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580.

The USFWS and the IADNR in turn have an Amended Cooperative Agreement, which is included in Appendix B. This agreement provides the state the authority to operate State wildlife habitat operations and public use management programs on lands under the agreement which shall be derived from the State, consistent with the General Plan, Corps regulations contained in 36 CFR, and the specific conditions provided in the agreement.

8. OPERATION

8.1. Operation Responsibilities

8.1.1. U.S. Fish and Wildlife Service Responsibilities

The USFWS is responsible for the operation and maintenance of all Project features in accordance with the Memorandum of Agreement and the environmental management regulations contained in Section 107(b) of WRDA 1992. The USFWS shall be responsible for developing and sustaining a program that will operate and maintain the Project and its features.

8.1.2. U.S. Army Corps of Engineers Responsibilities

The Corps is responsible for administration of the UMRR Program in accordance with current laws and Corps policies.

8.2. Project Features Requiring Operation

Pumps and gates are required to be operated by the sponsor to maintain water level management to meet project goals and objectives. Refer to Table 5 for more details on how river elevations affects the project operation. Refer to Table 6 for a summary of interior elevations of constructed features.

8.2.1 Moist Soil Unit (MSU) Water level Management

Fields are dewatered after spring floodwaters have receded using pumps or control structures (gravity). During the drier summer months, wetland vegetation flourishes in the MSUs. Beginning in September, water is gradually added to the units, attracting migrating waterfowl by providing feeding and resting opportunities.

8.2.1.1 Fields 4 and 5, Field 21, MSU 20. Enhanced water level management capability was accomplished by providing a portable pump and pump pad near Fields 4 and 5 and at Little Goose Pond. This allows water modifications in Field 21, Fields 4 and 5, and MSU 20. Perimeter berms that delineate and contain water in Fields 4 and 5 were already in place. The existing berms will allow water impoundment to elevation 538.5. The dedicated water bay and a portable pump will be used to raise and maintain the water to this level (83 acres flooded at 538.5). The portable pump is mounted on a trailer and stored when not in use. The pump pads were constructed using an articulated concrete mat and include a permanent hose hookup to reduce operation costs.

8.2.1.2 Unit 2. Enhanced water level management capability was accomplished by providing a portable pump and new water control structure. A portable pump can be used to raise and maintain interior water levels and flood 92 acres at 538.5. The portable pump is mounted on a trailer and stored when not in use. The existing berm is 2,800 feet long and required no additional work (an existing roadbed and the project's perimeter levee are used as Unit 2's north and west berms). The new water control structure is a 36-inch CMP with slide gate that will be located next to the existing 24-inch stop log structure under the road across Muscatine Slough. This structure's purpose is to assure that an adequate supply of water from Muscatine Slough reaches the portable pump.

8.2.1.3 Fox Pond. Stop log structure was constructed by the Corps to help control water levels in this unit. The water level management plans goal is to raise water levels from 536.0 to 537.0 in two 6-inch increments and to maintain the 537.0 elevation maintained for approximately 2 months to maximize feeding opportunities for waterfowl (336 acres flooded at 537.0). The existing 14,000-gpm pump station was left in place to facilitate draw down of Fox Pond. Portable pumps could also be used in this location in the early summer to promote drawdown. Dewatering promotes vegetation growth desired as a food source by migrating waterfowl.

8.2.1.4 IADNR MSU. Enhanced water level management capability was accomplished by providing a portable pump, constructing a new water control structure, and reducing the seepage rate. A portable pump is used to raise interior water levels 4 feet over 14 days (541.0) and then maintain that level for approximately 2.5 months to maximize feeding opportunities for waterfowl (49 acres flooded at 541.0). The portable pump is mounted on a trailer and stored when not in use. A pump pad, located on Burris Ditch, was constructed using articulated concrete matting, and includes a permanent hose hookup to reduce operation costs. A new 36-inch CMP water control structure with slide gate replaced the existing gate well structure. This area is seeded and plants are grown annually to provide a food source in the fall for migratory waterfowl.

During flood events where the any of the levee spillways are likely to be overtopped, the CMP water control structure should be fully opened to allow water to backfill the IADNR MSU prior to its berm being overtopped by floodwaters. This will help equalize water levels to prevent damage to the berm by erosion and scouring when overtopped.

8.2.1.5 Connecting Cuts. The channel dredging allows both ponds to drain during drawdown periods, which promotes vegetation growth that when re-flooded can be used by migratory waterfowl.

