UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA HABITAT REHABILITATION AND ENHANCEMENT PROJECT

PUBLIC REVIEW DRAFT
JANUARY 2010

US Army Corps of Engineers ®
Rock Island District

LA GRANGE POOL
ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

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

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ACKNOWLEDGEMENT

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US Army Corps of Engineers ®
Rock Island District

WE'RE PROUD TO SIGN OUR WORK

EXECUTIVE SUMMARY

The 6,800-acre Rice Lake Habitat Rehabilitation and Enhancement Project (HREP) lies on the right descending bank of the Illinois Waterway between River Miles (RM) 132.0 and 138.0, near Banner, Illinois. The project is located in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. The project area encompasses the land and water areas that comprise the Rice Lake State Fish and Wildlife Area (SFWA).

The Rice Lake SFWA has been managed for migratory birds and other wetland dwelling species since the Illinois Department of Natural Resources (ILDNR) purchased tracts of land in the project area during the 1940s, 1950s, 1980s, and 2000s. Site management by the State includes operation of pump stations and water control structures to provide reliable food production for migrating birds. The opportunity exists to increase overall preferred habitat quality and quantity by attenuating summer and fall flooding impacts, and by increasing native floodplain grassland and forest cover.

The goals of the proposed project are to restore and protect wetland, aquatic, and floodplain habitats. The following objectives have been identified to meet these goals:

(1) increase success rate of annual emergent/moist-soil vegetation production;
(2) reduce adverse effects of river stage fluctuations on wetland habitat;
(3) increase fish egress opportunities from Rice Lake during drawdown periods;
(4) maintain seasonal access between Rice Lake/Big Lake aquatic areas and Illinois Waterway;
(5) increase off-main channel aquatic habitat in Illinois Waterway; and
(6) increase natural food and cover for resident and migratory wildlife.

Four enhancement features and their associated construction options were considered to achieve the project goals and objectives (the “No Action” option was assessed for each feature):

A. Perimeter Water Control Levee

1. Construct a 12,500 ft (ft) perimeter levee to a top elevation of 440 ft National Geodetic Vertical Datum (NGVD) and a 2,500 ft overflow spillway with a top elevation of 438 ft.

2. Construct a 12,500 ft perimeter levee to a top elevation of 442 ft NGVD and a 2,500 ft overflow spillway with a top elevation of 440 ft.

B. Pump Station and Conveyance Channel

1. Construct a pump station with a capacity of 50,000 gallons per minute (gpm) and a 4,000 ft discharge channel to manipulate Big Lake water levels.

2. Construct a pump station with a capacity of 133,200 gpm and a 6,700 ft discharge channel to optimize management and operational flexibility for the entire project area.

C. Fish Egress Structures

1. Install a fish egress structure between Rice Lake and the quarry on Duck Island to facilitate fish passage during drawdown conditions.

2. Install fish egress structures connecting Rice Lake to the quarry and Goose Lake to the Illinois Waterway to facilitate fish passage during drawdown conditions.

D. Mast-Tree and Native Grassland Plantings

1. Plant approximately 57 acres of mast producing trees and 352 acres of native grasses and forbs on Duck Island's existing agricultural fields.
2. Plant approximately 147 acres of mast producing trees and 330 acres of native grasses and forbs on Duck Island's existing agricultural fields.
3. Plant approximately 238 acres of mast producing trees and 239 acres of native grasses and forbs on Duck Island's existing agricultural fields.
4. Plant approximately 330 acres of mast producing trees and 147 acres of native grasses and forbs on Duck Island's existing agricultural fields.
5. Plant approximately 352 acres of mast producing trees and 57 acres of native grasses and forbs on Duck Island's existing agricultural fields

Evaluation of the project enhancement features and construction options was accomplished through application of the Wildlife Habitat Appraisal Guide (WHAG) and annualization of outputs and costs. The WHAG evaluation methodology quantifies habitat output in the form of habitat units (HUs) that are used in conjunction with project cost data and functional life expectancy to compare the construction options of the proposed enhancement features. This incremental analysis identifies which combination of enhancement features would be cost efficient and cost effective. The analysis also shows the changes in cost for increasing levels of environmental output.

The recommended plan (shown on Figure ES-1) includes:

- Constructing a perimeter water control levee to a top elevation of 442 ft NGVD with an overflow spillway crest elevation of 440 ft NGVD and installing one gatewell structure (see paragraph A.2. above);

- Providing water control capability by constructing a pump station with a capacity of 133,200 gpm and excavating a discharge channel (see paragraph B.2. above);

- Installing two reinforced concrete fish egress structures, one between Rice Lake and the quarry on Duck Island, and one between Goose Lake and the Illinois Waterway (see paragraph C.1. and C.2. above); and

- Enhancing floodplain habitat by planting 352 acres of mast producing native trees and 57 acres of native grasses and forbs on Duck Island (see paragraph D.5. above).

Construction of the perimeter water control levee would protect interior areas from frequent Illinois Waterway stage fluctuations during the critical growing season for moist-soil food plants. The overflow spillway protects the perimeter water control levee from erosion by equalizing water levels on either side prior to overtopping. Constructing a pump station and discharge channel would allow water level manipulation (timely flooding and drawdowns) that is crucial to improving the success rate of submergent/emergent vegetation and their eventual use by migrating birds. The planting of native grassland and mast-trees on Duck Island would restore historic floodplain cover type diversity and provide food and cover for resident and migratory birds and mammals. Installing a fish egress structure would create access to deep water refuge, therefore increasing the probability of survival for individual fish during the summer drawdown periods.

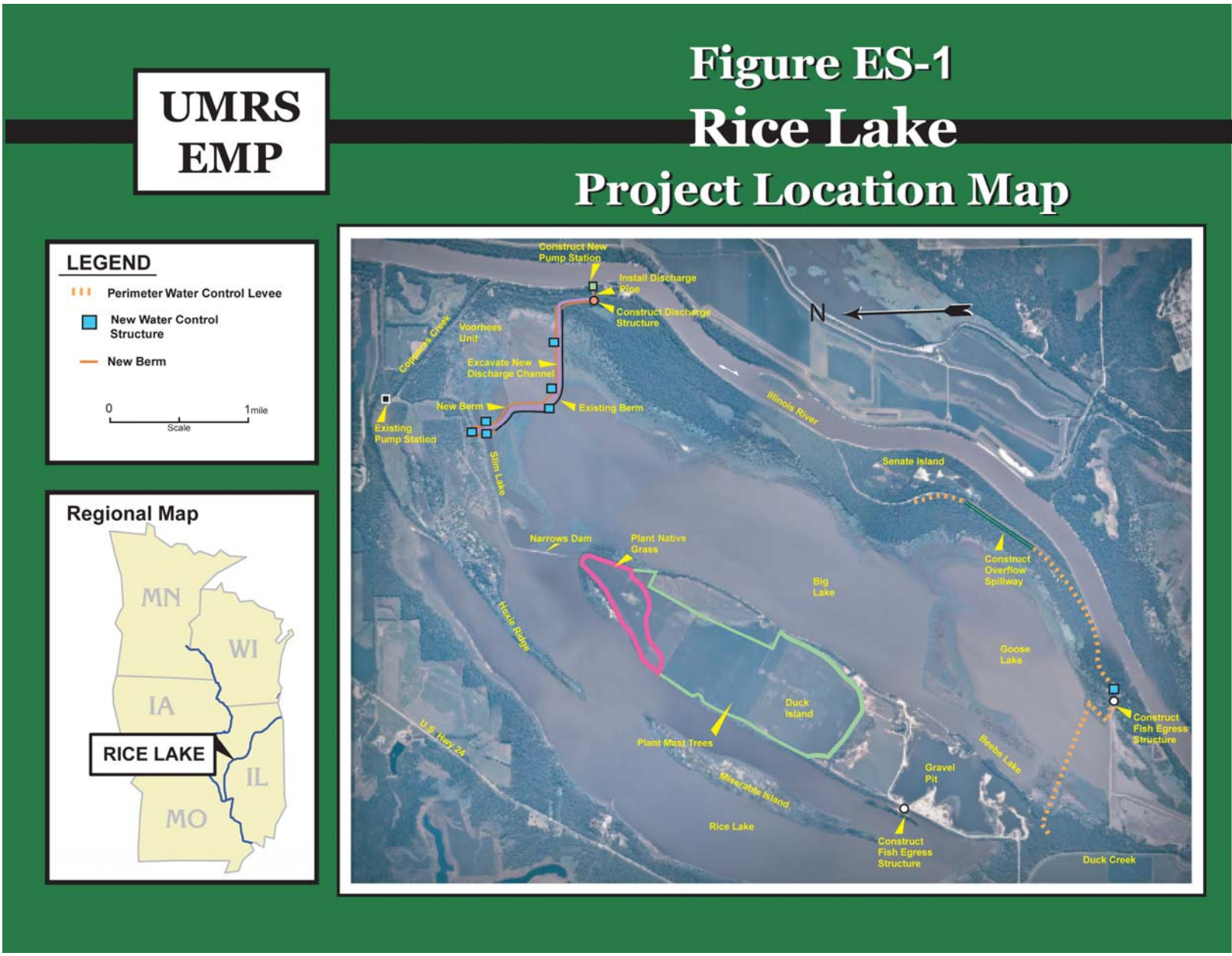
Implementation of the recommended plan would provide increased water management flexibility and the capability to optimize the quality and quantity of aquatic, wetland, and floodplain habitat at this location. The project outputs meet ILDNR site management goals and objectives and supports the overall goals and objectives of the Upper Mississippi River System – Environmental Management Program (UMRS-EMP), the North American Waterfowl Management Plan, and the Partners in Flight Program.

Per section 107(b) of the 1992 Water Resources Development Act (WRDA), project operation and maintenance, at an estimated average annual cost of $34,117 would be accomplished by the ILDNR, the non-Federal Sponsor.

The U.S. Army Corps of Engineers (Corps) would be 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 final Definite Project Report and that is needed as a result of specific storm or flood events. Rehabilitation of the project is considered to be reconstructive work that cannot be accurately estimated at this time.

In accordance with the 1999 WRDA, a 35-percent non-Federal cost share will be required for general design and construction costs assessable to those project features or portions thereof located on lands not "managed as a national wildlife refuge." All features identified for the Rice Lake HREP will require cost sharing. A Project Partnership Agreement (PPA) will be executed consistent with this requirement.

The U.S. Army Corps of Engineers, Rock Island District Engineer, has reviewed the project outputs and determined that the implementation of the selected plan is in the Federal interest. Therefore, construction approval for the Rice Lake HREP is recommended by the District Engineer at an estimated Federal expense of $11,744,268. The total non-Federal cost share is estimated at $6,789,044, which will be met using land credits.


UMRS
EMP
Figure ES-1
Rice Lake
Project Location Map
LEGEND
Perimeter Water Control Levee
New Water Control Structure
New Berm
0
1mile
Scale
Regional Map
MN
WI
IA
IL
MO
RICE LAKE
Construct New Pump Station
Install Discharge Pipe
Construct Discharge Structure
N
Voorhees Unit
Cottonwood Creek
Excavate New Discharge Channel
New Berm
Existing Berm
Existing Pump Station
Slim Lake
Illinois River
Senate Island
Narrows Dam
Plant Native Grass
Construct Overflow Spillway
Big Lake
Hoxie Ridge
Goose Lake
Duck Island
Construct Fish Egress Structure
U.S. Hwy 24
Plant Mast Trees
Beebe Lake
Gravel Pit
Miserable Island
Rice Lake
Construct Fish Egress Structure
Duck Creek

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1. INTRODUCTION

A. Location. The Rice Lake State Fish and Wildlife Area (SFWA) is a 6,800 acre wildlife management area located on the right descending bank of the Illinois Waterway's LaGrange Pool, approximately four miles downstream of Banner, Illinois, between River Miles (RM) 132.0 and 138.0. It is located in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. The Rice Lake SFWA is managed by the Illinois Department of Natural Resources (ILDNR) to provide quality nesting and mid-migration habitat for migratory and resident waterfowl. The project area is comprised of several backwater lakes, wet floodplain forests, and floodplain agricultural fields. The agricultural fields are located on a large tract of floodplain (Duck Island) that separates the two largest lakes, Rice and Big Lake. Plate 1 provides vicinity and general location maps for Rice Lake SFWA.

B. Purpose. The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of the Rice Lake SFWA project area. This Definite Project Report (DPR) provides planning, engineering, and sufficient construction details of the recommended plan to allow final design and construction to proceed subsequent to approval of this document.

C. Resource Problems and Opportunities. The Rice Lake SFWA has historically been excellent fisheries and mid-migration waterfowl habitat, but summer flood spikes and the loss of deep water habitat and mast trees has reduced the quality and quantity of habitat available to resident and migratory wildlife and fish species.

The summer flood spikes can kill the vegetation growth on low lying areas that then are unavailable to migratory waterfowl in the fall months. Sedimentation has resulted in the loss of deep water habitat used by fisheries for various life stage needs, including overwinter survival. Mast tree losses can be attributed to the magnitude and duration of the 1993 flood event, which has caused a change in species composition to less valuable species such as silver maple.

This report evaluates opportunities to restore and protect habitat for resident and migratory birds, wildlife, and fish species in existing backwaters of the Rice Lake SFWA.

D. Project Selection. The ILDNR nominated the Rice Lake SFWA Habitat Rehabilitation and Enhancement Project (HREP) for inclusion in the Corps' Environmental Management Program (EMP). The Fish and Wildlife Interagency Committee (FWIC) then ranked the project habitat benefits based on critical habitat needs along the Mississippi River and Illinois Waterway. After considering resource needs and deficiencies pool by pool, the Rice Lake SFWA HREP was recommended and supported by the FWIC and the River Resources Coordinating Team (RRCT) as providing significant aquatic, wetland, and floodplain benefits with opportunities for habitat enhancement. Development of this report was actively coordinated with the project sponsors - the ILDNR and the U.S. Fish and Wildlife Service (USFWS). Coordination occurred during on-site visits to the project area, team meetings, and phone conversations (see Appendix A - Correspondence).

E. Scope of Study. The scope of this study focuses on proposed project features that would improve aquatic, wetland, and floodplain habitat and enhance overall resource values. The project is consistent with agency management goals and was planned for the benefit of resident and migratory birds, fish, and other wildlife.

Field surveys, aerial photography, and habitat quantification procedures were completed to support the planning and assessment of proposed project alternatives. Hydrographic soundings were performed in developing sedimentation rates and estimating excavation quantities. Soil borings were taken to determine sediment types and construction difficulty. Baseline water quality monitoring was performed to define present water quality conditions/problems.

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

F. Format of Report. The report is organized to follow a general problem-solving format. The purpose, problems, and project selection process are presented in Section 1. Section 2 establishes the baseline for existing resources. Section 3 provides the goals and objectives of the project. Sections 4 and 5 propose and evaluate project alternatives. Section 6 describes the recommended plan and lists general design and construction considerations. Section 7 describes the schedule for design and construction. Section 8 contains cost estimates for initial construction and annual operation and maintenance. Section 9 assesses the environmental effects of the recommended plan. Section 10 details performance evaluation and monitoring plans. Section 11 describes real estate requirements. Sections 12 and 13 summarize implementation requirements and coordination. Sections 14 and 15 present the conclusions and recommendations. Section 16 contains a Finding of No Significant Impact statement. Drawings (listed on plate 2) and appendices have been furnished to provide sufficient detail to allow review of the existing features and the recommended plan.

G. Authority. The Upper Mississippi River System - Environmental Management Program's (UMRS-EMP) original authorizing legislation was the Water Resources Development Act (WRDA) of 1986 (P.L. 99-662). Section 1103 of this act states: "To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that the system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes". The EMP was originally comprised of five elements: Habitat Rehabilitation and Enhancement Projects (HREPs); Long-Term Resource

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

The original authorizing legislation has been amended three times since its enactment. The 1990 WRDA, Section 405, extended the original EMP authorization an additional five years to fiscal year 2002, which allowed for ramping up of the program. The 1992 WRDA, Section 107, amended the original authorization by allowing limited flexibility in how funds are allocated between the habitat projects program and the long-term resource monitoring program. WRDA 1992 also assigned sole responsibility for operation and maintenance of habitat projects to the agency that manages the lands on which the project is located. The 1999 WRDA, Section 509, reauthorized EMP as a continuing authority with reports to Congress every six years and changed the cost sharing percentage from 25 percent to 35 percent. The Rice Lake SFWA is located on state owned land managed by the ILDNR and is subject to a 35 percent cost-sharing requirement.

2. ASSESSMENT OF EXISTING RESOURCES

A. Resource History of Study Area. The Illinois Waterway historically functioned as a significant resting and foraging area for waterfowl during spring and fall migration. The shallow floodplain lakes provided abundant aquatic and emergent vegetation utilized as food and cover by diverse species of fish, water birds, and other animals. The wide floodplain also supported extensive bottomland forests with a substantial number of pin oaks, pecan, and hickories. This rich and diverse combination of food and cover supported large populations of waterfowl, fishes, and other wildlife. For these reasons, the Illinois Waterway was once considered one of the most productive riverine systems for fish and wildlife in North America.

B. Description of Project Area and Current Management. The Rice Lake SFWA is located in the LaGrange Pool of the Illinois Waterway. The project area is a complex of natural backwater lakes, sloughs, and floodplain lands located on the west side of the Illinois Waterway between approximate River Miles 132.0 and 138.0, on the east side of U.S. Route 24 in Fulton County. Figure 2-1 shows the dominant land cover types in the La Grange Pool and the Rice Lake SFWA. The project area is located adjacent to and immediately downstream of the Banner Marsh SFWA, the location of another recently constructed HREP.

Rice Lake SFWA encompasses approximately 6,800 acres of the floodplain. Rice Lake, Big Lake, Beebe Lake, and Goose Lake are the principle water bodies. Currently, Big Lake, Goose Lake, Beebe Lake, and the quarry are open to the Illinois Waterway and maintain approximately the same water elevation as the river. Rice Lake has the capability to be held higher (with pumping) because of the Narrows Dam (top elevation 439.0), which separates Rice Lake from Big Lake. The project area also includes several smaller, separate, wetland management units that are managed for native moist-soil vegetation and planted wildlife food crops. The remaining project area is covered by agricultural fields, an active gravel quarry, or bottomland hardwood forest typical of the Illinois Waterway Valley

The Rice Lake SFWA began with an initial purchase of 2,370 acres of land in 1945, through Federal assistance under the Pittman-Robertson Act. The area was designated as a refuge for migratory waterfowl with a portion open to hunting. Additional parcels of land acquired during the 1950s through the early 1980s increased the total acreage to approximately 2,700 acres. The purchase of two major waterfowl clubs in 1986 (2,900 acres) expanded the Rice Lake SFWA to approximately 5,600 acres at the beginning of the HREP planning process.

Following initiation of HREP planning and design, the ILDNR acquired Duck Island, which was a 1,200 acre private inholding that was nearly surrounded by ILDNR owned project lands. Duck Island is a natural floodplain ridge that separates Rice Lake to the west and Big and Goose Lakes on the east. Approximately 600 acres of this property had been leased for agricultural use and is currently planted in row crops (corn and soybeans) during the growing season. A tenant aggregate mining operation encompassing some 300+ acres is also located on Duck Island.

Primary human uses of the Rice Lake SFWA to date have been wildlife observation, waterfowl hunting, sport fishing, camping, and commercial fishing. Constructed facilities for public use include a camping area, a boat channel with floating docks and concrete launching ramp, parking areas, a public access road, administrative and maintenance buildings, and service roads. Most of these facilities are located on the west side of the project area adjacent to U.S. Highway 24. Existing water control structures and other facilities currently operated for habitat management purposes include the Narrows Dam, a pump station used to move water from the Illinois Waterway into Rice Lake, and a number of low water control levees, gated outlets, and drainage ditches associated with the smaller management units. The remnants of a water control berm (known

locally as the Hate Levee) are located at the southern end of Goose Lake. This structure was largely eradicated by repeated flooding and has been nonfunctional since the ILDNR acquired the property it occupies.

The Narrows Dam, located between Rice Lake and Big Lake, is operated by the ILDNR for the benefit of migratory waterfowl. When the stoplogs are removed, the Dam allows for summer drawdowns to promote vegetation growth and when the stoplogs are in, water levels can be maintained up to a 439.0 elevation. The existing 50,000 gpm pump station, located near Copperas Creek, is used to gradually fill Rice Lake over a 21-day period during the fall waterfowl migration. The pump station lies on the downstream end of a 3,900 ft access channel from the Illinois Waterway. This access channel requires periodic dredging every three years to supply adequate water to the pump station. Acceptable placement of this dredged material is becoming an increasing problem as historic adjacent placement may no longer be feasible.

C. Wetland Resources. The topography of the Rice Lake SFWA is primarily a low, relatively flat floodplain landscape that is characterized by a mosaic of backwater lakes, sloughs, floodplain forest, mud flats, and managed fields. Examination of National Wetland Inventory (NWI) maps of the project area indicates that most of the present acreage of the Rice Lake SFWA is classified as palustrine or lacustrine wetland. Big Lake, Rice Lake, and the smaller permanent water bodies comprise over half (>2000 acres) of the total wetland acreage. In addition, over 1,500 acres of nonforested wetland are subject to seasonal or temporary flooding on an annual basis. Annual grasses and forbs dominate the vegetative cover on the majority (>1200 acres) of these areas, with perennial emergents covering less than 10 percent of the non-forested wetland acreage (see Figure 2-1). Several hundred acres of exposed mud flats are normally present during low river stages.

The project area is a haven to numerous species of wildlife, and hosts thousands of migrating waterfowl, herons, and shorebirds. Strategically located within the Illinois Waterway Valley flight corridor of the Mississippi Flyway, this area and other sites in the immediate region are famous as historic resting areas for waterfowl and shorebirds on both their spring and fall migrations to and from their breeding grounds in Canada and their wintering grounds in the Mississippi delta, along coastal marshes, and Central and South America. Historically, the Illinois Waterway Valley has been one of the most important migration areas for mallards in the United States.

A large variety of birds utilize the project area during some part of their annual life cycles. Two hundred thirty-eight species of birds were reported for the Rice Lake SFWA during the 1987-97 periods. Waterfowl species are perhaps the most easily recognized due to their high visibility and recreational and economic value. A mean annual total of 2,517,100 duck use-days were recorded for the project area during the period 1975-1987, as reported in annual aerial inventories conducted by the Illinois Natural History Survey (INHS). The project area also provides extremely important foraging habitat for wading birds such as herons and egrets, and shorebirds such as sandpipers and yellowlegs. In 1997, the ILDNR nominated the Rice Lake SFWA for listing in the Important Bird Area (IBA) program administered by the American Bird Conservancy in cooperation with BirdLife International, a partnership of non-governmental organizations (NGOs) from around the world with a shared interest in bird conservation.

Migration during fall and spring is an energy-demanding activity for birds. Migrants need access to nutritious foods and rest at stopover areas to replenish reserves and satisfy the energetic costs of migration. As a result, waterfowl rely on diverse habitats at mid-migration latitudes to satisfy nutritional needs of various events during their annual cycle. Consequently, wetland programs for waterfowl in Illinois generally are directed at providing mid-migration habitat (Havera 1996).

Bellrose et al. (1979) reported that in the late 1930s some duck clubs in the Illinois Waterway Valley

began to use moist-soil management as a way to attract ducks to their property. Frederickson and Taylor (1982) defined moist-soil management as the manipulation of soil and water to produce food and cover in areas that experience seasonal flooding. The primary objective of moist-soil management is to mimic the natural (historic) water regime by lowering water levels during summer to expose mudflats for germination and growth of native annual plants typically found in seasonally flooded wetlands (generally referred to as “moist-soil” vegetation). Controlling the frequency, timing, length, and depth of water level manipulations can provide necessary habitat resources and conditions at times coincident with migration and other events in the annual life cycle of waterfowl. Moist-soil management continues to be one of the most effective techniques for managing migratory waterfowl habitat on public and private lands.

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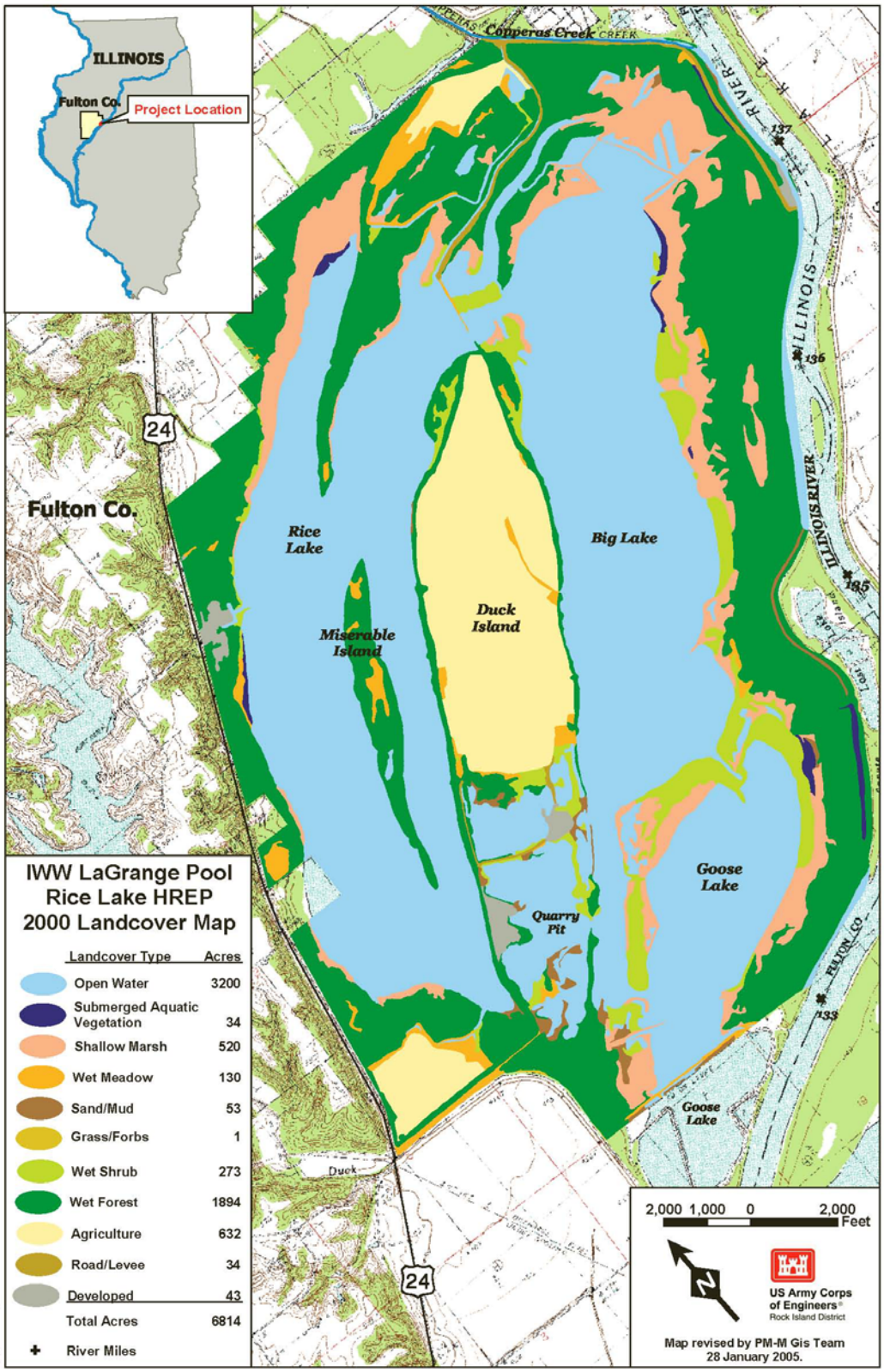


Figure 2-1 – 2000 Land Cover/Land Use, Rice Lake State Fish and Wildlife Area

D. Floodplain Resources. Wet floodplain forest, represents the largest single land cover type in the Rice Lake SFWA (approximately 1,854 acres of the project area). Dominant species include silver maple, cottonwood, green ash, and American elm. The majority of the forested area is composed of pole size to sawlog size material with limited reproduction. Willows and silver maples have invaded the shallow areas of Big Lake and Goose Lake due to the inability to control water levels in these areas. A small percentage of other desirable native species such as pin oak, basswood, river birch, box elder, mulberry, and pecan are also reported as occurring on areas of higher elevation in the project area.

The project area also provides habitat for a number of mammal species. Game and furbearing mammals important to the study area include fox squirrel, rabbit, woodchuck, white-tailed deer, muskrat, raccoon, opossum, skunk, mink, red fox, coyote, and beaver. Small mammal species collected during a 1987 survey of the project area included short-tailed shrew, least shrew, thirteen-lined ground squirrel, western harvest mouse, deer mouse, white-footed mouse, meadow vole, prairie vole, house mouse, little brown bat, Keen's bat, big brown bat, and red bat.

E. Aquatic Resources. The principal water bodies within the project area are Rice Lake, Big Lake, Goose Lake, Slim Lake, and Beebe Lake. These shallow backwater lakes are sustained primarily by groundwater seepage and overflow from the Illinois Waterway. The only deepwater areas within the project area boundary are located in the quarry at the downstream end of Duck Island. Because the Rice Lake SFWA is not separated from the Illinois Waterway by a high levee, its fish populations fluctuate in composition, numbers, and condition as the area is alternately flooded and dewatered by river levels. The basin of Rice Lake is broad and dish-shaped, constraining the quality and quantity of year-round fish cover. Ongoing water level management activities involve midsummer drawdowns to promote moist-soil plant production. As a result, water levels in Rice Lake during July and August are typically no more than 12-16 inches, with water temperatures during drawdown approaching 90 degrees Fahrenheit (F). These conditions severely limit both the composition and survival of fish populations.

Most fish species found in the project area are common to the La Grange Pool of the Illinois Waterway. Thirty-six fish species have been collected from the waters of the Rice Lake SFWA during recent years. Random sampling of Rice Lake conducted during 1991 and 1992, as part of the EMP's Long-Term Resource Monitoring Program (LTRMP), collected 15 species. LTRMP sampling of Big Lake, Goose Lake, Beebe Lake, and the Duck Island quarry during 1994 and 1995 yielded 35 species and one hybrid. The ILDNR's district fisheries biologist reported that several paddlefish were documented as occurring in this area during 1995 and three radio-tagged largemouth bass were documented traveling between Havana and the Duck Island quarry.

F. Water Quality. Baseline water quality monitoring studies conducted at the Rice Lake SFWA from May 1987 through February 1994 have shown that, on occasion, pH values exceed 9.0 and dissolved oxygen concentrations fall below 5 mg/l. Periodic extreme plant photosynthesis/respiration would appear to be the primary factors contributing to these events. The shallow nature of the lakes coupled with the aquatic vegetation present most likely result in wide swings in pH values and dissolved oxygen concentrations during a typical summer day. A combination of resuspended bed material and algal biomass appears to be causing the lakes' relatively high suspended solids concentration. A more detailed analysis of baseline water quality monitoring results can be found in Appendix F.

G Endangered Species. The following is a list of Federally-endangered species known to occur in Fulton County:

Status	Common Name	Scientific Name
Threatened	Bald eagle	*Haliaeetus leucocephalus*
Threatened	Decurrent false aster	*Boltonia decurrens*
Endangered	Indiana bat	*Myotis sodalist*

The bald eagle occurs in the vicinity of Rice Lake during winter months, and in 1997 an active bald eagle nest was located within the SFWA, which produced two fledglings. A portion of the Rice Lake SFWA has been designated as a significant winter roost site, and the present management plan provides for a refuge area for the species.

Decurrent false aster prefers disturbed, open sites of the Illinois Waterway floodplain. This species is under management at the Rice Lake SFWA and is present in two portions of the project area.

The Indiana bat may roost and forage for insects along the Illinois Waterway floodplain during spring and summer months. No records of the species are known for Fulton County, but the USFWS lists the bat as potentially occurring statewide in Illinois, and suitable habitat for the species exists in the floodplain forests of the study area.

At least 10 State listed endangered or threatened species (in addition to the bald eagle) have been recorded on the complex. These species are:

osprey (*Pandion haliaetus*)
little blue heron (*Florida caerulea*)
peregrine falcon (*Falco peregrinus*)
Wilson's phalarope (*Steganopus tricolor)*
American bittern (*Botaurus lentiginosus*)
black tern (*Chilidonias niger*)
black rail (*Laterallus jamaicensis*)
piping plover (*Charadrius melodus*)*
Mississippi kite (*Ictinia mississippiensis*)
black-crowned night heron (*Nycticorax nycticorax*)

*Note: the piping plover is a Federally listed species that has been reported as a rare sighting on the complex and in nearby refuge areas during migration periods, but the USFWS does not list this species for Fulton County and there is no known breeding habitat for the species in the project area.

H. Historic Properties. The Corps coordinated the project features with the ILDNR and the Illinois Historic Preservation Agency (IHPA) requesting comments concerning the possible effects of the project on historic properties. Correspondence from the IHPA, dated July 20, 1995 (Appendix A, IHPA LOG #950706004P-F), deferred comment to the ILDNR.

The ILDNR provided copies of cultural resource management reports documenting historic properties (Schroeder 1990, 1991, 1994). These reports document numerous archeological historic properties. These previously documented historic properties were avoided during the design of this HREP.

In July 1993, the IHPA and the Corps determined that portions of the Illinois Waterway Navigation Channel, from RM 80.2 to 327.0, were determined eligible for listing on the National Register of Historic Places. The Corps and the IHPA have undertaken investigations to determine significant elements and structures within the system.

As a result of the previous study (IHPA & Corps 1993), it is the preliminary opinion of the Corps that the Copperas Creek lock is eligible for the National Register of Historic Places, as documented in Rathbun Associates (1996).

In order to meet the requirements for historic properties identification as set out in 36 CFR Part 800.4 of the Advisory Council on Historic Preservation rules implementing Section 106 of the National Historic Preservation Act, the Corps contracted for the cultural resource survey report by Illinois State Museum (1996), This report investigated 177.87 hectares (439.5 acres) not covered by previous cultural resource studies conducted by the Illinois State Museum and others. The results of the Illinois State Museum (1996) investigation are discussed in Section 9D of this report.

I. Sedimentation. Backwater lakes on the Illinois Waterway from Peoria Pool down to Alton Pool, including Rice Lake, have experienced varying levels of sedimentation since 1903, resulting in significant loss of water depth and capacity. Previous studies have attempted to estimate sedimentation rates in these lakes. Demissie et al. found that sedimentation rates varied based on "lake location with respect to the river, the significance of local sediment inputs, and lake geometry." These rates varied from pool to pool, as well as among lakes in the same pool. Lee and Stall examined four backwater lakes, two in greater detail, and found average sedimentation rates ranging from 0.18 in/year (Swan Lake) to 0.59 in/year (Lake DePue). Demissie et al. used Lee and Stall's findings to estimate an average rate of 0.32 in/year in Rice Lake. This rate is similar to other backwater lakes in La Grange Pool, and is probably an accurate estimate of historical sedimentation.

J. Hazardous, Toxic, and Radioactive Waste. A hazardous, toxic, and radioactive waste (HTRW) site assessment was conducted. The project is located in an area that primarily is and historically has been agricultural, quarry, and outdoor recreational land. There is little evidence that the land has been used for other purposes. There were no obvious indications of potential contamination sources or migration pathways from surrounding properties. It does not appear that there is a risk of hazardous, toxic, or radioactive waste contamination within the project area.

3. PROJECT OBJECTIVES

A. Problem Identification. Over the past century, increased human activity within the Illinois Waterway basin, floodplain, and channel has altered the hydrology, topography, and biotic communities originally present in the project area. These alterations have reduced native plant and animal populations, degraded the quality of remaining natural resources and plant communities, impaired ecosystem functions, and threaten the future sustainability of the river-floodplain ecosystem.

1. Wetland Habitat Problem: Decreased Reliability of Seasonal Food and Cover for Migratory Birds. Alterations of the historic water level regime within the past 70 years have limited the ability of the project area to produce and sustain the native plant community that historically dominated the region and provided habitat for the diverse native wildlife community. Recreating the natural river stage cycle through a combination of active and passive water level management measures is critical to the restoration and protection of natural floodplain and aquatic habitats. Seasonal flooding and dewatering of the lake areas and management units of the Rice Lake SFWA are essential to provide the conditions necessary to promote growth of important native annual plants, which serve as a food resource and seasonal resting area for migratory waterfowl and shorebirds.

Existing facilities at the Rice Lake SFWA provide only very limited water level control capability on Rice Lake and some of the smaller moist-soil management units. Because no facilities for water level management currently exist on Big Lake and its associated management units, water levels in these portions of the project area are entirely controlled by the stage of the Illinois Waterway. Unseasonable midsummer fluctuations in river stage that result from the landscape modifications discussed above frequently prevent or reduce growth of annual native food plants in the area.

2. Aquatic Habitat Problem: Loss of Fish Access to Deep Aquatic Habitat During Low Water Periods. Historically, the frequency and duration of Illinois River flooding has increased over time as upstream development has intensified the rate of runoff. According to a 1979 study conducted by the INHS, increased siltation is reducing water depths in both Big Lake and Rice Lake. While fish isolated from the river in Big Lake during summer low-water periods have access to deepwater areas in the Duck Island quarry, Rice Lake has no interior deepwater areas and no access to the quarry or the river when water levels fall below 439.0 NGVD (the top elevation of the Narrows Dam). Currently, fish that move into Rice Lake during high water events and fail to move out during falling river stages have no avenue of escape from high temperatures or low DO levels, greatly increasing the potential for fish kills. Fish kills may also increase the potential for outbreaks of avian botulism, which can cause mortality in resident and migratory waterbird populations. Avian botulism outbreaks have occurred in the nearby Lake Chautauqua Refuge following fish kills caused by drawdowns for moist soil unit operation. No outbreaks have occurred at Rice Lake SFWA, but conditions similar to Lake Chautauqua could occur if fish have no escape route to deeper water areas.

Avian botulism is a paralytic disease of birds caused by ingestion of a toxin produced by the bacteria, *Clostridium botulinum*. This bacterium is widespread in soil and requires warm temperatures, a protein source, and an anaerobic (depleted oxygen) environment in order to become active and produce toxin. Birds either ingest the toxin directly or may eat invertebrates containing the toxin. A cycle develops in a botulism outbreak when maggots feed on animal carcasses and ingest toxin. Birds that consume toxin-laden maggots can then develop botulism. Birds with the disease are unable to use their wings and legs normally or control other muscles. Birds with

paralyzed neck muscles cannot hold their heads up and often drown. Death can also result from water deprivation, electrolyte imbalance, respiratory failure, or predation.

These conditions reduce the ability of the Rice Lake SFWA aquatic areas to contribute to the long-term sustainability of the larger Illinois Waterway aquatic ecosystem.

3. Floodplain Habitat Problem: Decreased Acreage and Diversity of Native Floodplain Vegetation as Habitat for Resident and Migratory Wildlife. Historic conversions of floodplain forest and wet prairie lands in the Illinois Waterway floodplain to agricultural use reduced the quantity and quality of both mesic bottomland forest and grassland/wet-meadow habitats. In addition, the existing pin oak population within the Rice Lake SFWA was extensively damaged if not eradicated by severe flooding during 1993 and 1995. Lack of mast-tree regeneration, reduction of species diversity, and increased tree mortality can be directly attributed to the increase in flood frequency and duration over time. These past losses in habitat value limit the present and future ability of the project area to attract and support a diverse community of resident and migratory wildlife species.

B. Resource Significance. The UMRS represents the largest riverine ecosystem in North America and the third largest in the world. The UMR ecosystem encompasses over 2.6 million acres of aquatic, wetland, forest, grassland, and agricultural habitats, supporting more than 300 species of birds; 57 species of mammals; 45 species of amphibians and reptiles; 150 species of fish; and nearly 50 species of mussels. More than 40 percent of North America's migratory waterfowl and shorebirds depend on the food resources and other life requisites (shelter, nesting habitats, etc.) that the system provides. The importance of these resources was recognized by Congress in WRDA 1986 by their declaration of the UMRS as a "nationally significant ecosystem", as noted in Section 1.G. of this DPR. Institutional recognition of the significance of this resource was further recognized by Congress' initial and continued authorization of the Environmental Management Program for the planning, construction, and evaluation of measures for rehabilitation and enhancement of fish and wildlife habitat in the UMRS.

The National Research Council recognized the ecological significance of large floodplain rivers and identified the Mississippi and Illinois Waterways as examples of two such rivers in the U.S. that could become healthy again with proper management and restoration.

Floodplain forests are declining in the Mississippi and Illinois Waterway floodplains due to agricultural and urban development, alteration of natural riverine flood pulses, rising water tables, and island loss due to wind and wave action. The remaining forests are changing in composition from high species diversity (including mast producing trees) to a more monotypic forest dominated by silver maple and even aged stands with little to no understory or regeneration of seedlings.

Grasslands are an important ecotype that was common and abundant in the UMRS ecosystem prior to the extensive agricultural development of the floodplain from the late 19th through the mid 20th centuries. Today, wet-mesic native floodplain grasslands are the rarest and most fragmented native ecotype in the UMR ecosystem.

Within La Grange Pool, existing land cover is predominately agricultural (47 percent of total floodplain acreage) and likely to remain so for the foreseeable future. Opportunities for restoration of native floodplain ecotypes and habitats are limited by the small percentage of land in public ownership (16 percent of total floodplain acreage). For this reason, the restoration of land and water resources of the Rice Lake SFWA has an increased importance.

C. Systemic Habitat Goals (Habitat Needs Assessment). The Habitat Needs Assessment prepared for the EMP in October 2000 summarized habitat needs for the Illinois Waterway Reach of the UMRS as follows:

1. Restore existing backwaters so that 25 percent of existing backwater lakes (19,000 acres) have an average depth of 6 ft.

2. Increase depth diversity and connectivity throughout the river.

3. Restore hydrologic variability needed to restore and maintain existing backwater habitats.

D. General Fish and Wildlife Management Goals for Rice Lake SFWA. The primary long-range management goal of the ILDNR at the Rice Lake SFWA is to moderate the historic trend of habitat degradation within the confines of the project area through implementation of a management, development, and acquisition program that will provide quality habitat, attractive to many species of wildlife, while at the same time providing the public with increased hunting, fishing, and other recreational opportunities (Illinois Department of Conservation-IDOC, presently ILDNR, 1989).

The objectives of the Rice Lake SFWA as stated in the ILDNR's Natural Resource Management Plan (1989) are as follows:

Primary Objective: The primary objective of Rice Lake SFWA is to conserve and enhance, where appropriate, essential quality nesting and mid-migration habitat, including refuge, for both migratory and resident waterfowl populations utilizing the Illinois Waterway Valley flight corridor of the Mississippi Flyway.

Secondary Objectives: The following secondary objectives have been developed to provide guidelines for acquisition, development and management, including public usage, of the site:

1. Conserve natural bottomland habitat of migratory and resident, game and non-game fauna inhabiting the site, including rare, threatened, and endangered species.

2. Conserve natural bottomland habitat of native flora inhabiting the site, including rare, threatened, and endangered species.

3. Provide an opportunity for quality public waterfowl hunting to the extent that the primary objective is not jeopardized.

4. Provide an opportunity for other compatible public recreational usage, including sport and commercial fishing, furbearer trapping, vehicular camping, pleasure boating, hiking, wildlife observation, and sightseeing to the extent feasible.

The emphasis on wetland and waterfowl management at the Rice Lake SFWA reflects not only the immediate goals of local resource managers, but also those of the FWIC for habitat enhancement in Pools 11-22 of the Upper Mississippi and Illinois Waterway, Partners in Flight, and the North American Waterfowl Management Plan (NAWMP). The NAWMP aims to increase waterfowl populations and their habitats, particularly those at critically low-levels. It has been estimated that 20 percent of all ducks in North America utilize the Upper Mississippi River System for feeding and resting during migration (Upper Mississippi River Basin Commission, 1981). This statistic points to the need for optimum management of refuge areas such as the Big Lake portion of the Rice Lake SFWA. In fact, a recent study indicates that refuge areas may be necessary to prevent

disturbance of waterfowl during spring and fall migrations (Havera *et al.*, 1992), particularly in areas where waterfowl numbers have declined.

In response to recommendations that the Rice Lake SFWA participate in the Western Hemisphere Shorebird Reserve Network, the ILDNR has recommended that the project area be managed to complement shorebird use, within the context of the primary site objective.

Successful management of the lake areas and management units of the Rice Lake SFWA is dependent on the ability to control water levels in the project area. The success of water level control efforts on Rice Lake is dependent on whether water levels on the Illinois Waterway remain below elevation 439.0 NGVD (the spillway crest elevation of the Narrows Dam) during the critical drawdown period. The water level management plan at Rice Lake, when Illinois Waterway elevations allow, is to hold the lake at a spring pool elevation of 437.0 NGVD, creating an approximately 1,400 surface-acre lake with an average depth of 2.4 ft and a shoreline at the timber's edge. During the third week of June, Rice Lake is drawn down over a 21-day period to elevation 435.0, exposing approximately 500 acres of mudflats. This exposure facilitates firming of the highly flocculent lake-bottom material. This, in turn, encourages production of native moist-soil vegetation and also allows aerial seeding of fast-growing crops when unseasonable river stage fluctuations reduce native food plant production. Both the native moist-soil plants and the non-native crop species provide a high quality food base for resident and migratory wildlife. In mid-September (or earlier during drought conditions), the lake is recharged by pumping to return to elevation 437.0 by the beginning of November.

The preferred management plan for Big Lake would be to hold the lake at a spring pool elevation of 436.0, with drawdown over a 21-day period to elevation 434.0 beginning June 15. Under current conditions, this management plan cannot be reliably implemented due to midsummer fluctuations in Illinois Waterway water levels and the inability to control water levels in the lake independent of river stage.

During initial project planning, the ILDNR's management goals for Duck Island involved restoring a portion of the agricultural fields to native vegetative cover types. Acquisition of the Duck Island property created an opportunity for large-scale restoration of native plant communities, specifically warm season grassland and bottomland hardwood forest dominated by mast-producing (e.g. oaks and hickories) tree species.

E. Project Goals, Objectives, and Potential Enhancement Features. Based on the identified problems, systemic goals of the cooperating agencies, and the overall fish and wildlife management goals of the project sponsor, the following specific goals, objectives, and potential project features have been developed for this HREP (Table 3-1). Potential project features and design alternatives are described in detail in Sections 4 and 5.

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

GOAL	OBJECTIVE	POTENTIAL REHABILITATION/ ENHANCEMENT FEATURES
Restore and Protect Wetland Habitat	Increase success rate of annual emergent/moist soil vegetation production Reduce adverse effects of river stage fluctuations on wetland habitat	Construct pump station with conveyance ditches Construct low perimeter levee around Big Lake and Goose Lake
Restore and Protect Aquatic Habitat	Increase fish egress opportunities from Rice Lake during drawdown periods Maintain seasonal access between Rice Lake/Big Lake aquatic areas and Illinois Waterway Increase off-main channel aquatic habitat in Illinois Waterway	Provide access from Rice Lake to deepwater areas in quarry Provide access from Goose Lake to Illinois River Dredge Senate Island side channel
Restore and Protect Floodplain Habitat	Increase natural food and cover for resident and migratory wildlife	Establish mast tree and native grass plantings on Duck Island

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

- **Environmental Laws and Regulations.** Construct features consistent with Federal, state, and local laws.
- **Operation and Maintenance.** Restoration features shall be designed to minimize operation and maintenance requirements.
- **Impacts to Flood Heights.** Restoration features should not increase flood heights or adversely affect private property or infrastructure.
- **Hazardous, Toxic, and Radioactive Waste.** Project features should be designed to avoid disturbance of HTRW to minimize and prevent Federal liability under the Comprehensive Environmental Response, Compensation, and Liability Act; to reduce any threats to project workers; and to avoid costly delays associated with environmental abatement activities.

G. Criteria for Potential Enhancement Features. Table 3-2 presents general and specific criteria developed to assess potential project features.

Table 3-2. Development Criteria for Potential Enhancement Features

ITEM	PURPOSE OF CRITERIA
A. General Criteria	
Locate and construct features consistent with EMP directives	Comply with program authorities
Construct features consistent with Federal, State, and local laws	Comply with environmental laws
Develop features that can be monitored	Provide baseline for project effects (e.g., sedimentation, stability, water quality)
Design features to facilitate operation and maintenance	Minimize operation and maintenance costs
B. Restore and Protect Wetland Habitat	
Provide a reliable source of water adequate to manage water levels over entire project area	Provide water level control over the rapid rise and fall of water levels consistent with management goals
Eliminate or reduce rapid water level fluctuations during the growing season	Increase water level control capability beyond simple gravity flow dependent on river stage
Increase flexibility of water level management capability within project area	Increase success rate of management plan implementation
C. Restore and Protect Aquatic Habitat	
Provide fish egress from Rice Lake to deep ($\geq$ 6' year-round) aquatic areas	Increase fish survival during drawdown periods and reduce potential for avian botulism outbreak
Design water control infrastructure to preserve and if practicable, enhance seasonal fish access between Big Lake and Illinois Waterway	Maintain connectivity between main channel of Illinois Waterway and floodplain aquatic habitats
D. Restore and Protect Floodplain Habitat	
Locate plantings in existing agricultural areas on Duck Island; plant multiple species of native woody and herbaceous vegetation	Increase quantity and quality of native bottomland hardwood and native grassland habitat within project area
Locate plantings on higher elevations within floodplain	Maximize survival rate and facilitate growth of plantings
Configure plantings in large single cover tracts	Reduce future habitat fragmentation

4. POTENTIAL PROJECT FEATURES

This section describes and assesses potential enhancement features that will meet the goals of restoring and protecting wetland, aquatic, and floodplain habitat. Potential enhancement features were evaluated based on their ultimate contribution to the project goals and objectives, engineering considerations, and local restrictions or constraints. Features that were determined not feasible or did not meet the criteria of Table 3-2 were not subject to further evaluation and can be found on Plate 5. Once the initial screening was completed, the remaining potential enhancement features were incrementalized and combined, where feasible, to formulate alternatives that fully or partially satisfy the project goals and objectives (Plate 4). For planning purposes, the project life was established as 50 years.

A. Potential Features to Restore and Protect Wetland Habitat. The following features were considered for inclusion in this HREP to contribute to the goal of restoring and protecting wetland habitat: construction of a perimeter water control levee around Big Lake; and construction of a new pump station for interior water level management. Details of these features are discussed below.

1. Improved Water Level Control (Perimeter Levee). This feature would involve construction of a low-level perimeter levee around Big Lake and Goose Lake to protect this area from midsummer river stage fluctuations that currently prevent reliable implementation of the ILDNR's management plan and limit the quality and availability of habitat for migratory waterbirds. The levee would be aligned to take full advantage of natural ground elevations on the east side of the lake and existing remnants of the Hate Levee (shown on Plate 3) to the south to minimize ground disturbance and reduce construction costs. The top elevation of the levee would be optimized to allow control of interior water levels to meet management goals while maintaining connectivity between the project area and the Illinois Waterway. The levee design would include an armored spillway located near the upstream end of the perimeter levee just west of Senate Island with a top elevation approximately two ft lower than the overall levee elevation, to allow the interior water level of Big Lake to equalize with the river level before overtopping. To allow maximum flexibility and to keep the operation and maintenance cost of the project down, the design will include a gravity flow (gatewell) structure installed through the levee at the southwest corner of Goose Lake (see Plate 6).