8.2.2 Levee Restoration

The Project is intended to inundate during flood events. The survival of the 9.5 mile perimeter levee depends on the interior filling nearly as fast as the river rises, such that when the levee is overtopped, damages are minimized. Refer to Table 7 for embankment elevations, and a description of actions which occurred at varies locations along the embankment.

The levee was restored to have a top elevation sloping levee profile starting at the 25-year level of protection (downstream) and gradually increasing the height to the 50-year level of protection (upstream). Additionally, the interior side slopes are graded to a flat enough slope to limit overtopping damage, and allow for a gradual overtopping during flood events. The top 2 feet of the levee was constructed using clay to allow for protection from erosion during overtopping events. Clay, especially when covered with established vegetation, is less likely to erode and breach than a similar embankment constructed of sand.

Three articulated concrete mat spillways were constructed by Corps, and one by the USFWS. These spillways were built to an elevation and width which will allow flooding river water to enter the system in a controlled rate, and allow the Project to fill prior to an overtopping event. By raising the interior water levels, damage to the perimeter levee is greatly reduced. While the project did not construct the inlet and outlet structures on the main stem levee, operating these structures in conjunction with the constructed features will aid in the protection of the infrastructure.

Not all levee failures are due to overtopping. High pore pressures can lead to piping failures, which is one reason it is recommended to restore the interior slopes of the perimeter levee to 1:5 (v:h). During the rising water levels of a flood, pore pressures in the levee are lower when water levels in the interior are high. The four spillways (Iowa River Spillway at RM 434.8 and Prairie Pocket Spillway at RM 440.4, and the newer ACM Spillway at RM 435.1 and ACM Spillway upstream on the Iowa River) have been designed to work together to fill the interior to within one foot of uncontrolled overtopping when it occurs due to a fast rising (2.1 feet/day) flood. Opening the gates of the outlet structure during a flood event will further aid in filling the interior of the Lake Odessa Project and will reduce the risk of incurring levee damage or excessive scour to the interior. The gates of the inlet structure do not need to be opened prior to a flood because, from experience, too much sediment is drawn into the Project.

The Mississippi River forecast is available at the tail water of L/D 17 (RM 437.1). The flood stage is 15.0 feet at this location corresponding to a water surface elevation of 541.57 feet (1912 datum). The gates of the outlet structure do not need to be opened prior to flood stage. In order to overtop the Iowa River Spillway crest of 545.2 feet, the tail water stage at L/D 17 needs to exceed 18.5 feet. The gates of the outlet structure should be opened prior to a river stage (L/D 17 tail water) of 18.5 feet, as follows:

> The gates of the outlet structure can be opened when the tail water stage at Lock and Dam 17 reaches 17.5 feet and the Mississippi River is predicted to rise above a stage of 18.5 feet for longer than 24 hours. If the Mississippi River stage is between 15 feet and 17.5 feet (at Lock and Dam 17), and the Iowa River is less than 1 feet below the crest of the Iowa River Spillway (at the spillway), and the nearest upstream Iowa River Gage at Oakville (US Hwy 99 Bridge) shows a significantly rising hydrograph, it is recommended that USFWS Refuge Managers and the Corps be in communication with one another. The goal of timing the gate opening of the outlet structure is to raise the interior water elevation to 540 feet or greater at the time of overtopping of the Iowa River Spillway; this is done to reduce scour at the spillway toes. For the same reason it is desirable for interior water levels to exceed 542.2 feet at the time of overtopping of the upstream most spillway (USFWS) near Prairie Pocket.
>
> When the river rises above flood stage, project managers should monitor the stage predictions at the tail water of L/D 17.

8.2.3 Ephemeral Wetlands. No operation is required.

8.2.4 Aquatic Diversity/Fisheries Enhancement. No operation is required.

Goose Pond - No operation is required.

Bebee Pond - No operation is required.

Swarms/Bebee Ponds Connections - No operation is required.

Blackhawk Chute/Yankee Chute Access - No operation is required.

Blackhawk Chute - No operation is required.

8.2.5 Floodplain Forest/Mast Tree Planting
No operation is required.

8.2.6 Fish Nursery
The USFWS will select and stock species in the nursery one out of five years. Water levels will be maintained over the 21 acres nursery through the manipulation of the water control structure. The new structure allows the area to ponded approximately 3 feet deep.

8.2.7 Shoreline Protection of Historic Sites
No operation is required.

9. CONTACT INFORMATION

The main point of contact for the Project is the Port Louisa National Wildlife Refuge Manager. Additional people in the USFWS that have been listed as points of contact are the Environmental Engineer, Upper Mississippi River National Wildlife and Fish Refuge Manager and Deputy Refuge Manager.

The main point of contact for the IADNR is the Odessa Wildlife Unit Wildlife Management Biologist.

The chain of command for the Corps starts with the Lead UMRR Engineer. This person will pass information along to the UMRR Program Manager.

U.S. Army Corps of Engineers

Clock Tower Building
PO Box 2004
Rock Island IL 61204-2004
District Website – http://www.mvr.usace.army.mil
River Gages Website – http://www.rivergages.com
UMRR Website: http://www.mvr.usace.army.mil/Missions/Environmental-Protection-and-Restoration/Upper-Mississippi-River-Restoration/

Marvin Hubbell, UMRR Regional Program Manager (2017)
(309) 794-5428
marvin.e.hubbell@usace.army.mil

Kara Mitvalsky, Project Engineer (2017)
(309) 794-5623
kara.n.mitvalsky@usace.army.mil

National Weather Service – Quad Cities, IA/IL Weather Forecast Office

9050 Harrison Street
Davenport Municipal Airport
Davenport, IA 52806-7326
Website – http://www.crh.noaa.gov/dvn/
Rainfall and River Stage Forecasts
(563) 386-3976

Port Louisa National Wildlife Refuge

https://www.fws.gov/refuge/port_louisa/
10728 County Rd X61
Wapello, IA 52653
319-523-6982

Sally Flatland (2017)
Port Louisa National Wildlife Refuge Manager
sally_flatland@fws.gov
(319) 523-6982

Iowa Department of Natural Resources, Odessa Wildlife Unit

9726 County Road X61
Wapello, IA 52653

Andy Robbins (2017)
Wildlife Management Biologist
Iowa Department of Natural Resources – Odessa Wildlife Unit
Office: (319) 523-3102 Cell: (319) 551-8459
Email Andy.Robbins@dnr.iowa.gov

Mike Griffin (2017)
Mississippi River Wildlife Biologist
206 Rose Street
Bellevue, IA 52031
563-872-5700
Michael.Griffin@dnr.iowa.gov

Upper Mississippi River National Wildlife and Fish Refuge

https://www.fws.gov/refuge/Upper_Mississippi_River/about.html
51 East 4th Street
Winona, MN 55987

Sharonne Baylor (2017)
Environmental Engineer
Sharonne_Baylor@fws.gov
507-494-6207

Sabrina Chandler (2017)
Refuge Manager
Sabrina_Chandler@fws.gov
507-494-6218

Tim Yager (2017)
Deputy Refuge Manager
Timothy_Yager@fws.gov
507-494-6219

10. MAINTENANCE AND INSPECTION

10.1. Maintenance

An active preventative maintenance program reduces damage to existing Project features by taking early corrective action. Additional costs associated with repair and rehabilitation are also avoided. An effective preventative maintenance program requires regular, thorough inspections. Routine inspections can aid USFWS (and IANDR) officials in discovering deficiencies within the Project. They can also provide USFWS (and IADNR) officials with baseline condition data. This data is necessary for considering repair options for major damage within the Project. Steps will be taken by the USFWS Refuge Manager (and IADNR) to correct conditions disclosed by Project inspections or joint inspections. Regular maintenance repair measures will be accomplished during the appropriate season as scheduled by the USFWS Refuge Manager to ensure structure serviceability.

10.1.1 Moist Soil Unit (MSU) Water Level Management

10.1.1.1 Fields 4 and 5, Field 21, MSU 20. Portable pumps shall follow the maintenance schedule as outlined by the manufacturer.

Articulated Concrete Mats (ACMs) shall be maintained for the pump pads. Any damages during routine flooding events should be repaired, including an erosion or deterioration of the ACMs. Cracked or broken ACMs can be repaired by removing the broken block and filling with concrete. Woody vegetation growing through or under the ACM shall be removed or treated. All debris should be removed from ACM following a high water event.

Pipe and access channels shall be kept clear of debris to ensure adequate water flow. The sponsor maintains the ditches as part of their routine maintenance.

The embankments are also maintained as part of the routine maintenance.

10.1.1.2 Unit 2. Portable pumps shall follow the maintenance schedule as outlined by the manufacturer.

The water control structure is a 36-inch CMP with slide gate that will be located next to the existing 24-inch stop log structure under the road across Muscatine Slough. All concrete and metal portions of the structure shall be repaired once deterioration makes the structure inoperable. Sedimentation within the structure and the inlet and outlet portions shall be removed as necessary to maintain water level management.