2. Improved Water Management Capability (Pump Station). A new pump station is proposed as shown on Plate 6. This feature would allow reflooding of the area in the fall, providing access to important food resources and feeding areas for migrating waterfowl. Construction of interior ditches also would be required to convey the water between the pump station and interior areas.

Three potential sources of water were initially considered in developing the pump station feature: the Duck Island quarry, Duck Creek, and the Illinois Waterway. Geotechnical investigations (borings) resulted in the determination that the quarry would not be a feasible source of water due to the degree of hydraulic connection between the lakes (see Plates 28 through 31). Diversion of water from Duck Creek was also investigated because of its potential low cost for construction and maintenance. However, the flow in the creek is largely controlled by outflows from a cooling reservoir for a nearby power plant. This source was not evaluated further because adequate water supply was uncertain and agreements with private entities were logistically impractical. Consequently, the Illinois Waterway was evaluated as the only feasible source of water in formulating and analyzing alternative designs of the pump station.

The location of the new pump station would be chosen to allow accessible water conveyance with minimal maintenance dredging problems. Several thousand ft of discharge channel are required to convey the water to and from the lakes. The discharge channel would be constructed by a combination of mechanical excavation and embankment placement. Water control structures would be constructed at the upstream end of the project along the new discharge channel. These structures would provide water to the Voorhees Unit, Big Lake, and Rice Lake. Water control structures would also be installed to maintain connectivity between Upper Slim Lake and Lower Slim Lake. Two options were considered to optimize the pump station feature.

a. The existing 50,000-gpm pump station would remain to supply Rice Lake, and a new 50,000-gpm pump station would be constructed upstream from the old Copperas Creek Lock to supply Big Lake. This alternative meets the objective of providing control over the water levels on both lakes. However, the inlet channel to the existing pump station is a 3,900 ft channel from the Illinois Waterway that requires maintenance dredging approximately once every three years. Adjacent dredged material placement has become an increasing problem. The total excavation for the discharge channel would be reduced, but the sedimentation problem in the existing channel supplying Rice Lake would not be eliminated.

b. The existing 50,000 gpm pump station would be abandoned. A new pump station would be constructed upstream from the old Copperas Creek Lock. The new pump station would have a capacity of 133,200 gpm to fill both Rice Lake and Big Lake in 14 days. This alternative meets the objective of providing control over the water levels on both lakes. The station would also be located close to the Illinois River to avoid maintenance costs associated with an inlet feeder channel.

B. Potential Features to Restore and Protect Aquatic Habitat (Fish Access). The following features intended to restore and protect aquatic habitat were considered for inclusion in this project.

1. Rice Lake to Quarry Access. This feature would involve construction of a fish passage structure between Rice Lake and the quarry at the downstream end of the Duck Island peninsula. The structure would be designed to operate during periods when water levels on Rice Lake are being lowered, to allow fish in Rice Lake to move into the deeper water of the quarry and escape the potentially lethal aquatic conditions that may occur in Rice Lake during the summer drawdown period. Access between Big Lake and the quarry already exists, so no similar structure was considered necessary for fish passage between the quarry and Big Lake.

2. Rice Lake to Quarry and Goose Lake to Illinois Waterway Access. This feature would involve construction of a fish passage structure between Goose Lake and the Illinois Waterway and would be in addition to option (1) described above. The structure would be designed to facilitate movement of fish between Goose Lake and the Illinois Waterway when water levels on Big Lake are being lowered to drawdown elevation.

3. Senate Island Side Channel Restoration. This feature would involve excavation of the Illinois Waterway side channel between Senate Island and the Rice Lake SFWA. This side channel has silted in over time and provides only limited aquatic habitat value at present. The relatively high value of side channel aquatic habitat for fish and the current scarcity of such habitat on the Illinois Waterway suggests that such a feature could potentially provide substantial fisheries benefits. In addition, material excavated from the channel could potentially be used as borrow material for construction of the perimeter levee. However, the material filling the channel consists of silt along with a large amount of timber and other debris. The quantity of suitable borrow material potentially available from the side channel was estimated to be less than half the quantity

required for construction of the perimeter levee. There are also ownership concerns, as Senate Island and a portion of the Senate Island side channel are privately owned. For these reasons, this feature was not evaluated in detail for this project, although it could be considered as a future habitat restoration proposal for construction either under EMP or other environmental restoration authorities.

4. **Island Building.** Construction of four islands (2 in Rice Lake/2 in Big Lake) to improve water quality by reducing the resuspension of sediments from wave action was considered, but not evaluated in detail for this project due to cost of construction and limited habitat benefits.

C. Potential Features to Restore and Protect Floodplain Habitat. Reestablishment of native plant species on the agricultural field located on the recently acquired Duck Island property was considered for inclusion in this project. The Rice Lake SFWA is currently dominated by two cover types - open water and wet floodplain forest. This feature would provide additional floodplain habitat diversity and would aid the ILDNR in meeting their secondary management objectives listed in Section 3.D.

1. Partial Conversion of Duck Island Agricultural Fields to Native Cover Types/Conversion to Single Native Cover Type. Initial planning of this feature evaluated the feasibility of converting only half of the agricultural field acreage and continuing row crop cultivation on the remaining half, or converting the entire acreage to a single cover type (forest or native grass). Following acquisition of the Duck Island property by the ILDNR, coordination within the interagency team revealed that conversion of only half of the agricultural field, or conversion of the entire agricultural field to native grass habitat, would not be fully compatible with the ILDNR's management objectives for the site. Additionally, conversion of the entire agricultural field to forest cover would not be compatible with the need to protect several historic properties identified during cultural resources surveys of the site (see section 2h. of this DPR for additional information). For these reasons, the alternatives described in this paragraph were subsequently determined not to be feasible and therefore were not included in the incremental analysis of planting alternatives.

2. Conversion of all Duck Island Agricultural Fields to Native Cover (Mast Trees and Native Grasslands). The entire agricultural field acreage of Duck Island would be converted to a combination of forest and grassland cover types featuring plant species historically native to the project area. Restoration of grassland habitat within the Rice Lake SFWA would involve planting a mixture of native warm season grass and forb species on a portion of Duck Island's agricultural field to protect historic properties identified during cultural resources surveys. Restoration of floodplain forest habitat with a substantial component of mast-producing tree species would involve planting a mixture of native tree species on the remaining agricultural field acreage.

5. EVALUATION OF FEASIBLE PROJECT FEATURES AND FORMULATION OF ALTERNATIVES

This section describes features that met the goals and objective of this project. Each feature was evaluated to determine its potential for environmental restoration and enhancement. Cost estimates were also derived for each of the feasible alternatives.

A. Environmental Output Evaluation. A habitat analysis was conducted to assess environmental outputs (benefits) of the proposed project. This analysis employed a multi-agency team approach with participation by resource managers and biologists representing the Corps, the USFWS, and the Illinois DNR.

Assessment of existing study-area conditions, projected future conditions without the project, and expected impacts of proposed project features and alternatives utilized procedures developed by the Missouri Department of Conservation and the Soil Conservation Service. This system, the Wildlife Habitat Appraisal Guide (WHAG), is a numerical habitat appraisal system based on USFWS Habitat Evaluation Procedures (HEP) (1980).

WHAG procedures evaluate the quality and quantity of particular habitats for animal species selected by the WHAG team members. The qualitative component of the analysis is known as the Habitat Suitability Index (HSI) and is rated on a 0.1 to 1.0 scale. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected evaluation species. From the qualitative and quantitative determinations, the standard unit of measure, the Habitat Unit (HU) is calculated using the formula (HSI x Acres = HUs). Changes in HUs will occur as a habitat matures naturally or is influenced by development. These changes influence the cumulative HUs derived over the life of the project. Cumulative HUs are annualized and averaged to determine Average Annual Habitat Units (AAHUs). AAHUs are used as the output measurement to compare all the features and alternatives for the proposed project.

The WHAG analysis evaluated the effects of proposed project features on habitat availability and quality for 23 wildlife and fish species. Seven species (mallard, Canada goose, least bittern, king rail, lesser yellowlegs, green-backed heron, and muskrat) were used to assess the effects of the levee and pump station features. Seven fish species (channel catfish, crappie, largemouth bass, bluegill, gizzard shad, carp, and black bullhead) were used to evaluate the fish access structures. Nine wildlife species (white-tailed deer, wild turkey, bobwhite, eastern cottontail, fox squirrel, eastern bluebird, wood thrush, Kentucky warbler, and indigo bunting) were used to evaluate native forest and grassland restoration. A detailed description of the habitat analysis is provided in Appendix D of this report.

B. Feasible Project Features. Plate 4, *Project Enhancement Features Evaluated,* shows the locations of all feasible project features described in Section 4. Project feature alternatives were identified and evaluated by the interagency team to aid in development of a recommended plan. These alternatives are described as follows.

1. Perimeter Water Control Levee (L)

a. No Action (L0). No action would result in no additional water control efforts. No AAHU gain or loss would be realized other than what may occur naturally. If no action is taken, it is anticipated that uncontrolled water level fluctuations will continue to substantially limit the habitat value of wetlands in the project area, particularly in Big Lake.

b. Levee at Elevation 440.0 (L1). This alternative would involve constructing the

perimeter water control levee with a top elevation of 440.0 and a spillway crest elevation of 438.0. Gravity drawdown of the Big Lake portion of the project area would be possible when river stage is below elevation 436; drawdown could be maintained as long as river stage remained below elevation 438.0. This alternative would provide protection to Big Lake, but would not improve conditions at Rice Lake. This option also includes the construction of a gatewell structure upstream of the two existing structures to facilitate drawdown in a 14 day period. This feature yields a net benefit of 1,529 AAHUs.

c. Levee at Elevation 442.0 (L2). This alternative would involve constructing the perimeter water control levee with a top elevation of 442.0 and a spillway crest elevation of 440.0. Gravity drawdown of the Big Lake portion of the project area could be maintained as long as river stage remained below elevation 440.0. This alternative would provide some additional protection from river stages below elevation 440.0, and would provide a slight increase in operating flexibility for the Rice Lake portion of the project area in addition to the Big Lake portion. This option also includes the construction of a gatewell structure upstream of the two existing structures to facilitate drawdown in a 14 day period. This feature yields a net benefit of 3,503 AAHUs.

2. Pump Station and Conveyance Facilities (P)

a. No Action (P0). No action would result in no additional water level management capability. No AAHU gain or loss would be realized other than what may occur naturally. If no action would be taken, it is anticipated that uncontrolled water level fluctuations will continue to substantially limit the habitat value of wetlands in the project area, particularly in Big Lake.

b. Pumping Facility for Big Lake (P1). This alternative would involve construction of a 50,000 gpm pump station, a 4,200 ft discharge channel, and water control structures to fill Big Lake. The existing pump station would remain to supply Rice Lake. This alternative would provide the capability to manipulate water levels on Big Lake, while separately maintaining existing water level management facilities on Rice Lake. This feature yields a net benefit of 1,274 AAHUs.

c. Pumping Facility for Big Lake and Rice Lake (P2). This alternative would involve abandoning the existing Rice Lake pump station, and constructing a 133,200 gpm pump station, a 7,000 ft discharge channel, and water control structures to fill Big Lake, Rice Lake, and the Voorhees Unit. Abandonment of the existing pump station and transfer of its function to the new pumping station would optimize management and operational flexibility for the entire project area, while reducing maintenance costs from a second pump station and its 3,900 ft access channel. This feature yields a net benefit of 2,866 AAHUs.

3. Fish Access (F)

a. No Action (F0). No action would result in no increase in fish access between Rice Lake and the deepwater areas of the Duck Island quarry, and no increase in fish access between Big Lake and the Illinois Waterway. No AAHU gain or loss would be realized other than what might occur naturally.

b. Rice Lake to Quarry Access (F1). This alternative would involve constructing a single structure to allow fish access between Rice Lake and the Duck Island quarry. Because a connection between Big Lake and the quarry already exists, this alternative would affect only Rice Lake. Access between the entire SFWA and the Illinois Waterway would be unaffected. This feature yields a net benefit of 2,329 AAHUs.

c. Rice Lake to Quarry and Goose Lake to Illinois Waterway Access (F2). This

alternative would involve constructing the Rice Lake-quarry access described above and also constructing a second structure between Goose Lake and the Illinois Waterway that would function both as a gravity drain and fish access for the entire SFWA during the summer drawdown. This feature yields a net benefit of 5,501 AAHUs.

4. Duck Island Native Vegetation Plantings (T)

a. No Action (T0). No action would result in no change in existing land cover or land use practices on Duck Island. Assuming continuation of Duck Island's current agricultural use, no AAHU gain or loss would be realized for the 548-acre site.

b. Conversion of Agricultural Fields to Forest and Native Grassland Cover (T1-T5). These alternatives involve conversion of Duck Island agricultural fields to native forest and grassland cover through active planting of native vegetation, in varying proportions described as follows:

(T1) 352 acres grassland, 57 acres forest, 594 AAHUs
(T2) 272 acres grassland, 137 acres forest, 604 AAHUs
(T3) 204 acres grassland, 205 acres forest, 611 AAHUs
(T4) 137 acres grassland, 272 acres forest, 619 AAHUs
(T5) 57 acres grassland, 352 acres forest, 629 AAHUs

C. Cost Estimates for Habitat Improvement Measures. Table 5-1 shows the estimated outputs (in AAHUs) and annualized costs for each feature alternative. The annualized costs are based on construction and real estate estimates. A detailed breakdown of costs for the recommended plan is outlined in Section 8 - Cost Estimates.

Table 5.1 Environmental Output and Costs of Each Feature

Feature	Symbol	Output [1]	Annualized Cost in $ [2]
Perimeter Levee			
No action	L0	0	0
Levee spillway 440, no pump	L1+P0	2229	131,000
Levee spillway 440, Big Lake pump only	L1+P1	2484	315,000
Levee spillway 442, no pump	L2+P0	2484	167,000
Levee spillway 440, Big/Rice Lake pump	L1+P2	2739	348,000
Levee spillway 442, Big Lake pump only	L2+P1	3949	351,000
Levee spillway 442, Big/Rice Lake pump	L2+P2	6369	384,000
Fish Access Structures			
No Action	F0	0	0
Passage from Rice Lake to Duck Island quarry	F1	2329	9,500
Passage from Rice Lake to Duck Island quarry pit and passage from Big Lake to Illinois River	F2	5501	19,800
Duck Island Native Vegetation Planting			
No action	T0	0	0
352 acres grassland, 57 acres forest	T1	594	34,400
272 acres grassland, 137 acres forest	T2	604	36,500
204 acres grassland, 205 acres forest	T3	611	39,000
137 acres grassland, 272 acres forest	T4	619	41,500
57 acres grassland, 352 acres forest	T5	629	43,500

[1] Outputs are calculated as Average Annual Habitat Units (AAHUs).
[2] Annualized cost is initial construction cost based on a 50-year project life, 5-5/8 percent interest rate.

D. Incremental Analysis of Project Alternatives. Cost effectiveness and incremental cost analysis (CE/ICA) was used to assist the process of determining what project features and design alternatives should be built based on comparison of quantified habitat benefits (outputs) and estimated costs of alternative feature designs. This process identifies alternative features or combinations of features that partially or fully meet the goals and objectives of the project and at the same time are the most cost effective. A cost effectiveness analysis is conducted to ensure that least cost alternatives are identified for various levels of output. After the cost effectiveness of the alternatives has been established, subsequent incremental cost analysis is conducted to reveal and evaluate changes in cost for increasing levels of environmental output.

CE/ICA is basically a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the best overall project alternative based on habitat benefits and cost. A detailed description of habitat evaluation and benefit quantification is provided in Appendix D of this report. Costs were annualized by applying a 5-5/8 percent interest rate to the construction cost over the life of the project, estimated at 50 years for planning purposes. The incremental analysis of alternatives was accomplished following guidance prepared by the Corps' Institute for Water Resources and using the methodology described in Robinson, *et al*. (1995).

Primary assumptions and constraints used in conducting CE/ICA for this HREP are as follows:

1. AAHUs for all analyzed fish and wildlife species were assumed to have equal value in comparing alternative plans.

2. Alternatives analysis was limited to combinations that at least partially met all three project objectives listed in Table 3.1.

3. Feature P (pump station) was assumed to be dependent on Feature L (perimeter levee). Because both the perimeter levee and pump station address the project objective of restoring and protecting wetland habitat, alternatives that included P0 were included in the CE/ICA analysis provided they also met the conditions of assumption No. 2 above.

A total of 61 plans were evaluated (out of a total of 162 possible combinations). Of these, 26 plans (including the no-action alternative L0+P0+F0+T0) were identified as being cost-effective using CE/ICA analysis. These plans are listed in Table 5-2 below.

Table 5-2. Cost-Effective Alternative Combinations

Plan	Outputs (AAHU)	Annualized Cost ($)	Avg. Cost ($/AAHU)
L0P0F0T0 (No Action)	0	0	0
L0P0F1T0	2329	$10,000	$4.30
L0P0F2T0	5501	20,000	3.60
L0P0F1T1	6095	55,000	9.00
L0P0F2T1	6105	57,000	9.30
L0P0F2T3	6112	59,000	9.70
L0P0F2T4	6120	62,000	10.10
L0P0F2T5	6130	64,000	10.40
L1P0F2T0	7730	151,000	19.50
L1P0F2T1	8324	186,000	22.30
L1P0F2T2	8334	188,000	22.60
L1P0F2T3	8341	190,000	22.80
L1P0F2T4	8349	193,000	23.10
L1P0F2T5	8359	195,000	23.30
L2P0F2T1	8579	222,000	25.90
L2P0F2T2	8589	224,000	26.10
L2P0F2T3	8596	226,000	26.30
L2P0F2T4	8604	229,000	26.60
L2P0F2T5	8614	231,000	26.80
L2P1F2T0	9450	371,000	39.30
L2P2F2T0	11870	404,000	34.00
L2P2F2T1	12464	439,000	35.20
L2P2F2T2	12474	441,000	35.40
L2P2F2T3	12481	443,000	35.50
L2P2F2T4	12489	446,000	35.70
L2P2F2T5	12499	448,000	35.80

Incremental cost analysis identified five of the above plans as “Best Buy” plans, defined as those cost-effective plans which provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost. These “Best Buy” plans are listed in Table 5-3.

Table 5-3. "Best Buys" of Cost-Effective Alternative Combinations

Plan	Output	Cost($)	$/Output	Inc. Output	Inc. $	Inc.$/ Output
NO ACTION	0	0	0	0	0	0
L0P0F2T0	5501	20,000	3.60	5501	20,000	3.60
L2P2F2T0	11870	404,000	34.00	6369	384,000	60.29
L2P2F2T1	12464	439,000	35.20	594	35,000	58.92
L2P2F2T5	12499	448,000	35.80	35	9,000	257.14

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

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

The question posed to the interagency team involved in this analysis was, "Is the cost of the added increment in output worth the added costs?" The Rice Lake HREP team concluded that the alternative plan that best meets the goals and objectives of each agency and the EMP program is **L2P2F2T5** (perimeter levee at 442 top elevation/440 spillway elevation, new pumping capacity for Big Lake and Rice Lake, fish access to Duck Island quarry and Illinois Waterway, and conversion of Duck Island agricultural fields to 352 acres native forest and 57 acres native grassland). While the other cost-effective alternatives evaluated for this project would partially address the goals and objectives of the project, the consensus of the interagency team was that the recommended alternative would reasonably maximize net environmental benefits for the greatest diversity of wildlife and fish species, and that other alternatives would be less effective in optimizing habitat benefits for the overall project.

The recommended alternative addresses all three of the identified key problems: decreased reliability of seasonal food and cover for migratory birds, loss of fish access to deep aquatic habitat during low water periods, and decreased acreage and diversity of native floodplain vegetation as habitat for resident and migratory wildlife. The perimeter levee project feature increases native floodplain vegetation acreage by allowing water level management on ~700 acres that were previously uncontrolled and unprotected. The perimeter levee, in conjunction with the pump station project feature, will improve the success rate of seasonal food and cover plants from one in 10 years to four in 10 years by allowing timely filling, draining, and water elevation control. The

perimeter levee will also stop summer water elevation spikes (up to elevation 440.0) from flooding the area and killing the young plants. The mast tree and native grassland planting project features will increase and diversify the native floodplain vegetation by converting 409 acres of row crops on Duck Island to native grasses and trees. The two fish egress structures will restore access to deeper aquatic habitat during low water periods by allowing fish to move from Rice Lake into the Quarry and then to the Illinois Waterway via Big and Goose Lakes. The fish in Big and Goose lakes could move directly to the Illinois Waterway.

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

The recommended plan for habitat rehabilitation and enhancement of the Rice Lake SFWA includes a Perimeter Water Control Levee (L2), Pump Station and Conveyance Facilities (P2), Fish Access (F2), and Duck Island Native Vegetation Plantings (T5). The details of this plan are described below and illustrated on Plate 6.

A. Perimeter Water Control Levee (L2). This feature consists of a levee, approximately 15,000 ft long, a 2,500-ft overflow spillway, and a 60-inch (in) gatewell structure. These structures would be designed to provide protection from low level summer flooding 4 out of 10 years, which would allow for moist soil plant production to benefit resident and migratory waterfowl.

The proposed perimeter water control levee would be aligned to take full advantage of natural ground elevations on the east side of Big and Goose lakes and existing remnants of the Hate Levee to the south, which would minimize ground disturbance and reduce construction costs (see Plates 7 through 14). The levee would be constructed to elevation 442 ft NGVD using adjacent clay material or clay material dredged from Goose Pond (55,000 cubic yards). The levee slopes would be a minimum three horizontal ft (run) on one vertical ft (rise) (3:1) in areas of dry construction and 4:1 where material dredged from Goose Lake is used.

The spillway would be located near the upstream end of the perimeter levee just west of Senate Island. It will be constructed using adjacent clay borrow to elevation 440 ft NGVD, which corresponds to approximately a five-year level of protection. Concrete matting (116,100 square foot (sq ft)) would be placed on both side slopes and the crown.

A new gatewell structure would be installed adjacent to the two existing gatewell structures. The 60-in gatewell would consist of reinforced concrete piping (RCP) and an interior sluice gate (see Plate 15).

B. Pump Station and Conveyance Facilities(P2). A new 133,200 gpm pump station and conveyance system would be constructed to allow for water management of Rice Lake, Big Lake, Goose Lake, and the Voorhees Unit.

Four 33,300 gpm pumps would be installed as shown on plates 25 and 26. Four smaller pumps were selected over larger pumps because of their reduced power requirements, greater management flexibility, and reduced operating expenses. The pump station building would be a weather-tight, vandal-resistant concrete structure. The intakes to the pump station would have steel trash racks and bulkheads to protect the pump from debris and sedimentation.

Seven thousand ft of clearing, grubbing, and channel excavation would be completed to convey the water between the pump station and the project's lakes (see Plates 18 and 19). The channel would be between an existing road embankment (on the southern side) and a newly constructed berm on the opposite side. The berm would be constructed from the channel excavation material with a top elevation of 440 ft NGVD, side slopes of 3:1, and a top width of 10 ft (minimum). The channel would have a bottom elevation of 430 ft NGVD and side slopes of 3:1. There would be a 10 ft buffer between the top bank of the channel and the toe of both the existing levee and the new berm.

Water control structures would be constructed along the new discharge channel (see Plates 20-24). Two (2) 24-in CMP stoplog structures and three (3) 48-in CMP stoplog structures would be installed to provide water to the Voorhees Unit and Big Lake, respectively. Three (3) more 48-in

CMP structures would be installed to connect the new discharge channel to the existing channel that leads to Rice Lake. In order to maintain connectivity between the upper and lower portions of Slim Lake, two water control structures (one going from the new discharge channel into the upper Slim Lake and the other to the lower portion of Slim Lake) will be installed. These two structures will be prefabricated Agridrain ® or similar type structures.

C. Fish Access (F2). Two reinforced concrete fish egress structures will be constructed as shown on Plates 16 and 17. These structures will be designed to provide passage of fish from Rice Lake and Goose Lake to the quarry and Illinois Waterway, respectively, during drawdown periods.

These fish egress structures will be 9 ft wide inside reinforced concrete structures able to support vehicular traffic. A stoplog structure will be included on the Rice Lake side and the Illinois Waterway side of the two structures. Both stoplog structures will have two bays to minimize length of stoplogs thus minimizing efforts for installation and removal of stoplogs. The invert elevations of both structures will be 430 ft NGVD. Structures will be constructed and designed such that the substrate of the fish egress is consistent with the surrounding substrate.

D. Duck Island Native Vegetation Plantings (T5). Approximately 409 acres will be planted in mast-producing trees and native grasses. The site of the planting will be the agricultural areas on Duck Island.

Mast-producing tree plantings will occur on approximately 352 acres of the site. Pin oak, swamp white oak, bur oak, northern pecan, hackberry, black cherry, shingle oak, Kentucky coffee tree, persimmon, red oak, shellbark hickory, and black walnut will be planted at an approximate 100 trees per acre. Species will be intermixed to avoid solid blocks of individual species (monoculture).

Per recommendation of the Illinois DNR, bare root seedlings approximately 12 to 24 inches in height will be planted. Trees will be planted on a 10’ by 10’ maximum spacing (=435 trees/acre). Species will be planted according to suitable site location on Duck Island (based on soils maps) and well mixed within planting rows. Following a three-year establishment period, the surrounding ground in all mast-tree planting areas will be allowed to assume natural growth.

Establishing the approximately 57 acres of grasslands on Duck Island will require tilling and seeding the area with a native grass mixture. Native grass and forbs species will be selected based on their historical range, their affinity for open, somewhat sandy conditions, and their ability to withstand some flooding. Candidate grass species include, but may not be limited to, big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), side oats grama (*Bouteloua curtipendula*), and perennial rye grass (*Lolium perenne*). Some areas will require clearing of recent growth. Weed control will be required until the preferred vegetation becomes well established. This can be accomplished through a combination of herbicides, mowing, and seasonal burning as appropriate.

Seeding will begin in the spring no earlier than March 15th and will be completed no later than May 5th. If planted in the fall, starting and ending dates will be October 1st and November 15th, respectively. Species will be intermixed to avoid solid blocks of individual species (monoculture).

E. Project Summary. Table 6-1 summarizes project data.

Table 6-1. Rice Lake HREP Feature Summary

Feature	Measurement	Unit of Measure
Perimeter Water Control Levee		
Length (excluding spillway)	15,000	Ft
Top Elevation	442	Ft NGVD
Crown Width	10	Ft
Side Slopes	3:1 and 4:1	H:V
Embankment	55,000	Cubic Yards
Overflow Spillway		
Length	2,500	Ft
Top Elevation	440	Ft NGVD
Concrete Matting	116,100	Square Ft
Side Slopes: Interior	3:1	H:V
Gatewell Structure		
Number	1	Each
Diameter	60	In
Length	100	Ft
Invert Elevation	430	Ft NGVD
Slide Gates	1	Each
Pump Station		
Pumps		
Number	4	Each
Flow	33,300	Gallon/Minute
Riverside Sill Elevation	419	Ft NGVD
Landside Sill Elevation	430	Ft NGVD
Trash Rack	1	Each
Slide Gate	4	Each
Discharge Pipe		
Number	4	Each
Diameter	42	In
Length	400	Ft
Discharge Channel		
Length	7,000	Ft
Berm Top Elevation	440	Ft NGVD
Channel Bottom Elevation	430	Ft NGVD
Channel Bottom Width	30	Ft
Side Slopes	3:1	H:V
Clearing/Grubbing	33	Acres
Excavation	100,000	Cubic Yards

Table 6-1 continued. Rice Lake HREP Feature Summary

Feature	Measurement	Unit of Measure
Water Control Structures		
Voorhees Unit (CMP)	2	Each
Diameter	24	In
Riprap	14	Tons
Slim Lake (Agridrain ®)	2	Each
Diameter	24	In
Riprap	14	Tons
Rice Lake (CMP)	3	Each
Diameter	48	In
Riprap	22	Tons
Big Lake (CMP)	3	Each
Diameter	48	In
Riprap	22	Tons
Invert Elevation (all structures)	430	Ft NGVD
Average Length (all structures)	80	Ft
Fish Egress Structures		
Number	2	Each
Opening Width	9	Ft
Opening Height	7	Ft
Approx. Length to Illinois Waterway	50	Ft
Approx. Length to Quarry	70	Ft
Invert Elevation	430	Ft NGVD
Stoplog structure	2	Each
Duck Island–Mast Tree Plantings		
Black Cherry	12,760	Trees
Black Walnut	12,760	Trees
Bur Oak	12,760	Trees
Hackberry	12,760	Trees
Kentucky Coffee Tree	12,760	Trees
Northern Pecan	12,760	Trees
Persimmon	12,760	Trees
Pin Oak	12,760	Trees
Red Oak	12,760	Trees
Shellbark Hickory	12,760	Trees
Shingle Oak	12,760	Trees
Swamp White Oak	12,760	Trees
Total Trees	153,120	Trees
Annual Grains + Red Top Grass (ground cover)	352	Acres
Duck Island - Native Grass Plantings		
Surface Area	72	Acres

F. Design Considerations

1. Existing Site Elevations. The entire Rice Lake HREP is located within the floodplain of the Illinois Waterway. Flat pool elevation is 429 ft NGVD. The land surface elevation in the Rice Lake SFWA ranges from 429 to 438 ft NGVD. Big Lake, Goose Lake, Beebe Lake, and the Quarry are open to the Illinois Waterway, which causes their water elevations to vary with the river stage. The Rice Lake elevation can be managed by the Narrows Dam stoplog structures, which allows for a water elevation up to 439 ft NGVD. It is anticipated that shallow borrow and subsequent embankment construction can be accomplished using traditional earth-moving equipment. Dewatering likely will be required for foundation work associated with the pump station, gatewell structure, fish egress structures, and water control structures.

2. Permits. A public notice, as required by Section 404 of the Clean Water Act, will be made prior to submission of this report for final approval. A Section 401 water quality certificate will be received from the State of Illinois during the plans and specifications phase. A Section 404(b)(l) Evaluation will be included in the final submission of this report (Appendix B). Because all land disturbances associated with this project are addressed in the 404(b)(l) Evaluation, a National Pollutant Discharge Elimination System (NPDES or Section 402) permit for storm water discharges will not be required.

3. Construction Materials. Suitable clay borrow material will be obtained from areas within Goose Lake. This will enhance benefits of wetland habitat obtained by construction of the perimeter water control levee and resulting water management. Borrow for topsoil shall be obtained from strip material that is free of objectionable material or shall be trucked in.

Only common construction materials are required for this project. Crushed stone and ready mix materials are available locally and can be trucked to the site. Riprap can be barged or trucked to the site. Construction areas are easily accessible, and construction materials can be transported on site by conventional equipment.

4. Storm Water Pollution/Erosion Control. The potential for storm water pollution during construction is minimal for this project. Stormwater runoff from the majority of the disturbed areas will be contained within the Rice Lake SFWA. Temporary stabilization measures will be employed on disturbed areas of the perimeter water control levee until final seeding and stabilization occurs. Stabilization practices may include mulching, temporary seeding, and/or the erection of silt fencing. Overall, the long-term storm water runoff characteristics of the site are not expected to change; all disturbed areas will be reseeded with similar vegetation types as before project conditions.

5. Construction Sequence. The probable construction sequence is summarized in Table 6-2. The contractor will be required to start pump station and discharge channel construction prior to initiating any of the other project features. All construction should be accomplished within two construction seasons and adhere to any endangered or threatened species restrictions in the area. Mast tree plantings should be accomplished within four construction seasons with weed control continuing an additional three years for the last plantings.

Table 6-2. Rice Lake HREP Probable Construction Sequence

Sequence	Construction Work Item	Instructions	Purpose
1	Install/Construct new pump station facility	Area of construction is restricted to the 100 ft wide area identified on plate 25.	Construction during low water levels will minimize dewatering operations.
2	Excavate discharge channel and construct berm	Use excavated material for berm.	Maximize use of on-site materials to minimize costs.
3	Restore perimeter levee	Clay material will be obtained within Goose Lake.	Maximize use of on-site materials to minimize costs.
4	Construct spillway	Use articulated concrete matting to reduce maintenance costs.	Provides access to operate downstream water control structures.
5	Install/Construct water control structures	Construct in manner that minimizes damage to existing berms and maintains access into refuge.	This will allow habitat management and public use to continue during project construction.
6	Plant mast trees	Trees will be planted in 100 acre increments.	Spreading plantings over four years will reduce losses from a major flood.
7	Plant native grass	Plant during dormant season (Nov 5 - Feb 5).	Sowing seeds during dormant season allows incorporation of the seed into the soil through frost heaving.

G. Operational Considerations. Operation of water supply and water control features enhances habitat for fall waterfowl migration. To that effect, the wetlands may be drained in the spring to allow establishment of vegetation, and flooded in the fall to provide resting habitat for migrating waterfowl. Controlled water level fluctuations provide a wider variety and dependable supply of food for migrating waterfowl and resident species.

H. Maintenance. The proposed features have been designed to ensure low annual maintenance requirements. Routine maintenance would include periodic inspection and lubrication of the pumps and water control structures. Pumps should be exercised periodically to ensure operational readiness. The discharge channel and perimeter levee should be routinely inspected for evidence of erosion. Debris removal along the perimeter levee and spillway will be required. Debris and sediment removal within the discharge channel and pump station forebay will also be required every one or two years. Weed control will be required around the trees three years following the plantings. Weed control may involve mowing and/or herbicides application. Additional maintenance may be required after flood events. The estimated annual maintenance costs are presented in Section 8 of this DPR. Maintenance requirements will be further detailed in the project's O&M manual published after construction is finished.

I. Value Engineering. A Value Engineering (VE) study was completed in May 2005 for this project in accordance with ER 11-1-321, Army Programs, Value Engineering, dated 28 February 2005. The VE study recommendations have been reviewed for technical acceptance and coordinated with the sponsor. The adopted recommendations have been incorporated into this DPR and are as follows: adjacent borrow for the overflow spillway, and articulated mat

construction for the spillway. A VE study was also completed in October 1998, which recommended a reduced length for the spillway and perimeter levee and a shorter fish passage structure. These recommendations from the 1998 study have also been incorporated into this DPR. Additional opportunities to provide added value to the project will be pursued during the development of the plans and specifications and construction phases of the project.

7. SCHEDULE FOR DESIGN AND CONSTRUCTION

Table 7-1 presents the schedule of project completion steps.

Table 7-1. Project Implementation Schedule

Event	Scheduled Date
Distribute draft DPR for agency review	Sep 97
Distribute public and agency review draft DPR	Jan 10
Submit Final DPR to Mississippi Valley Division	Mar 10
Approve plans and specifications	Apr 10
Construction approval by Mississippi Valley Division	Apr 10
Execute the Project Partnership Agreement	Jun 10
Advertise contract	Jul 10
Award contract	Aug 10
Complete construction	Dec 14

8. COST ESTIMATES

Table 8-1 compares costs for the fully funded estimate (FFE) and the current work estimate (CWE) (Appendix J, *Cost Estimate*.) The FFE was calculated based on the proposed construction schedule, expected escalation costs, and a contingency factor, and represents the money expected to be spent at the end of project construction. The CWE, with a 25 percent contingency factor, is shown in a detailed estimate of project design and construction costs as presented in table 8-2. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in table 8-3. Table 8-4 presents the annual monitoring costs. Quantities and costs may vary during final design. All cost estimates are calculated using present worth (January 2010) and do not include future inflation escalation.

Table 8-1. Project Design and Construction Cost Estimates

Account	Feature	Fully Funded Estimate[1] (FFE) ($)	Current Working Estimate (CWE) ($)
01	Lands and Damages	$7,653,000	$7,653,000
02	Relocations	0	0
06	Fish and Wildlife Facilities	$9,608,614	$9,307,294
30	Planning, Engineering and Design	$1,683,576	$1,670,359
31	Construction Management	$791,530	$766,615
	Project Costs Subject to Cost Sharing	**$19,736,720**	**$19,397,268**
	Non-Federal Cost[2]	**$6,907,852**	**$6,789,044**
	Estimated non-Federal Lands and Damages	$7,653,000	$7.653,000
	Required non-Federal Cash or Work In-Kind Contribution	0	0
	Excess non-Federal Lands and Damages	$745,148	$863,956
	Federal Cost[3]	**$12,083,720**	**$11,744,268**
	Ecosystem Restoration Report	$(1,200,000)	$(1,200,000)
	Remaining Federal Costs	**$10,883,720**	**$10,554,268**

1. Fully funded estimate is marked up to midpoint of construction
2. All project features are subject to 65 percent Federal and 35 percent non-Federal cost share.
3. The Federal cost is 65% of the Project Costs Subject to Cost Sharing line less the Excess non-Federal Lands and Damages line.

Table 8.2. Detailed Project Cost Summary, January 2010 Price Level

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
01	**Lands and Damages**					
	Real Estate	1	LS	$7,653,000	$7,653,000	$0
	TOTAL Lands and Damages				**$7,653,000**	
02	**Relocations**	-	-	-	-	-
06	**Fish and Wildlife Facilities**					
	Mob & Demob	1	LS	$193,133	$193,133	$48,283
	TOTAL Mob & Demob				**$193,133**	**$48,283**
06.10	**Perimeter Control Dike**					
	Access Road Improvement	1	LS	$130,772	$130,772	$32,693
	Overflow Spillway	1	LS	$389,093	$389,093	$97,273
	Articulated Concrete Block Mat	116100	SF	$7.57	$878,877	$219,719
	Perimeter Control Dike	55000	CY	$17.71	$974,050	$243,513
	TOTAL Perimeter Dike				**$2,372,792**	**$593,198**
	Gravity Outlet (Gatewell) Structure					
	Excavation	1	LS	$1,112	$1,112	$278
	Slide gate Structure	1	LS	$71,827	$71,827	$17,957
	60" RCP	1	LS	$52,435	$52,435	$13,109
	Backfill & Compaction	1	LS	$1,212	$1,212	$303
	TOTAL Gatewell Structure				**$126,586**	**$31,647**
06.20	**Pump Station**					
	Pump Station	1	LS	$1,373,900	$1,373,900	$343,475
	Added Pipe Length Costs	1	LS	$800,849	$800,849	$200,212
	Access Road to Pump Station	1	LS	$57,943	$57,943	$14,486
	Pavement Replace Over Pipe Trench	1	LS	$21,703	$21,703	$5,426
	TOTAL Pump Station				**$2,254,395**	**$563,599**

Table 8.2 Detailed Project Cost Summary, January 2010 Price Level (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
	Discharge Channel					
	Clearing and Grubbing	33	AC	$816.09	$26,931	$6,733
	Channel Excavation	100000	CY	$9.92	$992,000	$248,000
	Dewatering at Slim Lake	1	LS	$8,558	$8,558	$2,140
	Seeding	33	AC	$1,875.61	$61,895	$15,474
	Riprap Erosion Protection	1	LS	$186,776	$186,776	$46,694
	Articulated Concrete Block Mat	3000	SF	$7.72	$23,160	$5,790
	TOTAL Discharge Channel				**$1,299,320**	**$324,830**
	Water Control Structures					
	2 - 24" Control Voorhees	2	EA	$23,326.50	$46,653	$11,663
	2 - 24" Agri-drain Slim Lake	2	EA	$14,166.50	$28,333	$7,083
	3 - 48" Control Rice Lake	3	EA	$32,990.33	$98,971	$24,743
	3 - 48" Control Big Lake	3	EA	$32,990.33	$98,971	$24,743
	Riprap Scour Protection at Outfall	1	LS	$1,861	$1,861	$465
	TOTAL Control Structures				**$274,789**	**$68,697**
	Existing Voorhees Pump Station					
	New 36" Slide Gate	1	LS	$10,836	$10,836	$2,709
	New 36" Flap Gate	1	LS	$8,029	$8,029	$2,007
	Pump Removal	1	LS	$4,141	$4,141	$1,035
	Riprap Protection	1	LS	$14,282	$14,282	$3,571
	Remove Existing 36" Pipe	100	LF	$31.17	$3,117	$779
	Install New 36" Pipe	100	LF	$102.93	$10,293	$2,573
	TOTAL Voorhees Pump Station				**$50,698**	**$12,675**

Table 8.2 Detailed Project Cost Summary, January 2010 Price Level (Continued)

Acct Code	Item	Quantity	Unit	Unit Price	Cost	Contingency
	Existing Rice Lake Pump Station					
	Building Removal	1	LS	$4,566	$4,566	$1,142
	Electrical Removal	1	LS	$11,909	$11,909	$2,977
	Pump Removal	1	LS	$3,499	$3,499	$875
	Cap 36" Pipes	1	LS	$4,357	$4,357	$1,089
	Fill and Cap Pump Station	1	LS	$5,129	$5,129	$1,282
	TOTAL Existing Pump Station				**$29,460**	**$7,365**
06.30	**Fish Egress for Rice Lake**					
	Culvert Fish Egress	1	LS	$152,434	$152,434	$38,109
	Granular Surfacing Road Repair	1	LS	$2,277	$2,277	$569
	TOTAL Rice Lake Fish Egress				**$154,711**	**$38,678**
	Fish Egress for Big Lake					
	Culvert Fish Egress	1	LS	$156,131	$156,131	$39,033
	TOTAL Big Lake Egress				**$156,131**	**$39,033**
06.40	**Vegetation Plantings**					
	Mast Tree Plantings	352	AC	$1,299.04	$457,262	$114,316
	Warm Season Grass Plantings	57	AC	$1,343.12	$76,558	$19,139
	TOTAL Plantings				**$533,820**	**$133,455**
	SUBTOTAL Fish and Wildlife Facilities Cost				**$7,445,835**	
	SUBTOTAL Contingencies					**$1,861,459**
	TOTAL Fish and Wildlife Facilities Cost				**$9,307,294**	
30	**Planning, Engineering and Design**					
	Plans and Specifications				$300,000	
	Engineering During Construction				$170,359	
	Definite Project Report				$1,200,000	
	SUBTOTAL				**$1,670,359**	
31	**Construction Management**					
	Contract Administration				$766,615	
	Shop Drawing Review					
	Inspection and Quality Assurance					
	SUBTOTAL				**$766,615**	
	Total Project Cost				**$19,397,268**	

Table 8-3. Estimated Annual Operation and Maintenance Costs (January 2010 Price Level**)**

	Quantity	Unit	Unit Price ($)	Total Cost ($)
Operation				
Pump Operation [1]	336	Hours	$40	$13,440
Site Inspection [2]	40	Hours	48	1,920
Maintenance				
Mowing	32	Acres	9	272
Mowing, Mast Tree Plantings	352	Acres	17	5,984
Mowing/burning Grassland [3]	57	Acres	18	1,015
Road Gravel	200	CY	5	1,000
Debris Removal (channel/forebay /water controls)	100	Hours	48	4,800
Subtotal				28,431
Rehabilitation [4]				
Contingencies (20%)				5,686
Total				34,117

[1] Pump operation costs include utility and upkeep costs for all pumps.

[2] Yearly cost to inspect all items.

[3] Represents an average cost over the first five years. Includes mowing four times the first year, two times the second year, and burning one time per year for years three through five. After year five, field will be burned off every three years at $12 per acre.

[4] Rehabilitation cannot be accurately measured. Rehabilitation is the reconstructive work that significantly exceeds the annual operation and maintenance requirements identified above and that is needed as a result of major storms or flood events.

Table 8-4. Estimated Post-Construction Annual Monitoring Costs ($) (January 2010 Price Level)

Item	Annual Cost ($)
Engineering Data [1]	$6,000
Natural Resource Data [1]	4,000
Subtotal	**10,000**
Contingencies (20 percent)	2,000
Subtotal	**12,000**
Planning, Engineering, Design [2]	3,000
Total	**$15,000**

[1] Reference Tables 10-2 and 10-3.
[2] Includes cost of annual evaluation report.

9. ENVIRONMENTAL EFFECTS

A. Summary of Effects. The Rice Lake SFWA is a large and complex site with a variety of resources that vary greatly in quantity and quality. The goals for the project are to restore and protect wetland, aquatic, and floodplain habitat. For proposed wetland and aquatic habitat rehabilitation/enhancement (perimeter levee, pump station, and fish access structures), no alteration of vegetative cover type is anticipated, with the exception of the immediate construction footprint. The proposed measures are expected to have a net positive effect on the quality of existing habitat in the project area. For proposed floodplain habitat rehabilitation/enhancement, one cover type (agricultural field on Duck Island) would be converted to two other cover types (native grassland and mast-dominant floodplain forest). The expected increases in habitat quality and quantity would help to fulfill management objectives to meet the State's goals for the site, as outlined in Section 3(D) of this DPR.

Operation of the project to meet the management objectives of the Rice Lake SFWA is expected to have a positive effect on natural floodplain values. Because the perimeter levee would provide only a low level of protection from seasonal river stage fluctuations, no measurable change in floodplain storage is anticipated and no change in flood heights is expected to result from this action. The project is expected to have a net positive effect on wetland wildlife habitat. Despite the footprint impacts associated with construction of the discharge channel and perimeter levee, the overall wetland function within the complex will remain and be enhanced.

B. Economic and Social Impacts

1. Community and Regional Growth. No short-term or long-term impacts to the growth of the neighboring community or region would be realized as a result of the project. The project would improve recreation opportunities at the Rice Lake SFWA, increasing the attractiveness of the area for wildlife observation, waterfowl hunting, sport fishing, camping, canoeing, photography, and commercial fishing.

2. Community Cohesion. The proposed wildlife habitat restoration project has positive impacts on community cohesion as the wildlife area attracts many visitors and recreationists from other communities. Overall, the project would have no adverse impacts to the quality of the human environment.

3. Displacement of People. There are no residential properties in the study area that would be displaced by the proposed project.

4. Property Values and Tax Revenues. Approximately 507 acres on Duck Island are currently leased for crop production. The project proposes to convert 409 acres of agricultural field to a combination of forest and grassland cover types, thus removing the acreage from production.

5. Public Facilities and Services. The Rice Lake SFWA attracts over 150,000 visitors each year. The proposed wildlife habitat restoration project would positively impact public facilities and services by enhancing outdoor recreational opportunities.

6. Life, Health, and Safety. The project poses no threats to the life, health, or safety of recreationists in the area. A hazardous, toxic, and radioactive waste (HTRW) assessment was conducted and no obvious indications of potential contamination sources or migration pathways from surrounding properties were noted.

7. Business and Industrial Activity. No significant changes in business and industrial activities would occur during project construction. Long-term impacts to business and industrial development would be related to tourism and recreational activities. Duck Island is the site of a small sand and gravel operation that is permitted through 2010 with an option for renewal.

8. Employment and Labor Force. Short-term employment opportunities in the area may increase slightly during project construction. The project would not directly affect employment of the labor force in Fulton County, Illinois.

9. Farm Displacement. No farms would be displaced as a result of the proposed project. Conversion of Duck Island agricultural fields would remove 409 acres from crop production. This is leased land, and is not a main source of income for the tenant.

10. Aesthetic Values. The enhancement of the wildlife area would ensure continued waterfowl utilization of the complex and surrounding areas, and make the complex more aesthetically pleasing to visitors.

11. Noise Levels. Heavy machinery would generate a temporary increase in noise levels during project construction, disturbing wildlife and recreationists in the area. The project area is basically rural in nature, and no significant, long-term impacts would result.

C.. Natural Resources Impacts. Effects of the project on the quality and quantity of fish and wildlife habitat were evaluated using WHAG (Urich, *et al.*, 1984) methodologies, as described in Section 5 and Appendix D of this report. These habitat evaluation methods were used during project planning to evaluate features in terms of increased benefits to wildlife resources. Optimization of AAHUs in relation to project costs for evaluated species is considered the goal of feature selection. Results of the habitat evaluations are summarized in Table 5-1, with a more detailed analysis in Appendix D. Assessment of project impacts also was based on experience from past and current management practices.

Construction of the perimeter levee will require clearing approximately 4.8 acres of bottomland hardwood vegetation, primarily second growth silver maple with occasional large cottonwoods. The levee will be constructed using adjacent material or material mechanically dredged from Goose Lake. The levee will be reseeded with flood-tolerant grass species to control erosion and protect the integrity of the structure. Construction of pumping and drainage facilities will occur primarily in areas that have been previously disturbed; however, approximately 20 acres of forested and nonforested wetland will be impacted by construction activity. Clearing in all areas will be limited to the minimum necessary for construction. Operation of the project will not create conditions new to the plant species bordering the water level management structures.

1. Aquatic Resources. Additional discussion of aquatic and water quality impacts is contained in Appendix B - Clean Water Act, Section 404(b)(1) Evaluation. A slight increase in turbidity in Goose Lake may occur from mechanical dredging and stockpiling of borrow material. The increased turbidity is expected to have negligible impact considering existing turbidity levels in the Illinois Waterway and the backwaters of the Rice Lake SFWA. As indicated in the WHAG analysis, the fish passage structure should benefit fisheries by providing access to deepwater habitat during drawdown periods.

2. Wetland and Floodplain Resources. The proposed plan would benefit more than 3,054 acres of nonforested wetland/shallow aquatic habitat through enhancement of water level control capability. The primary benefits would be increased reliability of moist-soil food production and access to feeding areas during fall and spring migration. Migratory waterfowl, shorebirds, and wading birds would benefit from more reliable feeding and resting areas. Muskrat populations should not be negatively affected, and would be expected to benefit from an increase in emergent and moist-soil vegetation, as indicated by the WHAG analysis. Wetland and floodplain resources would benefit from the increased habitat diversity provided by the proposed warm season grassland and mast tree planting on approximately 409 acres of existing agricultural field on the Duck Island peninsula. While some loss of habitat to mallard and goose is expected to result from the agricultural field conversion, no overall loss of habitat value to these or any of the other evaluated species is expected if the recommended plan is implemented.

3. Endangered Species. The federally threatened bald eagle (*Haliaeetus leucocephalus*) occurs within the Rice Lake SFWA during the winter months. Construction of the perimeter levee is not expected to directly impact any trees regularly used by eagles during nesting or foraging activities. If necessary, construction activities will be scheduled for periods when few, if any, eagles are present (usually April 1 - October 30). The USFWS, in their 1997 Coordination Act Report (Appendix A), stated that the proposed project would not affect bald eagles or their habitats. The ILDNR has identified at least one bald eagle nest within the Rice Lake SFWA; however, no construction activities are expected to occur within close proximity ($\leq$ 0.25 mile) of this nest.

The Federally threatened decurrent false aster (*Boltonia decurrens)* is known to occur within the project area. Incidental impacts to individual specimens of decurrent false aster may occur during construction of the perimeter levee or conveyance channels. These effects would be minor and short-term. Clearing for construction of the perimeter levee could have a slight positive effect on decurrent false aster in the long term by expanding openings in the existing tree canopy and exposing previously shaded areas to full sun. Decurrent false aster populations in the Rice Lake SFWA are not expected to be adversely affected by operation of the proposed project. Impacts to the documented population located along the northern portion of the water control levee will be avoided by installing a temporary protective fence, if necessary, during construction work in the area.

The Federally endangered Indiana bat (*Myotis sodalis*) may roost and forage for insects along the Illinois Waterway floodplain during spring and summer months. The USFWS lists the bat as potentially occurring statewide in Illinois, and suitable habitat for the species exists in the floodplain forests of the study area. Prior to initiation of any activities that could disturb Indiana bat habitat, such as tree clearing, the Corps will consult with the USFWS to determine appropriate measures to establish the presence or absence of the species in the project vicinity, and to avoid or minimize potential harm to individuals if the species is found to be present.

D. Historic Properties. Illinois State Museum (1996:25) documents 27 archeological sites within the 177.87 hectares (439.5 acres) investigated, including seven prehistoric isolated finds, 14 prehistoric sites, one historic site, and five mixed component historic and prehistoric sites.

The Illinois State Museum recommended four of these sites as potentially eligible for listing to the National Register of Historic Places (NRHP): 11F2745, 11F2746, 11F2895, and 11F2886. Based on these NRHP-eligibility recommendations, the Corps has designed this project with a 30-meter (m) easement along the perimeter of these four sites, so that no trees are planted within this buffer. This avoids disturbance by both the tree planting process and by any future disturbance by mature tree roots.

In addition, the Corps has determined that the Copperas Creek Lock (11F2723) is individually eligible for listing to the NRHP under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois Waterway navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented by American Resources Group Ltd. (1996).

The proposed pump station location is adjacent to the Copperas Creek Lock and is buffered by mature trees and undergrowth. Therefore, those significant characteristics of the Copperas Creek Lock under Criteria A and C [as documented by American Resources Group Ltd. (1996)] will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, and have a low profile well below extant tree height. By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determined that No Effect to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake HREP and associated pump station feature.

Because of the potential for effects to the archaeological component of site 11F2723, the Corps provided Phase II testing at this location. In the report of this work, Illinois State Museum (2002:4) stated that 11F2723 did not meet the requirements for listing on the National Register of Historic Places and recommended project clearance.

The IHPA, Springfield, Illinois, concurred with the recommendations of the draft archeology reports prepared by Illinois State Museum, and with the Corps findings, recommendations, and determination of effect by letter dated December 6, 1996 (Appendix A, IHPA LOG# 961205001P-F), and letter, dated June 18, 2003 (Appendix A, IHPA LOG#010051503). A final copy of the archeology report: *Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois,* dated January 1997, and a final copy of the ASSR: *Subsurface Testing of Portions of 11F2723 for the Rice Lake Habitat Rehabilitation and Enhancement Project*, dated March 4, 2002, were provided to the IHPA and the ILDNR, as evidence of the Corps' compliance pursuant to Section 106 of the NHPA, and determination of No Effect pursuant to 36 CFR Part 800.5(b). All consulting parties must be aware that the specific locations of historic and archaeological properties are subject to protection through nondisclosure under Section 304 of the National Historic Preservation Act. This information is not to be released in order to protect the resources at the sites and any request for site reports and site location information shall include comment from the IHPA, Springfield, Illinois.

In a letter to the IHPA dated November 29, 1996 (Appendix A, an identical Corps letter was provided to the ILDNR), the Corps proposed avoidance of sites 11F2745, 11F2746, 11F2895, and 11F2886 by use of a 30-meter buffer around each site and determined that this project would have "no effect" on the Copperas Creek Lock. In a reply dated December 6, 1996 (Appendix A), the IHPA concurred with the Corps, stating "the project, as proposed, will have no effect on sites or structures eligible or potentially eligible for listing on the National Register of Historic Places."

If human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered or collected, the Corps will comply with all provisions outlined in the appropriate state acts,

statutes, guidance, provisions, etc., and any decisions regarding the treatment of human remains will be made recognizing the rights of lineal descendants, Tribes, and other Native American Indians and under consultation with the SHPO/THPO(s) and the other consulting parties, designated Tribal Coordinator, and/or other appropriate legal authority for future and expedient disposition or curation. When finds of human remains, funerary objects, sacred objects, or objects of cultural patrimony are encountered or collected from Federal lands or federally recognized tribal lands, the Corps will coordinate with the appropriate federally recognized Native American Tribes, pursuant to the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001 *et seq*.) and its implementing regulations (43 CFR Part 10).

The Corps has met its legal and regulatory requirements for compliance with historic properties laws and regulations. If any historic properties are encountered, uncovered, or discovered, indirectly or directly associated with the Rice Lake HREP construction, all disturbance activities will halt which could potentially affect the historic properties. The Corps will notify the IHPA to coordinate measures to determine significance, and avoid and minimize any potential effects to any significant historic properties.

E. Mineral Resources. No significant impacts to mineral resources are expected to occur as a result of this project. The remaining supply of aggregate material is variously estimated from approximately 6,400 tons per acre to 9,000 tons per acre with approximately 375 acres estimated suitable for potential mining. The mining activity on Duck Island has been seasonal and is subject to closure during high water. The minerals extracted are of average quality and when processed correctly meet the Illinois Department of Transportation standards. The mine operators lease was extended through 2010 with an option for renewal. The native grassland and mast tree planting feature could potentially affect future mining activity at the Duck Island quarry if the ILDNR does not continue the commercial lease beyond 2011.

F. Farmland Protection. There are approximately 507 acres of existing cropland on the Duck Island peninsula. The proposed planting features would convert 409 acres of this cropland through planting of warm season grasses and mast producing trees. Examination of the Fulton County Soil Survey indicates that most of the agricultural field soils are classified as prime farmland soils. An updated U.S. Department of Agriculture Form AD-1006 will be submitted to the Natural Resources Conservation Service (NRCS) for review. Full compliance under Farmland Protection Policy Act will be completed prior to implementation of the planting features.

G. Cumulative Impacts. Although minor short-term impacts are likely to occur to local animals and plants within the construction footprint, no significant cumulative adverse impacts are expected. The habitat restoration measures proposed as part of this HREP should have long-term benefits to the fish and wildlife populations utilizing the site. This project, cumulatively with other HREPs and other ecosystem restoration efforts on the Illinois Waterway, should help to counter other past and ongoing adverse impacts to the river ecosystem such as sedimentation, pollution, and general decline in riverine and floodplain habitat.

H. Adverse Impacts Which Cannot Be Avoided. The most notable unavoidable adverse impact would be the clearing of vegetation for construction of project features. The perimeter levee was designed to follow the alignment of the existing access road and the natural levee along the Illinois Waterway. Construction of the levee will involve placement of fill material in areas that currently are lower than the design crest elevation of 442.0. Approximately 4.8 acres of woody vegetation are expected to be cleared as a result of construction. Most of this clearing would occur along the downstream portion of the perimeter levee alignment, where more extensive filling would be required to meet the 442.0 crest elevation. Another 20 acres of forested and nonforested wetland are expected to be cleared for construction of pumping and drainage facilities. Clearing of existing vegetation, particularly mature woody vegetation, would be kept to the minimum required for construction activities and post-construction maintenance.

I. Short-Term versus Long-Term Productivity. Construction activities would temporarily disrupt wildlife and human use of the project area. Long-term productivity for natural resource management would benefit considerably by the construction of this project. Long-term productivity would be enhanced through increased reliability of seasonal water levels, promoting the success of emergent and moist-soil vegetation and providing more dependable feeding and resting areas for migratory and resident wildlife. Overall habitat diversity would be increased, and both game and nongame wildlife species would benefit from the proposed project. In turn, both consumptive and nonconsumptive users would realize heightened opportunities for recreational use of the Rice Lake SFWA.

J. Irreversible or Irretrievable Resource Commitments. The purchase of materials and the commitment of man-hours, fuel, and machinery to perform the project are irretrievable. Other than the aforementioned, none of the proposed actions are considered irreversible.

K. Relationship of the Proposed Project to Land-Use Plans. The proposed project is in compliance with the Rice Lake SFWA Natural Resource Management Plan (ILDNR, 1989). The proposed project is not in conflict with any land-use plans currently being used for the site.

L. Compliance With Environmental Statutes. Compliance with applicable statutes is summarized in Table 9-1.

Table 9-1. Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements

Federal Environmental Protection Statutes and Requirements	**Applicability/ Compliance**
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	Full Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Clean Water Act, Sections 404 and 401	Full compliance
Endangered Species Act of 1973, as amended, 16 U.S.C. 1531, et seq.	Full compliance
Farmland Protection Policy Act. 7 U.S.C. 4201, et seq.	Full compliance
Federal Water Protection Recreation Act, 16 U.S.C. 460-(12), et seq.	Full compliance
Flood Plain Management (Executive Order 11988)	Full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460/-460/-11, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Full compliance
Protection of Wetlands (Executive Order 11990)	Full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Not applicable
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not applicable

NOTES:

a. Full compliance. Having met all requirements of the statute for the current stage of planning.

b. Not applicable. No requirements for the statute required.

10. PROJECT PERFORMANCE ASSESSMENT MONITORING

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

Table 10-1 presents overall types, purposes, and responsibilities of monitoring and data collection.

Table 10-2 presents actual monitoring and data parameters grouped by project phase, as well as data collection intervals.

Table 10-3 presents the post-construction evaluation plan, which displays the specific parameters and the levels of enhancement that the project hopes to achieve.

Table 10-1. Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Pre-Project Monitoring Baseline Monitoring	Identify and define problems at HREP site. Establish need of proposed project features. Establish baselines for performance evaluation.	Sponsor Corps	Sponsor Field Station or Sponsor through Cooperative Agreements or Corps	Sponsor HREP/-Sponsor	See Table 10-2
Design	Data Collection for Design	Include quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	See Table 10-2
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring Biological Response Monitoring	Determine success of project as related to objectives. Evaluate predictions and assumptions of habitat unit analysis. Study beyond scope of performance evaluation.	Corps (quantitative) Sponsor (field observations) Corps	Field Station or Sponsor through Cooperative Agreement, Sponsor thru O&M, or Corps Corps	HREP/-Sponsor HREP	See Table 10-3

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

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
TYPE MEASUREMENT	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**							**Sampling Agency**	**Remarks**
Point Measurements														
Water Quality Stations [2]													Corps	
Turbidity														
Secchi Disk Transparency														
Suspended Solids														
Dissolved Oxygen														
Specific Conductance														
Water Temperature														
PH														
Total Alkalinity														
Chlorophyll														
Velocity														
Water Depth														
Water Elevation														
Percent Ice Cover														
Ice Depth														
Percent Snow Cover														
Snow Depth														
Wind Direction														
Wind Velocity														
Wave Height														
Air Temperature														
Percent Cloud Cover														
Elutriate Test Stations														
Column Settling Stations														
Column Settling Analysis								1					Corps	
Boring Stations [3]														
Geotechnical Borings								1					Corps	
Fish Stations														
Electrofishing/Seining										1		1Y 1-2	ILDNR	

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

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
TYPE MEASUREMENT	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**	**Apr-Sep**	**Oct-Mar**							**Sampling Agency**	**Remarks**
Transect Measurements														
Vegetation Transects														
Mast Tree Survey												5Y	Corps	
Area Measurements														
Mapping														
Vegetation Mapping										1		1Y 1-5	Corps	
Grassland Plant Survey												5Y 6-50	Corps	
Aerial Photography/ Remote Sensing							1					5Y	Corps	

Legend

W = Weekly — nW = n-Week Interval
M = Monthly — nY = n-Year Interval
Y = Yearly — 1,2,3 = Number of times data is collected within designated project phase

[1] See plate 32 for active monitoring sites.
[2] Water Quality Station (W-I135.4B)
[3] Corps of Engineers Geotechnical Borings - See Plates 28 through 31 for locations and boring dates.

TABLE 10-3. Post-Construction Evaluation Plan

Enhancement Potential									
Goal	**Objective**	**Enhancement Features**	**Unit**	**Year 0 w/out Alt.**	**Year 1 w/Alternative**	**Year 25 [1] w/ Alternative**	**Year 50 Target w/Alt.**	**Feature Measurement - See. Table 10-2**	**Annual Field Observations b Site Manager**
Restore and Protect Wetland Habitat	Increase success rate of annual emergent/moist soil vegetation production Reduce adverse effects of river stage fluctuations on wetland habitat Increase natural food and cover for wildlife during critical migration periods	Construct low perimeter levee around Big Lake and Goose Lake Construct pump station with conveyance ditches	probability of successful operation (%)	18	65	65	65	manager observation on whether the site achieved drawdown and flooding at the desired time	record observations fo both drawdown and flooding; inspect and rec discharge chan and water contr structures condition

TABLE 10-3 continued. Post-Construction Evaluation Plan

Restore and Protect Aquatic Habitat	Increase fish egress opportunities from Rice Lake during drawdown periods Maintain seasonal access between Rice Lake/Big Lake aquatic areas and Illinois Waterway Increase off-main channel aquatic habitat in Illinois Waterway	Provide access from Rice Lake to deepwater areas in quarry Provide access from Goose Lake to Illinois River Dredge Senate Island side channel	fish movement from Rice Lake to quarry and from Goose Lake to Illinois Waterway	0	structures accessible to fish during lowering of interior water levels	structures accessible to fish during lowering of interior water levels	structures accessible to fish during lowering of interior water levels	outlet side fish egress structure net sampling	record observations or fish kills, avian botulism cases
Restore and Protect Floodplain Habitat	Increase natural food and cover for resident and migratory wildlife	Establish mast tree and native grass plantings on Duck Island	survival (%) acre	0 0	100 57	50 57	25 57	tree count/random sampling vegetation survey	estimate effecti acreage and rec observed wildli use estimate area of established/ regenerated vegetation

[1] The year of monitoring varies with purpose and nature of goal and feature.

11. REAL ESTATE REQUIREMENTS

The project will be cost-shared by the ILDNR, as the non-federal sponsor, and will include the Rice Lake SFWA as well as a portion of Duck Island. All of the lands currently required for the project are owned in Fee Simple Title by the ILDNR. A portion of the Rice Lake SFWA was purchased using Federal funds through the Federal Aid in Wildlife Restoration Program. This portion of Rice Lake does not fall within the proposed project boundary. The lands proposed for the Rice Lake Habitat Rehabilitation and Enhancement Project currently do not entail previous Federal involvement. The real estate interests required for the project consist of Fee Simple Title. Detailed information relating to the real estate aspects of the project can be found in the Real Estate Plan included as Appendix L to this report.

The ILDNR will be required to enter into a Project Partnership Agreement (PPA) which includes the following responsibilities:

a. Provide all lands, easements, rights-of-way, relocations, and suitable borrow and disposal sites (LERRD).

b. Operate, maintain, repair, or replace the project, at no cost to the Government, in a manner compatible with the project's authorized purpose, in accordance with applicable Federal and State laws, and in accordance with specific directions prescribed by the Government. The non-Federal sponsor is required to grant the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of inspection, and if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project. Operation or maintenance by the Government shall not relieve the ILDNR of their responsibility to meet its obligation as set forth in the PPA (see Appendix C).

c. Save and hold the Government free from all damages arising from the construction, operation, maintenance, and repair of the project, except for damages due to the fault or negligence of the Government or its contractors.

Upon execution of the PPA, lands acquired for project purposes may be eligible for credit against the non-Federal sponsor's 35 percent requirement. Lands already owned as part of a previous Federal project cannot be considered for credit.

12. IMPLEMENTATION RESPONSIBILITIES AND VIEWS

A. U.S. Army Corps of Engineers, Rock Island District. The Corps is responsible for project management and coordination with the ILDNR, USFWS, and other affected agencies. The Corps will submit the subject Definite Project Report (DPR); program funds; finalize plans and specifications; complete all NEPA requirements; advertise and award a construction contract; and perform construction contract supervision and administration. Section 906(e) of WRDA 1986 states that first cost funding for enhancement features will be cost shared with the State of Illinois because the project features will be located on state owned land. Section 509 of WRDA 1999 indicates that the non-Federal share of the costs shall be 35 percent. Any mutually agreed upon major rehabilitation of the project that exceeds the identified annual operation and maintenance cost requirements will be the Corps' responsibility. Major rehabilitation would be considered as a result of specific storm or flood events and is not included in the project cost estimate (Tables 8-2 and 8-3). The Corps has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

B. U.S. Fish and Wildlife Service. The USFWS will produce a Coordination Act Report (CAR) for this project. The USFWS has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

C. Illinois Department of Natural Resources. The ILDNR, as the non-Federal Sponsor, will be required to provide all lands, easements, rights-of-way, relocations, and borrow and disposal sites. In addition, a cash contribution is needed if the creditable cost of the aforementioned real estate actions is less than 35 percent of total project costs. Operation and maintenance of the project is also the responsibility of the ILDNR in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580. These functions will be further specified in the Project Operation and Maintenance Manual to be provided by the Corps prior to final acceptance of the project by the Sponsor. The ILDNR has agreed to support this HREP's monitoring and data collection needs as outlined in Tables 10-1 and 10-2.

13. COORDINATION, PUBLIC VIEWS, AND COMMENTS

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

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

A. Coordination Meetings. Ongoing coordination among the Corps, the USFWS, and the ILDNR was demonstrated by the following meetings:

1. November 30, 1987. Plan formulation meeting with the Corps, the ILDNR, and the USFWS.

2. June 19, 1995. Corps in-house meeting; general project discussion.

3. June 22, 1995. General project discussion with the Corps and the ILDNR.

4. January 23, 1996. General coordination meeting with the Corps and the ILDNR.

5. February 5, 1996. General project discussion with the Corps and the ILDNR.

6. March 27, 2003. General project discussion with the Corps and the ILDNR.

7. June 2, 2004. General project discussion with the Corps and the ILDNR.

8. October 1, 2009. General project discussion with the Corps and the ILDNR.

B. Coordination by Correspondence. The following letters are contained in Appendix A - Correspondence:

1. Letter dated January 30, 1987, from the Illinois Department of Conservation to District Engineer, U.S. Army Engineer District, Rock Island District.

2. Rock Island District letter, dated June 29, 1995, to the Illinois Historic Preservation Agency.

3. Rock Island District letter, dated June 29, 1995, to the Illinois Department of Conservation.

4. Letter dated July 20, 1995, from the IHPA deferring comment to the ILDNR.

5. Rock Island District Memorandum for Record, dated June 6, 1996.

6. Rock Island District Memorandum for Record, dated June 8, 1996.

7. Letter dated September 9, 1996, from the Corps to project proponents and other reviewing agencies requesting preliminary comments concerning the proposed project.

8. Letter dated September 10, 1996, from the Corps to the ILDNR providing Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

9. Letter dated September 10, 1996, from the Corps to the IHPA providing a Scope of Work for Phase I Intensive Archeological Survey for Historic Properties.

10. Letter dated October 11, 1996, from the Corps to the Natural Resources Conservation Service requesting determination of whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981.

11. Farmland Conversion Impact Rating, dated November 5, 1996, prepared by the Natural Resources Conservation Service for the proposed project site.

12. Letter dated November 29, 1996, from the Corps to ILDNR forwarding results of the project's archeological investigation.

13. Letter dated November 29, 1996, from the Corps to the IHPA forwarding results of the project's archeological investigation.

14. Letter dated December 6, 1996, from the IHPA stating compliance of the proposed project with Section 106 of the National Historic Preservation Act of 1966.

15. Draft Fish and Wildlife Coordination Act Report, dated February 24, 1997, from the USFWS, Rock Island Field Office.

16. Rock Island District Memorandum for Record, dated March 9, 1998.

17. Letter dated January 9, 2005, from Sac and Fox Nation of Missouri in Kansas and Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District.

18. Letter dated December 27, 2005, from Winnebago Tribe of Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District.

19. Letter dated January 4, 20006, from Fish and Wildlife Service, Rock Island Field Office, to Colonel Duane P. Gapinski, District Engineer, U.S. Army Engineer District, Rock Island District.

14. CONCLUSIONS

The habitat value of the Rice Lake SFWA is not being fully realized due to frequent summer/fall flooding events that reduce food production and subsequent use by migrating birds.

The recommended project features (perimeter water control levee, pump station and discharge channel, fish egress structures, and native grass and mast-tree plantings) are designed to meet the project's goal of restoring and protecting wetland, aquatic, and floodplain habitat by increasing the success ratio of moist-soil/emergent vegetation, improving fish egress from Rice Lake during drawdown conditions, and increasing food, shelter, and cover for migrating birds, resident birds, mammals, and other wildlife.

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

This project is consistent with and fully supports the overall goal and objectives of the UMRS-EMP, the North American Waterfowl Management Plan, and the Partners in Flight program.

15. RECOMMENDATIONS

I have weighed the outputs to be obtained from the full implementation of this habitat rehabilitation and enhancement project against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. In my judgment, this project, as proposed, justifies expenditure of Federal funds. I recommend that the Mississippi Valley Division Engineer approve the proposed project to include constructing a perimeter water control levee with overflow spillway and gatewell structure, constructing a 133,200 gpm pump station and discharge channel, installing water control structures, planting 57 acres of native grasses and 352 acres of mast trees, and installing two reinforced concrete fish egress structures.

This project will be constructed on State-owned lands and will require cost-sharing with the non-Federal Sponsor, the Illinois Department of Natural Resources (ILDNR). Implementation will be cost shared 65 percent by the Federal government and 35 percent by the ILDNR. Total project costs subject to cost sharing are $19,397,268. This total includes construction of the project features, planning, engineering and design, construction management, and real estate. The ILDNR's 35 percent cost share is $6,789,044, which will be met using land credits totaling $7,653,000 (excess of $836,956). The total Federal cost (65 percent) less the excess land credits is $11,744,268. Operation and maintenance of the project is the responsibility of the ILDNR and is estimated to cost approximately $34,117 annually.

At this time, I further recommend that funds in the amount of $300,000 be allocated for the preparation of project plans and specifications.

_____ _____

(Date)

Shawn P. McGinley
Colonel, U.S. Army
District Engineer

16. FINDING OF NO SIGNIFICANT IMPACT

I have reviewed the information provided by this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that the proposed habitat enhancement project at the Rice Lake State Fish and Wildlife Area would not significantly affect the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required. This determination may be reevaluated if warranted by further developments.

An array of potential features and alternatives were considered for habitat enhancement. Features evaluated in detail were:

A. No Federal Action

B. Perimeter Levee

C. New Pump Station and conveyance channel

D. Native Forest/Grassland Planting

E. Fish Egress Structures

The preferred alternative consists of: constructing a perimeter levee with a top elevation of 442.0 and a spillway at elevation 440.0; constructing a new pump station and associated channels and structures to manage water levels on Big Lake and Rice Lake; converting cropland on Duck Island to grassland and forest habitat by planting 57 acres to native grassland species and 352 acres to mast-producing tree species; and constructing fish egress structures between Rice Lake and the Duck Island quarry, and between Goose Lake and the Illinois Waterway.

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

A. The project is anticipated to produce a net increase in the value of the Rice Lake area for migratory and resident birds, fish, and wildlife species.

B. Aside from temporary disturbance during construction periods, no long-term significant adverse effects to natural or cultural resources are anticipated. No State or Federal endangered or threatened species would be adversely affected by the proposed action.

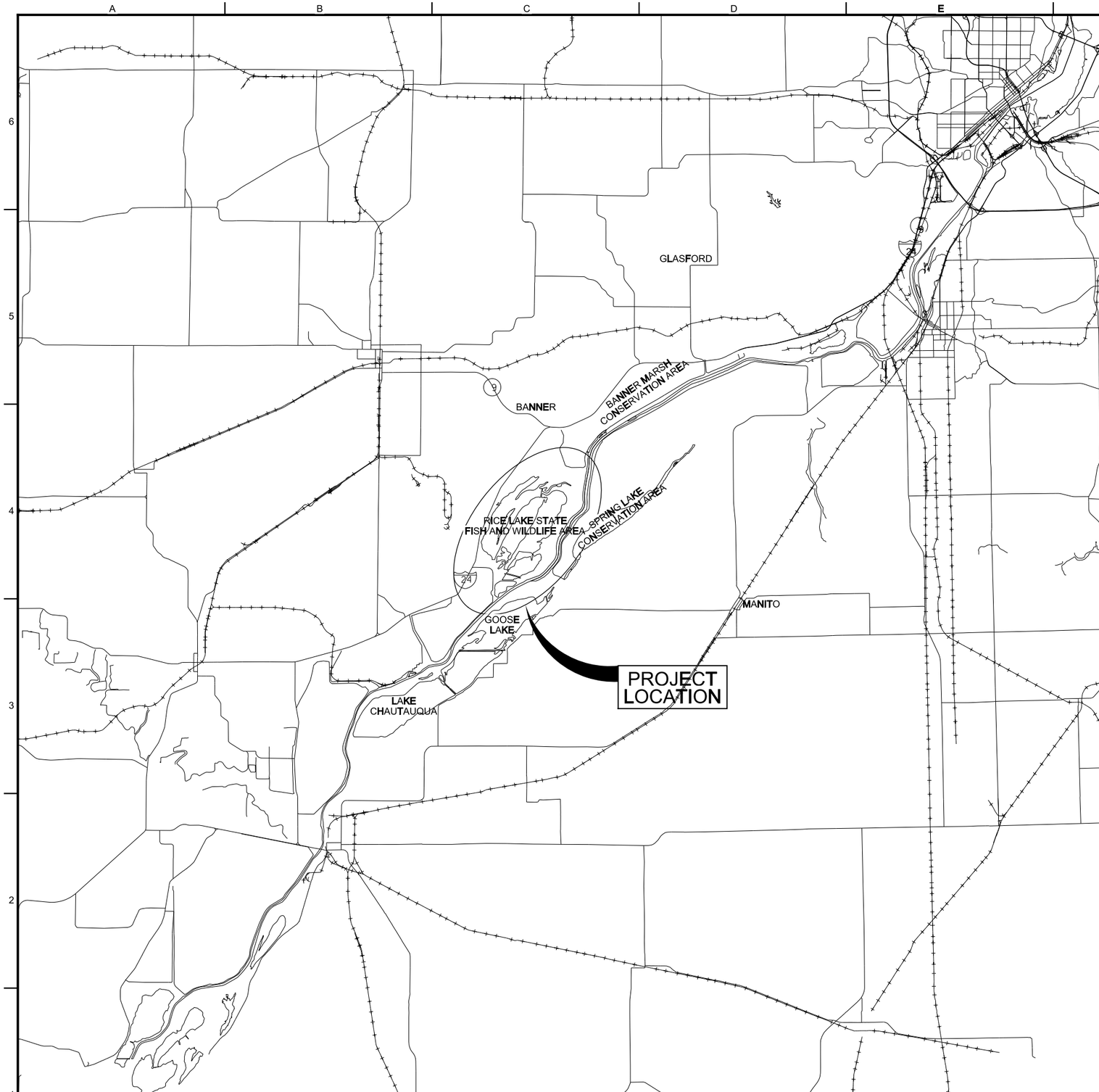
C. The project is in compliance with Sections 401 and 404 of the Clean Water Act.

D. No significant economic or social impacts are expected to occur in the project area.

_____ _____

(Date)

Shawn P. McGinley
Colonel, U.S. Army
District Engineer



LOCATION PLAN

1 0 1 2
SCALE IN MILE

VICINITY MAP

NO SCALE

LEGEND

INDICATES SECTION
IF DRAWN ON SAME SHEET

INDICATES SECTION
SHEET REFERENCE NUMBER FROM WHICH SECTION IS TAKEN
SHEET REFERENCE NUMBER ON WHICH DETAIL IS DRAWN

US Army Corps of Engineers®
Rock Island District

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	Revisions		

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Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

LOCATION PLAN, VICINITY MAP, AND LEGEND

Sheet Reference Number:
PLATE 1
Sheet 1 of 32

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PLATE1.dgn

INDEX

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PLATE 1	LOCATION AND VICINITY MAPS
PLATE 2	INDEX AND GENERAL NOTES
PLATE 3	EXISTING CONDITIONS SITE PLAN
PLATE 4	PROJECT ENHANCEMENT FEATURES EVALUATED
PLATE 5	PROJECT ENHANCEMENT FEATURES NOT EVALUATED
PLATE 6	RECOMMENDED PLAN
PLATE 7	PERIMETER WATER CONTROL LEVEE PLAN
PLATE 8	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 0+00 TO STA. 25+00
PLATE 9	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 25+00 TO STA. 50+00
PLATE 10	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 50+00 TO STA. 75+00
PLATE 11	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 75+00 TO STA. 100+00
PLATE 12	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 100+00 TO STA. 125+00
PLATE 13	PERIMETER WATER CONTROL LEVEE, PLAN AND PROFILE STA. 125+00 TO STA. 150+33
PLATE 14	PERIMETER WATER CONTROL LEVEE TYPICAL SECTIONS
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GENERAL NOTES:

1. ALL ELEVATIONS ARE NGVD 29.

INDEX AND GENERAL NOTES

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INDEX AND GENERAL NOTES

Sheet Reference Number:
PLATE 2
Sheet 2 of 32

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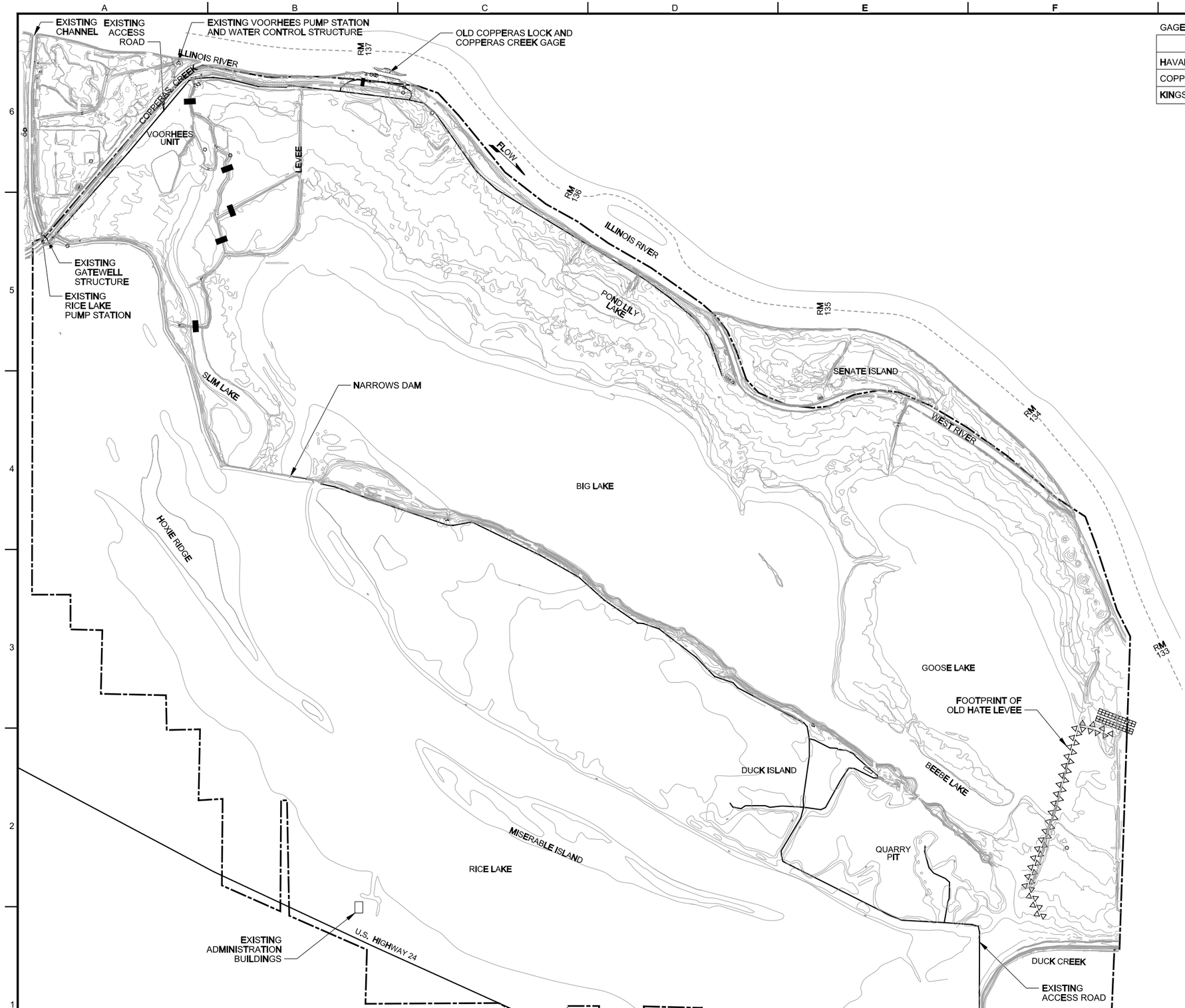
GAGE INFORMATION IS AS FOLLOWS:

NAME	LOCATION	GAGE ZERO	FLAT POOL
HAVANA GAGE	RIVERMILE 119.6	424.4 FT NGVD (1929)	429.2
COPPERAS CREEK GAGE	RIVERMILE 136.8	428.0 FT NGVD (1929)	429.5
KINGSTON MINES GAGE	RIVERMILE 145.4	428.0 FT NGVD (1929)	427.7



LEGEND:

- STATE PROPERTY BOUNDARY
- EXISTING CULVERT (18" UNLESS OTHERWISE NOTED)
- EXISTING 60" CMP STOPLOG STRUCTURE
- RM 123 - RIVER MILE MARKER
- EXISTING LEVEE

1000 0 1000 2000
SCALE IN FEET

EXISTING CONDITIONS SITE PLAN

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EXISTING CONDITIONS SITE PLAN

Sheet Reference Number:
PLATE 3
Sheet 3 of 32

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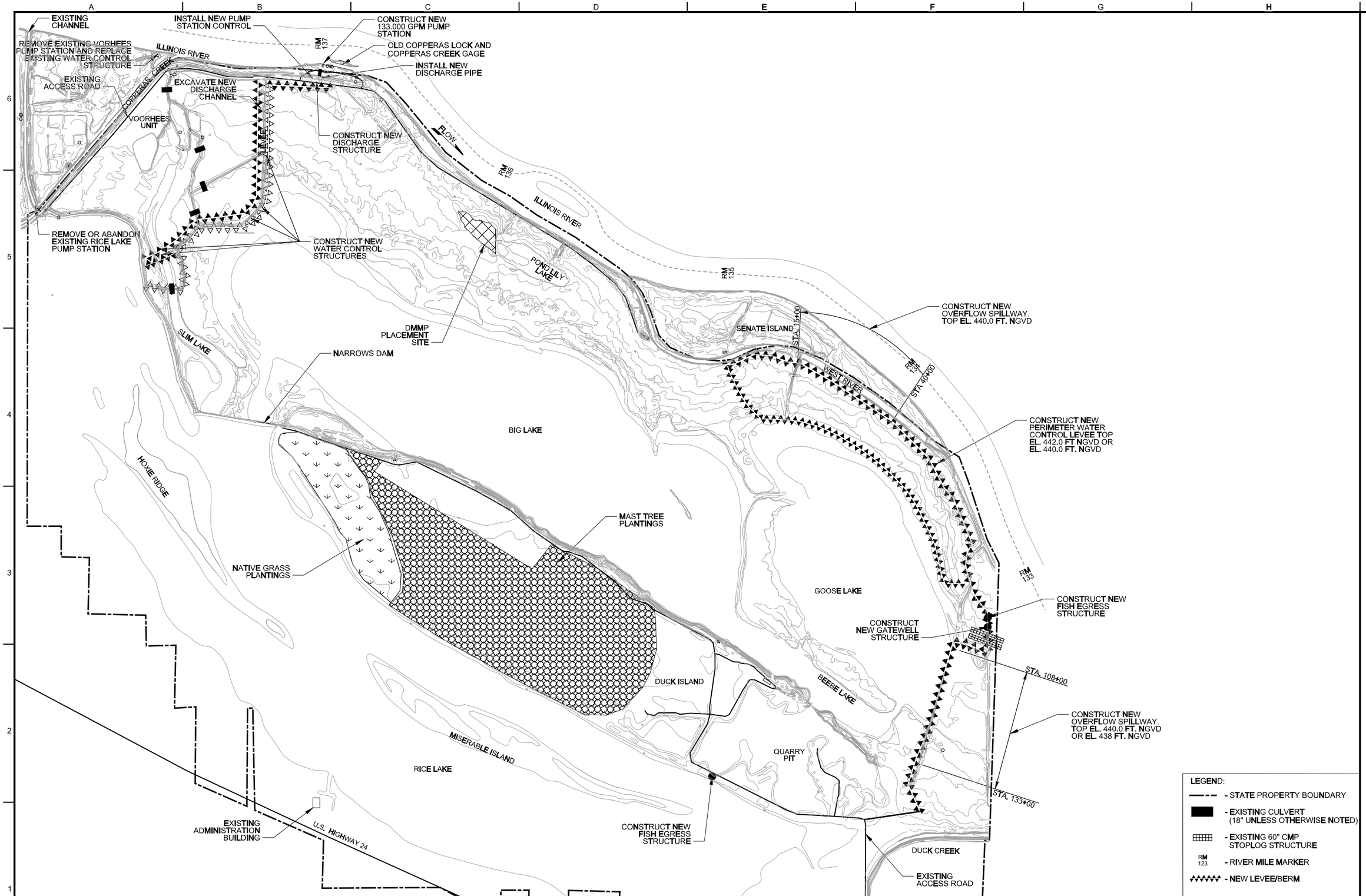

PROJECT ENHANCEMENT FEATURES EVALUATED

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PROJECT ENHANCEMENT FEATURES EVALUATED

Sheet Reference Number:
PLATE 4
Sheet 4 of 32

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EXISTING CHANNEL

ILLINOIS RIVER

EXISTING ACCESS ROAD

COPPERAS CREEK

VOORHEES UNIT

LEVEE

RM 137

OLD COPPERAS LOCK AND COPPERAS CREEK GAGE

ORIGINAL ALIGNMENT OF WATER SUPPLY DITCH

FLOW

RM 136

ILLINOIS RIVER

POND LILY LAKE

RM 135

SENATE ISLAND SIDE CHANNEL DREDGING

SENATE ISLAND

RM 134

ALTERNATE LEVEE DESIGN

SLIM LAKE

NARROWS DAM

BIG LAKE

HOWIE RIDGE

NATIVE GRASS PLANTINGS

GOOSE LAKE

RM 133

DREDGING

DUCK ISLAND

BEEBE LAKE

CONSTRUCT CLOSURE STRUCTURE

QUARRY PIT

MISERABLE ISLAND

ISLANDS

RICE LAKE

GRAVEL PIT PUMP STATION

DREDGING

U.S. HIGHWAY 24

EXISTING ADMINISTRATION BUILDINGS

DUCK CREEK DIVERSION CHANNEL

DUCK CREEK

EXISTING ACCESS ROAD

LEGEND:

- STATE PROPERTY BOUNDARY
- EXISTING CULVERT (18" UNLESS OTHERWISE NOTED)
- EXISTING 60" CMP STOPLOG STRUCTURE
- RM 123 - RIVER MILE MARKER
- NEW LEVEE/BERM

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SCALE IN FEET

PROJECT ENHANCEMENT FEATURES NOT EVALUATED

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Rock Island District

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ENHANCEMENT FEATURES NOT EVALUATED

Sheet Reference Number:
PLATE 5
Sheet 5 of 32

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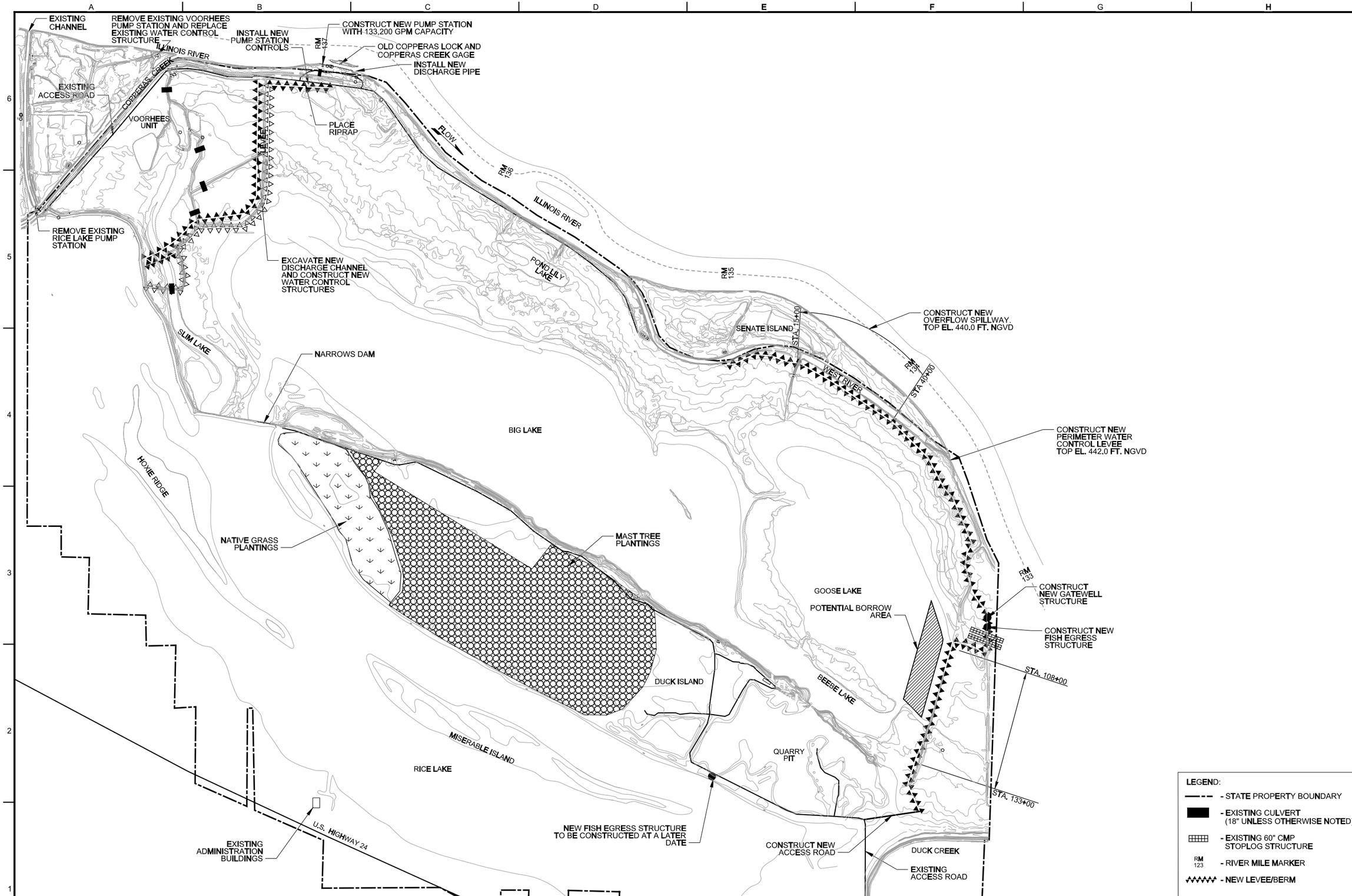

RECOMMENDED PLAN

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RECOMMENDED PLAN

Sheet Reference Number:
PLATE 6
Sheet 6 of 32

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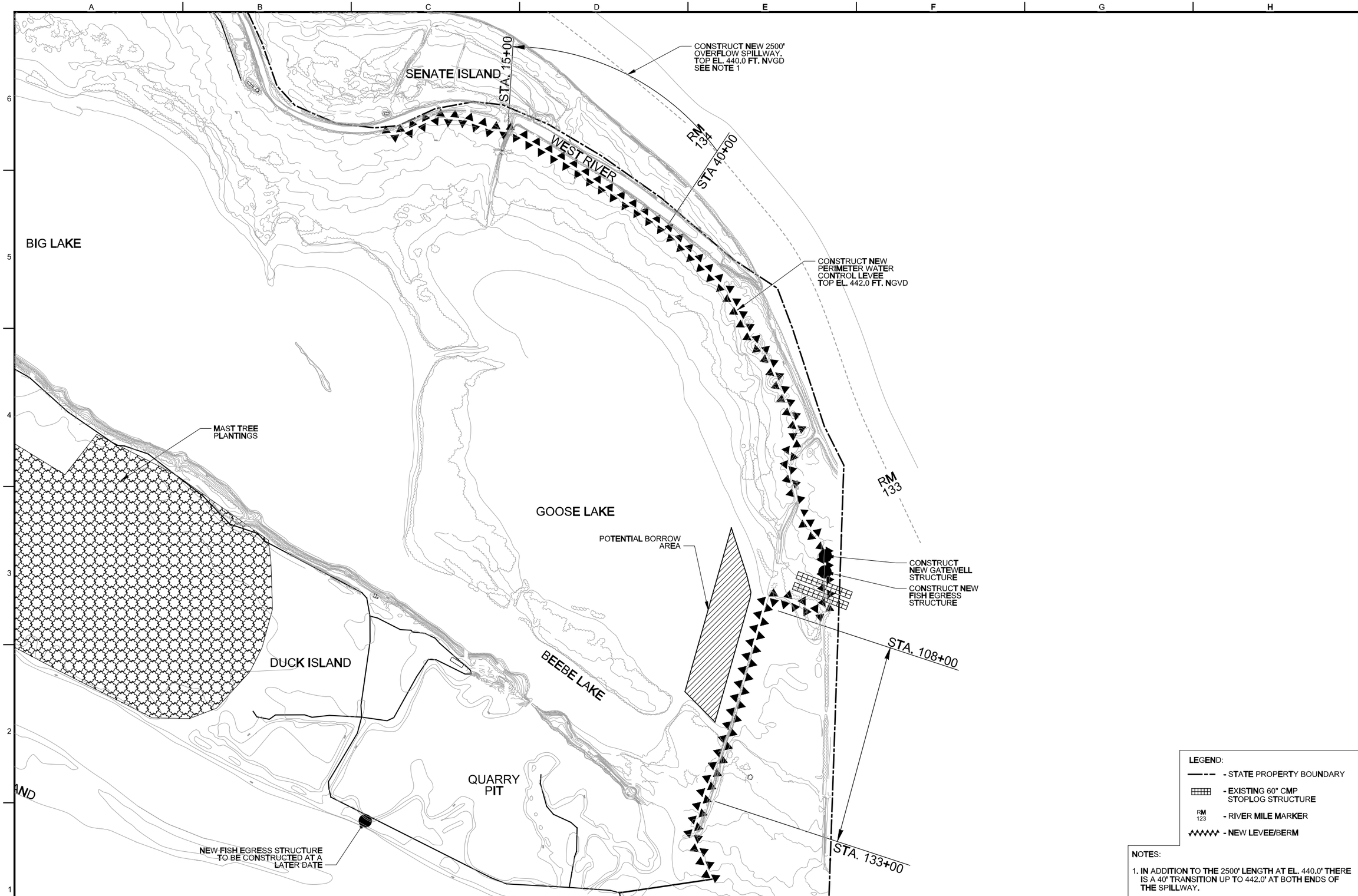


LEGEND:

- STATE PROPERTY BOUNDARY
- EXISTING 60" CMP STOPLOG STRUCTURE
- RM 123 - RIVER MILE MARKER
- NEW LEVEE/BERM

NOTES:

1. IN ADDITION TO THE 2500' LENGTH AT EL. 440.0' THERE IS A 40' TRANSITION UP TO 442.0' AT BOTH ENDS OF THE SPILLWAY.

PERIMETER WATER CONTROL LEVEE PLAN

600 0 600 1200
SCALE IN FEET

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

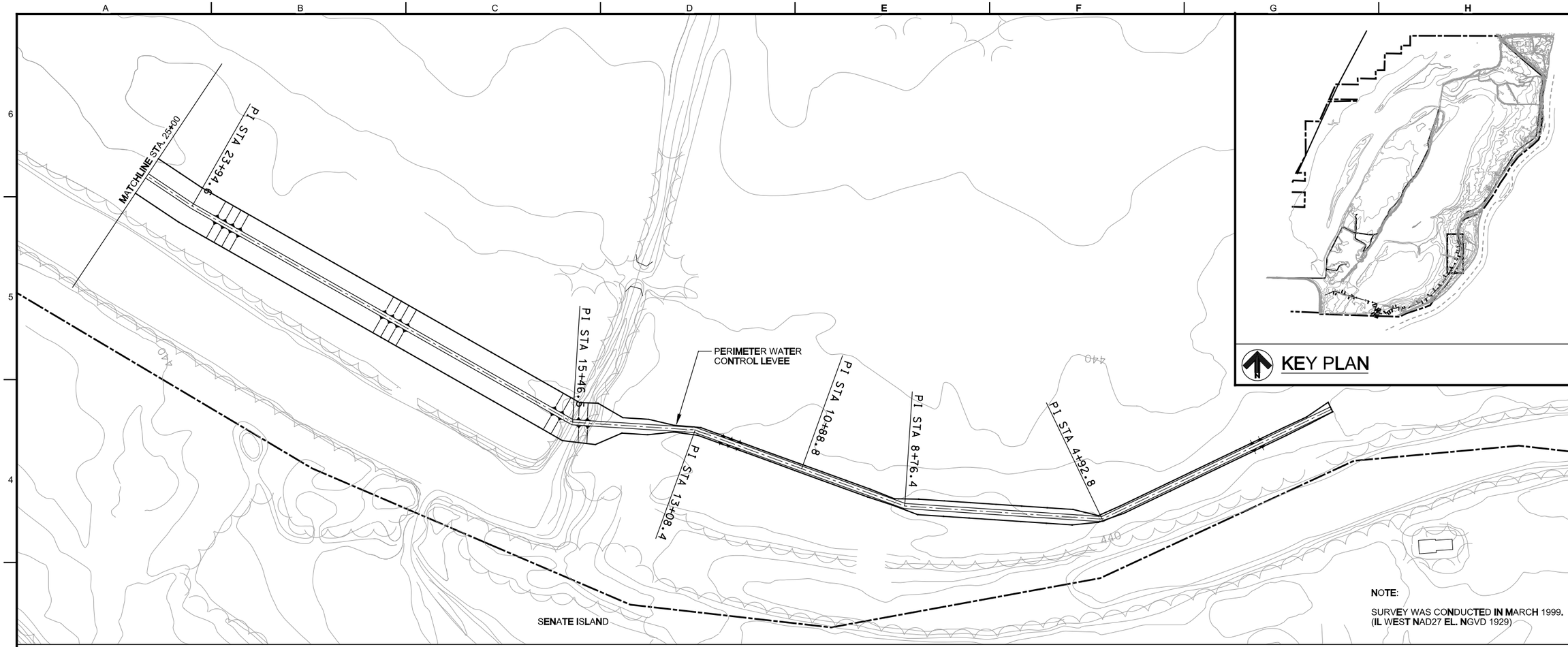
ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

PERIMETER WATER CONTROL LEVEE PLAN

Sheet Reference Number:
PLATE 7
Sheet 7 of 32

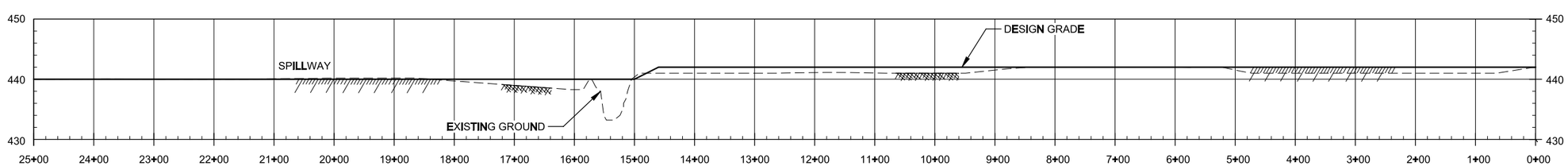
35% REVIEW

BSEDDUH
12-Jan-2010 11:18
PLATE7.dgn



NOTE:

SURVEY WAS CONDUCTED IN MARCH 1999.
(IL WEST NAD27 EL. NGVD 1929)



PROFILE STA. 0+00 TO STA. 25+00

NO SCALE

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

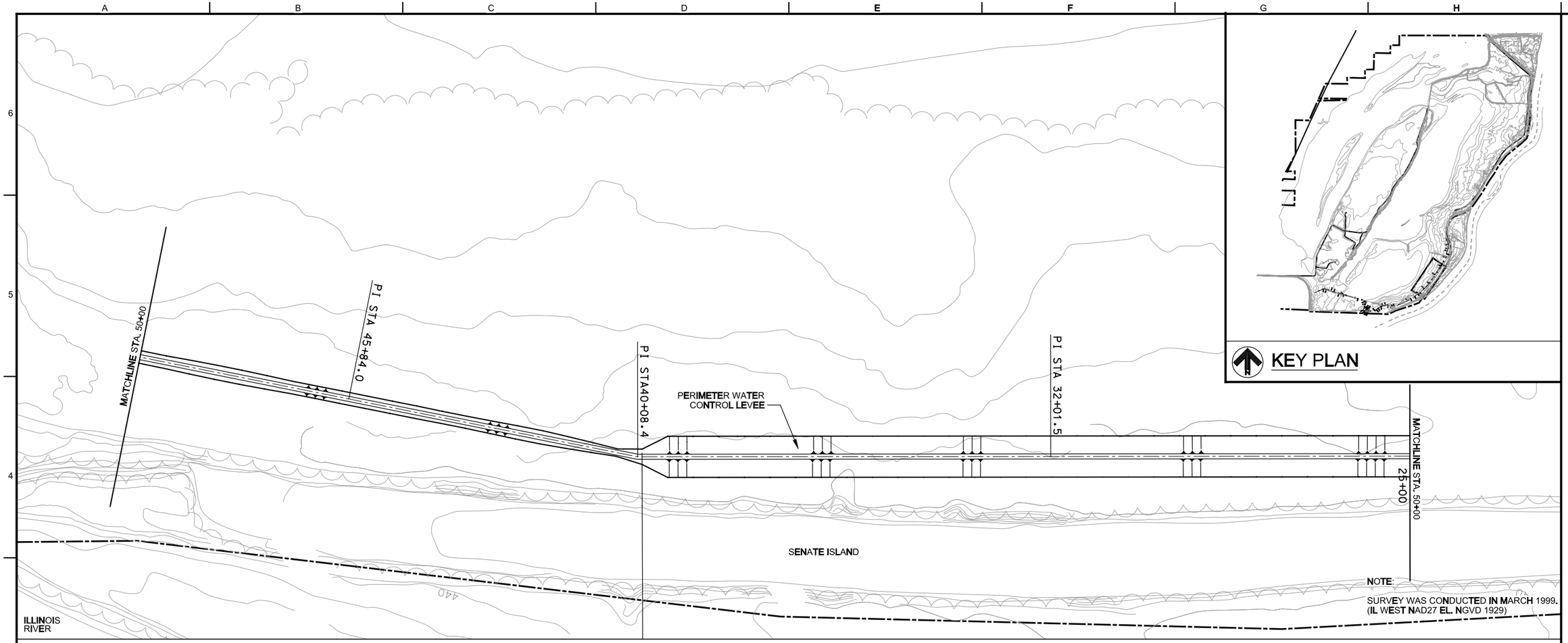
ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 0+00 TO STA. 25+00

Sheet Reference Number:
PLATE 8
Sheet 8 of 32

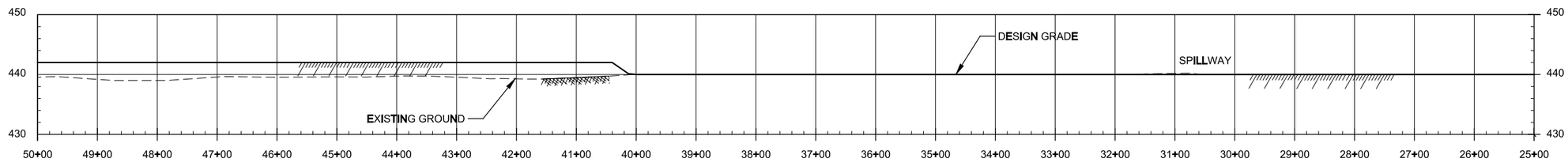
35% REVIEW

BSEDDUH
11-Jan-2010 11:19
PLATE8.dgn



PLAN

KEY PLAN



PROFILE STA. 25+00 TO 50+00

NO SCALE

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

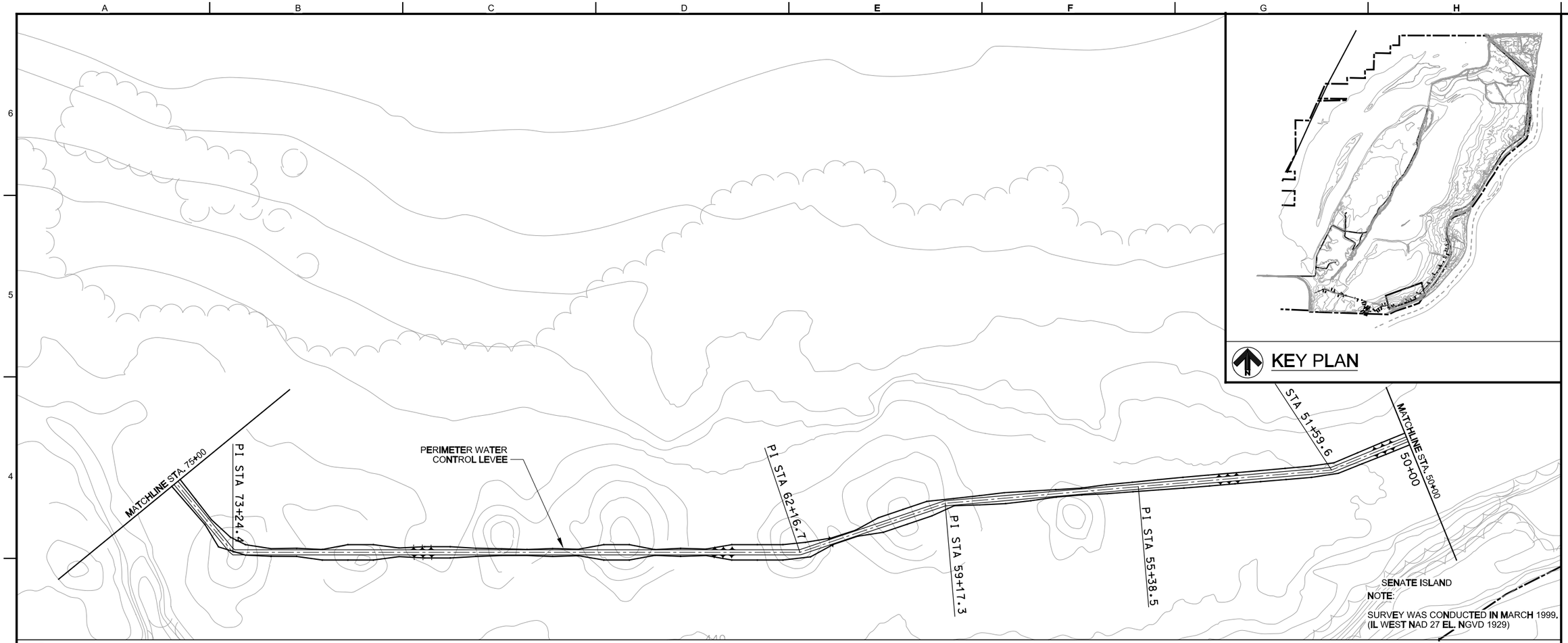
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 25+00 TO STA. 50+00

Sheet Reference Number:
PLATE 9
Sheet 9 of 32

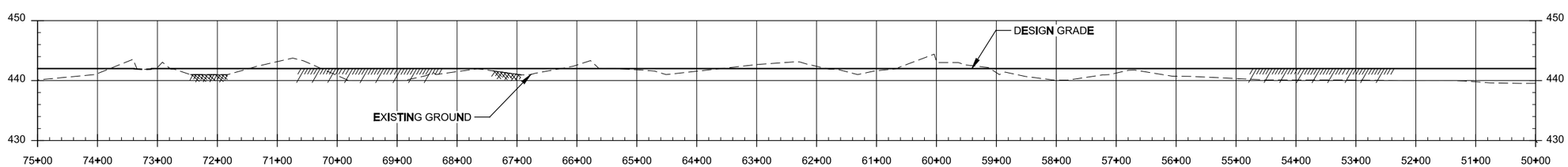
35% REVIEW

BSEDOUH
14-APR-2010 11:20
PLATE9.dgn



PLAN

KEY PLAN



PROFILE STA. 50+00 TO 75+00

NO SCALE

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved

Revisions

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 50+00 TO STA. 75+00

Sheet Reference Number:
PLATE 10
Sheet 10 of 32

35% REVIEW

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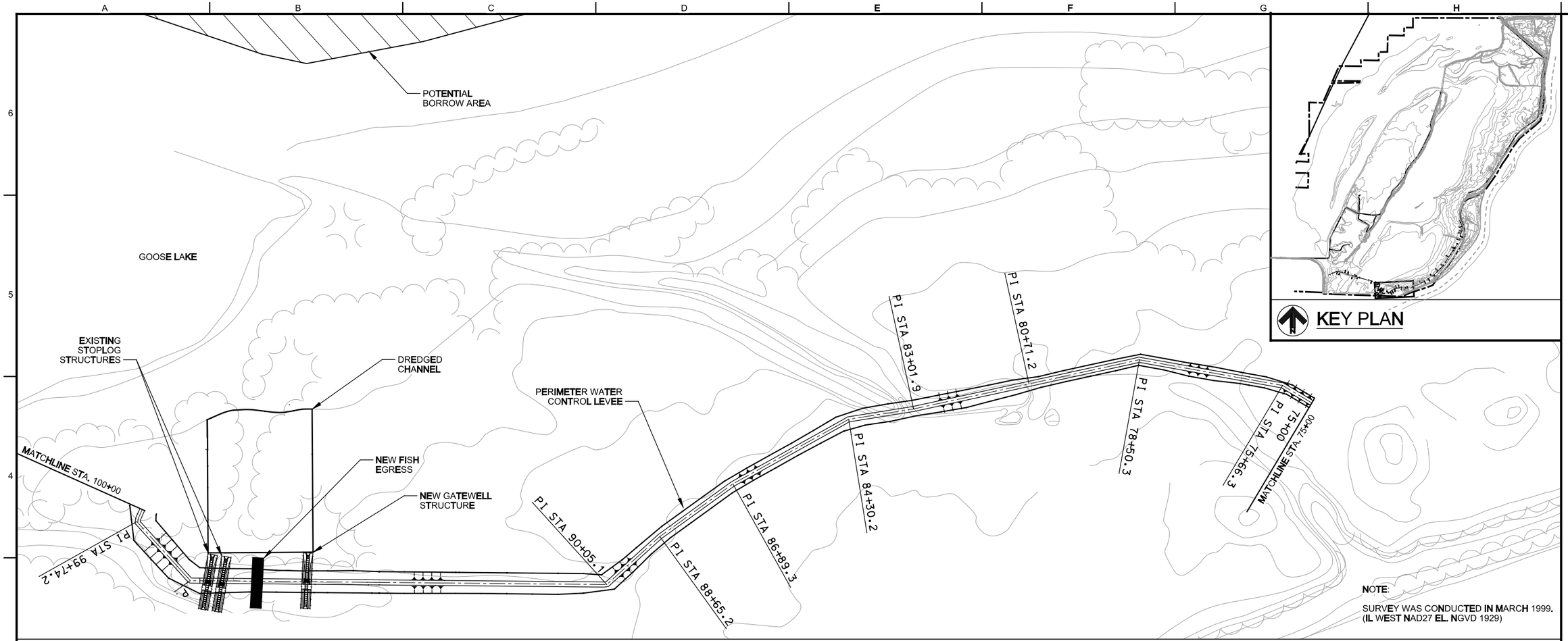
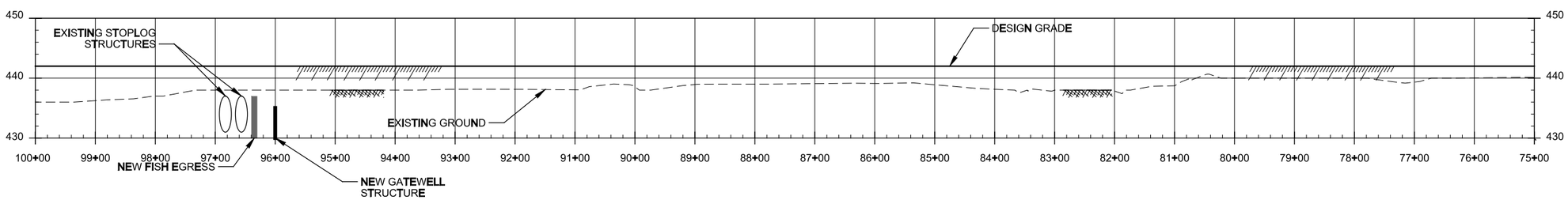
14-APR-2010 11:22
PLATE10.dgn



NOTE:

SURVEY WAS CONDUCTED IN MARCH 1999.
(IL WEST NAD27 EL. NGVD 1929)



PROFILE STA. 75+00 TO 100+00

NO SCALE

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

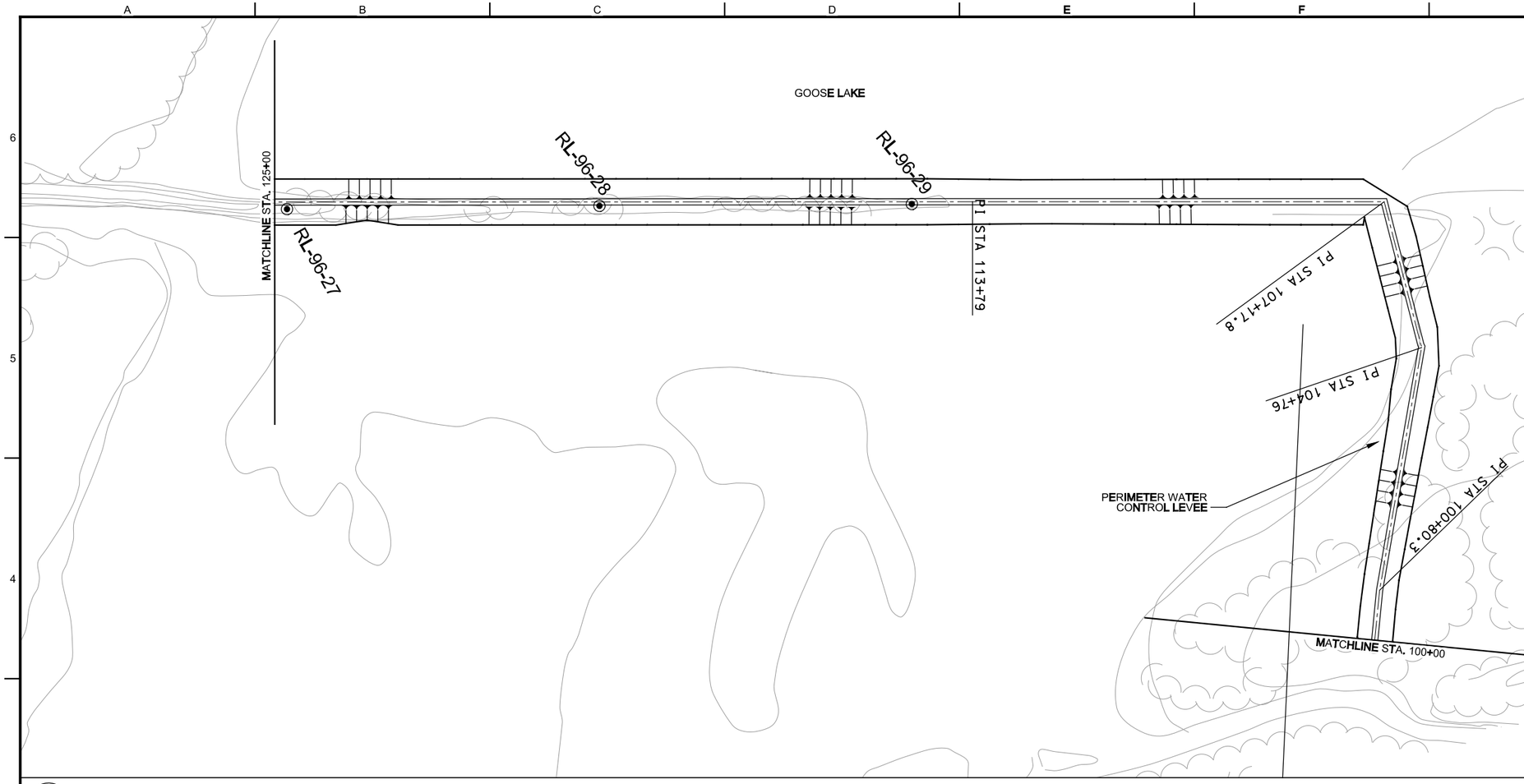
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 75+00 TO STA. 100+00

Sheet Reference Number:
PLATE 11
Sheet 11 of 32

35% REVIEW

BSEDOLLH
12-Jan-2010 11:23
PLATE11.dgn



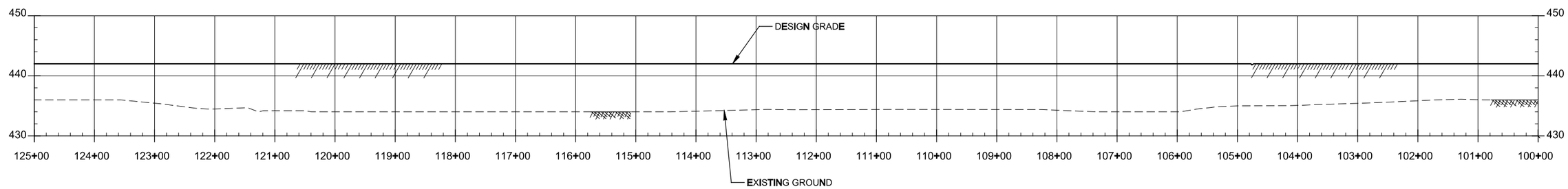
NOTE:

SURVEY WAS CONDUCTED IN MARCH 1999.
(IL WEST NAD27 EL. NGVD 1929)

PLAN

100 0 100 200
SCALE IN FEET

KEY PLAN



PROFILE STA. 100+00 TO 125+00

NO SCALE

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 100+00 TO STA. 125+00

Sheet Reference Number:
PLATE 12
Sheet 12 of 32

35% REVIEW

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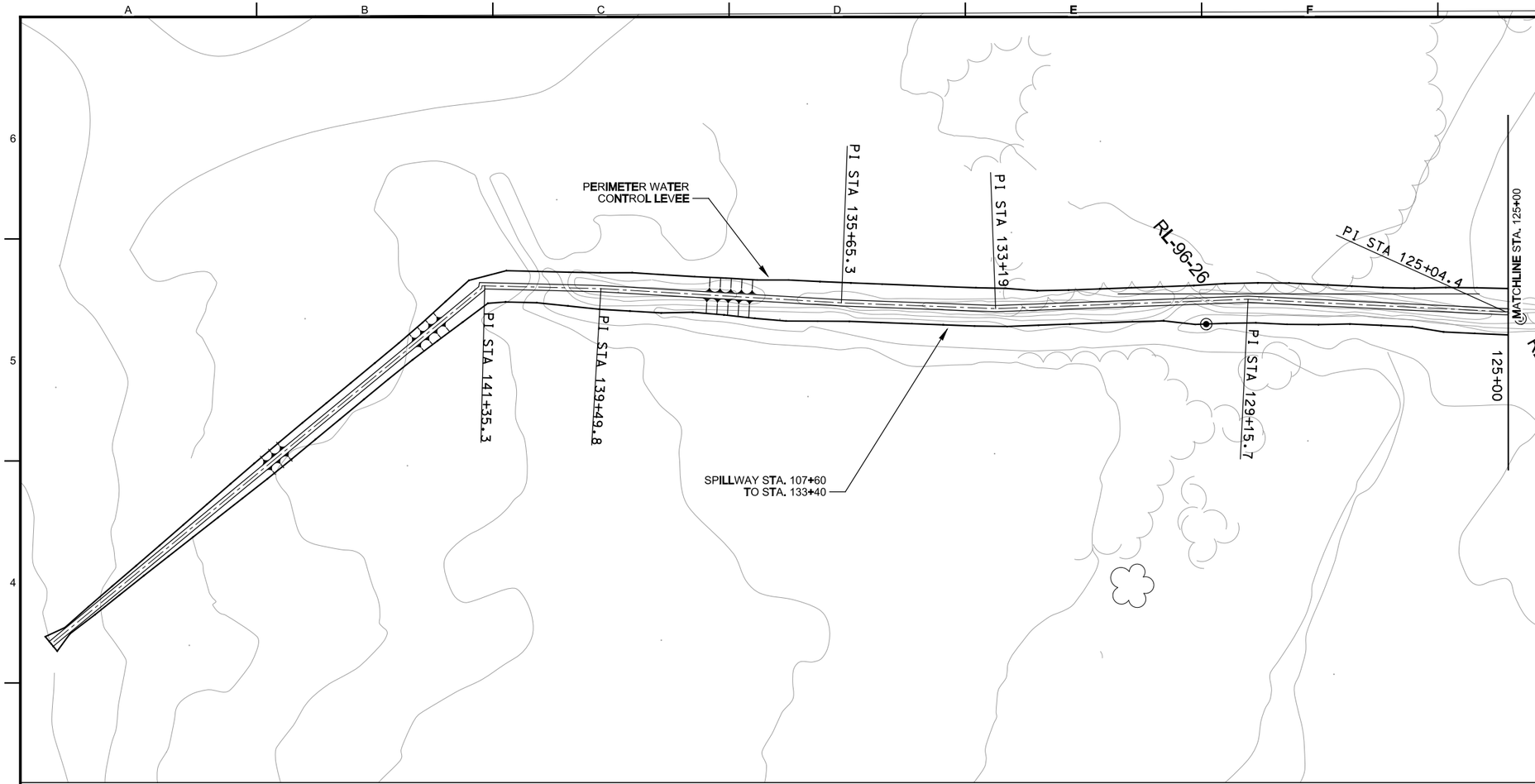
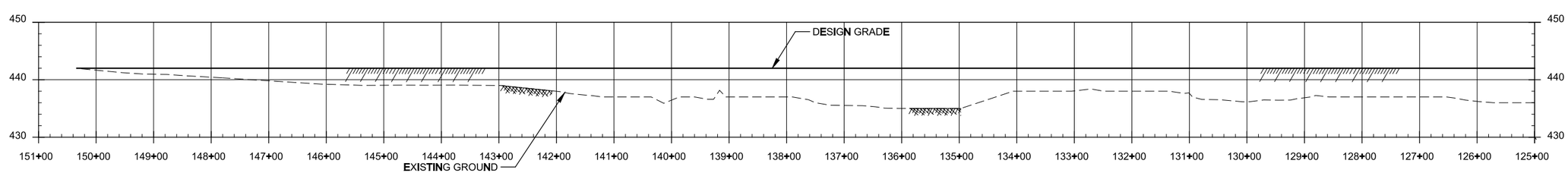
14-JAN-2010 11:24
PLATE12.dgn



PLAN

KEY PLAN



PROFILE STA. 125+00 TO 150+35

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

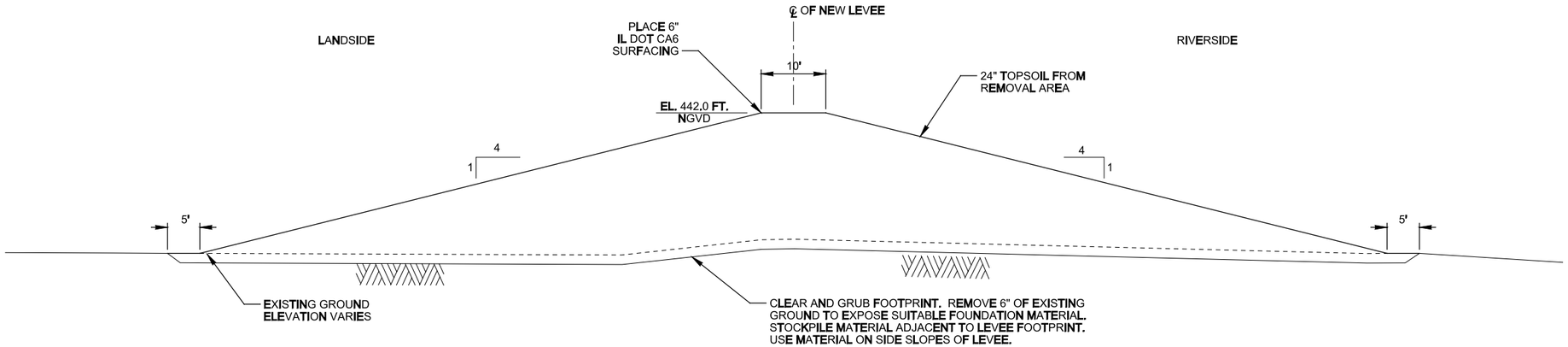
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION
PERIMETER WATER CONTROL LEVEE
PLAN AND PROFILE
STA. 125+00 TO STA. 150+33

Sheet Reference Number:
PLATE 13
Sheet 13 of 32

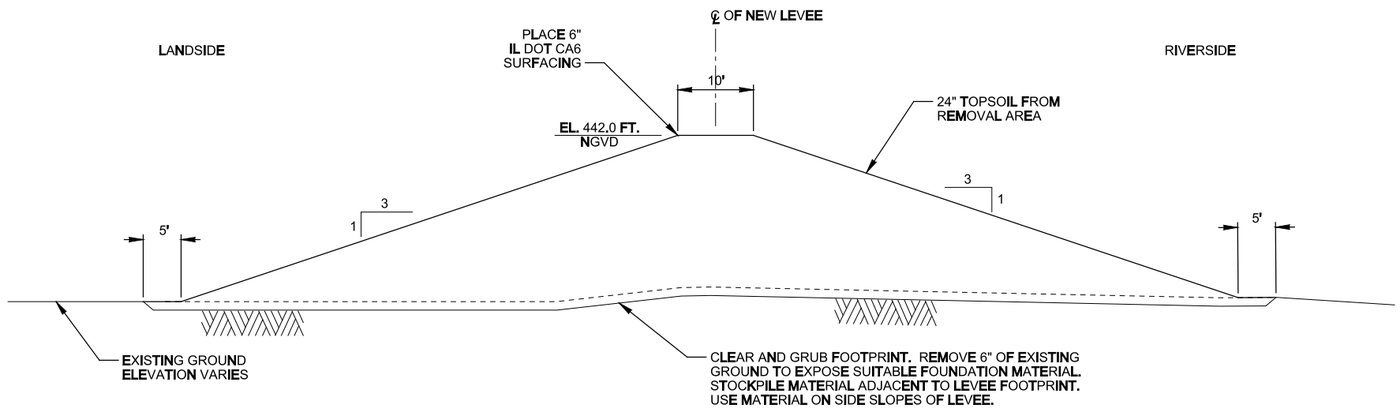
35% REVIEW

BSEDOLLH
12-Jan-2010 11:25
PLATE13.dgn



TYPICAL SECTION - PERIMETER WATER CONTROL LEVEE - STA. 90+00 TO END

NO SCALE



TYPICAL SECTION - PERIMETER WATER CONTROL LEVEE - STA. 0+00 TO STA. 15+00 AND STA. 40+00 TO STA. 90+00

NO SCALE

TYPICAL SECTION - OVERFLOW SPILLWAY - STA. 15+00 TO STA. 40+00

NO SCALE

US Army Corps of Engineers ®
Rock Island District

Revisions

Symbol	Description	Date	Approved

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

PERIMETER WATER CONTROL LEVEE TYPICAL SECTIONS

Sheet Reference Number:
PLATE 14
Sheet 14 of 32

35% REVIEW

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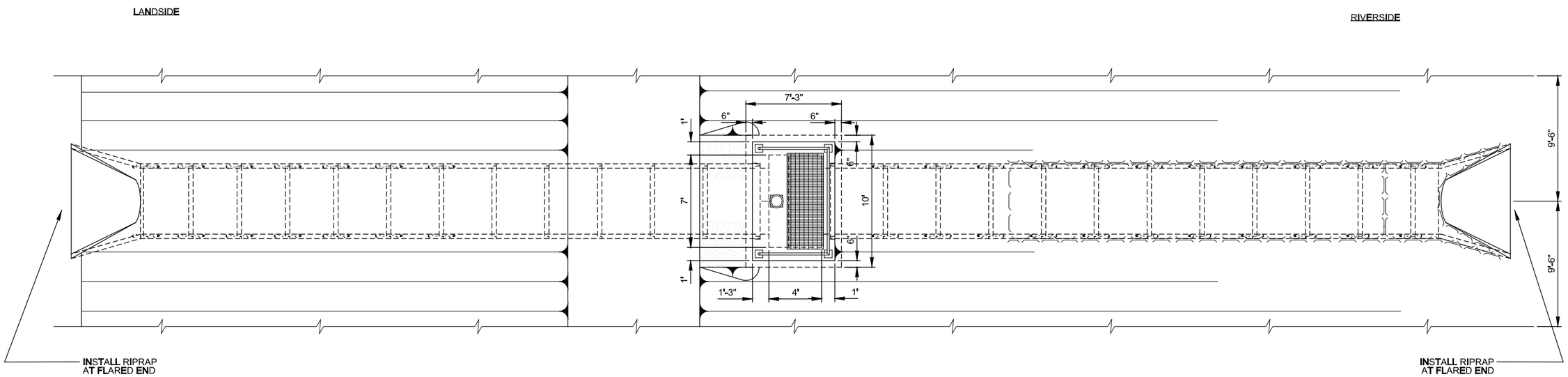
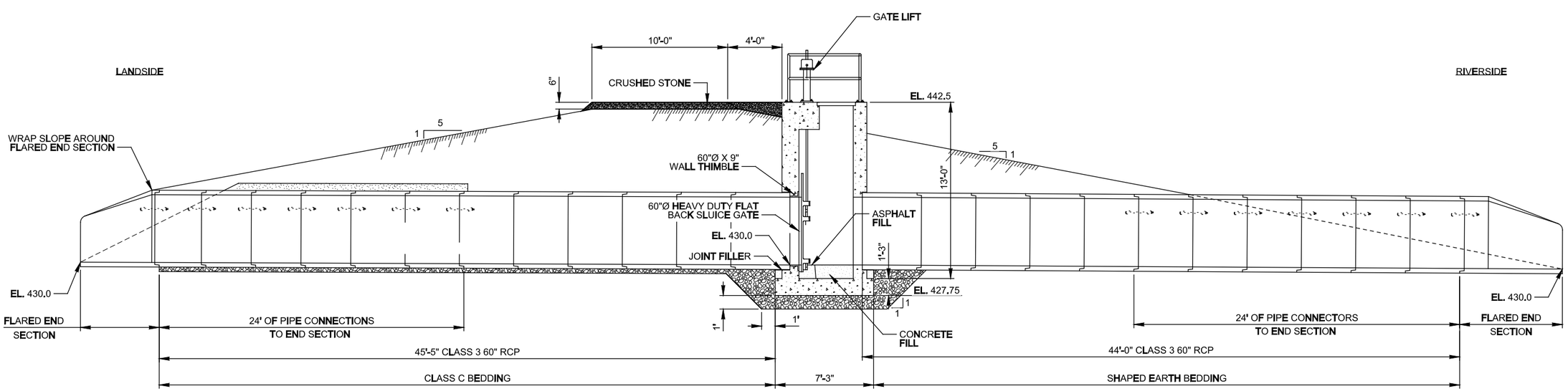
12-Jan-2010 11:27
PLATE14.dgn



GATEWELL STRUCTURE PLAN

SCALE IN FEET 4 0 4 8



GATEWELL STRUCTURE SECTION

SCALE IN FEET 4 0 4 8

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

GATEWELL STRUCTURE PLAN AND SECTION

Sheet Reference Number:
PLATE 15
Sheet 15 of 32

35% REVIEW

BSEDOLLH
12-Jan-2010 11:28
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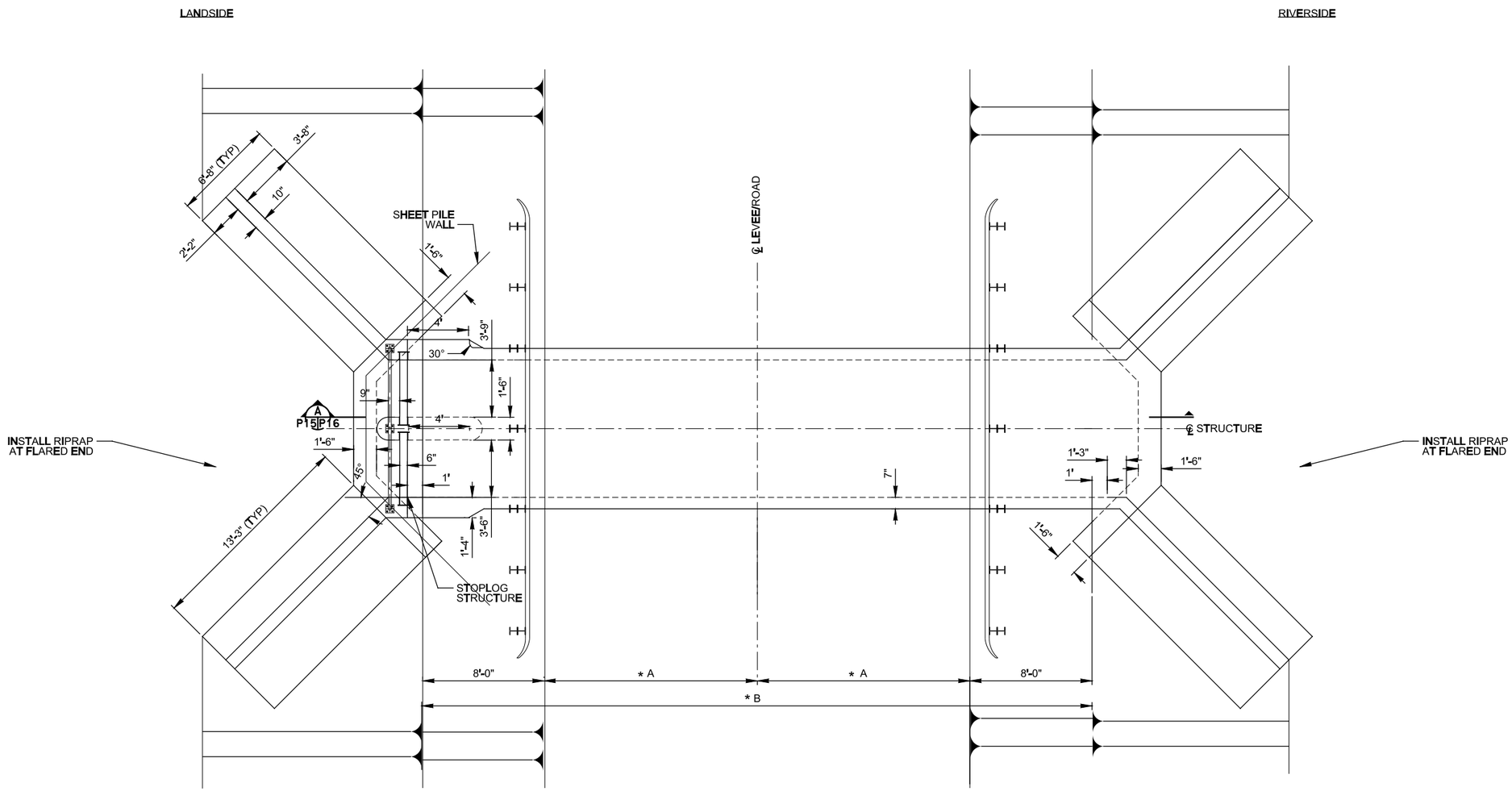


*

LOCATION	DIMENSIONS	
	A	B
ROAD	13'11"	43'10"
LEVEE	5'0"	26'0"

FISH EGRESS STRUCTURE PLAN

4 0 4 8
SCALE IN FEET

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

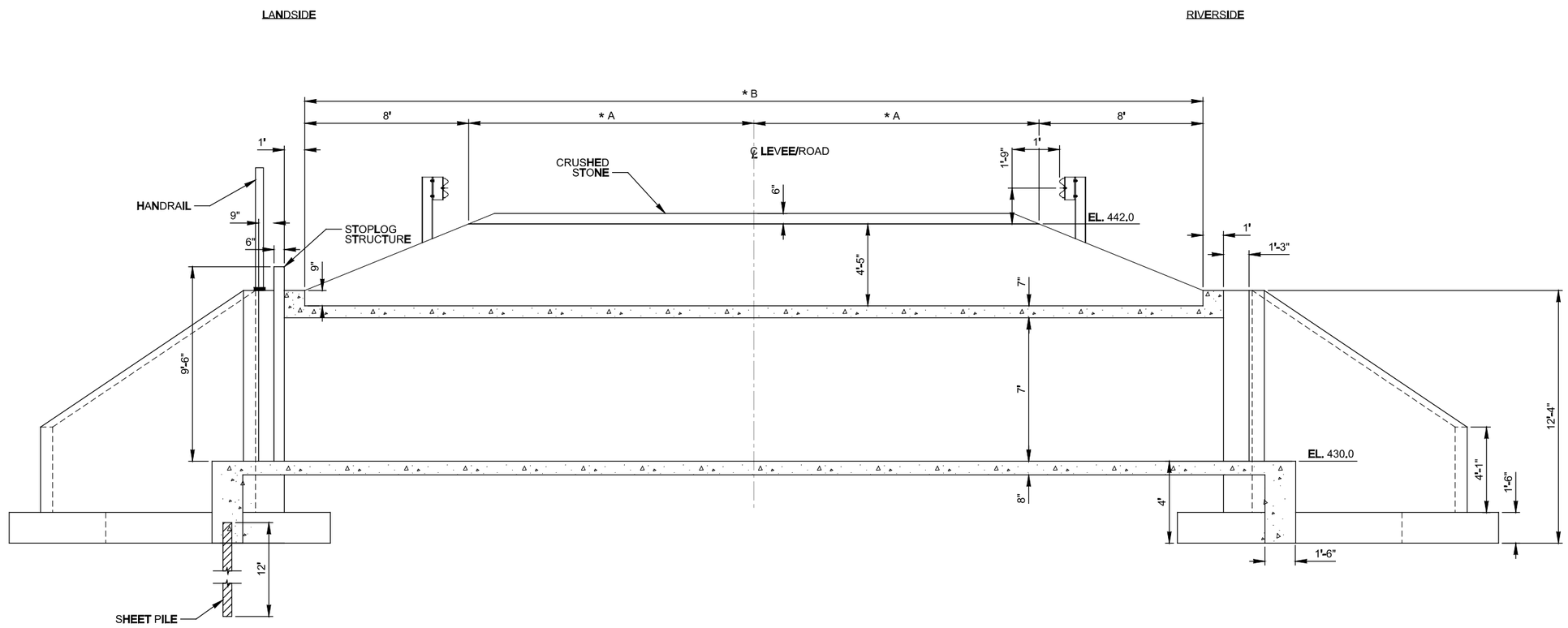
ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

FISH EGRESS STRUCTURE PLAN

Sheet Reference Number:
PLATE 16
Sheet 16 of 32

35% REVIEW

BSEDOLLH
12-JAN-2010 11:29
PLATE16.dgn



LOCATION	DIMENSIONS	
	A	B
ROAD	13'11"	43'10"
LEVEE	5'0"	26'0"

FISH EGRESS STRUCTURE SECTION

3 0 3 6
SCALE IN FEET

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved

Revisions

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

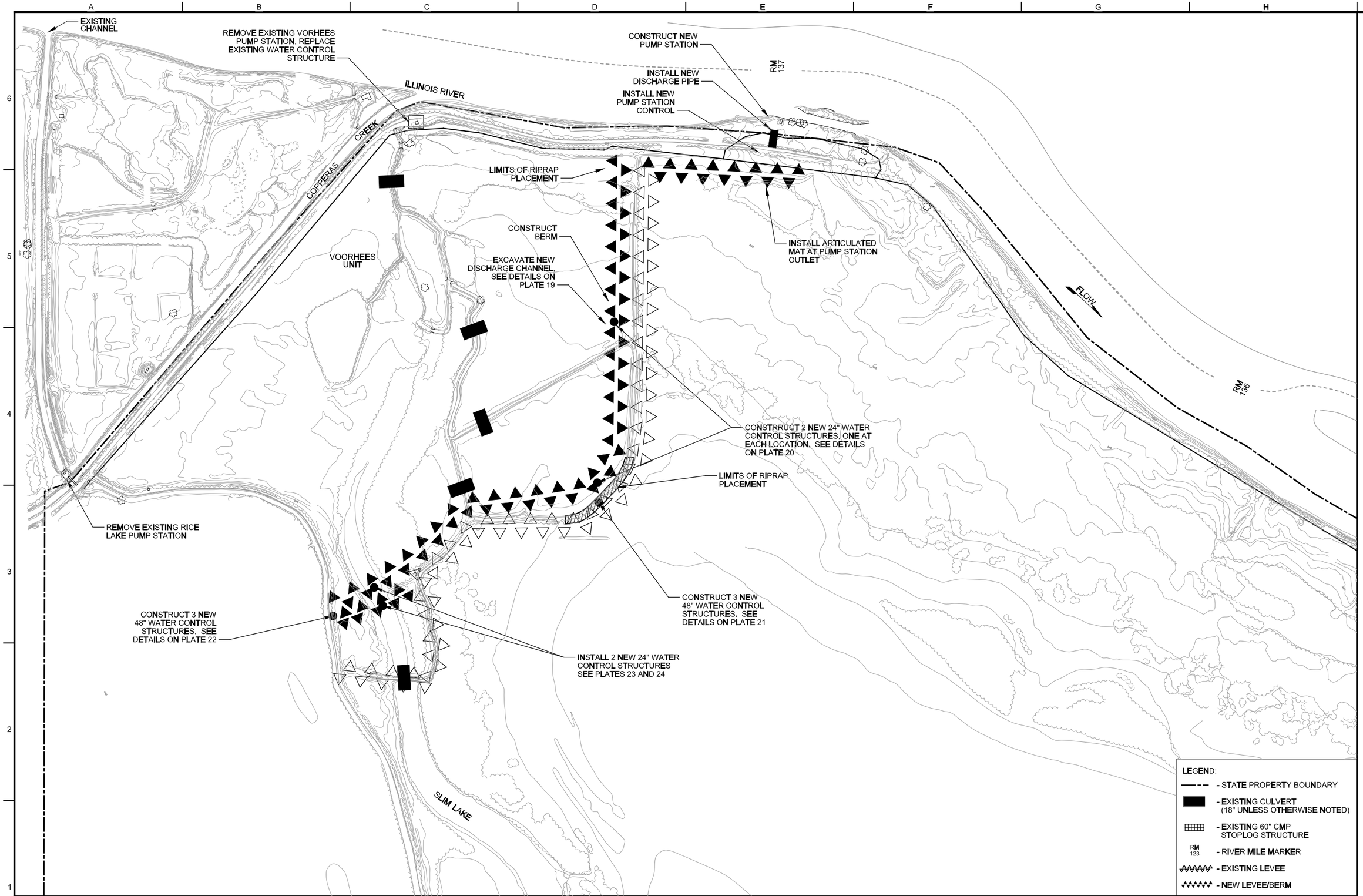
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT
FISH EGRESS STRUCTURE SECTION

Sheet Reference Number:
PLATE 17
Sheet 17 of 32

35% REVIEW

BSEDOLLH
12-Jan-2010 11:30
PLATE17.dgn



PUMP STATION DISCHARGE CHANNEL PLAN

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

PUMP STATION DISCHARGE CHANNEL PLAN

Sheet Reference Number:
PLATE 18
Sheet 18 of 32

35% REVIEW

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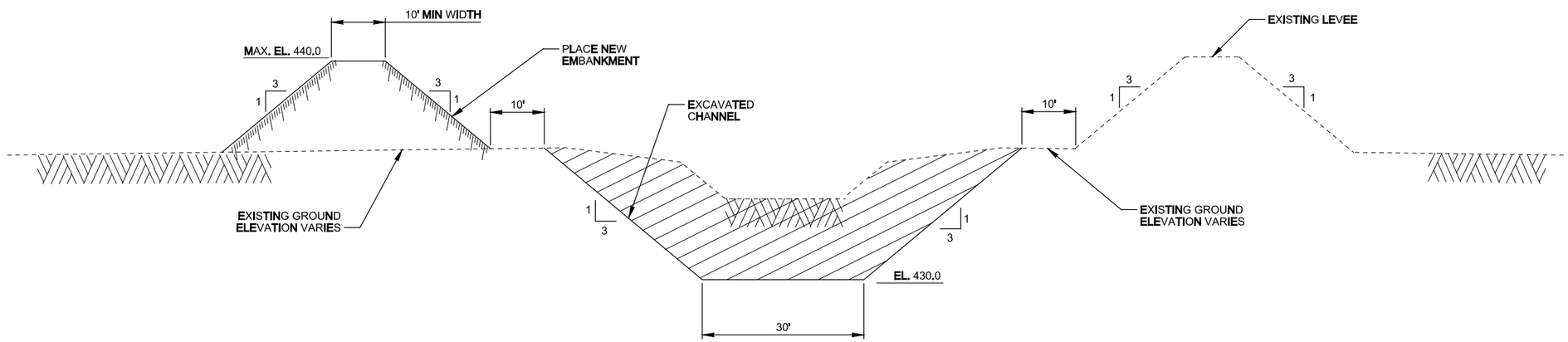
11-JAN-2010 11:32
PLATE18.dgn



LEGEND:

- EXCAVATE
- FILL

TYPICAL DISCHARGE CHANNEL SECTION

NO SCALE

US Army Corps of Engineers®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT
TYPICAL DISCHARGE CHANNEL SECTION

Sheet Reference Number:
PLATE 19
Sheet 19 of 32

35% REVIEW

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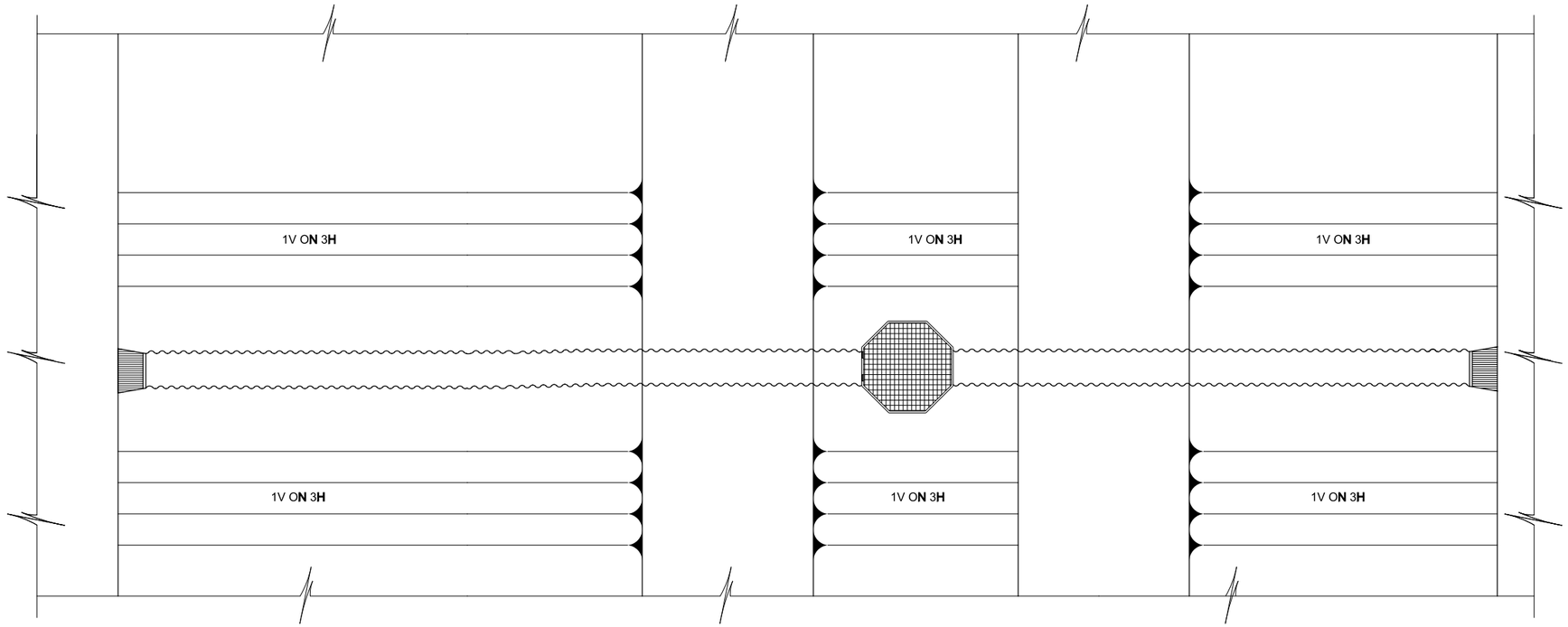
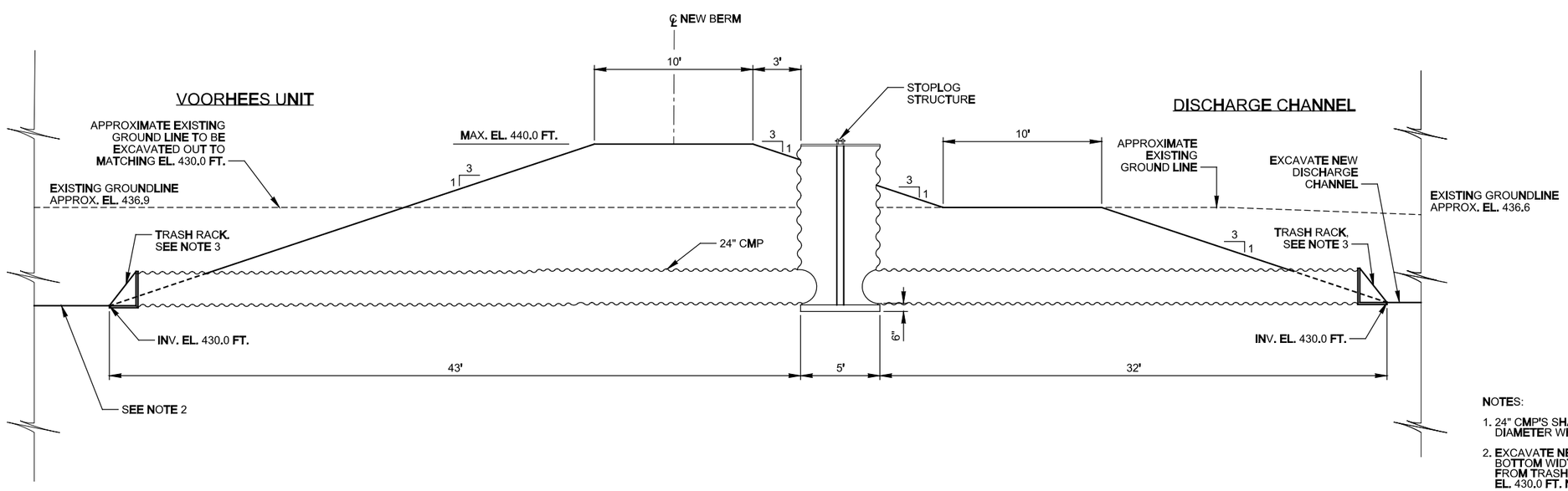
12-JAN-2010 11:33
PLATE19.dgn



WATER CONTROL STRUCTURE VOORHEES UNIT PLAN

4 0 4 8
SCALE IN FEET



NOTES:

1. 24" CMP'S SHALL BE UNDERCUT BY HALF THEIR DIAMETER WHEN PLACED.
2. EXCAVATE NEW DITCH TO EL. 430.0 FT.. WITH A BOTTOM WIDTH OF 10' AND 1V ON 3H SIDE SLOPES FROM TRASH RACK TO EXISTING GROUND LINE EL. 430.0 FT. NGVD29 (APPROX. 300 FEET)
3. FOR TRASH RACK, PLACE ½" SOLID BAR VERTICALLY AND WELD IN PLACE.