Pipe and access channels shall be kept clear of debris to ensure adequate water flow. The sponsor maintains the ditches as part of their routine maintenance. The embankments are also maintained as part of the routine maintenance.

10.1.1.3 Fox Pond. Portable pumps shall follow the maintenance schedule as outlined by the manufacturer.

All concrete and metal portions of the structure shall be repaired once deterioration makes the structure inoperable. Sedimentation within the structure and the inlet and outlet portions shall be removed as necessary to maintain water level management. Stop logs to be replaced with like parts as necessary.

Pipe and access channels shall be kept clear of debris to ensure adequate water flow. The sponsor maintains the ditches as part of their routine maintenance.

The embankments are also maintained as part of the routine maintenance.

10.1.1.4 IADNR MSU. Portable pumps shall follow the maintenance schedule as outlined by the manufacturer.

Articulated Concrete Mats (ACMs) shall be maintained for the pump pads. Any damages during routine flooding events should be repaired, including an erosion or deterioration of the ACMs. Cracked or broken ACMs can be repaired by removing the broken block and filling with concrete. Woody vegetation growing through or under the ACM shall be removed or treated. All debris should be removed from ACM following a high water event.

All concrete and metal portions of the structure shall be repaired once deterioration makes the structure inoperable. Sedimentation within the structure and the inlet and outlet portions shall be removed as necessary to maintain water level management.

Pipe and access channels shall be kept clear of debris to ensure adequate water flow. The sponsor maintains the ditches as part of their routine maintenance.

The embankments are also maintained, along with controlling trees and woody vegetation, as part of the routine maintenance.

10.1.1.5 Connecting Cuts. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.2 Levee Restoration

10.1.2.1. Erosion Control. Any adverse conditions such as washouts, erosion, undesirable debris, waste materials, and unauthorized structures shall be removed. Any eroded riprap shall be replaced.

10.1.2.2. Removal of Debris and Unwanted Structures. Any adverse conditions such as undesirable debris, waste materials, and unauthorized structures shall be removed.

10.1.2.3. Vegetation Management. While growth of trees may be beneficial throughout much of the project, trees and woody vegetation on the levee embankments should be controlled to preserve a root-free zone so that the project will function as designed. Damage from root wads of trees felled by flood or wind event could compromise this project feature, particularly in area with high erosion potential. Tree and woody vegetation growth also limits access to the levee, making inspection difficult and repairs more costly. Suggested methods for control include; mowing, herbicide application, saw cutting, and prescribed fire.

10.1.2.4. Riprap. Adequate stone protection shall be maintained for the spillways, water control structures, and levee embankments. Following high water events and during routine inspections, the stone protection should be inspected to determine if any damages have occurred or if there are any concerns that may cause damages in the future. Concerns to note include erosion under riprap, woody vegetation growing through the riprap, displaced riprap, significant deterioration of riprap, and inadequate riprap at placement sites. Erosion under riprap and woody vegetation growing

through the riprap may cause displacement and/or deterioration of the riprap. Displacement and deterioration of riprap and inadequate riprap may compromise the integrity of the project. Riprap shall be kept free from vegetation. Debris located on riprap following flood events shall be removed.

10.1.2.5 Spillways. ACMs shall be maintained. Any damages during routine flooding events should be repaired, including an erosion or deterioration of the ACMs. Cracked or broken ACMs can be repaired by removing the broken block and filling with concrete. Woody vegetation growing through or under the ACM shall be removed or treated. All debris should be removed from ACM following a high water event.

10.1.3 Ephemeral Wetlands. No maintenance is required.

10.1.4 Aquatic Diversity/Fisheries Enhancement
The USFWS Refuge Manager shall make annual observations of the dredged portions of the project to determine the approximate depth. The USFWS Refuge Manager shall make periodic inspections to observe any significant sedimentation. Fish activity and fish kills shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections. USFWS is not required to re-dredge these channels if depth is lost over time.

10.1.4.1 Goose Pond. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.4.2 Bebee Pond. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.4.3 Swarms/Bebee Ponds Connections. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.4.4 Blackhawk Chute/Yankee Chute Access. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.4.5 Blackhawk Chute. While no dredging is required as part of this project's maintenance requirements, ensuring that adequate depths are maintained will allow for the ideal project function.