WATER CONTROL STRUCTURE VOORHEES UNIT SECTION

4 0 4 8
SCALE IN FEET

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

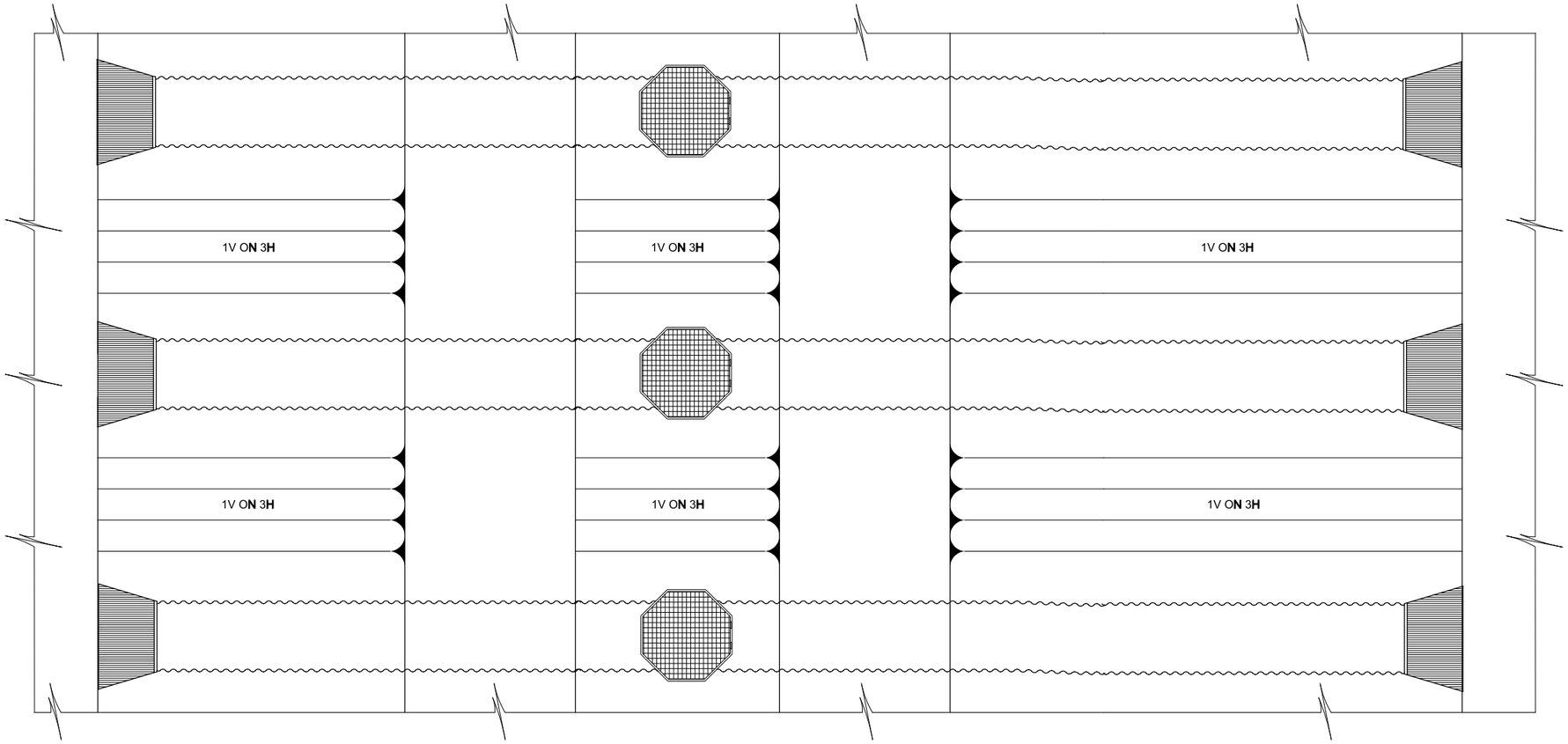
ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

WATER CONTROL STRUCTURE VOORHEES UNIT PLAN & SECTION

Sheet Reference Number:
PLATE 20
Sheet 20 of 32

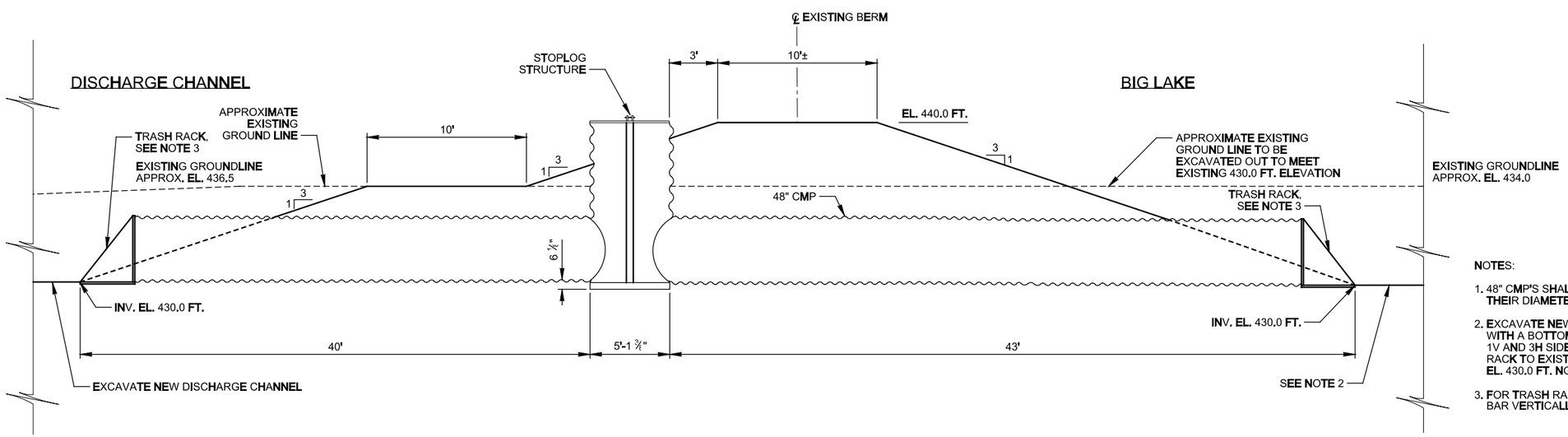
35% REVIEW

BSEDOLLH
12-Aug-2010 11:34
PLATE20.dgn



WATER CONTROL STRUCTURE BIG LAKE PLAN

4 0 4 8
SCALE IN FEET



NOTES:

1. 48" CMP'S SHALL BE UNDERCUT BY HALF THEIR DIAMETER WHEN PLACED.
2. EXCAVATE NEW DITCH TO EL. 43.0 FT., WITH A BOTTOM WIDTH OF 10' AND 1V AND 3H SIDE SLOPES FROM TRASH RACK TO EXISTING GROUNDLINE EL. 430.0 FT. NGVD (APPROX. 20 FEET).
3. FOR TRASH RACK, PLACE ¼" SOLID BAR VERTICALLY AND WELD IN PLACE.

WATER CONTROL STRUCTURE BIG LAKE SECTION

4 0 4 8
SCALE IN FEET

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT
WATER CONTROL STRUCTURE BIG LAKE PLAN & SECTION

Sheet Reference Number:
PLATE 21
Sheet 21 of 32

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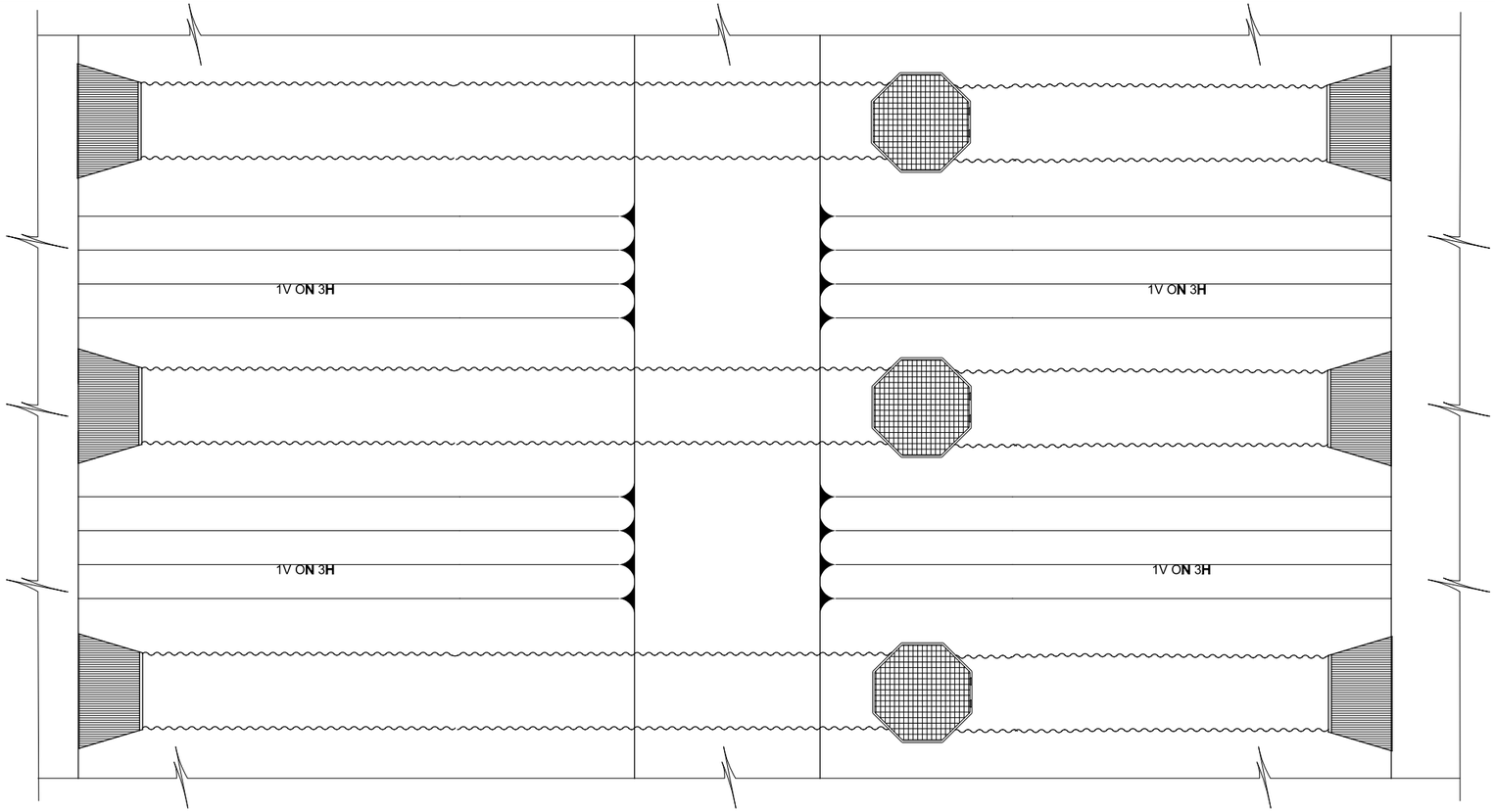
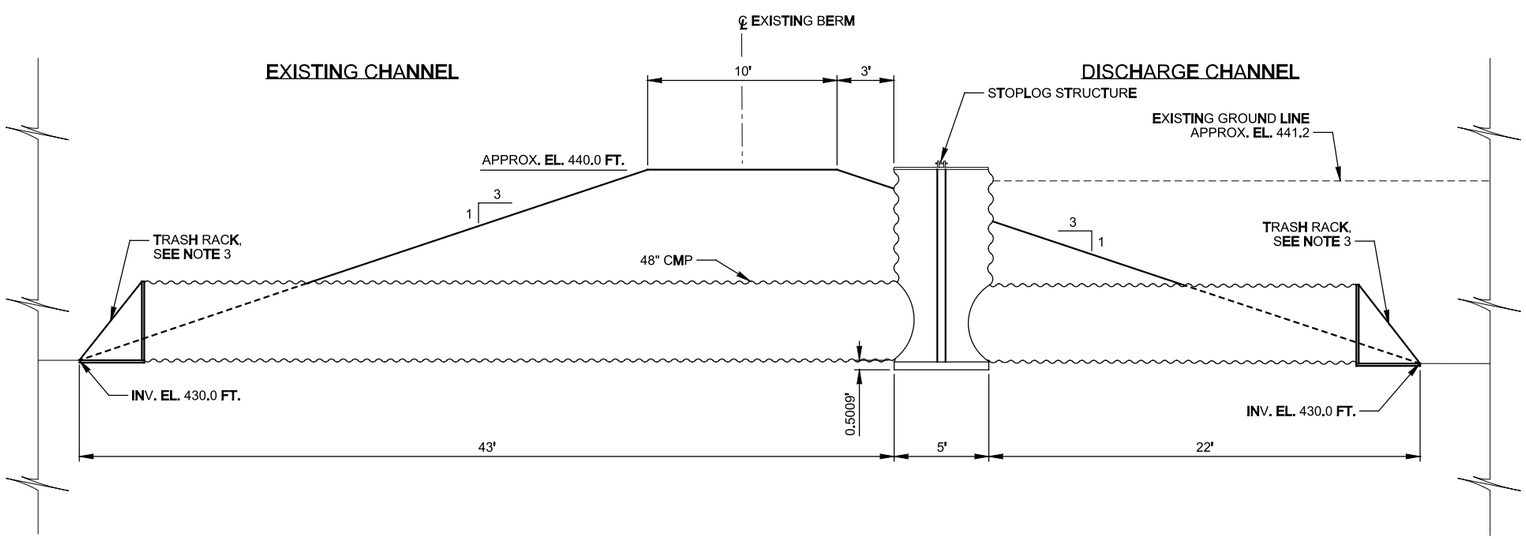
12-Jan-2010 11:35
PLATE21.dgn

35% REVIEW



WATER CONTROL STRUCTURE RICE LAKE PLAN

4 0 4 8
SCALE IN FEET



NOTES:

1. 48" CMP'S SHALL BE UNDERCUT BY HALF THEIR DIAMETER WHEN PLACED.
2. EXCAVATE NEW DITCH TO EL. 430.0 FT. WITH A BOTTOM WIDTH OF 10' AND 1V ON 3H SIDE SLOPES FROM TRASH RACK TO EXISTING GROUND LINE EL. 430.0 FT. NGVD (APPROX. 300 FEET).
3. FOR TRASH RACK. PLACE ½" SOLID BAR VERTICALLY AND WELD IN PLACE.

WATER CONTROL STRUCTURE RICE LAKE SECTION

4 0 4 8
SCALE IN FEET

US Army Corps of Engineers ®
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: RCF
Drawn By: LLH
Checked By:
Reviewed By: HLA
Date:
Scale: AS SHOWN
Project Code: EP100
Solicitation Number:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

WATER CONTROL STRUCTURE RICE LAKE PLAN & SECTION

Sheet Reference Number:
PLATE 22
Sheet 22 of 32

35% REVIEW

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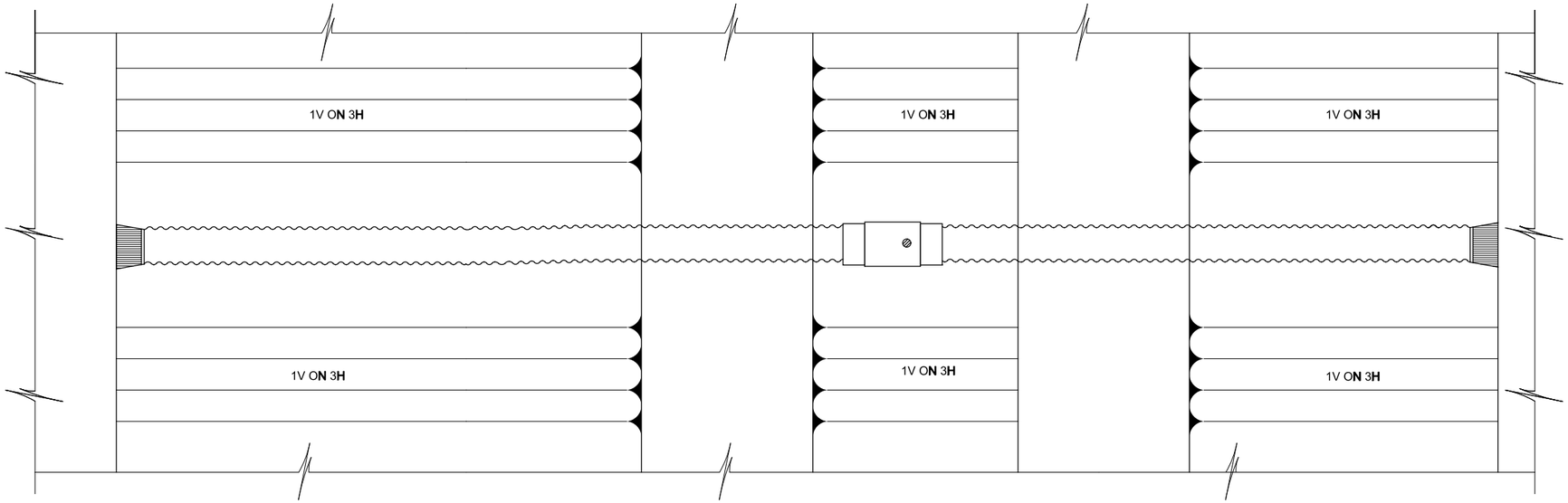

WATER CONTROL STRUCTURE LOWER SLIM PLAN

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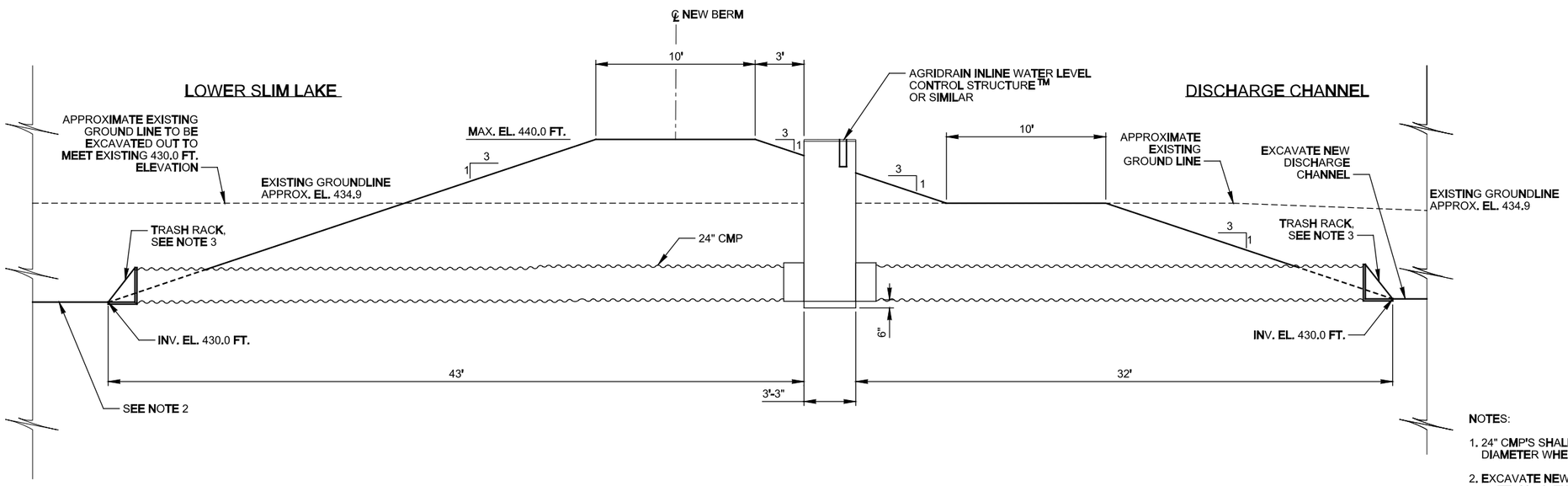
SCALE IN FEET



NOTES:

1. 24" CMP'S SHALL BE UNDERCUT BY HALF THEIR DIAMETER WHEN PLACED.
2. EXCAVATE NEW DITCH TO EL. 430.0 FT., WITH A BOTTOM WIDTH OF 10' AND 1V ON 3H SIDE SLOPES FROM TRASH RACK TO EXISTING GROUND LINE EL. 430.0 FT. NGVD (APPROX. 300 FEET).
3. FOR TRASH RACK, PLACE ½" SOLID BAR VERTICALLY AND WELD IN PLACE.

WATER CONTROL STRUCTURE LOWER SLIM SECTION

4 0 4 8
SCALE IN FEET

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Rock Island District

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Checked By:
Reviewed By: HLA

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

WATER CONTROL STRUCTURE LOWER SLIM PLAN & SECTION

Sheet Reference Number:
PLATE 23
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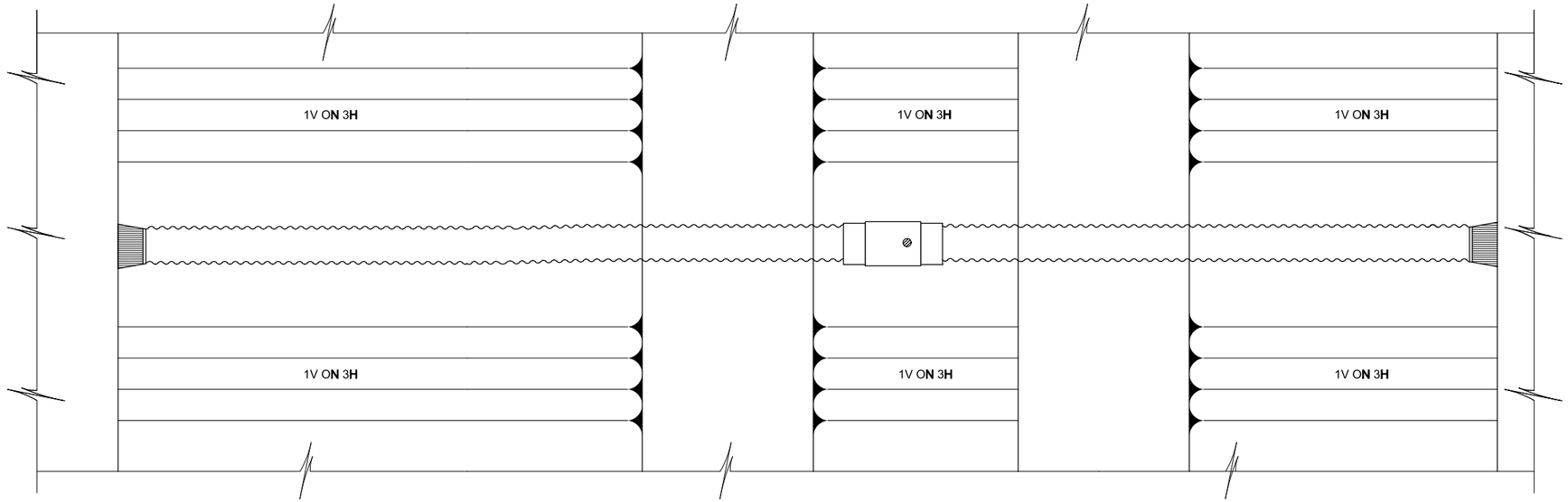
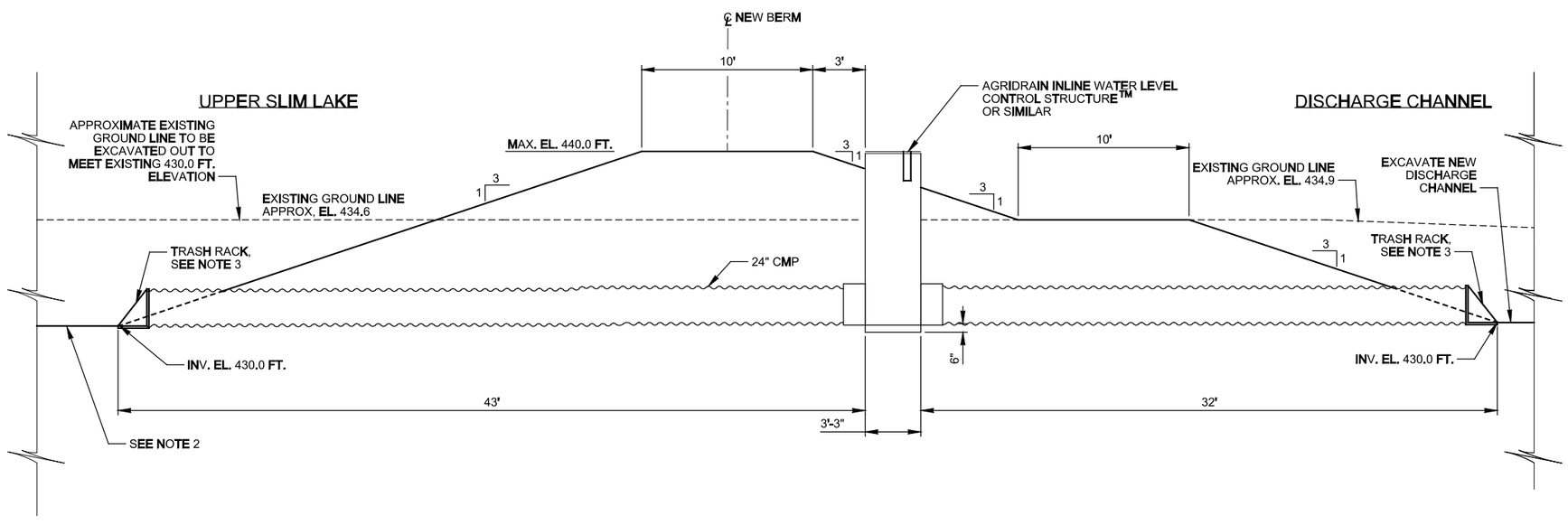


WATER CONTROL STRUCTURE UPPER SLIM PLAN

4 0 4 8
SCALE IN FEET



NOTES:

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3. FOR TRASH RACK, PLACE ½" SOLID BAR VERTICALLY AND WELD IN PLACE.

WATER CONTROL STRUCTURE UPPER SLIM PLAN AND SECTION

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BANNER, IL
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WATER CONTROL STRUCTURE UPPER SLIM PLAN & SECTION

Sheet Reference Number:
PLATE 24
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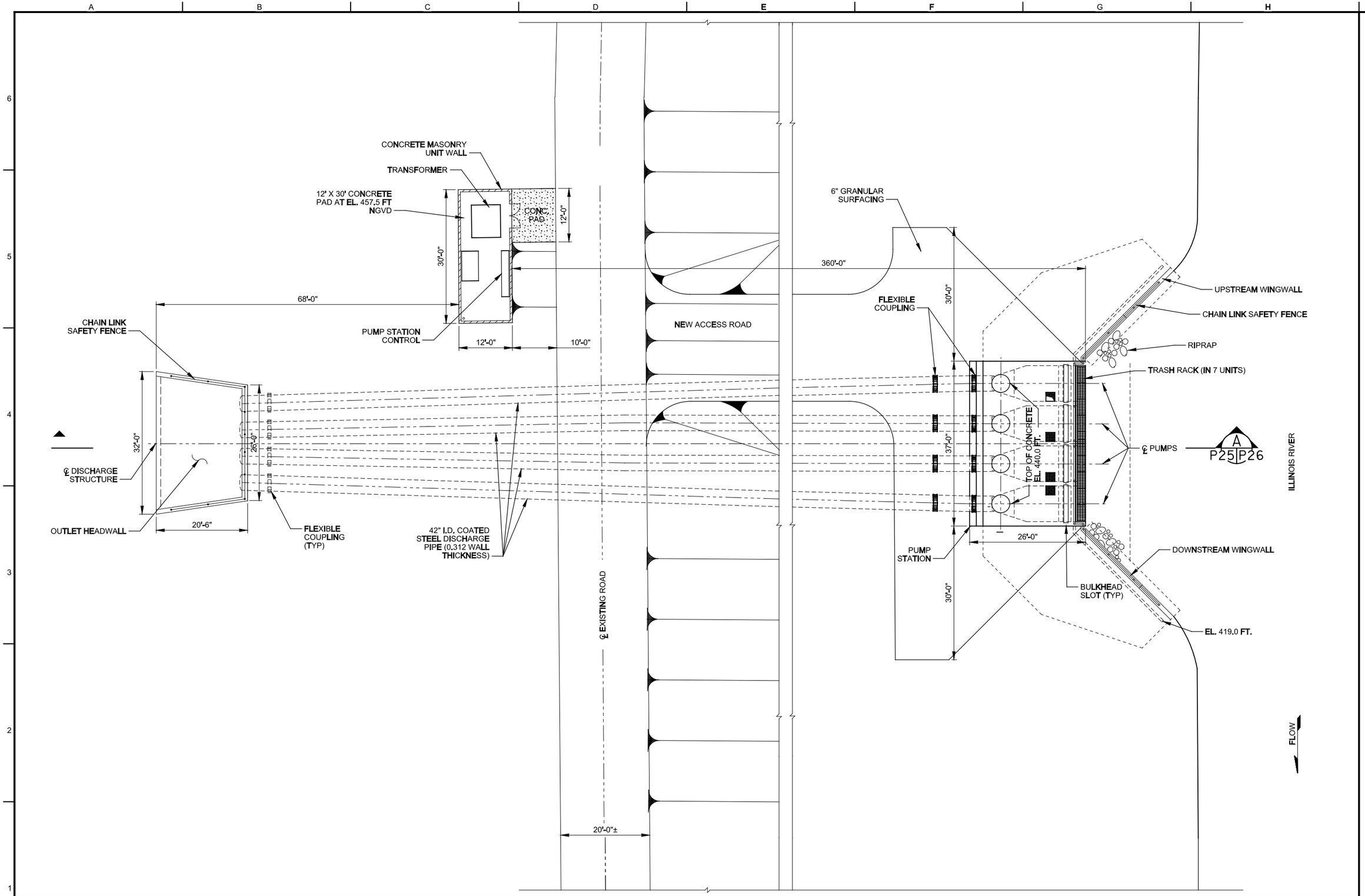

PUMP STATION SITE PLAN

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Rock Island District

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ROCK ISLAND, ILLINOIS

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LAGRANGE POOL
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PUMP STATION SITE PLAN

Sheet Reference Number:
PLATE 25
Sheet 25 of 32

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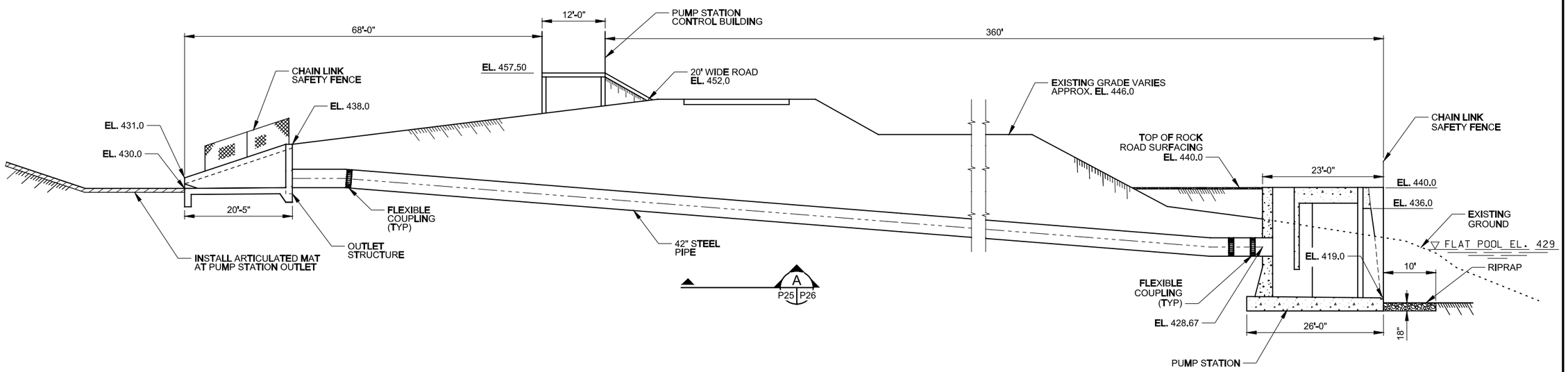

PUMP STATION SECTION A

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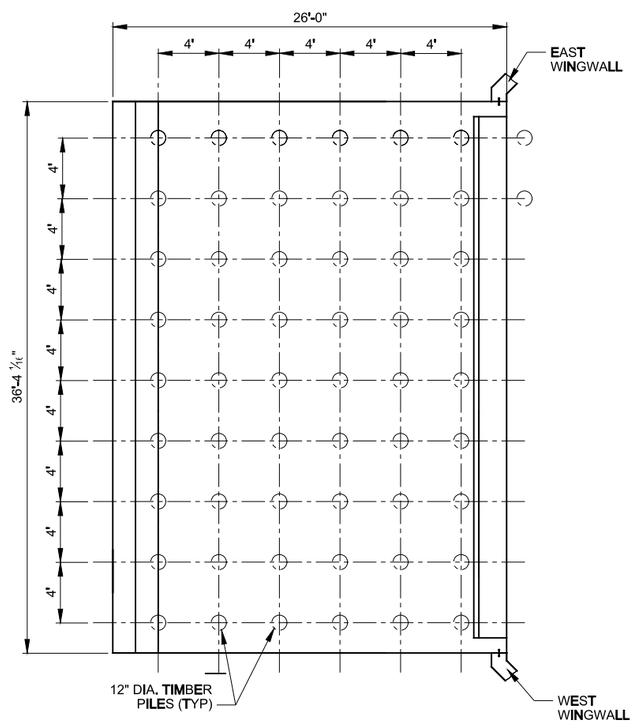

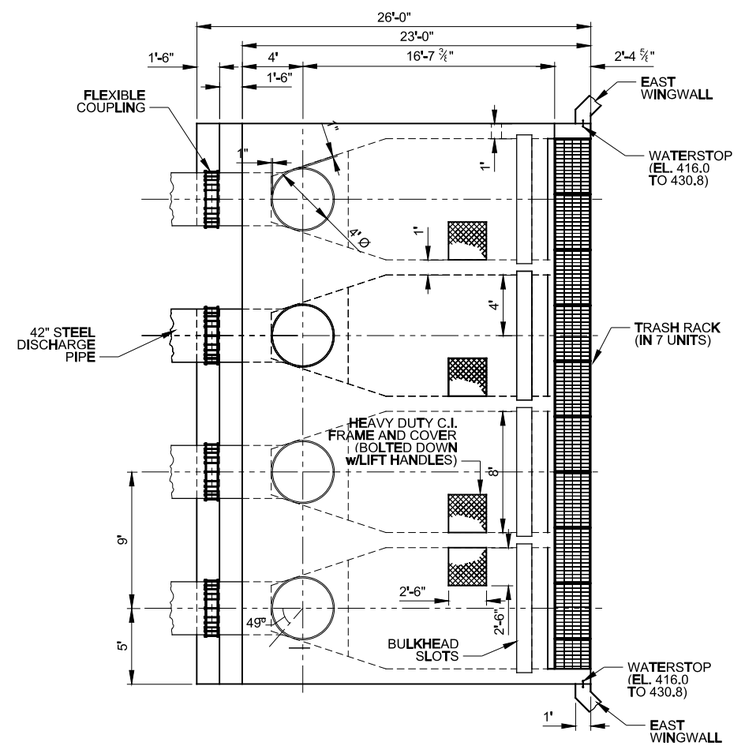

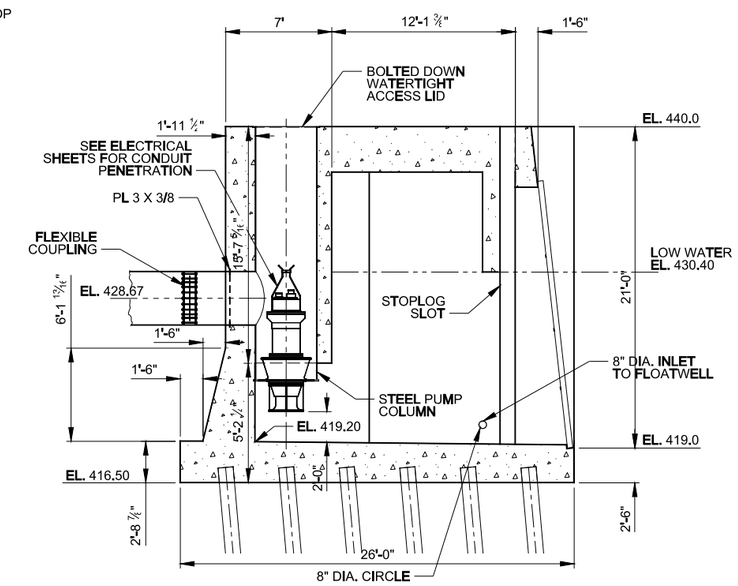

PUMP STATION ELEVATIONS AND DETAIL

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ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL

RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

PUMP STATION ELEVATIONS AND DETAILS

Sheet Reference Number:
PLATE 26
Sheet 26 of 32

35% REVIEW

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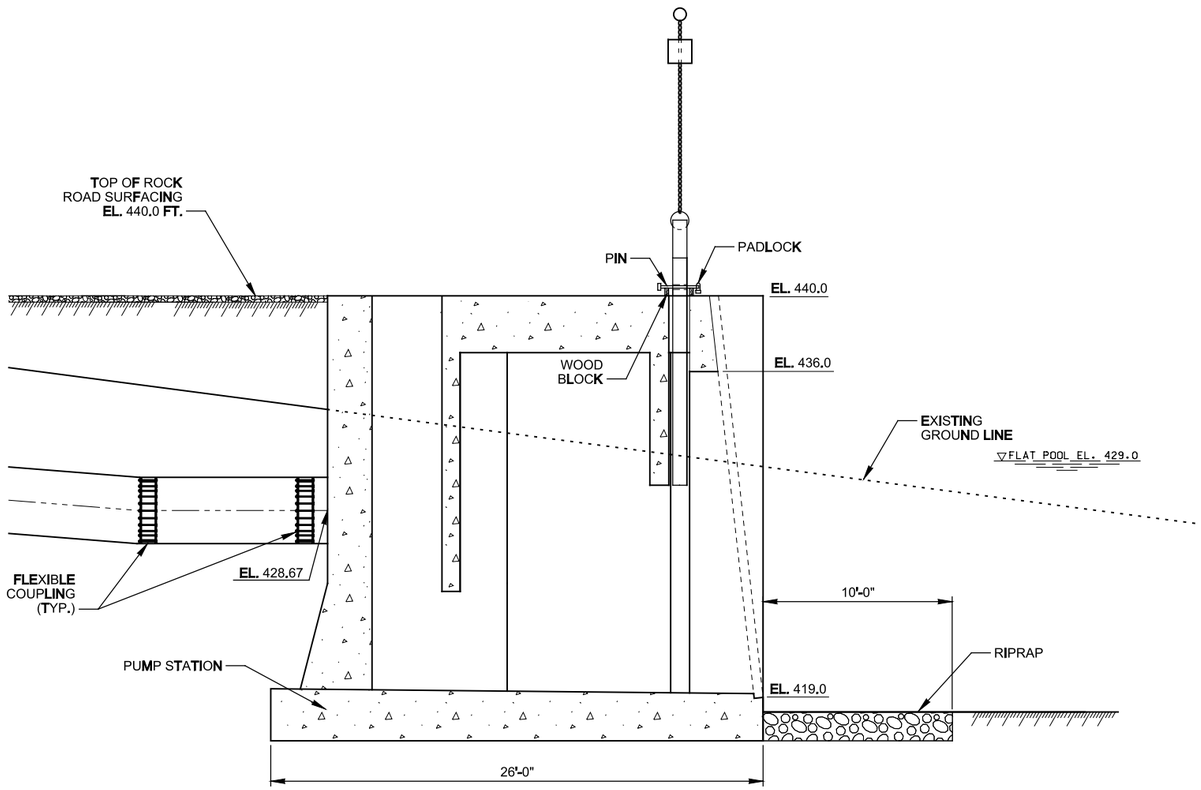

PUMP STATION BULKHEAD DETAIL

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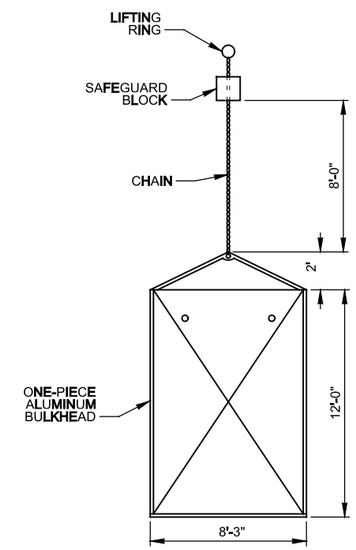

ALUMINUM BULKHEAD

4 0 4 8
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Rock Island District

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LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION
& ENHANCEMENT PROJECT

PUMP STATION BULKHEAD DETAILS

Sheet Reference Number:
PLATE 27
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35% REVIEW

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LEGEND:

- STATE PROPERTY BOUNDARY
- RL-96-12 BORING LOCATION
- RM 123 RIVER MILE MARKER

1000 0 1000 2000
SCALE IN FEET

BORING LOCATIONS

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ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

BORING LOCATIONS

Sheet Reference Number:
PLATE 28
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35% REVIEW

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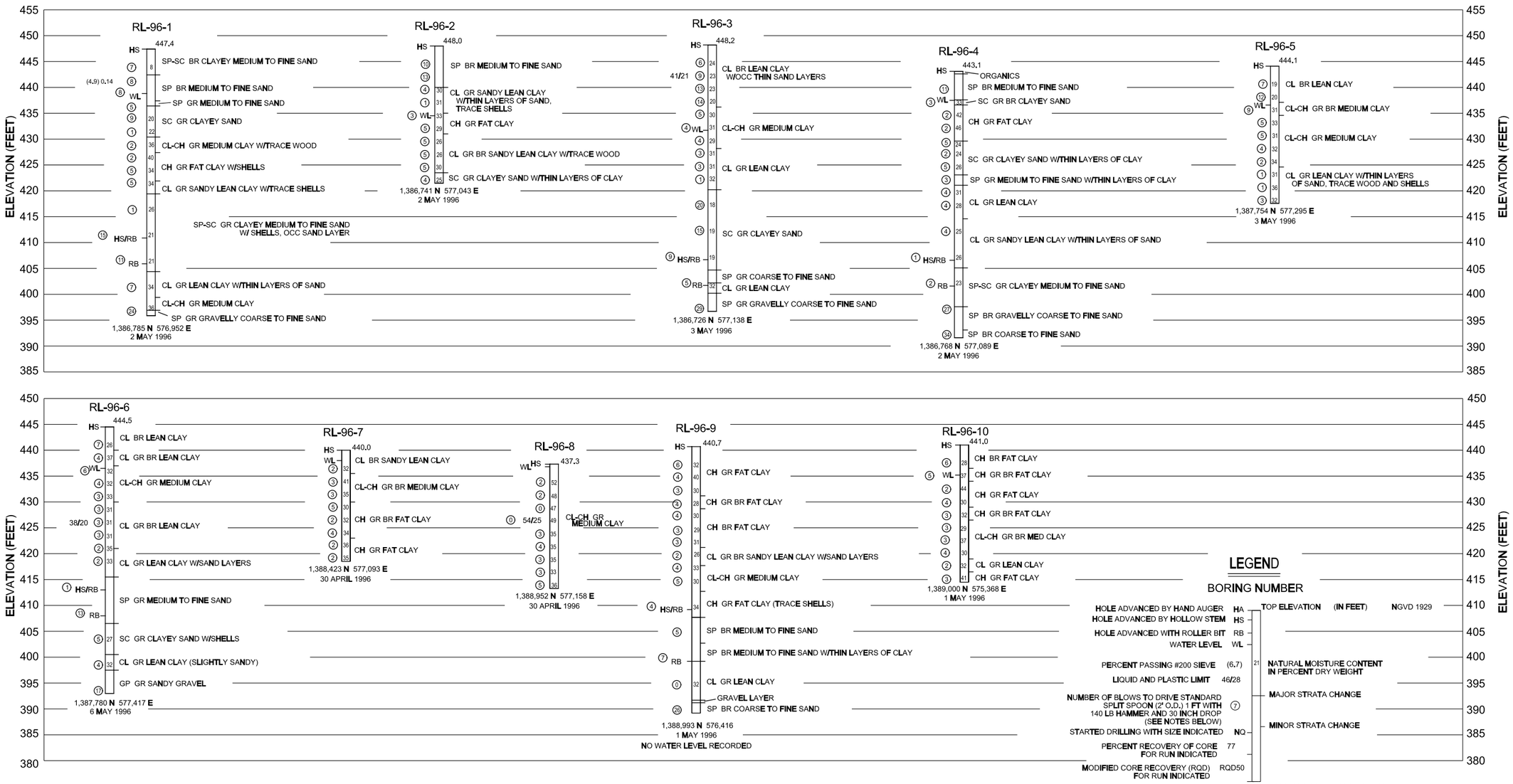

LEGEND

BORING NUMBER

HOLE ADVANCED BY HAND AUGER	HA	TOP ELEVATION (IN FEET) NGVD 1929
HOLE ADVANCED BY HOLLOW STEM	HS	
HOLE ADVANCED WITH ROLLER BIT	RB	
WATER LEVEL	WL	
PERCENT PASSING #200 SIEVE	(6,7)	NATURAL MOISTURE CONTENT IN PERCENT DRY WEIGHT
LIQUID AND PLASTIC LIMIT	46/28	
NUMBER OF BLOWS TO DRIVE STANDARD SPLIT SPOON (2" O.D.) 1 FT WITH 140 LB HAMMER AND 30 INCH DROP (SEE NOTES BELOW)	7	MAJOR STRATA CHANGE
STARTED DRILLING WITH SIZE INDICATED	NQ	MINOR STRATA CHANGE
PERCENT RECOVERY OF CORE FOR RUN INDICATED	77	
MODIFIED CORE RECOVERY (RQD) FOR RUN INDICATED	RQD50	

* PROBE OR SPLIT SPOON REFUSAL

LOCATION OF BORING
4 JULY 1976

APPROXIMATE DATE OF DRILLING
ALSO, DATE WATER LEVEL NOTED

GRID COORDINATES TAKEN IN ILLINOIS
STATE PLANE SYSTEM, WEST ZONE
NAD 1927

NOTES:
1. - BLOW COUNTS ARE FOR 1 FT DRIVE UNLESS OTHERWISE INDICATED BY /.

2. - A BLOW COUNT OF 0 INDICATES SPLIT SPOON ADVANCED BY WEIGHT OF DRILL TOOLING ONLY.

3. - IF BLOW COUNTS WERE OBTAINED USING CME AUTO HAMMER, EFFICIENCY IS ASSUMED TO BE 90%. N VALUE DATA SHOULD BE NORMALIZED TO 60% AS PER ETL 1110-1-138.

RQD (ROCK QUALITY DESIGNATION)	
RQD (%)	ROCK QUALITY
0-25	VERY POOR
25-50	POOR
50-75	FAIR
75-90	GOOD
90-100	EXCELLENT

BORING LOGS I

NO SCALE

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

BORING LOGS I

Sheet Reference Number:
PLATE 29
Sheet 29 of 32

35% REVIEW

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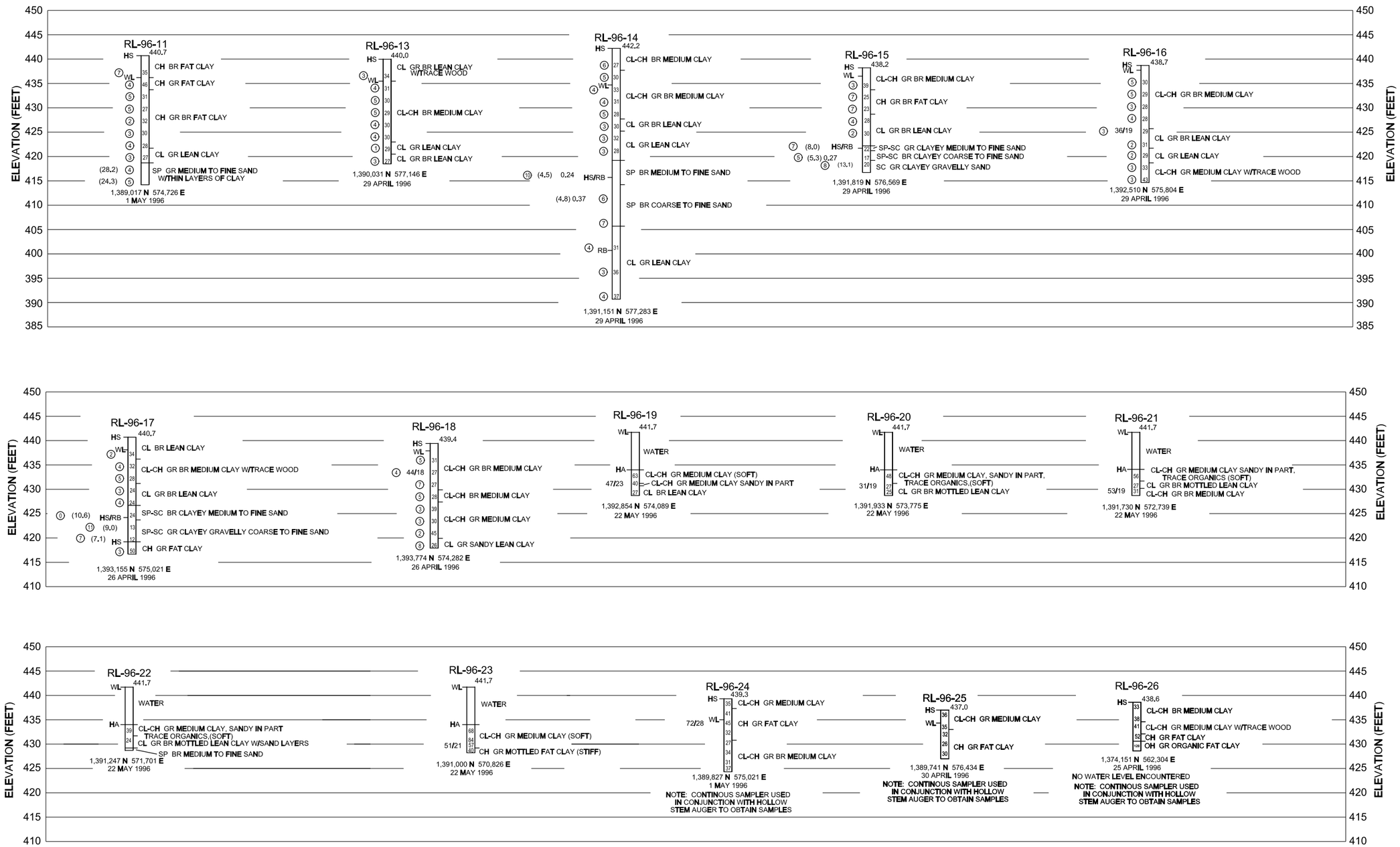

NOTE:
1. FOR LEGEND SEE PLATE 29.

BORING LOGS II

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

BORING LOGS II

Sheet Reference Number:
PLATE 30
Sheet 30 of 32

35% REVIEW

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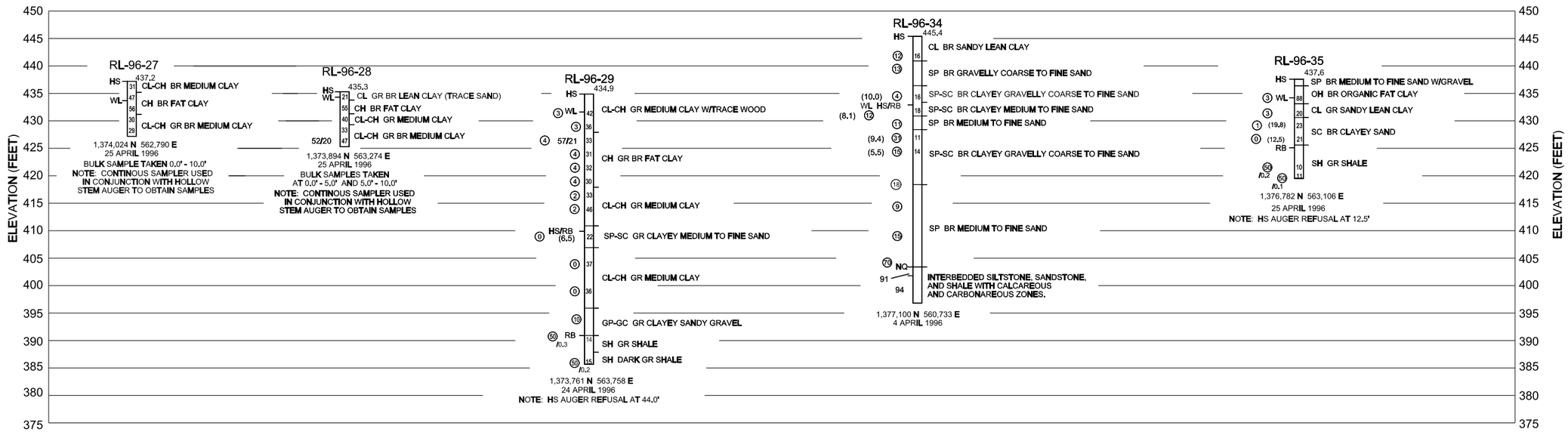

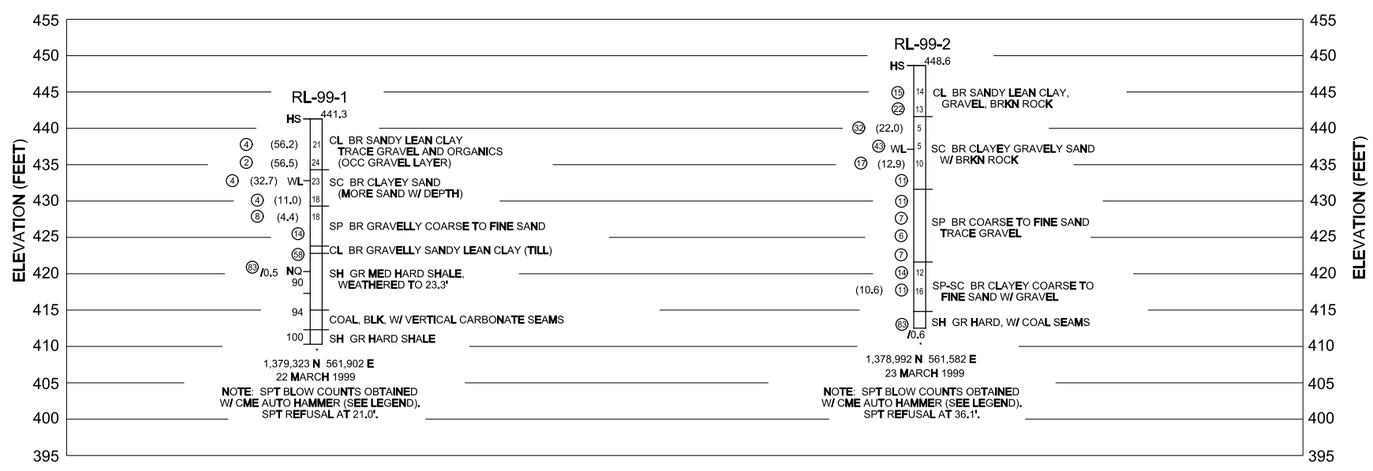

NOTE:
1. FOR LEGEND SEE PLATE 29.

US Army Corps of Engineers ®
Rock Island District

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT

BORING LOGS III

Sheet Reference Number:
PLATE 31
Sheet 31 of 32

BORING LOGS III

NO SCALE

35% REVIEW

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12-AUG-2010 11:47
PLATE31.dgn

WATER CONTROL STRUCTURE
EXISTING CHANNEL
EXISTING ACCESS ROAD
ILLINOIS RIVER
COPPERAS CREEK
PUMP STATION
PUMP STATION CONTROLS
RM 137
OLD COPPERAS LOCK AND COPPERAS CREEK GAGE
DISCHARGE PIPE
VOORHEES UNIT
DISCHARGE CHANNEL
LEVEE
RIPRAP
FLOW
RM 136
ILLINOIS RIVER
POND LILY LAKE
RM 135
SENATE ISLAND
STA. 15+00
OVERFLOW SPILLWAY, TOP EL. 440.0 FT. NGVD
WEST RIVER
RM 134
STA. 40+00
SLIM LAKE
NARROWS DAM
BIG LAKE
HOXIE RIDGE
PRAIRIE GRASS PLANTING
MAST TREE PLANTINGS
PERIMETER WATER CONTROL LEVEE TOP EL. 442.0 FT. NGVD
RM 133
GOOSE LAKE
GATEWELL STRUCTURE
FISH EGRESS STRUCTURE
STA. 108+00
DUCK ISLAND
BEEBE LAKE
W1
L135.4B
MISERABLE ISLAND
RICE LAKE
QUARRY PIT
STA. 133+00
FISH EGRESS STRUCTURE TO BE CONSTRUCTED
EXISTING ADMINISTRATION BUILDINGS
U.S. HIGHWAY 24
DUCK CREEK
EXISTING ACCESS ROAD

TYPE OF MEASUREMENT
- POINT
W1 - W=WATER QUALITY

LEGEND:
- STATE PROPERTY BOUNDARY
- EXISTING CULVERT (18" UNLESS OTHERWISE NOTED)
- EXISTING 60" CMP STOPLOG STRUCTURE
RM 123 - RIVER MILE MARKER
- EXISTING LEVEE
- NEW LEVEE/BERM

1000 0 1000 2000
SCALE IN FEET

POST-PROJECT MONITORING PLAN

US Army Corps of Engineers®
Rock Island District

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

ILLINOIS WATERWAY
LAGRANGE POOL
BANNER, IL
RICE LAKE HABITAT REHABILITATION & ENHANCEMENT PROJECT
POST CONSTRUCTION MONITORING PLAN

Sheet Reference Number:
PLATE 32
Sheet 32 of 32

35% REVIEW

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PLATE32.dgn

APPENDIX A

CORRESPONDENCE

DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX A
CORRESPONDENCE

CONTENTS

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Letter dated January 30, 1987, from the Illinois Department of Conservation to District Engineer, U.S. Army Engineer District, Rock Island District. A-1

Rock Island District letter, dated June 29, 1995, to the Illinois Historic Preservation Agency..... A-7

Rock Island District letter, dated June 29, 1995, to the Illinois Department of Conservation A-9

Letter dated July 20, 1995, from the Illinois Historic Preservation Agency stating that the IHPA was deferring the Corps' request for comments concerning effects of the project on historic properties to the ILDNR……. A-11

Rock Island District Memorandum for Record, dated June 6, 1996..... A-12

Rock Island District Memorandum for Record, dated June 8, 1996..... A-17

Rock Island District letter, dated September 9, 1996, to project proponents and other reviewing agencies requesting preliminary comments concerning the proposed project A-23

Rock Island District letter, dated September 10, 1996, to the Illinois Department of Conservation providing Scope of Work for Phase I Intensive Archeological Survey for Historic Properties A-28

Rock Island District letter, dated September 10, 1996, to the Illinois Historic Preservation Agency providing a Scope of Work for Phase I Intensive Archeological Survey for Historic Properties A-30

Rock Island District letter, dated October 11, 1996, to the Natural Resource Conservation Service requesting determination of whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981.....A-32

Farmland Conversion Impact Rating, dated November 5, 1996, from the Natural Resources Conservation Service for the proposed project site A-35

Rock Island District letter, dated November 29, 1996, to the Illinois Department of Conservation forwarding results of the project's archeological investigation A-36

Rock Island District letter, dated November 29, 1996, to the Illinois Historic Preservation Agency forwarding results of the project's archeological investigation A-40

Letter dated December 6, 1996, from the Illinois Historic Preservation Agency stating compliance of the proposed project with Section 106 of the National Historic Preservation Act of 1966 ..... A-44

Draft Fish and Wildlife Coordination Act (FWCA) report, dated February 24, 1997, from the U.S. Fish and Wildlife Service, Rock Island Field Office A-46

Rock Island District Memorandum for Record, dated March 9, 1998 ..... A-57

Letter dated January 9, 2005, from Sac and Fox Nation of Missouri in Kansas and Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District A-59

Letter dated December 27, 2005, from Winnebago Tribe of Nebraska to District Engineer, U.S. Army Corps of Engineers, Rock Island District A-60

Letter dated January 4, 2006, from Fish and Wildlife Service, Rock Island Field Office, to Colonel Duane P. Gapinksi, District Engineer, U.S. Army Engineer District, Rock Island District A-61

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
Michael B. Witte, Director • James C. Helfrich, Assistant Director

January 30, 1987

District Engineer
U.S. Army Engineer District, Rock Island
Attn: Planning Division, PD-R
Clock Tower Building
PO Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

Enclosed is the appendix for the engineering and design of the proposed project at the Rice Lake Complex to be included in the Second Annual Addendum of the Environmental Management Program.

We are currently working on several other project scopes and should have them submitted to both your district and St. Louis by February 10, 1987. Should you have any questions, do not hesitate to call me.

Sincerely,

William R. Donels

William R. Donels
Landscape Architect
Division of Planning

cc: Gary McCandless
Bob Thornberry

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
GENERAL PLAN APPENDIX
FOR ENGINEERING AND DESIGN

RICE LAKE COMPLEX
LAGRANGE POOL, ILLINOIS RIVER
FULTON COUNTY, ILLINOIS

INTRODUCTION

Project Authority

The 1985 Supplemental Appropriation Act (Public Law 99-83) provides authorization and appropriations for an environmental management program for the Upper Misissippi River system that includes fish and wildlife habitat rehabilitation and enhancement. The proposed project would be funded under this authorization.

Project Location

The Rice Lake Complex is a series of natural backwater lakes geographically situated between river miles 132 and 138 of the LaGrange Pool of the Illinois River, 25 miles south of Peoria along U.S. Route 24 in Fulton County, IL.

Originally, the area consisted of 2639 acres of water and bottomland forest. Recently an additional 3053 acres were acquired to bring the total complex area to 5592 acres and managed by the State of Illinois, Department of Conservation.

Land and Water Acreage Composition:

3242	acres water
350	acres cultivated fields
2000	acres bottomland forest
5592	acres total

See Attachment 1

Resource Problems and Opportunities

Presently the increased flood and sedimentation levels within the Illinois River Valley and specifically Rice Lake Complex have resulted in the degradation of this historic mid-migration waterfowl and aquatic habitat as documented by the Illinois Natural History Survey's bulletin Vol. 32 Article 1, August 1979 entitled Waterfowl Populations and the Changing Environment of the Illinois River Valley.

This condition has necessitated the use of moist soil plant communities requiring water level manipulation by water control structures and low level levees. Up to recent years this practice has been successful, however current conditions will not guarantee annual food production whereas upon completion of this proposed project, food production will be guaranteed seven out of ten years for

the 2.7 million average annual waterfowl use days.

Additionally these properties provide a wide variety of habitat opportunities for numerous other migratory and resident species while water level manipulation associated with other moist soil management provides the habitat required for foraging by herrons egrets, and a mirade of shore birds.

The construction of islands will provide additional habitat diversity, improve water quality, and reduce resuspension of sediment caused by wind generated waves.

Proposed Solution

The proposed project would re-establish the Hate Levee to function as the major water impoundment structure and adjustable water control facility for the entire complex; construct a pumping facility on the Illinois River adjacent to old Lock #1, create discharge channels to supply water to the management areas, upgrade the riverside access road/levee for flood and sedimentation control during the 90 day moist soil management period, upgrade and establish interior levees to optimum moist soil management capabilities, and construct habitat islands for food production, additional mud flat area for shore and wading birds, waterfowl loafing, and reduce wind generated wave action causing resuspension of sediment adversely effecting water quality and acquatic environments.

The benefits of this project will insure quality habitat for not only migrating and resident waterfowl but for eagles, cormorant, and other endangered species which utilize the area.

See Attachment 2

PROJECT REQUIREMENTS

Estimated Engineering and Design Cost

The estimated costs for the engineering and design project are:

Hydraulic Analysis	$100,000.00
Surveying	50,000.00
Engineering and Design	250,000.00
Coordination/Project Preparation	40,000.00
TOTAL	$440,000.00

The planning, engineering, and design costs would be 100 percent Federal because the project's primary purpose is habitat improvement for migratory waterfowl. The Illinois Department of Conservation spent $1.3 million to acquire 3053 acres of additional habitat at the complex in FY'86 and FY'87.

The Illinois Department of Conservation has estimated project implementation costs to be $3,400,000.00. This cost estimate would be refined during the engineering and design phase.

Compliance with the Natural Environmental Policy Act of 1969 and other environmental laws and regulations would be documented during the engineering and design phase.

Project Participation

The primary project participants would be the Illinois Department of Conservation, U.S. Fish and Wildlife Service, and the Corps of Engineers.

Project Schedule

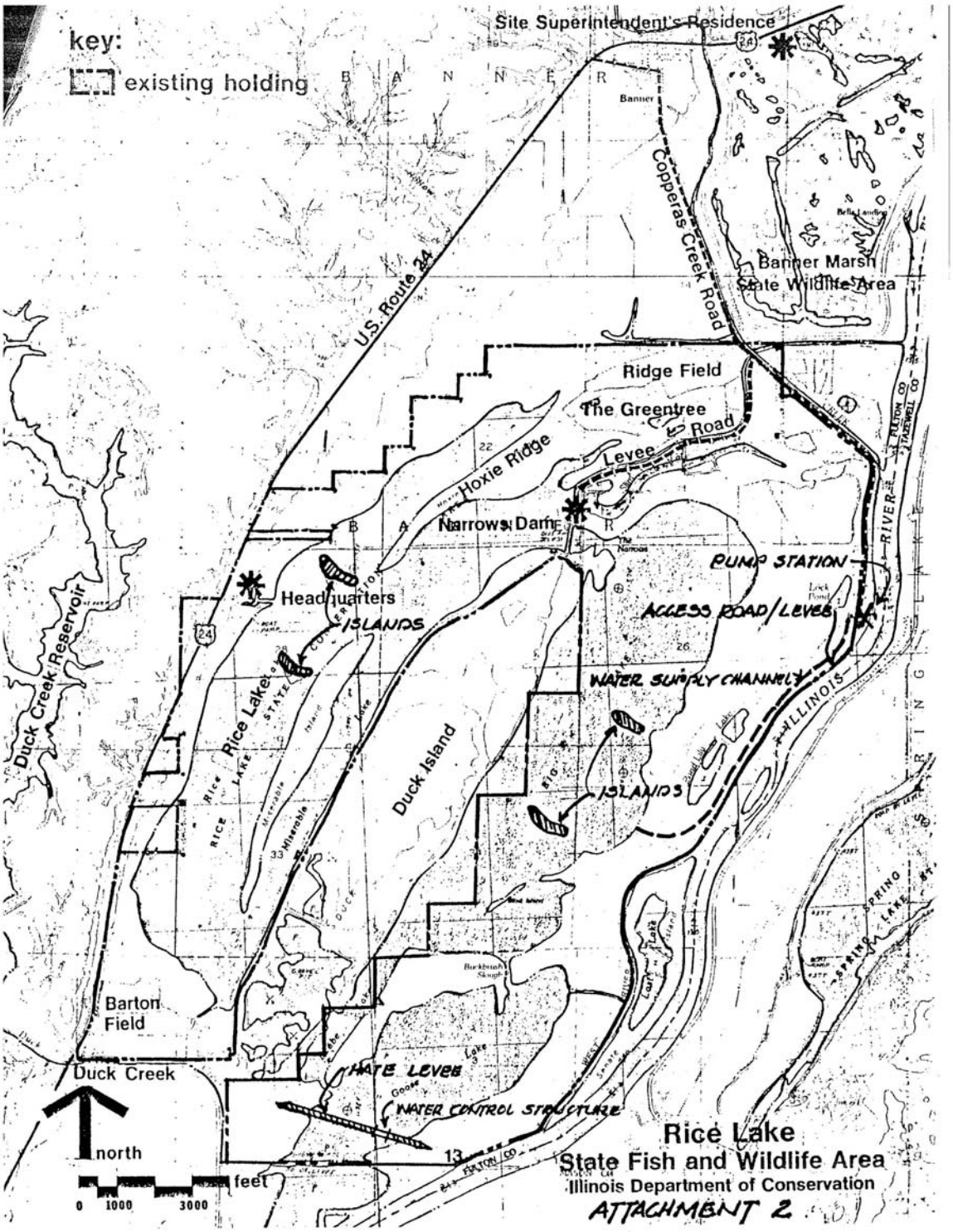
It is estimated that the engineering and design phase of their project could be completed within 8 months following receipt of funds.

RECOMMENDATION

I recommend that the Secretary of the Army provide $440,000.00 for the engineering and design for the Rice Lake Complex project under the Upper Mississippi River System Environmental Management Program.

William C. Burns
Colonel, Corps of Engineers
District Engineer

PEORIA
COUNTY
CANTON
INGERSOLL AIRPORT
HAWALTS
MONTEREY
BANNER
BRYANT
MAPLES MILL
LEWISTOWN
EUSTELE AMERICA
LEVERING
DICKSON MOUNDS STATE MEMORIAL
TAZEWELL
COUNTY
RIVER
RICE LAKE COMPLEX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PUMP STATION
ACCESS ROAD/LEVEE
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ISLANDS
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Rice Lake
State Fish and Wildlife Area
Illinois Department of Conservation
ATTACHMENT 2

DEISS/dmd/5185

June 29, 1995

Planning Division (1165-2-26a)

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

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed locational data for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP), a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The enclosed United States Geological Survey 1982 Duck Island Quadrangle Illinois 7.5 Minute Series (Topographic) map provides the proposed boundaries for the HREP. The HREP is authorized under Public Laws 99-88 and 99-662.

The Rice Lake Complex is a 5,592-acre series of natural backwater lakes situated between Illinois Waterway River Miles 132 and 138, approximately 25 miles south of Peoria, Illinois, in Fulton County. The historically excellent mid-migration waterfowl and aquatic habitat has degraded as a result of sedimentation. The proposed rehabilitation and enhancement would include private land purchases, levee repair, improvement of pumping facilities, island construction, and channel dredging.

We request the location of historic properties which may be affected by the proposed undertaking and a bibliography of pertinent archeological survey reports. The locational and bibliographical information will be used to (1) determine the effects to sites eligible to or listed on the National Register of Historic Places, (2) evaluate the area for its archeological potential, and (3) produce a physiographical data base for historic property resource assessments, management, and avoidance.

We request information and comments on this project within 30 days. If you should have questions concerning the Rice Lake Complex HREP, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
PATRICK T. BURKE, P.E.

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

Copies Furnished:

Mr. Harold Hassen
Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787 (wo/enclosure)

Mr. Michael Wiant
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (w/enclosure)

(all wo/encls):
Dist File (PD) (w/encl):
PD (Herrmann)
PD-E (Deiss) (w/encl)
PD-E (Carmack)
PD-E Jordan)
PD-W (Niles)
ED
ED-DN (Kimler)
ED-DN (Hoffman)
PP-M (Kowalczyk)

DEISS/dmd/5185

June 29, 1995

Planning Division (1165-2-26a)

Mr. Harold Hassen
Illinois Department
of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Hassen:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed a copy of locational data for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP), a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

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Sincerely,

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Chief, Planning Division

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PD-E Jordan)
PD-W (Niles)
ED
ED-DN (Kimler)
ED-DN (Hoffman)
PP-M (Kowalczyk)

Illinois Historic Preservation Agency

1 Old State Capitol Plaza • Springfield, Illinois 62701–1507 • (217) 782–4836 • TTY (217) 524–7128

217/785-4997

FULTON COUNTY
Rice Lake Complex Habitat
Rehabilitation and Enchancement Project

PLEASE REFER TO:
IHPA LOG #950706004P-F

July 20, 1995

Mr. Dudley M. Hanson, P.E.
Dept of the Army/Rock Island Dist/CoE
Chief, Planning Division
Clock Tower Building/Post Office Box2004
Rock Island, Illinois 61204-2004

Gentlemen:

Thank you for requesting comments from our office concerning the possible effects of the project referenced above on cultural resources. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

It is our understanding that Dr. Harold Hassen will be providing the requested information for the above referenced project. We do not wish to duplicate his effort. However, should you require additional information please contact us and we will try to provide what assistance we can.

If you need additional information, please contact Joseph S. Phillippe, Staff Archaeologist, Illinois Historic Preservation Agency, Old State Capitol, Springfield, Illinois 62701, 217/785-1279.

Sincerely,

Anne E. Haaker
Deputy State Historic
Preservation Officer

AEH:JSP

PD-E

Printed on Recycled Paper

CENCR-PD-W(1165-2-26a) 6 June 1996

MEMORANDUM FOR RECORD

SUBJECT: Upper Mississippi River System-Environmental Management Program (UMRS-EMP) Rice Lake, Illinois, Habitat Rehabilitation and Enhancement Project (HREP) General Coordination Meeting

1. The subject meeting was held on 5 February 1996 at the Illinois Department of Natural Resources' (ILDNR) Rice Lake Complex Offices. The following representatives from the Rock Island District (CENCR) and the ILDNR were in attendance:

Darron Niles	CENCR-PD-W	John Ball	ILDNR
Dan Johnson	CENCR-ED-DN	Dave Earleywine	ILDNR
Bob Hoffman	CENCR-ED-DN	Norman Emerick	ILDNR
Charlene Carmack	CENCR-PD-E	Rob Hilsabeck	ILDNR
Bob Lazenby	CENCR-RE-A	Mike Cochran	ILDNR
Bill Douglass	ILDNR	Carla Murray	ILDNR
Marvin Hubbell	ILDNR(by phone)		

2. The purpose of the meeting was to refine the proposed project features for ILDNR use in deciding whether to pursue purchasing Duck Island or recommending an alternate plan.

3. The following potential project features were discussed (see attached map):

a. Repairing the existing Hate Levee and constructing a low level berm at approximately a 442.0 elevation between the Hate Levee and an existing road bed upstream would provide water control and flood protection for the project area. Late season flood protection (June-September) is critical for growing migratory waterfowl food plants, which under current conditions is successful approximately 3 out of 10 years. The Hate levee would also include a rock overflow section at elevation 440.0. The low level berm would be a non-continuous structure that utilizes areas of higher elevation to minimize impacts to trees and reduce the required berming. Hate Levee repairs and low level berm construction would utilize adjacent borrow or channel maintenance sand from the Illinois Waterway.

b. In association with the Hate Levee repair, overflow and outlet structures would be constructed. The overflow structure would be sized to protect the levee from overtopping damage and constructed of rock. The outlet structure would reduce pumping costs by allowing gravity drainage of the project and also provide fish an escape route during drawdowns.

c. A pump station constructed near the old Copperas Creek Lock site is needed to provide water level control capability. Two scenarios for providing water level control are under study: 1) water is pumped into Big Lake first and then allowed to flow into Rice Lake through gated culverts at the existing quarry on

Duck Island; and 2) water is pumped into Rice Lake directly and the existing ILDNR 36'' pumps would be maintained for filling/draining Big Lake. The pump station size would vary according to the scenario selected. Channel excavation to Rice Lake and/or Big Lake is also needed. Along this channel, a stoplog structure or relocation of an existing pump would be incorporated into the plan to provide water level control capability to the Voorhees moist soil management unit.

d. If the ILDNR purchases Duck Island (1,200 acres), mast tree and cool/warm season grass plantings would be placed on the currently farmed land and the quarry on the downstream end of the island would be maintained as a deep water refuge for fish during drawdown periods. A refuge for fish during drawdowns may also reduce avian botulism problems caused by fishkills.

4. Required CENCR work items:

a. Old borings from coal mining surveys need to be obtained from the ILDNR engineering section (ED-DN).

b. A baseline and with and without project features WHAG analysis is needed (PD-E).

c. The impact on flood heights from construction of the low level berm need to be assessed (ED-HH).

d. A revised Project Appraisal Report and detailed cost and quantity estimates are needed before the next coordination meeting tentatively scheduled for July 1996 (ED-DN).

e. The ILDNR needs an interim cost estimate by March 1996 to determine what scale project they are able to support and to justify increasing their bonding authority to match the revised project features (ED-DN).

DARRON NILES
Waterway Systems Branch

Encl

Copies Furnished: (See Distribution List)

Dist File (PD)	
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PD-W (Skalak)	ED-G
PD-W (Niles)	ED-DN
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PD-E (Bollman)	OD-T (DeVos)
PD-E (Deiss)	OD-I
ED	OD-IA
ED-H	PP-M (Kowalczyk)
ED-HH	

. Ross Adams
S. Fish and Wildlife Service
rk Twain National Wildlife Refuge
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incy, IL 62301

. John Barko
tional Biological Service - EMTC
'5 Lester Drive
alaska, WI 54650-8552

. Harlan Hirt
.S. Environmental Protection Agency
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icago, IL 60604

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Mr. Doug Blodgett
LTRM, Havana Field Station
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Havana, IL 62644

Mr. Tom Beissel
Illinois Dept. of Natural Resources
2612 Locust Street
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Illinois Environmental Protection Agen
2200 Churchill Road
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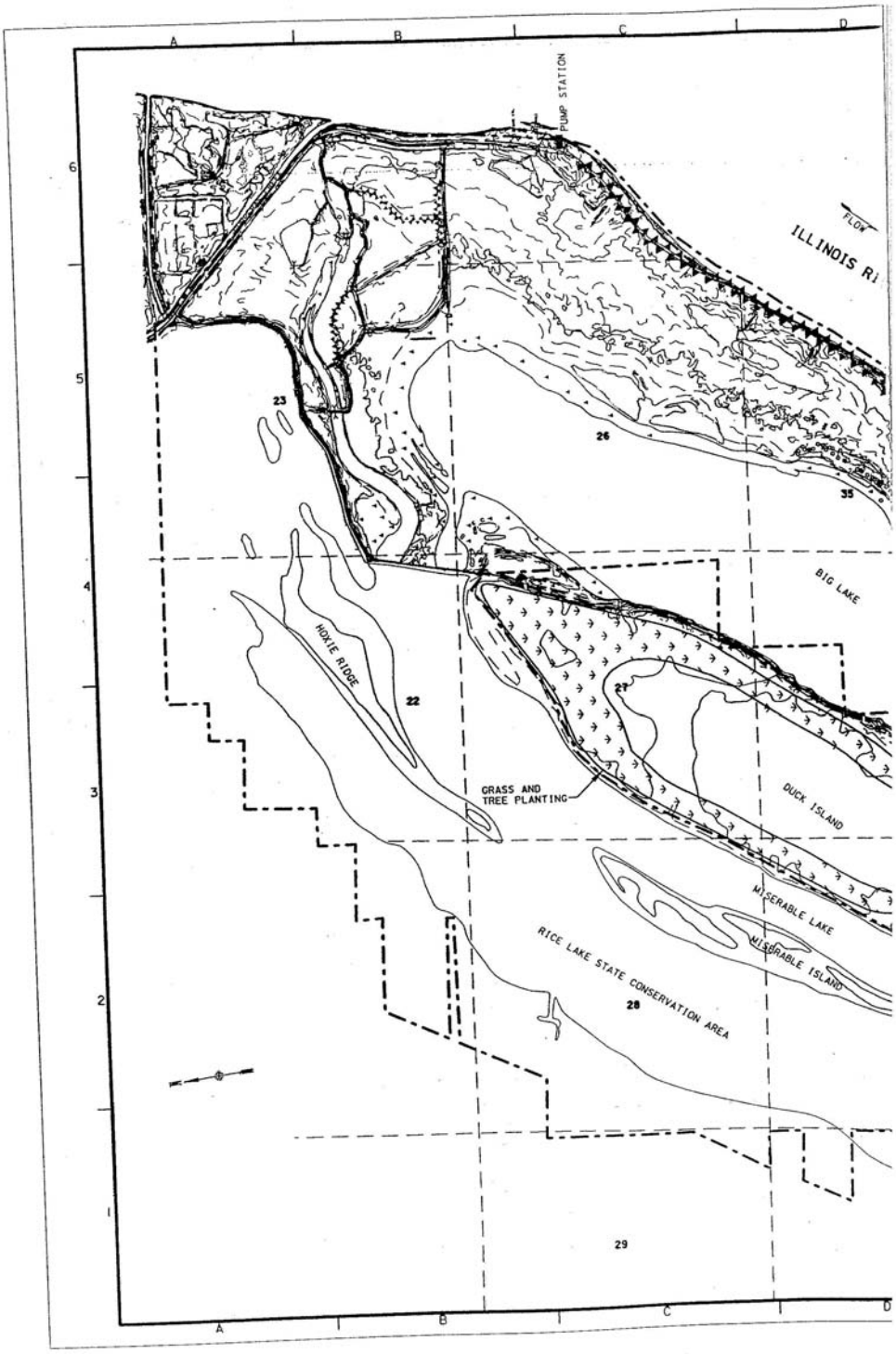
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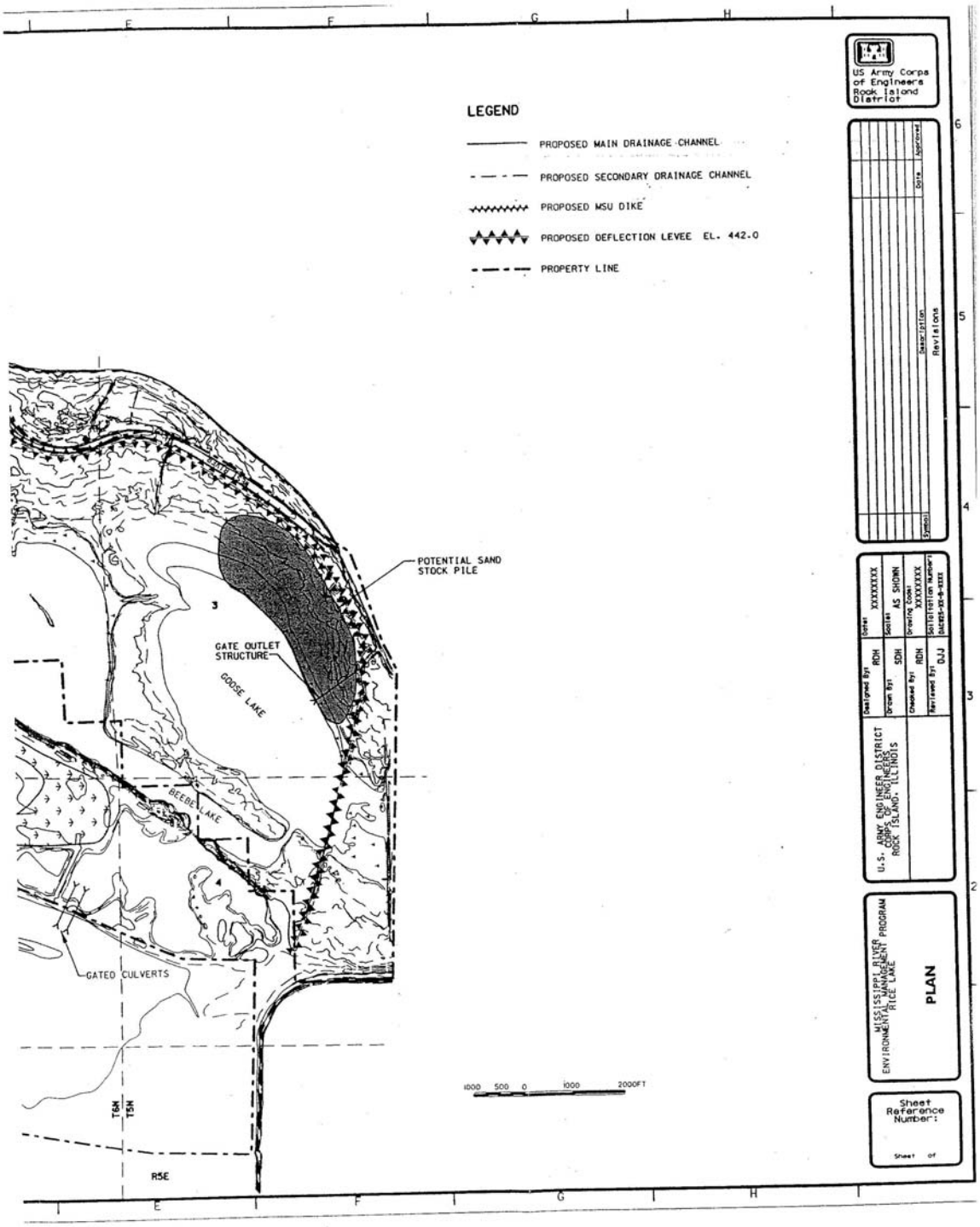
US Army Corps of Engineers Rock Island District
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PROPOSED MSU DIKE
PROPOSED DEFLECTION LEVEE EL. 442.0
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POTENTIAL SAND STOCK PILE
GATE OUTLET STRUCTURE
GOOSE LAKE
BEEBE LAKE
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Designed by RDH
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Revised by DJJ
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Drawing Code XXXXXXXX
Solicitation Number DACW25-00-B-XXXX
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS
MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM RICE LAKE
PLAN
Sheet Reference Number:
Sheet of

CENCR-PD-W(1165-2-26a) 8 June 1996

MEMORANDUM FOR RECORD

SUBJECT: Upper Mississippi River System-Environmental Management Program (UMRS-EMP) Rice Lake and Banner Marsh, Illinois, Habitat Rehabilitation and Enhancement Projects (HREP)

1. The subject meeting was held on 23 January 1996 at the Illinois Department of Natural Resources' (ILDNR) Springfield office. The following representatives from the Rock Island District (CENCR) and the ILDNR were in attendance:

Paul Kowalczyk	CENCR-PP-M	Jim Garner	ILDNR
Darron Niles	CENCR-PD-W	Jerry Beverlin	ILDNR
Charlene Carmack	CENCR-PD-E	Kirby Cottrell	ILDNR
Bob Hoffman	CENCR-ED-DN	Jim Hoffman	ILDNR
Marvin Hubbell	ILDNR	Dave Earleywine	ILDNR
Bill Douglass	ILDNR	John Ball	ILDNR

2. The purpose of the meeting was to review the Rice Lake project scope and the status of the Banner Marsh project.

3. **RICE LAKE:** The Rice Lake Complex is a 5,600 acre series of natural backwater lakes located between river miles 132.0 and 138.0 on the Illinois Waterway's right bank, 25 miles south of Peoria, Illinois. The ILDNR is the project sponsor and non-federal cost sharing partner.

4. CENCR presented a revised cost estimate of ~$3,000,000 ($896,000 previously) for the minimum features required to construct a viable project. The features include: a deflection levee at elevation 442 that would incorporate existing levees and natural high ground, a rock overflow structure at elevation 440 on the Hate Levee section of the deflection levee, an outlet structure through the Hate levee to allow gravity drainage of the project, and a pump station to provide water control (see attached map).

5. In addition to the minimum project features, the ILDNR will assess the possibility of purchasing Duck Island (1200 acres) to increase the benefits produced from the project features identified and to provide a terrestrial component to the project. The island currently hampers management efforts by dividing the Rice Lake Management Area. If purchased by the ILDNR, mast tree and warm/cool season grass planting features would be incorporated into the proposed project. Purchasing the island, now rather than later, would benefit the ILDNR because the acquisition costs incurred now would be credited toward the cost sharing requirement for the project.

6. The ILDNR will pursue additional bonding authority in response to the revised cost estimate. The current bonding of $177,000 would need to increase to between $500,000 and $750,000.

7. An additional coordination meeting at Rice Lake was proposed for 5 February 1996 to review updated cost estimates and refine the proposed project features. The ILDNR will discuss the results of this meeting internally before deciding whether to pursue purchasing Duck Island or recommending an alternate plan.

8. The current schedule for Rice Lake Definite Project Report (DPR) preparation and project construction is as follows:

Draft DPR	November 1996*
Public Review Draft DPR	January 1997
Final DPR to CENCD	March 1997
Construction Approval	November 1997*
Complete Plans and Specs	January 2000*
Contract Award	August 2000*
Complete Construction	September 2002

* Schedule changes since 5 February 1996 meeting.

9. **BANNER MARSH:** The final DPR is being reviewed by HQUSACE before being forwarded to ASA(CW) for approval (received 28 May 1996). Preliminary indications are that the report looks good and will be approved soon. However, due to budgetary difficulties awarding of the construction contract has been delayed until June 1999.

10. Since project construction will be delayed, the ILDNR will pursue a Section 215 agreement in advance of the EMP project as a solution to the immediate repairs needed for sections of the perimeter levee. Once construction is initiated, the ILDNR would receive credit toward their cost sharing requirement for the advance work performed. The ILDNR currently has ~$1.1 million available for this work. CENCR would supply the plans and specs for the levee repair effort. CENCR-ED-DN will also give the ILDNR a cost estimate for repairing the worst levee sections.

11. **OTHER TOPICS:**

a. Performance Evaluation (PE) Reports: CENCR requested that the ILDNR forward pertinent data associated with EMP projects for inclusion in future PE reports, especially biological information (CENCR performs physical parameter monitoring). The ILDNR said they would pursue this with their personnel and the LTRM field stations.

b. Dedication Ceremonies: CENCR personnel stated that they would support the ILDNR if they wanted to hold dedication ceremonies at the recently completed projects (Andalusia Refuge, Peoria Lake, or Potters Marsh). The ILDNR said they may have an interest in arranging these, but could not commit to them at this time.

DARRON NILES
Waterway Systems Branch

Encl

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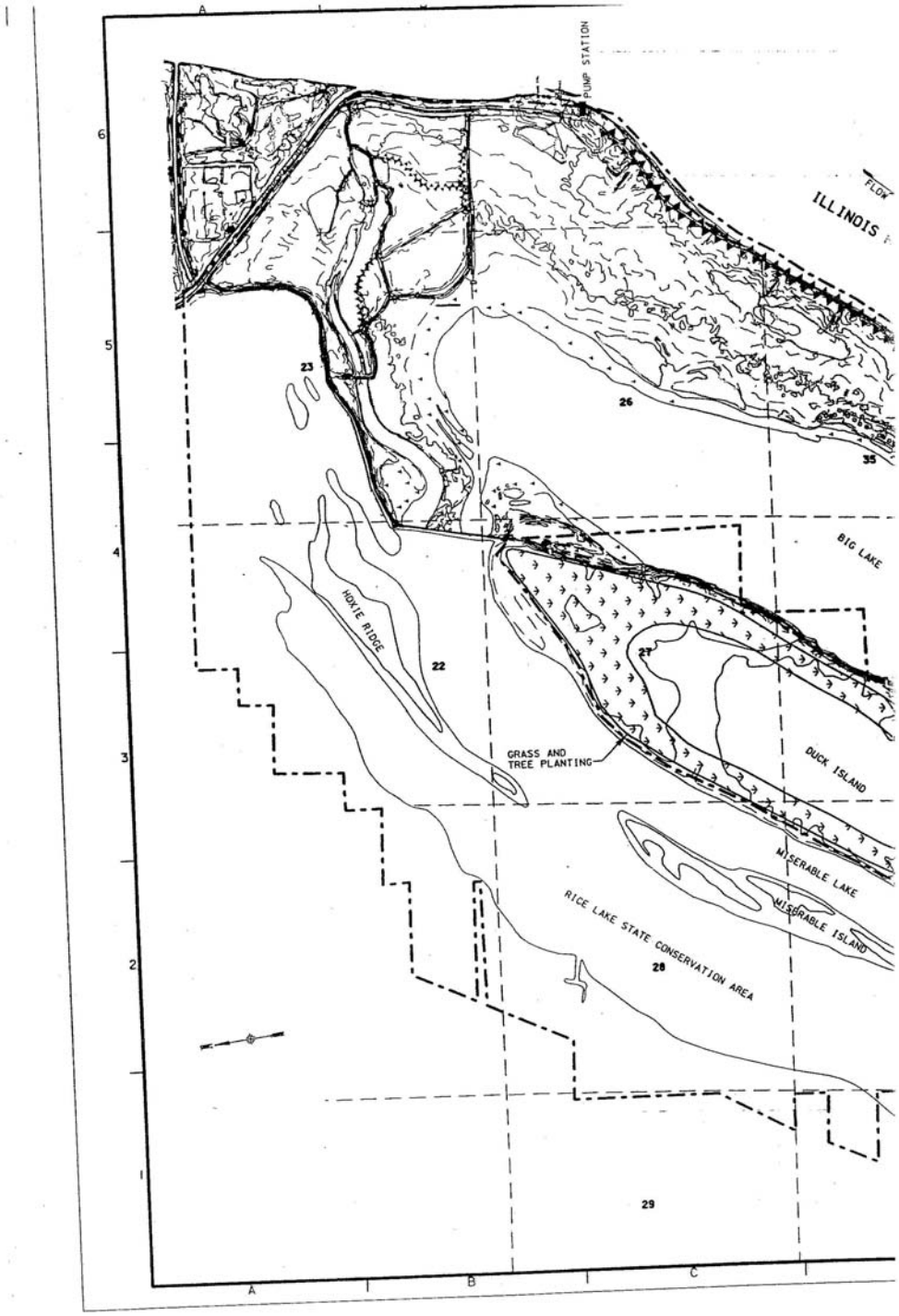
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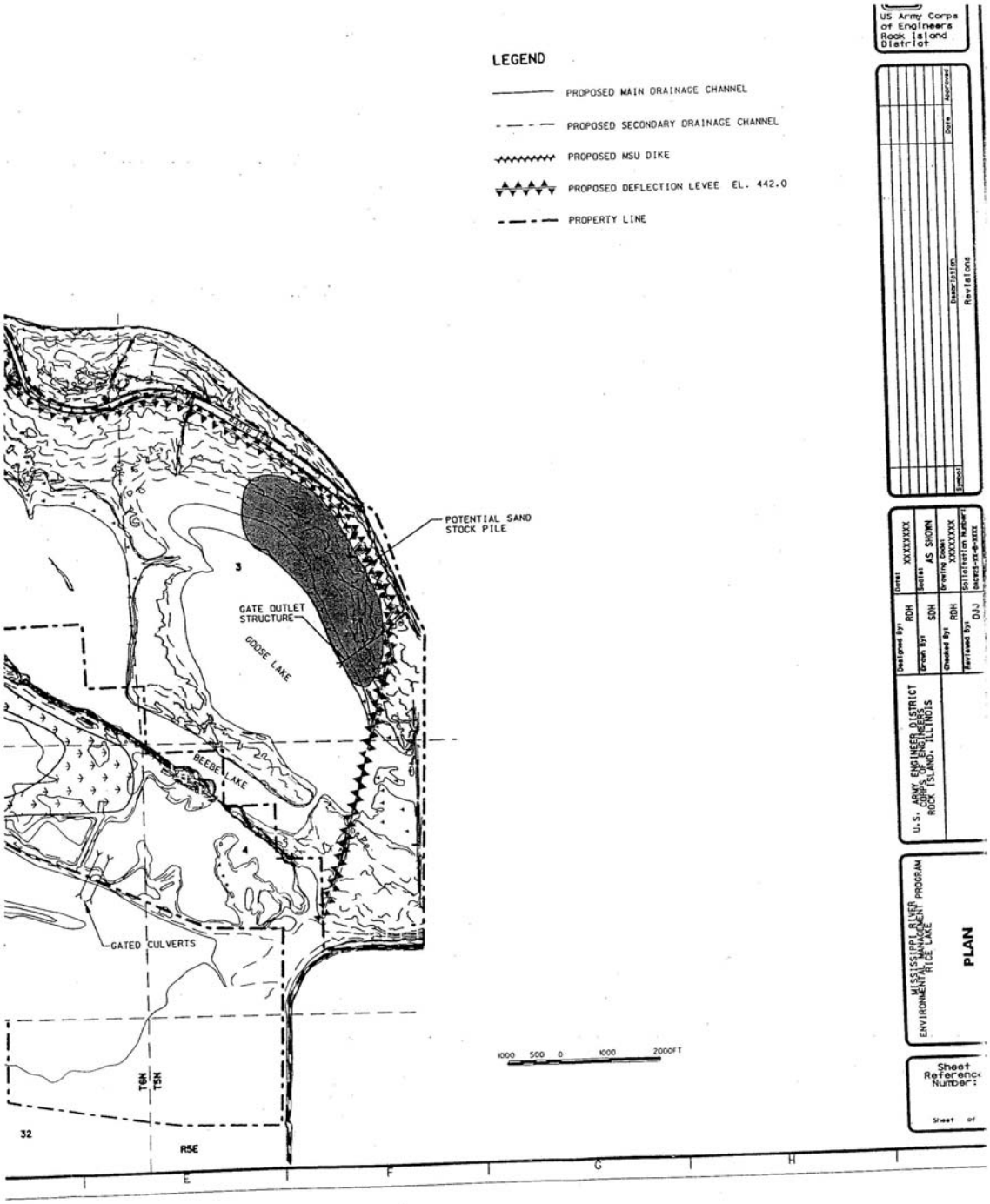
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Drawn By SDH
Checked By RDH
Reviewed By DJJ
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MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM
RICE LAKE
PLAN
Sheet Reference Number:
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DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING — P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

September 9, 1996

Planning Division

SEE DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is currently preparing a Definite Project Report (DPR) with Environmental Assessment (EA) for the rehabilitation of Rice Lake State Fish and Wildlife Area (SFWA), Illinois. Rice Lake has been funded for design as a Habitat Rehabilitation and Enhancement Project of the Upper Mississippi River System - Environmental Management Program under authority of the Water Resources Development Act of 1986. In accordance with the provisions of Section 906(e) of the Water Resources Development Act of 1986 (Public Law 99-662), cost sharing for general design and construction would be 75 percent Federal/25 percent non-Federal. The non-Federal sponsor for this project would be the Illinois Department of Natural Resources (ILDNR).

The Rice Lake SFWA is a 5,592-acre complex of natural backwater lakes and wetlands located on the right descending bank of the Illinois River between River Mile 132 and 138, in Fulton County, Illinois (see enclosed location map). The project area is owned by the State of Illinois and is managed as a conservation area. The historically excellent mid-migration waterfowl and aquatic habitat has declined in recent years as a result of sedimentation.

The overall goal of the Habitat Rehabilitation and Enhancement Project for the Rice Lake SFWA is the restoration of wetland habitat. The following objectives have been identified to meet the restoration goal: (1) increase the rate of success of submergent/emergent aquatic vegetation; (2) increase food and shelter for wildlife; (3) provide egress for fish from Rice Lake during drawdown periods; and (4) improve bottomland hardwood and native cool season grass diversity and quality. Several rehabilitation measures to meet the identified objectives will be addressed and evaluated in the DPR and EA. These measures are shown on the enclosed preliminary plan and described in the following paragraphs:

a. Reestablishment of the existing Hate Levee at the downstream end of the project area and construction of a low level deflection dike along the riverward perimeter of the project area. This measure would increase the rate of success of submergent/emergent vegetation and provide more reliable food production for migratory birds.

b. Excavation of channels, construction of low level dikes, construction of a pump station, and construction of an outlet structure in the northeastern portion of the project area currently managed for production of moist soil vegetation. These measures would increase the ability to manage water levels in the area and improve habitat for herons, egrets, and shorebirds at critical times during the year.

c. Construction of gated culverts for fish egress from Rice Lake. This measure would increase the availability of deepwater habitat to fish in the project area and reduce fish kills related to the drawdown of Rice Lake, thereby reducing the occurrence of avian botulism which has been a serious problem in Rice Lake. Implementation of this measure and the measure described in paragraph (d) below would require the ILDNR to purchase lands or easements on Duck Island, a private inholding within the SFWA.

d. Planting mast producing trees such as pin oak, bur oak, swamp white oak, pecan, and sycamore, and cool season grasses on Duck Island. This measure would improve habitat value for wildlife by increasing the occurrence of mast-producing trees in the project area which is currently dominated by silver maple and cottonwood.

The overall effect of the project is expected to be beneficial to wetland habitat with no significant adverse impacts to the quality of the human environment. While construction of project features will initially affect some existing habitat within the project area, anticipated increases in habitat values throughout the area should offset any negative impacts. The proposed project will be compatible with the Natural Resources Management Plan developed by the ILDNR for the Rice Lake SFWA. Because several of the potential project features would require placement of fill material into waters of the U.S., the project will require processing under Section 404 of the Clean Water Act.

We request your preliminary comments concerning the proposed project within 30 days of the date of this letter. Additional opportunities to comment will be provided as part of our processing of the draft and public review DPR's for the subject project. Distribution of these documents is currently scheduled for November 1996 and February 1997, respectively.

If you have any questions or need additional information, please call Ms. Charlene Carmack of our Environmental Analysis Branch, telephone 309/794-5570. Written comments may be sent to our address above, ATTN: Planning Division (Charlene Carmack).