10.1.5 Floodplain Forest/Mast Tree Planting
Additional tree plantings and timber stand improvements continues at this site by the Corps, USFWS, and the IADNR using various funding sources. Maintaining tree plantings and timber stand improvement areas may include the further thinning treatments, target specific herbicide applications, and supplemental tree planting efforts. Determining when to conduct work to ensure previous forest improvement efforts meet full potential will be done through coordination and monitoring by the Corps, USFWS, and the IADNR.

10.1.6 Fish Nursery
All concrete and metal portions of the structure shall be repaired once deterioration makes the structure inoperable. Sedimentation and debris within the structure and the inlet and outlet portions shall be removed as necessary to maintain water level management.

10.1.7 Shoreline Protection of Historic Sites

Any adverse conditions such as washouts, erosion, undesirable debris, waste materials, and unauthorized structures shall be removed. Any eroded riprap shall be replaced. Rills and washouts shall be reported. Also, any adverse conditions such as undesirable debris, waste materials, and unauthorized structures shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections, in particular in locations protecting historical or archeological sites.

10.1.8. Control of Unauthorized Activities

The USFWS Refuge Manager shall make periodic inspections to observe any signs of unauthorized activities. Illegal All-Terrain Vehicle use and other such problems shall be reported. Steps should be taken to remedy adverse conditions disclosed by the inspections.

10.2 Inspections

An active maintenance program is based on inspections and subsequent servicing, adjustment, or repair. An effective maintenance program ensures Project serviceability by timely and thorough inspections, thereby avoiding or reducing maintenance costs. Also, by documenting the condition of the Project, a baseline for consideration of rehabilitation can be established for Project damage resulting from a major storm or flood event. The two types of inspections for the Project are: (1) Project inspections by the USFWS Refuge Manager and (2) joint inspections by the USFWS Refuge Manager and the Corps. A blank inspection form is shown in Appendix E. Should any improvements or modifications be made to the Project, additional instructions may become necessary for proper operation and maintenance.

10.2.1. Routine Inspections

There are four types of routine inspections required for the project. They include inspections by USFWS, inspection by Corps, inspections by IADNR, and post-flood inspections.

10.2.1.1 U.S. Fish and Wildlife Service. The Project inspection should be performed by the USFWS Refuge Manager or an appropriate representative for the purpose of noting routine deficiencies and initiating corrective actions. This inspection will be performed at periods not exceeding 12 months and will follow inspection guidance presented in subsequent sections of this manual. It is suggested that the inspection be conducted every May, which is representative of after-spring flood conditions. Additional Project inspections should occur as necessary after high water events or as scheduled by the USFWS Refuge Manager. A Project inspection checklist has been developed as presented in Appendix E. It is suggested that the USFWS Refuge Manager shall furnish a copy of the completed checklist to the U.S. Army Corps of Engineers, Rock Island District, ATTN: UMRR Project Manager, CEMVR-PM-M, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61204-2004, immediately following each Project inspection.

10.2.1.2 U.S. Army Corps of Engineers. A joint inspection by the USFWS Refuge Manager and the Corps shall be made in accordance with the Memorandum of Agreement. The purpose of this inspection is to assure that adequate maintenance is being performed as presented in the DPR and this manual. The District Engineer or authorized representative should have access to all portions of the constructed Project upon coordination with the USFWS Refuge Manager for this purpose. An IADNR representative shall be present for the joint inspections of the IADNR managed portion of the project. After a routine inspection, the Corps shall provide the USFWS with a copy of the report. The USFWS must file any response or objections to the Corps inspection rating with the Corps' District Engineer. The response must include pertinent engineering data, such as plans and schedules for correcting all reported deficiencies. The Corps will maintain records of all inspection reports for a minimum of 10 fiscal years, or longer if warranted or needed for historical purposes.

10.2.1.3 Iowa Department of Natural Resources. If damages to the Project occur, the IADNR office shall be notified. The IADNR shall report any damages that occur on the IADNR managed portion of the project to the USFWS.

10.2.1.4 Post-Flood Reports. The USFWS Refuge Manager shall request a joint inspection with the Corps and IADNR immediately following a specific storm or flood event which causes damage exceeding the annual O&M as specified in this manual and the DPR. It is recommended to notify the project cooperators as well. The Project inspections by the USFWS Refuge Manager and joint inspections results will be the basis for determining maintenance responsibility and potential rehabilitation by the Corps. USFWS shall compile a post-flood report and forward one copy to the Corps District Engineer, indicating in writing an official request for assistance if needed. This report shall serve as a request for assistance to receive rehabilitation support from the Corps under the UMRR program. The report shall include:

- a complete history of the flood event, including any damages sustained to the Project;
- all operation and maintenance logs;
- a daily tabulation of river stages (river stages can be calculated by installing a gauging station, checking the nearest river gage, or using a level rod);
- a discussion of pertinent factors in operating and maintaining the Project, such as problems encountered during operation and maintenance, weather conditions (including ice effects), damage incurred, and repairs required;
- a summary of the number, time, and cost of manpower and the quantities and costs of supplies and equipment the risk management effort required; and
- any other useful information.