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

Copies Furnished:

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Mr. Marvin Hubbell
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Mr. Dennis Kennedy
Senior Water Resources Engineer
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Office of Water Resources
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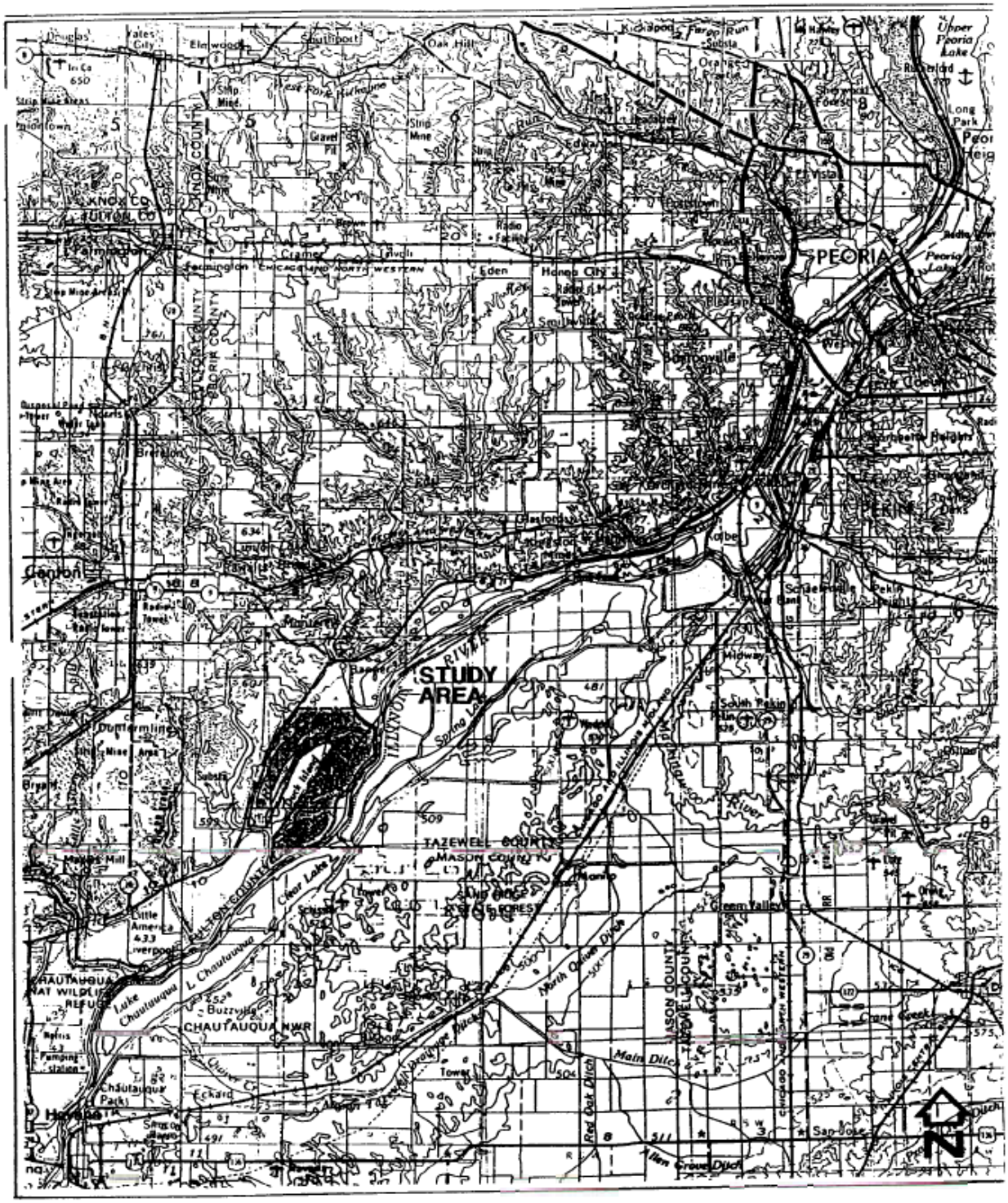
P.O. Box 19484
Springfield, Illinois 62794



LOCATION MAP

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

REPLY TO
ATTENTION OF:

September 10, 1996

Planning Division (1165-2-26a)

Mr. Harold Hassen
Illinois Department
of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Hassen:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed the Scope of Work (SOW) for a Phase I Intensive Archeological Survey for Historic Properties for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The SOW was awarded to Illinois State Museum, Springfield, Illinois. The SOW may be useful in your department's review and comment on our reports, necessary in meeting our requirements promulgated under Section 106 of the National Historic Preservation Act of 1966, as amended.

If you should have questions concerning the Rice Lake Complex HREP or the Phase I archeological survey and contract, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
P. BURKE

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

Copies Furnished:

Ms. Anne Haaker
Deputy State Historic
  Preservation Officer
Illinois Historic
  Preservation Agency
Old State Capitol
Springfield, Illinois 62704 (wo/enclosure)

Mr. Michael Wiant
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/enclosure)

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

REPLY TO
ATTENTION OF

September 10, 1996

Planning Division (1165-2-26a)

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

Dear Ms. Haaker:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed the Scope of Work (SOW) for a Phase I Intensive Archeological Survey for Historic Properties for the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

The SOW was awarded to Illinois State Museum, Springfield, Illinois. The SOW may be useful in your agency's review and comment on our reports and in meeting our requirements promulgated under Section 106 of the National Historic Preservation Act of 1966, as amended.

If you should have questions concerning the Rice Lake Complex HREP or the Corps' Phase I archeological survey and contract, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

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Chief, Planning Division

Enclosure

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Springfield, Illinois 62701-1787 (wo/enclosure)

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Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/enclosure)

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

REPLY TO
ATTENTION OF:

October 11, 1996

Planning Division

Mr. Robert McLeese
State Soil Scientist
U.S. Department of Agriculture
Natural Resource
Conservation Service
1902 Fox Drive
Champaign, Illinois 61820

Dear Mr. McLeese:

The Rock Island District of the U.S. Army Corps of Engineers is currently preparing a Definite Project Report (DPR) with Environmental Assessment (EA) for the rehabilitation of Rice Lake State Fish and Wildlife Area (SFWA), Illinois. Rice Lake has been funded for design as a Habitat Rehabilitation and Enhancement Project of the Upper Mississippi River System - Environmental Management Program under authority of the Water Resources Development Act of 1986.

In accordance with the provisions of Section 906(e) of the Water Resources Development Act of 1986 (Public Law 99-662), cost sharing for general design and construction would be 75 percent Federal/25 percent non-Federal. The non-Federal sponsor for this project would be the Illinois Department of Natural Resources (ILDNR).

The Rice Lake SFWA is a 5,592-acre complex of natural backwater lakes and wetlands located on the right descending bank of the Illinois River between River Mile 132 and 138, in Fulton County, Illinois (see Enclosure 1). The project area is owned by the State of Illinois and is managed as a conservation area.

The overall goal of the Habitat Rehabilitation and Enhancement Project for the Rice Lake SFWA is the restoration of wetland habitat. The following objectives have been identified to meet the restoration goal: (1) increase the rate of success of submergent/emergent aquatic vegetation; (2) increase food and shelter for wildlife; (3) provide egress for fish from Rice Lake during drawdown periods; and, (4) improve bottomland hardwood and native warm season grass diversity and quality.

Several measures to accomplish these objectives are currently being evaluated for the DPR. Measures to fully accomplish objectives 2, 3, and 4 above would require acquisition by the ILDNR of the Duck Island property. This property was identified in the ILDNR's 1989 Natural Resource Management Plan for the Rice Lake SFWA as a top priority for acquisition.

The Duck Island peninsula is located in portions of Sections 27, 28, 33, and 34, Township 6 North, Range 5 East, and a portion of Section 4, Township 5 North, Range 5 East, Fulton County, Illinois. This privately owned inholding is surrounded on all sides by the Rice Lake SFWA, with the exception of a narrow corridor bordering the access road. The total area of the property that would be acquired is approximately 1,200 acres. Approximately 600 acres of this property is leased for farming. The remaining acreage is a combination of open water areas in Big Lake, wooded areas, and a gravel quarry at the southern end of the peninsula.

Potential habitat enhancement features being evaluated include planting mast producing trees and warm season grasses on approximately 300 acres of the farmed land. The remaining farmed land, approximately 300 acres, would continue to be managed under agricultural leases and would not be converted to wildlife habitat.

Draft soil survey maps provided by the Lewistown District office are enclosed as Enclosures 2 and 3. Additional soil survey information was provided by the Jacksonville District office (Enclosure 4).

By submittal of the enclosed Form AD-1006 (Enclosure 5), we request a determination from your office as to whether the proposed project site contains farmland subject to the provisions of the Farmland Protection Policy Act of 1981. The DPR and EA being prepared for this action will be provided to your office for review.

We request that you return the completed Form AD-1006 to us within 45 days of the date of this letter.

If you have any questions, please call Ms. Charlene Carmack of our Environmental Analysis Branch, telephone 309/794-5570. Written comments may be sent to our address above, ATTN: Planning Division (Charlene Carmack).

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosures

Copies Furnished:

Mr. Bill Douglass
Illinois Department of Natural Resources
Rice Lake State Fish and Wildlife Area
R.R. 3, Box 91
Canton, Illinois 61520 (w/enclosures)

Mr. James Hartwig
Illinois Department of Agriculture
Division of Natural Resources
State Fairgrounds
P.O. Box 19281
Springfield, Illinois 62794 (w/enclosures)

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request: October 11, 1996
Name Of Project: Rice Lake State Fish and Wildlife Area	Federal Agency Involved: U.S. Army Corps of Engineers, Rock Island
Proposed Land Use: State Conservation/Refuge Area	County And State: Fulton County, Illinois
PART II *(To be completed by SCS)*	Date Request Received By SCS: 10-24-96

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply — do not complete additional parts of this form).* Yes ☒ No ☐		Acres Irrigated: —	Average Farm Size: 321
Major Crop(s): Corn, Soybeans, Wheat, Hay	Farmable Land In Govt. Jurisdiction Acres: 29,633,500 % 97	Amount Of Farmland As Defined in FPPA Acres: 27,695,900 % 91	
Name Of Land Evaluation System Used: Illinois	Name Of Local Site Assessment System: Statewide	Date Land Evaluation Returned By SCS: 11-5-96	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	300			
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	1200			
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	290			
B. Total Acres Statewide And Local Important Farmland	10			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	0.001			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	56.9			
PART V *(To be completed by SCS)* Land Evaluation Criterion: Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	81			

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	20			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	10			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	10			
9. Availability Of Farm Support Services	5	3			
10. On-Farm Investments	20	10			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	5			
TOTAL SITE ASSESSMENT POINTS	160	128			
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	81			
Total Site Assessment *(From Part VI above or a local site assessment)*	160	128			
TOTAL POINTS *(Total of above 2 lines)*	260	209			

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☒ No ☐

Reason For Selection:

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

REPLY TO
ATTENTION OF

November 29, 1996

Planning Division (1165-2-26a)

Mr. Harold Hassen
Chief Archeologist
Illinois Department
of Conservation
Lincoln Tower Plaza, Room 310
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Hassen:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has been coordinating with the Department of Natural Resources concerning the Rice Lake Complex Habitat Rehabilitation and Enhancement Project (HREP). The HREP is a part of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

Coordination with your agency is promulgated under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. In compliance with NHPA, the Corps contracted a Scope of Work (SOW) with the Illinois State Museum, Springfield, Illinois, to conduct a Phase I survey for historic properties. The SOW was provided to your agency to aid in review and comment on our reports.

The attached draft report (Attachment 1) is provided for your review and comment. The report, entitled Phase I Intensive Archaeological Survey for Historic Properties Within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central, Illinois--Draft (archeology draft report), dated November 1996, was prepared by the Illinois State Museum, Springfield, Illinois, under Corps Indefinite Quantities Contract Number DACW25-93-D-0014, Delivery Order Number 17. Page 25 of the archeology draft report documents 27 archaeological sites, including 7 prehistoric isolates finds, 14 prehistoric sites, 1 historic site, and 5 mixed component historic and prehistoric sites, and that 4 of these sites are potentially eligible to the National Register of Historic Places (Site 11F2745, Site 11F2746, Site 8, and Site 23).

Following the recommendations of the report, the Corps will provide a 30-meter easement along the perimeter of Sites 11F2745, 11F2746, Site 8, and Site 23, so that (1) the planting of trees with power planters does not impact the four sites and (2) the roots of future mature trees do not grow into the sites (p. 25).

The Corps has determined that the Copperas Creek Lock is individually eligible for listing to the National Register of Historic Places (NRHP) under Criteria A and C. This lock was constructed by the Corps and the State of Illinois between 1873 and 1877 as part of the Illinois River navigation improvement and is presently owned by the city of Canton, Illinois. The history and significance of this lock and the NRHP eligible Multiple Property Chicago to Grafton, Illinois, Navigable Water Link, 1836-1945, is extensively documented in the Corps' June 1996 report entitled Architectural and Engineering Resources of the Illinois Waterway Between 130th Street in Chicago and La Grange, Volume I (architectural draft report) prepared by American Resources Group Ltd., Carbondale, Illinois, under Indefinite Quantities Contract Number DACW25-93-D-0012, Delivery Order Number 23. A copy of the draft architectural report has been provided for your files and your agency concurred with the findings by letter dated November 4, 1996 (Attachment 2).

Two separate locations have been studied for the location of the proposed Rice Lake UMRS-EMP Pump Station. The preferred location is located approximately 100 meters from the closest point of the Copperas Creek Lock and buffered by mature trees and undergrowth (Attachment 3). Those significant characteristics of the Copperas Creek Lock under Criteria A and C (as documented within the architectural draft report) will remain. The primary visual boundaries of the lock are between the ground surface and waterline, while the proposed Pump Station will be visually hidden from Copperas Creek Lock by vegetation, an unobtrusive color to blend into surrounding vegetation, and have a low profile well below extant tree height.

By applying the Criteria of Effect under 36 CFR Part 800.9(a): "Protection of Historic Properties," the Corps determines that **No Effect** to the NRHP eligible Copperas Creek Lock would occur from the construction of the Rice Lake Complex HREP Project and Pump Station.

Please provide your comments or concurrence with the recommendations and findings of this archeological draft report, as promulgated under Section 106 of the NHPA, and determination of **No Effect** pursuant to 36 CFR Part 800.5(b). If no comments

or objections are made within 30 days after receipt of this letter, the Corps will assume your concurrence with the findings, recommendations and determination, and proceed with the Rice Lake Complex HREP, as proposed.

If you should have questions concerning the Rice Lake Complex HREP, the Corps' Phase I archeological survey and contract, or the determination of **No Effect** to the NRHP eligible Copperas Creek Lock, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

ORIGINAL SIGNED BY
P. BURKE

Dudley M. Hanson, P.E.
Chief, Planning Division

Attachments

Copies Furnished:

Ms. Anne Haaker
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704 (wo/attachments)

Mr. Bill Douglas
Site Manager
Rice Lake State Fish and Wildlife Area
19721 North U.S. 24
Canton, Illinois 61520 (wo/attachments)

Mr. Michael Wiant
Museum Director
Illinois State Museum
Research and Collections Lab
1920 South 10 1/2 Street
Springfield, Illinois 62703 (wo/attachments)

Copies Furnished (Continued):

Mr. Robert Anderson
City Engineer
6 East Elm Street
Canton, Illinois 61520 (wo/attachments)

Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (wo/attachments)

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

REPLY TO
ATTENTION OF

November 29, 1996

Planning Division (1165-2-26a)

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

Dear Ms. Haaker:

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Please provide your comments or concurrence with the recommendations and findings of this archeological draft report, as promulgated under Section 106 of the NHPA, and determination of **No Effect** pursuant to 36 CFR Part 800.5(b). If no comments

or objections are made within 30 days after receipt of this letter, the Corps will assume your concurrence with the findings, recommendations and determination, and proceed with the Rice Lake Complex HREP, as proposed.

If you should have questions concerning the Rice Lake Complex HREP, the Corps' Phase I archeological survey and contract, or the determination of **No Effect** to the NRHP eligible Copperas Creek Lock, please call Mr. Ron Deiss of our Environmental Analysis Branch, telephone 309/795-5185, or write to our address above, ATTN: Planning Division (Ron Deiss).

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Attachments

Copies Furnished:

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Illinois Department of Conservation
Lincoln Tower Plaza, Room 310
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Mr. Donald Edwards
Mayor
City Hall
210 East Chestnut
Canton, Illinois 61520 (wo/attachments)

Illinois Historic Preservation Agency

1 Old State Capitol Plaza • Springfield, Illinois 62701-1507 • (217) 782-4836 • TTY (217) 524-7128

Fulton County
Rice Lake State Conservation Area
COERi-Rice Lake Habitat Rehabilitation and Enhancement Project (HREP)-Upper Mississippi River System-Environmental Management Program (UMRS-EMP)
Copperas Creek Lock; Site 11F2746, Site 11F2745, Site 8, Site 23
DACW25-93-D-0014
IHPA Log #04120596, #961205001P-F

December 6, 1996

Dudley Hanson, P.E., Chief, Planning Div
Department of the Army
Rock Island District, Corps of Engineers
Clock Tower Bldg., P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Mr. Hanson:

We have reviewed the referenced project. The Copperas Creek Lock is eligible for listing on the National Register of Historic Places. Archaeological Site 11F2745, Site 11F2746, Site 8 and Site 23 are potentially eligible for listing on the National Register.

In our opinion the project, as proposed, will have no effect on sites or structures eligible or potentially eligible for listing on the National Resgister of Historic Places. Specifically, the proposed pump station construction near Copperas Creek Lock as outlined in your November 29, 1996 letter will not affect those qualities which make the structure eligible.

Additionally, the avoidance of Archaeological Site 11F2745, Site 11F2746, Site 8 and Site 23, as recommended in the draft "Phase I Intensive Archaeological Survey for Historic Properties within the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) for the Rice Lake State Conservation Area, Fulton County, West-Central Illinois," will have no effect on these sites which may be potentially eligible for listing on the National Register of Historic Places.

We, therefore, have no objection to the undertaking proceeding as planned. Should the project be modified from what is now proposed, please let our office know so that we may reassess any impacts to historic properties.

When the final report is sent to our office it should contain the appropriate State site file numbers throughout the text and tables. Also, the recommendations section should contain a table indicating the National Register eligibility recommentations (i.e., eligible, potentially eligible, not eligible) for all 27 archaeological sites.

A copy of this letter should be kept on file as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

If you have any questions regarding the lock please contact Ms. Tracey A. Sculle, Cultural Resources Manager, at 217/785-3977. Any questions regarding the archaeological sites and the final report should be addresed to Mr. Joseph S. Phillippe, Staff Archaeologist, at 217/785-1279.

Sincerely,

Anne E. Haaker
Deputy State Historic
Preservation Officer

AEH:TAS

cc: Ron Deiss, COE-Rock Island District
Dr. Harold Hassen, IDNR
Dr. Dale Henning, Illinois State Museum

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office (ES)
4469 - 48th Avenue Court
Rock Island, Illinois 61201

COM: 309/793-5800
FAX: 309/793-5804

February 24, 1997

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

Dear Colonel Cox:

This letter constitutes our draft Fish and Wildlife Coordination Act (FWCA) report for the Rice Lake State Fish and Wildlife Area Habitat Rehabilitation and Enhancement Project (HREP) in LaGrange Pool, Illinois River, Fulton County, Illinois. It has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat.401, as amended; 16 U.S.C. 661 et seq.); the Endangered Species Act of 1973, as amended; and in accordance with the Fish and Wildlife Service's Mitigation Policy.

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

DESCRIPTION OF THE PROJECT AREA

The study area is located adjacent to the right descending bank of the Illinois River between river miles 132.5 and 138 near the town of Banner, Illinois. Presently, the 5,592-acre area is owned in fee title and managed by the Illinois Department of Natural Resources. However, a large private land inholding, known as Duck Island, is situated in the middle of the state-owned lands. Primarily an upland agricultural area that is intensively farmed, Duck Island contains a gravel quarry pit with over 150 acres of deeper water suitable to support fish. The State is currently negotiating with the landowners to purchase the island outright. Upon acquisition of Duck Island the total acreage of the Rice Lake State Fish and Wildlife Area would exceed 6000 acres.

As an actively managed state fish and wildlife complex, Rice Lake provides a unique and diverse wildlife area with importance to resident and migrating waterfowl. Located adjacent to the Banner Marsh State Fish and Wildlife Area, the Rice Lake area compliments the deeper water habitats of Banner Marsh with several thousand acres of shallow water habitats that can be manipulated seasonally. Over eleven thousands acres of critical migratory bird habitat are under management by the State between the two sites. Fish and wildlife habitats at Banner Marsh are currently being restored under a similar HREP project initiated several years ago.

PROJECT OBJECTIVES

The goals of the Rice Lake HREP are to rehabilitate, enhance, and protect aquatic, forested and nonforested wetlands, and upland and grassland habitats for the benefit of resident and migratory birds. Both upland game and nongame species will benefit from increased habitat diversity and better management capabilities on site. These goals will be accomplished through a combination of construction features and management practices. Specifically, an increase in nesting and brood habitat as well as feeding and loafing areas for migratory birds is a priority. Creation of a deep-water refuge will provide for an improved fishery resource and reduce the incidence of avian botulism which is of great concern. Increased diversity of the area for resident upland species populations like deer, turkey, and pheasant will be enhanced through the combination of grassland and hardwood plantings described below. In addition, the integrity and reliability of the entire marsh complex will be improved by upgrading the existing dike system.

METHODOLOGY

Habitat analysis of existing study area conditions, future conditions without the project and impacts of the several proposed alternatives and increments was accomplished using the Wildlife Habitat Appraisal Guide (WHAG) procedures developed by the Missouri Department of Conservation and the USDA Natural Resources Conservation Service. This analysis employed a multi-agency team approach with representatives from the Corps of Engineers, the Illinois Department of Natural Resources, the Illinois Natural History Survey, as well as the Service.

The WHAG analysis is a numerical system for evaluating the quality and quantity of particular habitats for species selected by the WHAG team members. The qualitative component of the analysis is known as the habitat suitability index (HSI) and is rated on a 0.1 to 1.0 scale. The suitability of a given habitat type for a set of evaluation species is determined by the qualitative characteristics of the habitat type. The WHAG procedures include the use of limiting factors, habitat requirements for an individual species during a critical time of year. Absence of one or more habitat characteristics makes the habitat unsuitable and results in the lowest HSI value of 0.1. The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected target species. From the qualitative and quantitative

determinations, the standard unit of measure, the Habitat Unit (HU), is calculated using the formula (HSI x Acres = HU's).

Existing habitat conditions were evaluated on-site by the team, whereas future conditions with and without the project were estimated using the expertise of team members. The team considered wetland and upland habitats and both game and nongame species aspects of the project. Target species were selected to represent groups of species to be able to focus in on, and evaluate, the goals and objectives of the project. Several planning iterations were required as the project evolved and engineering data was refined.

For project planning and impact analysis, project life was established as 50 years. To facilitate comparison, target years were established at 0 (existing conditions) 1, 25 and 50 years. Habitat suitability indices (HSI) and average annual habitat units (AAHU's) for each evaluation species were calculated to reflect expected habitat conditions over the life of the project.

THREATENED AND ENDANGERED SPECIES

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

Therefore, we are furnishing you the following list of species which may be present in the concerned area:

Classification	Common Name	Scientific Name	Habitat
Endangered	Bald eagle	Haliaeetus leucocephalus	Winters along major rivers and reservoirs
Threatened	Decurrent false aster	Boltonia decurrens	disturbed alluvial soil

The bald eagle winters in the Illinois River valley regularly. Eagles are present in the Rice Lake area from late September or early October through April. Both diurnal perching/loafing and night roosting areas have been documented in the complex. Avoiding impacts to the night roost areas and minimal clearing of the larger perch trees used by the eagles during the day is recommended. In addition, construction activities will need to be considerate of the seasonal window from late September to late April when eagles are using the Rice Lake area.

Construction activities will need to be scheduled to avoid disturbance of the eagles, especially at the night roost sites.

The decurrent false aster has been documented within the Rice Lake project area with one location containing a population of 250-300 plants. Other sites containing lesser numbers of the plant are also documented. The species is somewhat opportunistic, responding to periodic flood events to colonize an area. It is possible that new populations will be discovered depending on future hydrologic cycles and the disturbance of soil as a result of construction activities. Known populations of decurrent false aster must be avoided during construction of the project and if new populations are discovered during construction, additional coordination with this agency is mandatory at that time.

With consideration of the above recommendations the proposed project will not negatively affect these species or their habitats and this precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should this project be modified or new information indicate endangered species may be affected, consultation should be initiated.

EXISTING FISH AND WILDLIFE RESOURCES

For the purpose of evaluation, the study area was categorized according to the following habitat types: wetland, upland and aquatic. These habitat types were further subdivided into the following categories: nonforested wetland, upland hardwoods, cropland, and grassland. Table (1) presents the acreage calculations of existing habitat types.

Table 1. Rice Lake HREP existing habitat types and acreage.

Wetland habitat type	Acres
Aquatic (deep water)	0
Non-forested wetland	3054

Upland habitat type	Acres
Upland hardwoods	0
Cropland	600
Grassland	0

The results of the WHAG analysis for existing conditions indicate a broad range of values for the evaluation species, reflective of the variety of habitat requirements for those species (Table 2).

Table 2. Rice Lake HREP existing habitat suitability and corresponding Habitat Unit values.

SPECIES	HSI	HU
Mallard	0.10	0.00
Canada goose	0.10	0.00
Least bittern	0.71	2117.00
Lesser yellowlegs	0.59	1797.00
Muskrat	0.29	867.00
King rail	0.10	0.00
Green-backed heron	0.69	2253.00
Fox squirrel	0.00	0.00
White-tailed deer	0.64	385.00
Turkey	0.00	0.00
Dickcissel	0.00	0.00
Bluebird	0.00	0.00
Bobwhite quail	0.11	864.00
Cottontail rabbit	0.10	0.00
Indigo bunting	0.00	0.00
Ring-necked pheasant	0.50	1635.00
Wood thrush	0.00	0.00
Kentucky warbler	0.00	0.00
Catfish	0.10	0.00
Crappie	0.10	0.00
Largemouth bass	0.10	0.00
Gizzard shad	0.10	0.00
Common carp	0.10	0.00
Bluegill	0.10	0.00
Black bullhead	0.10	0.00

The habitat values calculated using the WHAG matrix are consistent with past field data collected at the project site. The mixture of habitats within the marsh fulfill the life of many resident and nonresident wildlife species as is reflected by the wide range of habitat values of the above target species. However, an HSI value of 0.1 is calculated by the model when a critical component of a species' life requisite is absent. A corresponding "0" numerical value is then indicated in the Habitat Unit column, but this does not mean that those species represented by that particular target species are not present in the project area. Instead, it is indicative that the habitat is less than suitable for that group of species as will be discussed below.

FUTURE WITHOUT PROJECT

The No Federal Action alternative is the future without the project condition with the Rice Lake marsh complex continuing to function primarily as floodplain wetland, with minor successional changes occurring over time. The area will be actively managed with the existing pump facility, but there would be no new construction under this alternative. Another critical component of the continued success of the marsh complex, the protective dike system, will be subjected to further degradation over time, jeopardizing management of the entire complex. The without project values that have been calculated for this analysis assume that the dike system remains intact over the next 50 years. Erosional forces of the Illinois River at flood stages further degrade the protective dike system each year, increasing the potential for failure at some point in the future. The loss of the protective dike system would permanently alter the habitat types and water regime of the Rice Lake complex subjecting the area to the flooding and sedimentation of the Illinois River. Habitat values projected under this scenario would be much lower, reflecting the overall negative impacts that would result without the afforded protection of the dike. In addition, the lack of deep water for fish refuge will result in continued fish kills which have caused recurrent avian botulism outbreaks at Rice Lake.

FUTURE WITH PROJECT

Enhancement options at the project site included increasing the quality of existing habitat types, increasing the acreage of a particular habitat type(s), or a combination of both. Several alternatives were evaluated using the WHAG methodology to determine the best management of the habitat types in project area. To meet the overall goal of increasing the reliability of mid-migration habitats for migratory birds, continued active management of the area was evaluated. This included evaluating the existing degree of flood protection, the current water control and pumping facilities as well as improved pumping capacity to flood additional acreage in the fall after desired vegetation has matured. One of the primary objectives is to ensure the future value of the Rice Lake area by protecting it with a reliable dike system. Secondly, a goal of increasing the quality and acres of habitat for fish and waterfowl, dabbling ducks in particular, was identified.

Thirdly, the overall diversity of habitats in the area would be increased through acquisition of Duck Island. The island's croplands would be converted to native grasses (the prairie ecosystem is all but lost in Illinois) and plantings of hardwood mast producing trees. In addition, a deep water fish refuge would be created in the gravel pits to reduce the number of fish kills occurring in Rice Lake during low water drawdowns.

Proposed Array of Options Considered:

- Water control dike upgrade with gated outlet and rock weir overflow.

This option involves the necessary upgrade of the perimeter dike system with dredged sand from the Illinois River channel and/or selective excavation of borrow from the interior of the marsh. Two alternatives of upgrading the dike were considered: (1) top of dike at elevation 440 with the spillway at elevation 438 and (2) top of dike at elevation 442 with the spillway at elevation 440. The rock spillway structure will be constructed at the lower end of Rice Lake, on top of an existing deteriorated cross-dike known locally as the hate levee. During higher flood pulses on the Illinois River, the spillway will allow the river to flood Rice Lake gradually from the downstream end of the area, equalizing the water level on both sides of the dike before it overtops the dike. This will reduce damage to the dike and the interior marsh during major flood events. To facilitate drawdown of the Rice Lake complex two 5-foot diameter gated culverts will be installed in the dike near Goose Lake. The culverts will be gravity fed and only function when the Illinois River level is lower than the water level in the marsh.

- Improved pumping capacity and network of distribution channels.

Several alternatives were considered for improving the ability to control water levels and distribute water throughout the Rice Lake wetland habitats. The existing pump station could be abandoned and a new pump station constructed above the old Copperas Creek lock. The new station would be a larger capacity pump (100,00 gpm) complete with new distribution channels to convey water to Big Lake as well as Rice Lake. Alternatively, the new pump station could be constructed with a similar capacity to the existing pump station (approximately 50,000 gpm) to supply water to Big Lake. The existing pump station would be kept in operation to pump water into Rice Lake. This alternative would have a lower initial cost (50,000 gpm pump vs. 100,000 gpm pump), but could have higher maintenance costs associated with it since the existing pump station frequently silts in and requires maintenance dredging.

- Warm season grass plantings.

This option would convert 200 acres of existing crop fields on Duck Island to native grass prairie (see Table 3). The plantings would include a mixture of warm season grasses like big and little bluestem, indiangrass, and side oats gramma, with the option of introducing prairie

forbs into the site depending on seed availability and cost. A cool season component of grassland planting is also under consideration to provide green browse for Canada geese in the spring and summer months.

Table 3. Rice Lake HREP habitat types and acreage with warm season grass conversion.

Habitat	W/O	With
Cropland	600	400
Grassland	0	200

- Hardwood mast tree planting

This option would convert 100 acres of existing crop fields on Duck Island to a mixed hardwood planting (see Table 4). The planting would include a combination of the following tree species: pin oak, sycamore, bur oak, northern pecan, and swamp white oak.

Table 4. Rice Lake HREP habitat types and acreage with warm season grass conversion.

Habitat	W/O	With
Cropland	600	300
Grassland	0	200
Upland hardwoods	0	100

- Fish ingress/egress structure

This option involves placement of two 5-foot diameter, gated culverts between Rice Lake and the quarry pits of Duck Island. Carried in by flood events, fish become trapped in the shallow lake waters once the river recedes. Spring drawplants frequently result in fish kills. The link between the shallow manipulated waters of Rice Lake and the deeper permanent pool of the gravel pit will provide both winter and summer refugia for the fish trapped within the marsh complex. Construction of a fish passage structure would permit fish to escape to the deeper waters of the quarry during the drawndown phase as well as overwinter in the quarry pits when the rest of the shallow lake waters are frozen.

DISCUSSION

Evaluation of Alternatives

The success of the Rice Lake State Fish and Wildlife Area in providing a reliable mid-migration food source for the thousands of migratory birds that use the Illinois River flyway annually, lies in the ability to accomplish two primary objectives each year. The first is the need to drawdown the area in late spring to expose mudflats and promote a lush growth of annual plants which are protected from flooding until after the growing season. Second, is the capacity to reflood the area before arrival of the first migrants south in the fall and to be able to manipulate water levels as needed to meet specific management goals (i.e. mudflats for shorebirds vs. 2-feet of water for dabbling ducks).

Presently, the site managers have limited ability to drawn down the complex to encourage plant growth which is then subject to random flooding during the growing season and unpredictable flooding in the fall. In addition, the existing pump station is only adequate enough to flood Rice Lake proper, but inlet channel frequently silts in and must be dredged out. The Big Lake component of the complex is without a complete dike system around it and it floods when the river rises above elevation 434. Consequently, only a portion of the complex can be managed for food production with any predictability or reliability. This is reflected in the qualitative assessment of the WHAG analysis.

The wetland target species represented in the list of evaluation species presented earlier in Table 2. include: mallard, canada goose, green-backed heron, least bittern, lesser yellowlegs, muskrat, and king rail. The HSI values for these shallow water wetland species indicate that the area provides suitable habitat for a wide variety of species though the values are less than optimum for species like mallard and king rail. With a normal growing season and hydrologic cycle, the Rice Lake area attracts tens of thousands of waterfowl to the flooded moist soil plants of the marsh. However, these numbers drop significantly in years when the river remains high late into the spring and does not allow draw down of the marsh until well into the growing season, delaying or preventing the germination of the annual plants that the birds rely so heavily on. On the other hand, early fall floods may drown out the year's growth prior to arrival of the birds or flood plants too deep for dabbling ducks to utilize. Consequently, rehabilitation of the existing dike is critical to improving the overall management of the marsh. Predictability of annual success increases from the present 20% (2 out of 10 years) to 70% (7 out of 10 years) with a dike elevation at 442 and spillway elevation at 440. This represents a significant improvement in management opportunity without completely severing the backwater complex from the river's natural flood cycle. Periodic flood events are necessary to suppress woody invasion and set back annual weeds that compete with the moist soil plants. Elevation 442 represents this optimum elevation and is the preferred alternative.

As discussed above, the capacity to pump and draw down water is critical to successful waterfowl management during migration. While the managers at Rice Lake have an operational pump station at present, it is undersized to meet the demands of Big Lake and Goose Lake after the perimeter dike is rehabilitated. In addition, sedimentation has been a recurrent problem at the present pump station location resulting in higher maintenance costs. Construction of a new pump station with increased capacity located near the old Copperas Creek lock would serve as a reliable water source to the entire marsh complex. However, a new network of distribution channels would need to be constructed to convey water to both Rice and Big/Goose Lakes independently. While increased pumping capacity is preferred, the incremental analysis process will determine which alternative is the most cost effective.

Intensive management for waterfowl is usually contrary to fisheries management practices due to the shallow water levels needed for moist soil management. However, these low water levels and exposed mud flats can also have negative effects on waterfowl populations when fish kills occur. Fish trapped in the shallow lakes following flood events are subjected to the low water levels of the spring drawndown which results in lower dissolved oxygen levels and higher water temperatures and a subsequent fish kill. Decomposing fish serve as a host for maggots producing the toxin that causes avian botulism. If waterfowl ingest the maggots they succumb to the toxin and die and the cycle is perpetuated. This cycle creates a serious concern among the managers at Rice Lake, especially when waterfowl numbers are high and concentrated at the marsh. To reduce the potential for fish kills and improve the overall fisheries resource at Rice Lake, it is proposed to connect the Rice Lake marsh with the Duck Island gravel pits with two large diameter culverts that will allow fish to move between the two locations. Both winter and summer conditions will be improved for fish which should decrease the incidence of both fish kills and outbreaks of avian botulism.

Additional habitat improvements at Rice Lake will be accomplished by direct land use changes to increase the diversity of habitat types in the area. Converting a portion of the intensively farmed cropland on Duck Island to grassland and upland hardwoods is proposed. Three hundred of the 600 acres of cropland will be converted to a mixture of grassland (200 acres) and upland hardwoods (100 acres). Species diversity, both game and nongame, will be increased dramatically by creating this triad of upland habitats. In addition, the upland grasslands will provide critical nesting habitat for resident waterfowl that remain in the area. Portions of the grassland or cropland can be rotated with a cool season mixture to provide green browse for resident goose populations.

CONCLUSIONS AND RECOMMENDATIONS

The Rice Lake HREP offers a multi-faceted opportunity to protect and enhance a floodplain wetland community, improve a limited fishery resource, and restore upland grassland and hardwood communities under the umbrella of one HREP project. In addition, the proposed HREP will contribute directly to achieving the goals of the North American Waterfowl

Management Plan (an international, inter-agency plan to increase waterfowl populations),and the goals of the Partners for Flight program to protect and increase the habitats for neotropical migrants.

First and foremost, the successful management of the Rice Lake area for migratory birds is dependent on the production of a reliable food source seasonally. With the current level of dike and water level control capabilities, this success is greatly limited (about 1 in 5 years). Improvements to the dike system and water control capabilities will increase the reliability of annual food production to about 7 out of 10 years.

A decline in the incidence of avian botulism and an improved fishery resource will result by creating a deep water refuge for fish in the Duck Island gravel pits.

Furthermore, habitat improvements in the uplands consist of converting cropland to grasslands and replanting hardwood trees. A larger diversity of species will be able to utilize the Rice Lake area with the restoration of these two habitat types which are currently not found on the Rice Lake project area.

Therefore we recommend:

1. The perimeter dike improvements, spillway and gated outlets be constructed to protect the marsh and increase the reliability of food production for migrating waterfowl and shorebirds.

2. The new pump station facilities be constructed to improve water level control and increase the acreage of aquatic and nonforested wetland habitats.

3. The link between Rice Lake and Duck Island be constructed to create a fisheries refuge.

4. The habitat diversity of the complex be increased through the restoration of 200 acres of grasslands and 100 acres of upland hardwoods in an existing crop field.

We appreciate the opportunity to provide these comments and look forward to continued coordination. If you have any questions, please contact Mr. Joe Slater of my staff at (309) 793-5800 ext. 523.

Sincerely,

Wayne A. Fischer

for Richard C. Nelson
Supervisor

CEMVR-PP-M

9 March 1998
P. Kowalczyk/5210

MEMORANDUM FOR THE RECORD

SUBJECT: EMP - Rice Lake and Banner March Meeting with Illinois DNR

1. A meeting was held at the Illinois DNR's Springfield office on 3 March 1998 to discuss the Rice Lake DPR and the start of construction on Banner Marsh. Persons in attendence were as follows:

Marvin Hubbell	State of Illinois EMP Coordinator
Bob Roads	Illinois DNR – Construction Engr.
Rene Umberger	Illinois DNR – Financial
Paul A Kowalczyk	CEMVR-PP-M – Project Manager
Darron Niles	CEMVR-PD-W – Study Manager
Mike Tarpey	CEMVR-ED-N – Project Engineer
Charlene Carmack	CEMVR-PD-E – Project Biologist

2. Mr. Hubbell gave the following list of state personnel who will be working on the construction contract at Banner Marsh:

Larry Leaker – Capital Development Board (CDB) –Project Manager
Bob Roads - District Engineer
Bob Smith - Regional Engineer
Bill Douglass – Site Superintendent/Inspector
John Ball – Asst. Site Superintendent/Inspector
Norm Emerick – Wildlife Biologist
Rob Hilsabeck – Fisheries Biologist
Ann Mankowski – District Heritage Biologist

Paul Kowalczyk explained that credit towards the states share of the project costs can be given to any state employees who work on the administration of the contract. That would generally include inspectors, regional and district Engineers, as well as any engineering support (including any Engineering Firm hired to assist the state). Personnel involved in the management of the EMP program, senior managers, personnel management, and financial management are generally counted as part of the state's overhead. The state is setting up a system to track their costs on this project. The question of how to pay for the dewatering of the site by the site superintendent came up. The state would like to get credit for dewatering the site for their contractor. No decision was reached on whether this cost can be included in the credit the state get, but it will be considered if it is submitted. On the Federal contract, the contractor will be responsible for dewatering and can hire the site superintendent to do it for him if he chooses. Mr. Roads noted that they will be meeting with the contractor on 13 March 1998 and that the Corps is invited as

observers. Prior to that meeting they would like a resolution of the riprap problem (riprap specified is too big for the thickness specified).

3. The Rice Lake project shown in the Draft DPR was reviewed. The Illinois DNR concurs in the design as modified by the 18 February 1998 onsite meeting. The one modification that they would make is to include all of Duck island as part of the project. A major consideration for the project is how much credit can be given for the State's acquisition of Duck Island. It is impossible for the Corps to give an answer until the source of funding is clearly identified. If the source is another Federal Agency, then the legislation providing the funding will have to be reviewed. A name and phone number from the Federal Agency involved would be helpful in making this determination. At this time, the Illinois DNR is reviewing all of the commitments it has made for cost sharing with the Federal Government (EMP/1135/etc.). Mr. Kirby Cottrell is leading the effort and is expected to be done by mid March 1998. Mr. Hubbell will give the impact of this review on the Rice Lake project by 1 April 1998. Options being considered are, termination, a reduced project (phase I), and a full project (phase II). Ms. Carmack discussed the project benefits. She indicated that there would be benefits to aquatic, terrestial, and waterfowl. The net habitat units obtained are around 10,000. In addition to the benefits to the immediate area, this project fits in nicely with the other projects on this section of the Illinois River (Banner Marsh, Spring Lake, Lake Chautauqua, and Emiquon). This makes this one of the best projects in the EMP program. Due to limitations in federal funding, the project would not be able to be started until FY01.

Paul A. Kowalczyk
Paul A Kowalczyk
Project Manager

CF: Marvin Hubbell
600 N. Grand Ave
West Suite 6
Springfield, IL 62701

Bill Douglass
Rice Lake State Fish & Wildlife Area
Illinois Department of Natural Resources
RR3 Box 91
Canton, IL 61520

DP
✓PD-W
PD-E
ED-DN
CD
CD (Eastern Area Office)
RE-A (Grizzle)
RE-A (Lazenby)

Sac and Fox Nation of Missouri in Kansas and Nebraska

305 North Main Street • Reserve, Kansas 66434
Phone (785) 742-7471 • Fax (785) 742-3785

JAN 0 9 2006

January 6, 2006

Department of the Army
Corps of Engineers
Rock Island District
ATTN: OD-P (Wayne Hannel)
Clock Tower Building - Post Office Box 2004
Rock Island Illinois 61204-2004

Dear Mr. Hannel:

Thank you for your letter, which is in compliance with Section 106 of the National Historic Preservation Act, and Section 110.

Project: CEMVR-OD-P-2005-1256

The Sac and Fox Nation of Missouri in Kansas and Nebraska NAGPRA department have determined the above project as:

No objections. However, if human skeletal remains and/or any objects falling under NAGPRA are uncovered during construction, please stop immediately and notify NAGPRA representative, Deanne Bahr, at the address above.

There are two other bands of Sac and Fox that also need to be contacted, the Sac and Fox Nation of Oklahoma and the Sac and Fox of the Mississippi in Iowa.

Johnathan Buffalo, NAGPRA Representative
Sac and Fox of the Mississippi in Iowa
349 Meskwaki Rd.
Tama, IA 52339-9629

Sandra Massey, NAGPRA Representative
Sac and Fox Nation of Oklahoma
Rt. 2, Box 246
Stroud, OK 74079

If you have any questions, please contact me at the number or address above.

Sincerely,

Deanne Bahr

Deanne Bahr
Sac and Fox Nation of Missouri in Kansas and Nebraska
NAGPRA Contact Representative

WINNEBAGO TRIBE of NEBRASKA

WINNEBAGO TRIBAL COUNCIL P.O. BOX 687 WINNEBAGO, NEBRASKA 68071

December 21, 2005

District Engineer
US Army Corps of Engineers
Rock Island District
Attn: OD-P (Wayne Hannel), Clock Tower Bldg.
P.O. Box 2004
Rock Island, IL 61204-2004

DEC 27 2005

Re: CEMVR-OD-P-2005-1322 & 1256

Dear Mr. Wayne Hannel,

Thank you for your recent letter. The Cultural Preservation Office of the Winnebago Tribe of Nebraska would like to inform you that the Winnebago Tribe has cultural properties in the area of your proposed construction. According to the oral tradition, the Winnebago Tribe has lived in the area in the pre-historic period. The tribe had lived in the area in the early years of the historic period before the depopulation of the tribe.

You may proceed with your proposed construction, but if there are any burial sites or other cultural properties discovered in the area, please notify my office right away. Thank you.

Sincerely,

Emily DeLeon

Emily Lucy De Leon
Repatriation and Cultural Preservation Office
(402)878-3313
esmith@lptc.bia.edu

United States Department of the Interior

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

IN REPLY REFER TO:

FWS/RIFO

January 4, 2006

JAN 0 6 2006

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

Dear Colonel Gapinski:

This responds to Public Notice CEMVR-OD-P-2005-1256, dated December 7, 2005. The applicants, U.S. Army Corps of Engineers, and the Illinois Department of Natural Resources, are proposing to rehabilitate habitats at the Rice Lake State Fish and Wildlife Area, near Banner, Illinois, as part of the Rice Lake Habitat Rehabilitation and Enhancement Project (HREP).

Regarding federally listed species, the federally threatened bald eagle (*Haliaeetus leucocephalus*), the decurrent false aster (*Boltonia decurrens*), and the federally endangered Indiana bat (*Myotis sodalis*) are known to occur within the project limits as described. Since the actual construction phase of the project is difficult to predict, effects to each of the species cannot be assessed until that growing or breeding season.

Prior consultation with the Service, in conjunction with the Pond Lily Lake dredged material placement site, included discussion of the potential impacts to decurrent false aster plants when the material was used to rehabilitate berms as part of the aforementioned HREP. It was determined at that time that the Pond Lily Lake site could be used as a mitigation area for the additional impacts incurred during the HREP construction.

Therefore, coordination with the Service will be required prior to the start of the construction phase of the project to assess the current status of each species with respect to the proposed construction activities. In particular, a botanical plant survey will be required along the alignment of the proposed berm and borrow areas to determine the presence/absence of the decurrent false aster plants. Based on the impacts to plants incurred during construction, the mitigation plan at the Pond Lily Lake site can be modified to offset those impacts.

This letter provides comments under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and the Endangered Species Act of 1973, as amended.

If you have any questions concerning our comments, please contact Mr. Joe Slater of my staff at (309) 793-5800 ext 208.

Sincerely,

Richard C. Nelson
Field Supervisor

cc: ILDNR (Schanzle)

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APPENDIX B

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

RICE LAKE STATE FISH AND WILDLIFE AREA

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0 FULTON COUNTY, ILLINOIS

APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

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LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0 FULTON COUNTY, ILLINOIS

APPENDIX B
CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

SECTION I. PROJECT DESCRIPTION

A. Location. The proposed project is located on the right descending bank of the Illinois River (River Miles 132.0 - 138.0) in Fulton County, Illinois. The Rice Lake State Fish and Wildlife Area (SFWA) was purchased and is managed by the Illinois Department of Natural Resources (DNR) for the purpose of providing consumptive and nonconsumptive enjoyment of fish, wildlife, and natural habitats. The area comprises approximately 5,600 acres of primarily backwater lakes and floodplain forest. (See plates 1 and 2 of the Definite Project Report (DPR).)

B. General Description. The Rice Lake Habitat Rehabilitation and Enhancement Project (HREP) is proposed to enhance wetland, aquatic and floodplain habitats by increasing the success rate for emergent and moist-soil vegetation, increasing food and cover for wildlife, and providing access to deepwater areas for fish. Measures to accomplish these objectives will include construction of a perimeter water control levee with a spillway structure and gated culvert for passive water level control; increasing water level management capability through construction of a new pump station and associated interior distribution channels; construction of fish access structures between the shallow water and deepwater areas within the SFWA and between the SFWA and the Illinois River; and planting warm season grasses and mast producing tree species on the cropfields of Duck Island within the SFWA. By definition and Federal regulatory jurisdiction, much of the site is classified as wetland or as "waters of the United States" and is therefore subject to evaluation and regulation under Section 404**(b)(1)** of the Clean Water Act.

C. Authority and Purpose. The authority for this action is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). Section 1103 is summarized in the DPR.

The purpose of this project, under Section 1103, is "to ensure the coordinated development and enhancement of the Upper Mississippi River (UMR)." The project is the result of planning efforts by the State of Illinois, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers.

D. General Description of Dredged and Fill Material. Perimeter water control levee construction will require approximately 130,000 cubic yards of material. Approximately 45,000 cubic yards of sand will be hydraulically dredged from the Illinois River. This material will be obtained from a nearby reach of the navigation channel that has required frequent dredging in the recent past. Dredged sand will be temporarily stockpiled along the shoreline of Goose Lake. The rest of the material (approximately 85,000 cubic yards) will be obtained from the Duck Island gravel pit. The alignment of the water control levee will be stripped of topsoil prior to placement of the stockpiled sand. Following placement and shaping of the sand material, the levee structure will be capped with the stripped topsoil material and reseeded. Material excavated from the distribution channels associated with pump station development will be placed on the adjacent bankline or used to rehabilitate existing levee structures in the smaller management units. Soils in the levee and channel construction areas are primarily of the Titus-Beaucoup-Tice association and are deep, nearly level, somewhat poorly to poorly drained, clayey, and silty soils that formed in alluvium on flood plains.

E. Description of the Proposed Placement Site. Construction of the perimeter water control levee, pumping facilities, and distribution channels will involve placement of dredged and fill material on areas currently covered by herbaceous and woody vegetation, or by sand and mud. Placement sites will be allowed to revegetate naturally, reseeded to grass, or riprapped as needed.

Construction activities are anticipated to last at least one construction season (May through October). If bad weather, high water or other circumstances arise, construction will carry on to the next season.

Transportation of borrow material will be primarily on existing roadways or other disturbed areas. Any temporary haul roads or stockpile areas built in wetlands will be degraded to original contour once the project is completed.

Planting of warm season grasses and mast trees on the Duck Island peninsula will take place in areas not identified as jurisdictional wetland. Consequently, this activity is not addressed in detail in this evaluation.

F. Description of the Placement Method. Approximately 55,000 cubic yards of clayey material for the perimeter levee structure will be found adjacent to the levee alignment or mechanically dredged from Goose Pond. The borrow material will be graded and shaped using bulldozers and other mechanical means during levee construction.

The pump station will require a concrete pad, as well as construction of inlet and discharge pipes. The discharge channel will be excavated by mechanical means. The fish egress structures will involve construction of 9 ft x 7 ft box culverts through a causeway that separates Rice Lake from the Duck Island gravel pit and through the new perimeter levee separating Goose Lake from the Illinois River.

SECTION II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. Substrate Elevation and Slope. The main channel of the Illinois River is considerably lower (up to 10+ ft) than the proposed placement sites. Within the project area, existing elevations of placement sites range from approximately 442 ft to 432 ft.

2. Sediment Type. Substrate materials to be dredged would consist of medium to fine sand with little or no organic content.

3. Dredged/Fill Material Movement. The main channel of the Illinois River is characterized by an unstable sand substrate. This substrate would eventually be covered with material of similar character. The placement sites are located in areas that are relatively sheltered from higher current velocities.

4. Physical Effects on Benthos. Any immobile benthos present in shallow water/mudflat placement sites would be buried as a result of construction activities.

5. Actions Taken to Minimize Impacts. Constructed levee embankments are designed with gradual slopes to minimize erosion or other movement of dredged material.

B. Water Circulation, Fluctuation, and Salinity Determinations

1. Water. No significant differences in water chemistry are expected following project construction, and no violations of applicable State water standards are anticipated.

2. Current Patterns and Water Circulation. No significant effects to existing current patterns or water circulation are expected to result from this action.