10.3. Project Encroachments and Modifications

33 USC 408 (Section 408) provides authority solely to the Secretary of the Army for modifications or alterations to Corps projects. According to Army policy, there is very limited delegated authority to District Commanders to approve minor, low impact modifications to projects operated and maintained by sponsors.

Approval from the District Engineer of the Corps, Rock Island District is required prior to any minor improvement or change in any feature of the Project. In addition, no encroachment shall be made on Project rights-of-way without prior determination that the proposed work will not adversely affect the Project. Before starting work on any such improvements, changes, or encroachments, USFWS officials shall submit for consideration and approval a complete set of the proposed plans to the U.S. Army Corps of Engineers, Rock Island District, ATTN: UMRR Project Manager, CEMVR-PM-M, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61204-2004. After a sufficient review period, the Corps shall notify the USFWS by letter of the findings and if approval is granted. If approval is granted, and after the work is completed, the USFWS will update the O&M manual to reflect the modification to the Project and provide a copy to the CEMVR-EC-DN. Additionally, the sponsor shall furnish the Corps drawings, which show the new “as-built” condition.

10.4. As-Built Construction Drawings

The drawings, included in the Appendices, depict as-built or as-repaired Project features. Due to the large number of contracts, the as built drawings were combined into a single set of drawings which are attached to this document. As Built drawings for each project stage were provided to the Project Sponsors for their records.

11. REPAIR, REPLACEMENT, AND REHABILITATION

Repair, Replacement and Rehabilitation actions are to conform to the Project as-builts unless otherwise approved by the Corps. As stated in the Memorandum of Agreement between the USFWS and the Corps (Appendix A), the Department of the Army is responsible for 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.

Should inspection of the Project area following a major flood or natural disaster disclose substantial damage to any of the major components of the Project that appears to exceed the annual O&M as specified in this manual and the DPR, the Corps and the USFWS shall meet and discuss the appropriate course of action in light of the original Project design. The inspections by the USFWS Refuge Manager (as summarized in the submitted checklist) and the joint inspections with the Corps will be the basis for determining maintenance responsibility by the USFWS versus potential rehabilitation by the Corps. Repair of damage attributable to lack of maintenance is a USFWS responsibility.

The options of rehabilitation or abandonment of the Project may be considered at such time that damage exceeds O&M requirements. Any decision would be carried forth only upon written mutual agreement of the USFWS and the Corps. Included within such agreement would be a description of the agreed-upon course of action and funding responsibilities, if any.

- Repairs. Those activities of a routine nature that maintain the Project in good condition after it has been damaged by a flood event.
- Replacement. Features that no longer operate or function as designed and must be replaced.
- Rehabilitation. A set of activities necessary to restore the Project to its pre-flood event condition.

12. ACRONYMS

ACB	Articulated Concrete Block
ACM	Articulated Concrete Mat
ARRA	American Recovery And Reinvestment Act
ATTN	Attention
ATV	All-Terrain Vehicles
CFR	Code Of Federal Regulations
CMP	Corrugated Metal Pipe
CY	Cubic Yards
DL	Dollars
DO	Dissolved Oxygens
DPR	Definite Project Report
EA	Environmental Assessment
ER	Engineering Regulation
FWIC	Fish And Wildlife Interagency Committee
HDPE	High Density Polyethylene
HR	Hour
IDIQ	Indefinite Delivery/Indefinite Quantity (Contract)
L/D	Lock And Dam
L/D	Lock And Dam
LF	Linear Feet
MOA	Memorandum of Agreement
MSL	Mean Sea Level
MSU	Moist Soil Unit
N/A	Not Applicable
NAVD	North American Vertical Datum
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NRCS	Natural Resource Conservation Service
RRCT	River Resources Coordinating Team
SHPO	State Historic Preservation Officer
TSI	Timber Stand Improvement
UMESC	Upper Mississippi River Environmental Sciences Center
VEQ	Variation In Quantity
WCS	Water Control Structure
WMA	Wildlife Management Area