3. Normal Water Level Fluctuation. Fluctuations in the adjacent Illinois River system, both daily and seasonal, depend on discharge changes, lock and dam operations, and seasonal weather patterns. Project implementation is not expected to affect normal river stages or flood heights. The relatively low height of the water control levee ensures that the structure will be overtopped at the spillway on an annual basis and will overtop along its length in at least 50 percent of the years throughout the life of the project.

Proposed water control operations call for a one- to two-ft fluctuation on both Rice Lake and Big Lake for wildlife management purposes, primarily in summer and fall. The managed water level fluctuations are anticipated to vary from without-project conditions in timing but not in scope; in fact, it is expected that interior water level fluctuations will be more predictable, more gradual, and possibly less extreme under with-project conditions.

4. Salinity Gradient. This consideration is not applicable in the location of the proposed project.

5. Actions Taken to Minimize Impacts. The water control levee alignment was designed to take advantage of existing roadways and high ground paralleling the Illinois River in order to minimize the size of the placement area and the quantity of fill material required for project construction. Excavation of distribution channels for additional water control facilities will primarily involve work in existing ditches and other previously disturbed areas. The use of on-site borrow material and material dredged from a chronic shoaling area of the Illinois River to meet a portion of construction requirements is intended to minimize impacts to the aquatic ecosystem.

C. Suspended Particulate/Turbidity Determinations

1. Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Placement Site. Construction activities would increase turbidity in existing water bodies in the short term. A return to ambient conditions should occur shortly after completion of construction. No long-term impacts to suspended solids and turbidity levels are anticipated.

2. Effects on Physical and Chemical Properties of the Water Column. Some minor short-term increases in suspended particulates and turbidity levels could occur in the immediate vicinity of construction activities. These effects would be limited in both scope and duration. No significant differences in water chemistry are expected following project construction.

3. Effects on Biota. Sessile organisms within the construction zone will likely be destroyed by clearing or filling activities. Dredging and placement of fine material is not expected to have toxic effects on fish, wildlife, or other aquatic organisms. No long-term adverse effects to biota would be anticipated to result from this action. The overall impact of the HREP project is expected to be beneficial to biota in the project area and the river system.

D. Contaminant Determinations. Construction activities are not expected to increase total suspended solids or to change pH or dissolved oxygen levels. Any contaminants introduced into the Rice Lake State Fish and Wildlife Area or adjacent river systems are not expected to differ from those ordinarily found in these systems. The sandy material to be dredged is of large enough particle size so that contaminant binding is negligible. Historically, sediment sampling of sandy dredged material has shown an insignificantly low level of contamination, since contaminants have a greater affinity for smaller-sized particles.

Possible introduction of equipment or construction-related contaminants would be controlled by adherence to runoff monitoring plans during construction activity. No toxic materials would be introduced to the area as a result of construction activities. Appropriate measures, such as the placement of hay bales or silt fences, would be implemented to control stormwater discharge. Should any such discharges occur, they would be contained on site.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton and Nekton. Only short-term and minimal effects are anticipated to occur as a result of dredging. No significant impacts to either plankton or nekton are expected.

2. Effects on Benthos. (See Section 2.A.4 *Physical Effects on Benthos*, page D-3.) No significant impacts to benthos either at the location of hydraulic dredging or at the placement site is anticipated.

3. Effects on Aquatic Food Web. Only short-term and minimal impacts would be expected to occur during the construction period. No long-term adverse effects to the aquatic food web are anticipated to result from this action.

4. Effects on Special Aquatic Sites. No vegetated shallows, coral reefs, or riffle and pool complexes are present in the project area. No adverse impacts to mudflats are anticipated. The

proposed action is expected to have an overall beneficial effect on wetland wildlife, wetland functions and values, and sanctuaries and refuges. Project planning considered to the full extent the minimization of wetland loss, and it is anticipated that wetland values would be improved as a result of project implementation.

5. Threatened and Endangered Species. Correspondence from the U.S. Fish and Wildlife Service (see Appendix A) indicates that no impacts are envisioned to threatened or endangered species or their habitats, provided that construction activities are scheduled and monitored to avoid direct impacts to these species.

6. Other Wildlife. Wildlife species which utilize nonforested wetland habitats should benefit in the long term from the proposed action. Species which utilize forested wetlands should not be adversely affected by the removal of approximately 4.8 acres of trees from the perimeter levee alignment and conveyance channels.

F. Proposed Placement Site Determinations

1. Mixing Zone Determinations. Discussions pertaining to turbidity and suspended particulates are summarized under Section II. C.2, *Effects on Physical and Chemical Properties of the Water Column*, page D-4 Contaminants were discussed previously under Section II. D, *Contaminant Determinations*, page D-4. The large capacity of the navigation channel should provide an adequate mixing zone for any contaminated sediments that may be present. As mentioned earlier, most contaminants have affinities for finer sediments than are found at either the dredge cut or the placement location.

2. Determination of Compliance with Applicable Water Quality Standards. An application for State water quality certification under Section 401 of the Clean Water Act is being submitted to the Illinois Department of Natural Resources, Office of Water Resources.

3. Potential Effects on Human-Use Characteristics. Implementation of the proposed project will have no significant adverse effects on municipal or private water supplies; recreational or commercial fisheries; water related recreation or aesthetics; parks; national monuments; or other similar preserves. Any adverse impacts will be minimal and of short-term duration.

G. Determination of Cumulative Effects on the Aquatic Ecosystem. The project would have positive benefits to aquatic resources found on the site. Temporary turbidity impacts may occur on and off site, but would be short-term in duration. No cumulative negative impacts are anticipated to occur. Beneficial impacts are expected to occur on site for wetlands, wetland wildlife, and fish. Long-term productivity would be enhanced with the habitat improvements that are proposed.

H. Determination of Secondary Effects on the Aquatic Ecosystem. The existing rate of sediment deposition in the project area is not expected to change significantly as a result of project implementation. Although material would be pushed into some of the interior water bodies, this would not significantly contribute to degradation of these waters. Creatures utilizing these water bodies should benefit from the physical conditions that the structure would create when managed to meet site objectives.

SECTION III. FINDINGS OF COMPLIANCE OR NONCOMPLIANCE WITH THE RESTRICTIONS ON PLACEMENT

1. No significant adaptations of the 404(b)(1) guidelines were made relative to this evaluation.

2. Alternatives which were considered for the proposed action were as follows:

Alternative A - No Federal Action

Alternative B - Preferred Alternative. The recommended plan includes construction of a perimeter levee at 442 top elevation/440 spillway elevation, new pumping capacity for Big Lake and Rice Lake, fish access to Duck Island gravel pit and Illinois River, and conversion of Duck Island cropfields to 352 acres native forest and 57 acres native grassland.

Alternative C - Management features considered but not selected included restoration of the Senate Island side channel, and conversion of Duck Island cropfields to a single cover type (forest or grassland).

3. Certification under Section 401 of the Clean Water Act will be obtained from the Illinois Department of Conservation and will be included in the final version of this report. The project will therefore be in compliance with the water quality requirements of the State of Illinois.

4. The project will not introduce toxic substances into nearby waters or result in appreciable increases in existing levels of toxic materials.

5. No significant impact to federally-listed endangered species will result from this project. This determination is supported by the U.S. Fish and Wildlife Service, Ecological Services Office, Rock Island, Illinois.

6. The project is located along a freshwater inland river system. No marine sanctuaries are involved or will be affected, and no degradation of waters of the U.S. is anticipated.

7. No municipal or private water supplies will be affected. There will be no adverse impact to recreational fishing, and no unique or special aquatic sites are located in the project area. No long-term adverse changes to the ecology of the river system will result from this action.

8. Project construction materials will be chemically and physically stable. No contamination of the river is anticipated.

9. No other practical alternatives have been identified that would have less adverse impact on the aquatic ecosystem. The proposed project is in compliance with the guidelines for Section 404(b)(1) of the Clean Water Act, as amended. The proposed project will not significantly impact water quality or the integrity of the aquatic ecosystem.

10. On the basis of the guidelines, the proposed placement site for the discharge of dredged material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

_____ _____

(Date)

Shawn P. McGinley
Colonel, U.S. Army
Commander and District Engineer

APPENDIX C

PROJECT PARTNERSHIP AGREEMENT

A Project Partnership Agreement will be included in the Final report.

APPENDIX D

HABITAT EVALUATION AND QUANTIFICATION AND INCREMENTAL COST ANALYSIS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX D

HABITAT EVALUATION AND QUANTIFICATION
AND INCREMENTAL COST ANALYSIS

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UPPER MISSISSIPPI RIVER SYSTEM
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RIVER MILES 132.0 THROUGH 138.0
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APPENDIX D

HABITAT EVALUATION AND QUANTIFICATION
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I. INTRODUCTION TO HABITAT EVALUATION

A habitat analysis was used to evaluate the potential benefits of alternative HREP features at the Rice Lake State Fish and Wildlife Area. Evaluated features and alternatives are described in detail in Section 4 of the main report text of this DPR. Active participants included biologists from the Rock Island District of the Corps of Engineers (the Corps); the U.S. Fish and Wildlife Service, Rock Island Ecological Service Office; and the Illinois Department of Natural Resources (ILDNR) (formerly Department of Conservation).

The need for quantification of HREP outputs as a project performance evaluation tool, a project ranking tool, and a project planning tool has been discussed by various agencies associated with the UMRS-EMP. This application involves quantification solely for the purpose of project planning.

Quantification of project outputs (benefits) for the Rice Lake HREP is expressed in Habitat Units (HUs). Habitat units are a measure of habitat quality (habitat suitability indices (HSI)) and quantity (acres). Annualization of HUs can then be used to determine changes brought about by project features/alternatives over time. This annualization computes average annual habitat units (AAHUs). Once construction begins and as a project matures, habitat changes occur, and therefore habitat benefits may change. Many features, such as tree planting, would not begin to show benefits until well into the project life. The particular dynamics of the ecosystem under study then determine the target years chosen for analysis. With or without a project, habitat conditions change over time; therefore, the overall value of a proposed project depends upon the comparison of expected with-project benefits to expected without-project benefits.

II. HABITAT EVALUATION METHODOLOGY

The methodology used in this evaluation was the Wildlife Habitat Appraisal Guide (WHAG) (Urich, *et al.*, 1984). The WHAG was developed by the Missouri Department of Conservation and the U.S. Department of Agriculture, Soil Conservation Service (now NRCS). It is a field evaluation procedure designed to estimate habitat quality and account for changes due to land management practices. Checklist-type appraisal guides are used for upland, wetland, and aquatic habitats, and computer programs are used to analyze field data in terms of habitat suitability for various wildlife species. This analysis employed a multi-agency team approach with representatives from the Corps of Engineers, the U.S. Fish and Wildlife Service, the Illinois Department of Natural Resources, and the Illinois Natural History Survey.

The WHAG analysis is a numerical system for evaluating the quality and quantity of particular habitats for species selected by WHAG team members. The qualitative component of the analysis is known as the habitat suitability index (HSI) and is rated on a 0.1 (unsuitable) to 1.0 (optimal) scale. The suitability of a given habitat type for a set of evaluation species is determined by the qualitative characteristics of the habitat type. The WHAG procedures include the use of limiting factors, which is a habitat requirement for an individual species during a critical time of year. Absence of that habitat characteristic makes the habitat unsuitable and results in the lowest HSI value of 0.1. Habitat quality values can be improved by: (1) increasing the quantity of habitat types that may be limited or lacking in the study area; (2) altering a limiting factor, such as excessive current velocity; (3) altering a management strategy, such as cropping practices or water level manipulation; or (4) a combination of the preceding, depending on management goals, target species requirements, or available funds.

The quantitative component of the WHAG analysis is the measure of acres of habitat that are available for the selected species. From the qualitative and quantitative determinations, the standard unit of measure, the habitat unit (HU), is calculated using the formula (HSI x Acres = HUs). For project planning and impact analysis, project life was established as 50 years. To

facilitate comparison of project alternatives, target years were established at 0 (existing conditions), 1, 25, and 50 years. HSIs and average annual habitat units (AAHUs) for each evaluation species were calculated to reflect expected habitat conditions over the life of the project.

Prior to field evaluation, the study team reviewed aerial photography, topographic maps, and preliminary design drawings. During field evaluation, assumptions were developed regarding existing conditions and projected post-project conditions relative to limiting factors and management practices.

III. EVALUATION SPECIES SELECTION

Table D-1 lists the 23 fish and wildlife species used in this analysis. These are part of an established set used in the habitat matrices of the WHAG model. Although a set list of species has been used, each individual represents a guild of other similar species that utilize the habitat in similar ways. In essence, each species reflects an array of habitat variables for the species being evaluated. The evaluated species also reflect the goals and objectives (listed in Section 3 of the main report) established for the Rice Lake State Fish and Wildlife Area HREP.

Table D-1. Evaluation Species Selected for Habitat Analysis

Species	Scientific Name	Habitat Evaluated
Channel catfish	*Ictalurus punctatus*	aquatic
Crappie	*Poxomis sp.*	aquatic
Largemouth bass	*Micropterus salmoides*	aquatic
Gizzard shad	*Dorosoma cepedianum*	aquatic
Carp	*Cyprinus carpio*	aquatic
Bluegill	*Lepomis macrochirus*	aquatic
Black bullhead	*Ictalurus melas*	aquatic
Mallard	*Anas platyrhynchos*	nonforest wetl./cropland
Canada goose	*Branta canadensis*	nonforest wetl./cropland
Least bittern	*Ixobrychus exilis*	nonforested wetland
Lesser yellowlegs	*Tringa flavipes*	nonforested wetland
Muskrat	*Ondatra zibethicus*	nonforested wetland
King rail	*Rallus elegans*	nonforested wetland
Green-backed heron	*Butorides striatus*	nonforested wetland
White-tailed deer	*Odocoileus virginianus*	crop/grass/forest
Wild turkey	*Meleagris gallopavo*	grassland/forest
Fox squirrel	*Sciurus niger*	forest
Wood thrush	*Hylocichla mustelina*	forest
Kentucky warbler	*Oporornis formosus*	forest
Eastern bluebird	*Sialia sialis*	grassland/forest
Bobwhite quail	*Colinus virginianus*	crop/grass/forest
Eastern cottontail	*Sylvilagus floridanus*	grassland/forest
Indigo bunting	*Passerina cyanea*	forest

Seven bird and mammal species were selected to evaluate the effect of proposed water control and water level management features on nonforested wetland habitat: Mallard and Canada goose are migratory waterfowl that utilize early successional, seasonal wetland habitat, including wet cropfields, and have socioeconomic importance as game species. The green-backed heron is a wading bird species found in midsuccessional herbaceous and shrub-dominated wetland habitat.

The least bittern is a State listed endangered/threatened species that favors permanent, midsuccessional nonforested wetland habitat. Lesser yellowlegs is a migratory shorebird that favors initial successional, seasonal wetland habitat (e.g. mudflats, waterlogged substrates). The king rail is a migratory water bird that utilizes midsuccessional, sedge dominated, permanent wetland habitat. The muskrat is a resident furbearing mammal found in midsuccessional herbaceous, permanent wetland habitat. These species were selected to analyze changes in habitat quality for a wide range of bird and mammal species, migratory and resident, game and nongame, common and rare, that utilize nonforested wetlands.

Seven species of fish were selected to evaluate the effects of this project feature on the quality of the backwater aquatic habitat: channel catfish, crappie, largemouth bass, gizzard shad, carp, bluegill, and black bullhead. This group represents a wide range of sport, commercial, and forage species commonly found in the project area, and all of which utilize backwaters during part of their life cycle. A total of nine bird and mammal species were selected to evaluate both positive and negative effects of conversion of the existing cropfield habitat to grassland and/or forest habitat. Species selected for evaluation include several which utilize only one of the habitat types (e.g. grassland) potentially impacted by the project as well as several which use more than one habitat type. Mallard and Canada goose can utilize cropfield habitats as feeding areas (Note: these two species were also used to evaluate nonforested wetland habitat for the water control/management features). White-tailed deer and wild turkey are game species that favor a diversity of habitats. The eastern bluebird and the indigo bunting utilize grassland/forest edge habitat. The fox squirrel favors mature forest habitat with snag and cavity trees as well as mast producing tree species. Wood thrush and Kentucky warbler are species found in mature bottomland forest habitats. The bobwhite quail and eastern cottontail are game species that favor early successional habitats with an abundance of openland edge.

IV. HABITAT EVALUATION ASSUMPTIONS

Several assumptions have been made in regards to model performance, changes in habitat conditions over time, future management use, habitat use, management reliability, design of fish passage structures, and Duck Island plantings.

A. Model Performance. The WHAG methodology has been designed to be applied to many different types of habitat. To evaluate the habitat effects of the proposed features for improved water control and water level management, the nonforested wetland habitat matrix was used. An aquatic matrix for backwater habitat (MOFISH) was used to evaluate changes in aquatic habitat quality resulting from proposed fish passage structures. Cropfield, grassland, and bottomland forest habitat types were evaluated to quantify habitat changes related to conversion of agricultural fields on Duck Island to native floodplain plant cover types.

B. Changes in Habitat Conditions Over Time. Habitat conditions are not static. Either through natural processes or human activity, habitat evolves and may change in quality and/or quantity. Imbedded in each habitat type evaluation, change has been added to the model. To assess the change over the period of analysis, target years have been defined. At each target year, a change in the habitat variables may be noticed. Noticeable changes can be characterized by a change in habitat benefit output.

Target years of 0, 1, 25, and 50 were considered sufficient to analyze HUs and characterize habitat changes resulting from proposed features over the estimated project life.

For planning purposes, future conditions without implementation of the project were assumed to be similar to baseline conditions. Land cover in the future would be similar to current conditions.

Habitat quality would be equal to or less than what currently exists in the project area. Rice Lake would be actively managed by the ILDNR for waterfowl food production and use, but Big Lake and associated shallow water areas would continue to be subject to Illinois River fluctuations during the growing season and interior water levels could not be managed in this portion of the SFWA. Rice Lake would continue to be isolated from deepwater areas when Illinois River levels drop below the top elevation of the Narrows Dam. The Duck Island fields would continue to be cultivated for agricultural production.

Future river stage seasonal patterns of fluctuation and recurrence of moderate to severe flooding were assumed to be similar to river stage fluctuations recorded over the past 50+ years. Assumptions concerning the influence of river stages on the effectiveness of alternative levee and pump station designs are discussed in section 4e below. In most cases, future without-project conditions were assumed to be similar, though not identical, to baseline conditions (no significant future degradation or loss of habitat).

The potential for restoration of historically diverse native bottomland forest and grassland communities on Duck Island through passive means (cessation of cultivation followed by natural regeneration) was assumed to be severely limited to nonexistent due to altered hydrology of the Illinois River over the last 70+ years combined with depletion of natural seed banks.

C. Future Management Use. The analysis assumed that there would be minor capital improvements made at Rice Lake that would have some effect on wildlife and human use. One assumption was that the integrity of existing water control structures would remain essentially the same over the 50-year project life. Another assumption was that current operating plans would remain in effect during that time, and that the current management objectives would remain in effect.

D. Habitat Use. The proposed project would affect all the principal water bodies of the Rice Lake State Fish and Wildlife Area, as well as the agricultural fields on the Duck Island peninsula. While most evaluated species are selected to identify changes to just one habitat type, the nonforested wetland/shallow aquatic habitat in the project area is evaluated both as wetland that provides habitat to birds and mammals, and as backwater/overflow lakes that provide habitat for fish of the Illinois River ecosystem. The plantings feature was evaluated for species associated with floodplain habitat types (grassland, forest) as well as wet cropfield habitat.

Existing forested wetland habitat in the Rice Lake SFWA was not evaluated in the WHAG analysis. (Anticipated impacts to forested wetland resulting from construction of the perimeter levee, pump station, and interior channels are addressed in the integrated Environmental Assessment and Biological Assessment.) Forested wetland is one of the major habitat types currently found in the Rice Lake State Fish and Wildlife Area (approximately 2,000 acres) and conservation of this habitat is one of the project objectives for the site. However, the primary goal of the HREP project is the enhancement of the quality of wetland and floodplain habitat by increasing the success rate of emergent and moist soil vegetation, and providing reliable food and shelter for wildlife.

Construction of proposed water level management features would require the permanent clearing of approximately 4.8 acres of bottomland hardwoods, mostly along the levee alignment and conveyance channel rights-of-way. The proposed conversion of a portion of Duck Island to forest cover that includes mast-producing tree species would be expected to contribute to the overall quality and diversity of forest habitat in the project area, and should also result in a net increase in the overall quantity of this habitat type long term.

Operation of water control features is not expected to adversely affect forested wetlands. Proposed normal pool elevations for both lakes (437.0 for Rice Lake and 436.0 for Big Lake) approximate the existing tree line and increased flooding of wooded areas is not anticipated. The ability to draw down the lakes during the majority of the growing season, and the increased protection from minor summertime flooding, could potentially result in slightly improved conditions for bottomland timber survival and growth.

E. Management Reliability (Probability of Successful Operation) for Perimeter Water Control and Water Level Management Features. Alternative combinations of features to incrementally increase water control and water level management capability (perimeter levee and additional pumping/distribution facilities) were difficult to incrementalize through the WHAG analysis. The suitability variables addressed in the WHAG matrix for nonforested wetland are not sensitive enough to measure the differences in habitat outputs between the incremental levels of management capability evaluated for this project. For this reason, the "future with-project condition" developed through the WHAG analysis reflects the projected outputs of the combination of levee elevation and pumping capacity which provided the highest level of output measured in total AAHUs (see discussion of cost-effectiveness/incremental analysis below). In order to account for the outputs of alternative (lower) levee heights and water control capability, it was necessary to develop a method of quantifying the benefits of alternative combinations expected to provide lower levels of output than the evaluated combination.

Successful water level management is dependent on the ability to manipulate interior water levels independent of river stage. The higher the level of protection, and the greater the capacity to manipulate interior water levels independent of Illinois River levels, the greater the probability of successful operation and the greater the reliability of meeting habitat needs of wetland species to achieve management objectives. The 1991 water control study conducted for the ILDNR by Crawford, Murphy and Tilly analyzed 41 years of river stage data (1950-1990) to evaluate the probability (success rate) of meeting operational objectives for the site with different levels of water control capability. Analysis of river stage data by Corps staff further refined the expected performance of levee and pump alternatives based on more recent historic records (1960-2000) and the size of the total area affected by each alternative (the lower increments of levee and pumping primarily affect Big Lake only, while the higher increments affect both Big Lake and Rice Lake). The results of the Corps analyses of historic river stage data were used to derive a multiplier factor reflecting relative reliability in meeting operational objectives for comparison of each combination of levee (L) and pumping (P) alternative features. The multipliers applied to each L+P combination are listed below:

Combination	Multiplier [1]
L2+P2	1.00
L2+P1	0.62
L1+P2	0.43
L2+P0	0.39
L1+P1	0.39
L1+P0	0.35

[1] % success relative to maximum with-project condition evaluated

Definitions:

L0 - No new perimeter levee on Big Lake
L1 - Big Lake perimeter levee with 440' top elevation, 438' spillway elevation *
L2 - Big Lake perimeter levee with 442' top elevation, 440' spillway elevation
P0 - No new pump station
P1 - New pump station for Big Lake and adjacent interior management units only

P2 - New pump station for Big Lake, Rice Lake and all interior management units
* Because the CMT study did not evaluate a levee structure lower than elevation 439.0, their analysis did not include a projected success rate for a 438.0 level of protection on Big Lake (P1).

It is important to note that the multiplier values listed above are keyed to the "with-project" condition estimated through the WHAG analysis, and do not represent the expected absolute rate of success in following the management plan. For example, the L2+P2 combination is not expected to result in achievement of summer drawdown 100 percent of the time through the project life. The actual rate of drawdown success (assuming future river stage fluctuations would reflect recent historic hydrologic profiles) anticipated for the highest degree of water control and water level management evaluated for this project is approximately 39 percent, or about four out of every 10 years (compared with less than 10 percent or one out of 10 years expected for baseline and future without-project conditions). This assumption was reflected in the WHAG analysis of the with-project condition. It is also important to note that the highest level of water control evaluated for this project still affords only a very low level of flood protection relative to many neighboring areas in the floodplain, including the Spring Lake Levee and Drainage District and the Banner Marsh State Fish and Wildlife Area.

F. Design of Fish Passage Structures. The evaluation of aquatic habitat using the MOFISH Overflow Waters matrix assumed that the fish passage structure F1 would facilitate fish movement from Rice Lake into deepwater areas of the Duck Island gravel pit, and that the addition of a passage structure between Goose Lake and the Illinois River would benefit fisheries over the entire complex by helping to maintain connectivity of the backwater complex with the Illinois River. Both alternatives assume that the existing connection between Big Lake, Beebe Lake, Goose Lake, and the Duck Island gravel pit remains open and functioning through the life of the project, and that movement of fish between Goose Lake and the Illinois River is minimal during the low river stages that frequently occur during summer months.

G. Duck Island Plantings. The conversion of cropfield acreage on Duck Island to native plant cover types involves more extensive physical alteration to the existing project area land cover than would be expected for either the wetland or aquatic features. Consequently, the WHAG analysis accounted for the value of cropfield, grassland, and forest habitats to certain wildlife species under baseline and future without-project conditions to address the anticipated "trade-offs" between habitat values for the full range of species evaluated for this feature. The analysis also assumed differing rates of maturity for the two native cover types (warm-season grassland and bottomland hardwood forest) evaluated for the project.

V. RESULTS OF HABITAT EVALUATION

This section describes the HSI scores and benefits in net AAHUs for each feature discussed in the main report. These features are: development of a perimeter water control levee (L); improved water level management capability through constructing a new pump station and associated distribution channels (P); constructing fish passage structures (F); and planting native vegetation on Duck Island (T). In each feature discussion, the no action, or without-project condition is also discussed.

A. Water Control/Management Alternatives. The WHAG analysis evaluated two alternative perimeter levee designs and two pump station alternatives. Levee alternative 1 (L1) would involve constructing a perimeter levee around Big Lake with a top elevation of 440.0 and a spillway elevation of 438.0. Levee alternative 2 (L2) would construct the Big Lake perimeter levee with a top elevation of 442.0 and a spillway elevation of 440.0. Pump station alternative 1 (P1) would involve constructing a new pump station and conveyance channels to provide water for Big

Lake and adjacent management units with continued operation of the existing Rice Lake pump station. Pump station alternative 2 (P2) would construct the new pump station and conveyance channels to the entire Big Lake-Rice Lake backwater complex and replace the existing Rice Lake pump station. These alternatives are described in greater detail in Section 5 of the DPR.

Results of the analysis indicated that under baseline and expected future without-project conditions the nonforested wetlands of the Rice Lake SFWA provide habitat suitable for species that utilize either seasonal mud flats (lesser yellowlegs) or permanent midsuccessional wetlands dominated by perennial vegetation such as cattail and bulrush (bittern, muskrat, heron). However, unseasonal river stage fluctuations limit the capability of the project area to provide reliable seasonal or permanent wetland habitat dominated by annual vegetation such as sedge and wild millet. This in turn limits the area's suitability as habitat for migratory and resident species such as mallard, Canada goose, and king rail. Under the expected future with-project condition (perimeter levee, new pump station, and associated water control structures), restoration of historic seasonal water level cycles within the project area is expected to increase the availability and/or quality of habitat for all evaluated wildlife species, as displayed in Table D-2.

Table D-2. Habitat Suitability Index (HSI) Values for Water Control/Management Alternatives

	HSI VALUES						
Species	**TY 0 Base**	**TY1 No Act.**	**TY25 No Act.**	**TY50 No Act.**	**TY 1 w/Proj.**	**TY 25 w/Proj.**	**TY 50 w/Proj.**
Mallard	0.1	0.1	0.1	0.1	0.54	0.54	0.54
Canada Goose	0.1	0.1	0.1	0.1	0.66	0.66	0.66
Least Bittern	0.71	0.71	0.69	0.69	0.71	0.76	0.76
Lesser Yellowlegs	0.59	0.59	0.59	0.59	0.68	0.68	0.68
Muskrat	0.29	0.29	0.28	0.28	0.33	0.33	0.33
King Rail	0.1	0.1	0.1	0.1	0.67	0.67	0.67
Green-backed Heron	0.69	0.69	0.75	0.75	0.78	0.78	0.78

Note: In the WHAG methodology, an HSI value of 0.1 or less indicates unsuitable habitat.
TY=target year

As shown in Table D-3, evaluation of net AAHUs for alternative combinations of water level control (perimeter levee) and water management capability (pump station) reflected the comparative degree of reliability and capability associated with each combination, as discussed in Section IV E above. All of the alternative combinations resulted in net positive effects to all evaluated species, with king rail, Canada goose and mallard expected to experience the greatest increases in habitat value. This result indicates that operation of the proposed features to mimic the historic seasonal pattern of river stage fluctuation should enhance the habitat function of the project area for a wide range of migratory and resident wetland species.

Table D-3. Water Control/Management – Estimated Net Habitat Benefits (AAHUs) [1]

Species	No Act.	(35%)[1] L1P0	(39%)[1] L1P1	(39%)[1] L2P0	(43%)1 L1P2	(62%)[1] L2P1	(100%) L2P2
Mallard	0	411	674	971	1086	1250	1645
Canada Goose	0	502	824	1185	1326	1527	2009
Least Bittern	0	40	66	95	106	122	161
Lesser Yellowlegs	0	67	109	158	176	203	267
Muskrat	0	35	57	81	91	105	138
King Rail	0	508	834	1199	1342	1545	2033
Green-backed Heron	0	29	48	68	77	88	116
SUM NET AAHU[1]	**0**	**2229**	**2484**	**2484**	**2739**	**3949**	**6369**

[1] Effectiveness Multiplier

B. Fish Passage Structures. This feature involves constructing structures to allow fish access to deeper water, increasing opportunities for survival during summer drawdown periods within the project area. Table D-4 displays the HSI values computed for baseline, future without-project (No Action), and future with-project conditions. The results of the WHAG analysis showed positive effects to all evaluated fish species. Carp, black bullhead, gizzard shad, and channel catfish showed the greatest increase in habitat suitability under the with-project condition, while crappie, largemouth bass, and bluegill showed only slight increases in suitability. This result reflects the assumption that the primary effect of the proposed features will be to increase access to deep water areas without affecting other aquatic habitat characteristics within or outside the SFWA.

Although not addressed through the WHAG analysis, providing refugia for fish in the Duck Island quarry pit could potentially provide some secondary benefit to waterfowl. Decomposing fish can serve as a host for maggots producing the toxin that causes avian botulism. Improving fisheries habitat is expected to decrease the likelihood of fish kills, which in turn could potentially reduce the probability of future outbreaks of avian botulism.
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Table D-4. Habitat Suitability Index (HSI) Values for Fish Passage Alternatives

	HSI VALUES						
Species	**TY 0 Base**	**TY1 No Act.**	**TY25 No Act.**	**TY50 No Act.**	**TY 1 w/Proj.**	**TY 25 w/Proj.**	**TY 50 w/Proj.**
Channel Catfish	0.1	0.1	0.1	0.1	0.28	0.30	0.30
Crappie	0.1	0.1	0.1	0.1	0.1	0.14	0.14
Largemouth Bass	0.1	0.1	0.1	0.1	0.1	0.15	0.15
Gizzard Shad	0.1	0.1	0.1	0.1	0.35	0.35	0.35
Carp	0.1	0.1	0.1	0.1	0.38	0.38	0.38
Bluegill	0.1	0.1	0.1	0.1	0.1	0.16	0.16
Black Bullhead	0.1	0.1	0.1	0.1	0.38	0.38	0.38

Note: In the WHAG methodology, an HSI value of 0.1 or less indicates unsuitable habitat.
TY=target year

Table D-5 displays the net benefits in AAHUs computed for two fish passage alternatives. Both alternatives are expected to result in net benefits to all evaluated species. The first alternative (F1) involves construction of a single structure to provide fish access between Rice Lake and the Duck Island gravel pit. The second alternative (F2) would involve construction of a second structure to allow fish passage from Goose Lake to the Illinois River, in addition to the Rice Lake-gravel pit structure.

Table D-5. Fish Passage Alternatives – Estimated Net Habitat Benefits (AAHUs)

Species	No Action	F1 Rice Lake 1134 acres	F2 Rice Lake + Big Lake 3054 acres
Channel Catfish	0	375	886
Crappie	0	170	401
Largemouth Bass	0	177	418
Gizzard Shad	0	449	1061
Carp	0	485	1145
Bluegill	0	182	430
Black Bullhead	0	491	1159
SUM NET AAHU	**0**	**2329**	**5501**

C. Duck Island Planting Alternatives. This feature involves restoration of floodplain habitat by converting 409 acres of cropfield on Duck Island to native vegetative cover through active planting. The ILDNR's specific management objective for Duck Island is to maximize restoration of floodplain forest cover to enhance landscape level benefits for forest-dwelling animal species. However, a portion of the cropfield (57 acres minimum) will be planted in native grass species. This is necessary to ensure that tree planting activities do not adversely affect four archeological sites located on Duck Island that are potentially eligible for inclusion on the National Register of Historic Places.

Table D-6 displays the HSI values computed for existing (cropfield) and proposed (grass, forest) plant cover types for Duck Island for target years 1, 25, and 50. Analysis of cropfield habitat produced baseline values for four species (deer, quail, mallard, and goose). Conversion of the cropfield habitat on Duck Island to native warm season grassland and/or forest cover is expected to result in a slight reduction in suitability for deer and a total loss of suitability (within the converted cropfield) for mallard and goose. The establishment of warm season grassland habitat is expected to produce conditions suitable for turkey, bluebird, and cottontail. Establishment of native hardwood forest with mast-producing trees should provide conditions suitable for squirrel, thrush, warbler, and bunting, though the suitability for the different species changes as the forest habitat changes and matures over the 50-year project life.

Table D-6. Habitat Suitability Index (HSI) Values for Duck Island Planting Alternatives
No Action (Crop), Native Grassland (Grass), Bottomland Forest (Forest)

	HSI VALUES						
Species	**TY 0 Crop**	**TY1 Grass 1**	**TY25 Grass 25**	**TY50 Grass 50**	**TY 1 Forest 1**	**TY 25 Forest 25**	**TY 50 Forest 50**
White-tailed Deer	0.64	0.71	0.71	0.71	0.67	0.67	0.67
Wild Turkey	0	0.75	0.75	0.75	0.24	0.24	0.25
Fox Squirrel	0	0	0	0	0	0.55	0.55
Wood Thrush	0	0	0	0	0	0.36	0.36
Kentucky Warbler	0	0	0	0	0	0	0.52
Eastern Bluebird	0	0.72	0.72	0.72	0.78	0.62	0
Bobwhite Quail	0.11	0.51	0.51	0.51	0.27	0.20	0.16
	HSI VALUES						
Species	**TY 0 Crop**	**TY1 Grass 1**	**TY25 Grass 25**	**TY50 Grass 50**	**TY 1 Forest 1**	**TY 25 Forest 25**	**TY 50 Forest 50**

Eastern Cottontail	0	0.43	0.43	0.43	0.29	0.19	0.15
Indigo Bunting	0	0	0	0	0	0.68	0
Mallard	0.37	0	0	0	0	0	0
Canada goose	0.54	0	0	0	0	0	0

Note: In the WHAG methodology, an HSI value of 0.1 or less indicates unsuitable habitat.

Table D-7 lists net benefits computed for several alternative combinations of native cover type restoration on Duck Island. Alternatives T1 (352 acres grassland) and T5 (352 acres forest) involve conversion of the 409-acre Duck Island cropfield to a single cover type. Alternatives T2, T3 and T4 involve converting the cropfield to various combinations of grassland and forest. Because of differences in their individual habitat requirements, the wildlife species evaluated for this feature respond differently to the alternatives. While alternative T5 has the highest total benefits, this alternative does not fully meet the ILDNR's management objective to restore large contiguous tracts of native forest cover to the Illinois River floodplain.

Table D-7. Duck Island Planting Alternatives – Estimated Net Habitat Benefits (AAHUs)

Species	**No Act. (crop)**	**T1 352 grass 57 tree**	**T2 272 grass 137 tree**	**T3 204 grass 205 tree**	**T4 137 grass 272 tree**	**T5 57 grass 352 tree**
White-tailed Deer	0	26	23	21	18	15
Wild Turkey	0	274	234	200	166	126
Fox Squirrel	0	25	60	90	119	155
Wood Thrush	0	19	47	70	93	120
Kentucky Warbler	0	12	28	42	55	72
Eastern Bluebird	0	280	265	252	239	224
Bobwhite Quail	0	144	120	100	80	56
Eastern Cottontail	0	161	143	128	113	95
Indigo Bunting	0	22	52	78	104	135
Mallard	0	-150	-150	-150	-150	-150
Canada Goose	0	-219	-219	-219	-219	-219
SUM NET AAHU	**0**	**594**	**604**	**611**	**619**	**629**

VI. DISCUSSION

The results of the habitat analysis support the premise that the functions and values of the Rice Lake floodplain-wetland complex can be enhanced with the features proposed for this project. The WHAG analysis indicates that improved water level control and water management capability, conversion of Duck Island cropfields to native forest and grassland through active planting, and the fish passage culvert would provide a high level of quantified project outputs (net benefits), with no unacceptable trade-offs in habitat values for any evaluated species. This combination of features would allow the ILDNR site manager optimal management flexibility conditioned on the level of flood protection provided by the perimeter levee, would add to habitat diversity as well as quality, and would best meet the overall management objectives for the site.

VII. COST EFFECTIVENESS AND INCREMENTAL ANALYSIS OF ALTERNATIVES

Comparison of alternative feature designs and combinations of features is accomplished through cost-effectiveness evaluation and incremental cost analysis. Cost-effectiveness evaluation is used

to identify the least costly solution to achieve a range of project benefits. Incremental cost analysis is a tool that can assist in making decisions on the scale or size of the project or of individual features by determining changes in costs associated with increasing levels of benefits.

A. Enhancement Features. The proposed project for Rice Lake involves four primary enhancement features: perimeter water control levee; improved water level management capability (pump station and distribution channels); construction of fish access structures; and planting native vegetation on Duck Island cropfields. As explained in the text of the main report, establishment of the perimeter water control levee is an essential starting point for implementation of these features. Thus, the incremental cost analysis evaluated the perimeter water control levee (two alternative heights) by itself and in combination with the two water control options — two planting options, and the fish access structures.

1. Perimeter Water Control Levee (L). The successful management of the Rice Lake State Fish and Wildlife Area for migratory birds is dependent on the reliable production of a seasonal food source. The key to achieving this objective lies in the ability to accomplish a late spring drawdown to expose mudflats and promote the growth of annual vegetation that is protected from flooding until after the growing season, coupled with the capacity to reflood the area during fall migration and manipulate water levels as needed to meet management goals (e.g. mudflats for shorebirds vs. $\leq$2-foot water depths for ducks). The addition of a perimeter water control levee to the project area is essential to achieve any degree of improved wetland management. This feature includes a spillway structure and a gravity flow outlet for water level control and to protect the structure from flood damage.

Quality of existing wetland habitat would be raised by improving the ability to promote food plant production and provide feeding areas for waterfowl during migration periods. The results of the WHAG analysis show positive impacts for all evaluated species, particularly those which utilize moist soil vegetation as a food source (mallard and Canada goose) or require stable water levels (king rail).

a. Levee at Elevation 440.0 (L1). The earth segment of the perimeter water control levee would be constructed with a spillway elevation of 440.0 (part of the northern portion of the alignment exceeds this elevation). This alternative would protect the Big Lake area from minor fluctuations in Illinois River levels up to elevation 440.0 during the summer drawdown. Drawdown and reflooding of the Big Lake area would be accomplished by gravity flow and would be dependent on favorable river stage conditions.

b. Levee at Elevation 442.0 (L2). The earth segment of the perimeter water control levee would be constructed with a spillway elevation of 442.0. This alternative would protect the Big Lake area from Illinois River fluctuations up to elevation 442.0 and would provide some additional protection to the Rice Lake area as well. Drawdown and reflooding of the Big Lake area would be accomplished by gravity flow under favorable river stage conditions. This alternative would provide greater management reliability than alternative L1, but flexibility would still be constrained by dependence on gravity flow to manipulate water levels.

2. Improved Water Level Management Capability (P). As discussed in Section IV, paragraph E, the probability of achieving the operational goals of the project is dependent not only on the ability to maintain desired water levels in Big Lake and Rice Lake, but also on the ability to manipulate those water levels independent of Illinois River stages. Additional pumping capacity and associated distribution channels (drainage ditches) would provide the management flexibility needed to reliably achieve project goals and objectives. Additional pumping and distribution capacity would provide greater management flexibility for the entire project area, and would further improve habitat quality by increasing the success rate for the operational plan.

a. New Pump Station and Distribution System for Big Lake Only (P1). This alternative would involve construction of a new pumping station with a capacity of 50,000 gpm on the Illinois River near the old Copperas Creek lock, and excavation of distribution channels to move water between the river and Big Lake. The newly constructed facilities would provide the capability to drawdown and reflood the Big Lake area to achieve desired water levels when Illinois river stages would prevent such manipulation by gravity flow. The existing pump station would continue to be operated and maintained to manage water levels in the Rice Lake area.

b. New Pump Station and Distribution System for Big Lake and Rice Lake (P2). This alternative would involve construction of a new pumping station with a capacity of 133,200 gpm on the Illinois River near the old Copperas Creek lock, and excavation of distribution channels to move water between the river, Big Lake, and Rice Lake. The newly constructed facilities would provide the capability to drawdown both the Big Lake area and the Rice Lake area, in order to achieve desired water levels when Illinois River stages did not permit manipulation by gravity flow. The existing pump station would no longer be operated and maintained to manage water levels in the Rice Lake area.

3. Fish Access Structures (F). Restoration and protection of habitat for fish in the backwater aquatic areas of the Rice Lake SFWA involves reducing the potential for fish mortality due to seasonal fluctuations in water levels (primarily midsummer drawdowns), and by maintaining or, if possible, enhancing seasonal connectivity with the Illinois River. The access structures would allow movement of fish from shallow water to areas with greater water depth (Duck Island gravel pit and the Illinois River) during spring and summer drawdown periods within the SFWA.

a. No Action (F0). No action would result in no increase in fish access between Rice Lake and the deepwater areas of the Duck Island gravel pit, and no increase in fish access between Big Lake and the Illinois River.

b. Rice Lake-Gravel Pit Access (F1). This alternative would involve constructing a single structure to allow fish access between Rice Lake and the Duck Island gravel pit. Because a connection between Big Lake and the gravel pit already exists, this alternative would affect only Rice Lake. Access between the entire SFWA and the Illinois River would be unaffected.

c. Rice Lake-Gravel Pit Access plus Goose Lake-Illinois River Access (F2). This alternative would involve constructing the Rice Lake-gravel pit access described above and also constructing a second structure between Goose Lake and the Illinois River that would function both as a gravity drain and fish access for the entire SFWA during the summer drawdown.

4. Duck Island Native Vegetation Plantings (T). This feature would convert the 409 acres of cropfield habitat on the Duck Island peninsula to native vegetation to provide habitat for a diversity of wildlife species. Although Duck Island lies entirely within the 500-year floodplain, most of the peninsula is considerably higher in elevation than the surrounding wetlands of the Rice Lake State Fish and Wildlife Area. The higher topography of Duck Island provides conditions suitable for the reintroduction of native floodplain hardwoods, particularly mast producing species, and herbaceous plant species less tolerant of frequent flooding than those which are currently common in the project area.

a. No Action (T0). No action would result in no change in existing land cover or land use practices on Duck Island. Agricultural activities would be assumed to continue as currently practiced.

b. Conversion of Cropfields to Native Forest and Grassland Cover (T1-T5). These alternatives involve conversion of Duck Island cropfields to native forest and grassland cover through active planting of native vegetation, in varying proportions, described as follows:

(T1) - 352 acres grassland, 57 acres forest
(T2) - 272 acres grassland, 137 acres forest
(T3) - 204 acres grassland, 205 acres forest
(T4) - 137 acres grassland, 272 acres forest
(T5) - 57 acres grassland, 352 acres forest

The primary difference between these alternatives would be the proportional availability of habitat for forest-dwelling versus grassland-dwelling species.

B. Cost Estimates for Habitat Improvement Measures. Table D-8 shows the estimated outputs (in AAHUs) and annualized costs for each feature alternative. A detailed breakdown of costs for the recommended plan is outlined in Appendix J of this DPR . Costs were annualized and are based on construction and real estate estimates.

Table D-8. Environmental Output and Costs of Each Feature

Feature	Symbol	Output [1]	Annualized Cost in $ [2]
Perimeter Levee			
No action	L0	0	0
Levee spillway 440, no pump	L1+P0	2229	131,000
Levee spillway 440, Big Lake pump only	L1+P1	2484	315,000
Levee spillway 442, no pump	L2+P0	2484	167,000
Levee spillway 440, Big/Rice Lake pump	L1+P2	2739	348,000
Levee spillway 442, Big Lake pump only	L2+P1	3949	351,000
Levee spillway 442, Big/Rice Lake pump	L2+P2	6369	384,000
Fish Access Structures			
No Action	F0	0	0
Passage from Rice Lake to Duck Island quarry	F1	2329	9,500
Passage from Rice Lake to Duck Island quarry pit and passage from Big Lake to Illinois River	F2	5501	19,800
Duck Island Native Vegetation Planting			
No action	T0	0	0
352 acres grassland, 57 acres forest	T1	594	34,400
272 acres grassland, 137 acres forest	T2	604	36,500
204 acres grassland, 205 acres forest	T3	611	39,000
137 acres grassland, 272 acres forest	T4	619	41,500
57 acres grassland, 352 acres forest	T5	629	43,500

[1] Outputs are calculated as Average Annual Habitat Units (AAHUs).
[2] Annualized cost is initial construction cost based on a 50-year project life, 5⅝% interest rate.

C. Incremental Analysis of Project Alternatives. Cost effectiveness and incremental cost analysis (CE/ICA) was used to assist the process of determining what project features and design alternatives should be built based on comparison of quantified habitat benefits (outputs) and estimated costs of alternative feature designs. This process identifies alternative features or combinations of features that partially or fully meet the goals and objectives of the project and at the same time are the most cost effective. A cost effectiveness analysis is conducted to ensure that least cost alternatives are identified for various levels of output. After the cost effectiveness of the alternatives has been established, subsequent incremental cost analysis is conducted to reveal and evaluate changes in cost for increasing levels of environmental output.

CE/ICA is basically a three-step procedure: (1) calculate the environmental outputs of each feature; (2) determine a cost estimate for each feature; and (3) combine the features to evaluate the

best overall project alternative based on habitat benefits and cost. Costs were annualized by applying a 5⅝ percent interest rate to the construction cost over the life of the project, estimated at 50 years for planning purposes. The incremental analysis of alternatives was accomplished following guidance prepared by the Corps of Engineers Institute for Water Resources and using the methodology described in Robinson, *et al*.

Primary assumptions and constraints used in conducting CE/ICA for this HREP are as follows:

1. AAHUs for all included fish and wildlife species were accorded equal weight in comparing benefits of alternative plans. Alternatives analysis was limited to combinations that at least partially met all three project objectives listed in Table 3.1 in the main report**.**

3. Feature P (pump station) was assumed to be dependent on Feature L (perimeter levee). Because both the perimeter levee and pump station address the project objective of restoring and protecting wetland habitat, combinations of alternatives that included P0 (no new pumping capacity) were included in the CE/ICA analysis provided they also met the conditions of assumption #2 above.

Operating under the above assumptions, a total of 126 plans were evaluated. Of these, 25 plans (plus the no-action alternative L0+P0+F0+T0) were identified as cost-effective using CE/ICA analysis. These plans are listed in Table D-9.

Table D-9. Cost-Effective Alternative Combinations

Plan	Outputs (AAHU)	Annualized Cost ($)	Avg. Cost ($/AAHU)
L0P0F0T0 (No Action)	0	0	0
L0P0F1T0	2329	$10,000	$4.30
L0P0F2T0	5501	20,000	3.60
L0P0F1T1	6095	55,000	9.00
L0P0F2T1	6105	57,000	9.30
L0P0F2T3	6112	59,000	9.70
L0P0F2T4	6120	62,000	10.10
L0P0F2T5	6130	64,000	10.40
L1P0F2T0	7730	151,000	19.50
L1P0F2T1	8324	186,000	22.30
L1P0F2T2	8334	188,000	22.60
L1P0F2T3	8341	190,000	22.80
L1P0F2T4	8349	193,000	23.10
L1P0F2T5	8359	195,000	23.30
L2P0F2T1	8579	222,000	25.90
L2P0F2T2	8589	224,000	26.10
L2P0F2T3	8596	226,000	26.30
L2P0F2T4	8604	229,000	26.60
L2P0F2T5	8614	231,000	26.80
L2P1F2T0	9450	371,000	39.30
L2P2F2T0	11870	404,000	34.00
L2P2F2T1	12464	439,000	35.20
L2P2F2T2	12474	441,000	35.40
L2P2F2T3	12481	443,000	35.50
L2P2F2T4	12489	446,000	35.70
L2P2F2T5	12499	448,000	35.80

Incremental cost analysis identified five of the above plans as "Best Buy" plans, defined as those cost-effective plans which provide the greatest incremental increase in output (benefits) for the lowest incremental increase in cost. These "Best Buy" plans are listed in Table D-10.

Table D-10. "Best Buys" of Cost-Effective Alternative Combinations

Plan	Output	Cost($)	$/Output	Inc. Output	Inc. $	Inc.$/ Output
NO ACTION	0	0	0	0	0	0
L0P0F2T0	5501	20,000	3.60	5501	20,000	3.60
L2P2F2T0	11870	404,000	34.00	6369	384,000	60.29
L2P2F2T1	12464	439,000	35.20	594	35,000	58.92
L2P2F2T5	12499	448,000	35.80	35	9,000	257.14

D. Selection of Recommended Plan. Federal planning for water resources development is conducted in accordance with the requirements of the *Economic and Environmental Principles and*

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

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

The question posed to the interagency team involved in this analysis was, "Is the cost of the added increment in output worth the added costs?" The Rice Lake HREP team concluded that the alternative plan that best meets the goals and objectives of each agency and the EMP program is **L2P2F2T5** (perimeter levee at 442 spillway elevation, new pumping capacity for Big Lake and Rice Lake, fish access to Duck Island gravel pit and Illinois River, and conversion of Duck Island cropfields to 352 acres native forest and 57 acres native grassland). While the other cost-effective alternatives evaluated for this project would partially address the goals and objectives of the project, the consensus of the interagency team was that the recommended alternative would reasonably maximize net habitat benefits for the greatest diversity of wildlife and fish species, and that other alternatives would be less effective in optimizing habitat benefits for the overall project.

APPENDIX E

GEOTECHNICAL CONSIDERATIONS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX E

GEOTECHNICAL CONSIDERATIONS

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX E

GEOTECHNICAL CONSIDERATIONS

I. PURPOSE AND SCOPE

This appendix presents the general geology and specific geotechnical analysis pertinent to the project. Geologic information was obtained from publications produced by the Illinois State Geological Survey. Detailed soils information was obtained from borings collected under the direction of the Rock Island District, U.S. Army Corps of Engineers, (District) which also performed the laboratory interpretation of the samples. Additional soils information was obtained from a pre-published county soil survey obtained from the Illinois Department of Natural Resources in Fulton County.

II. DESCRIPTION OF PROJECT GEOTECHNICAL FEATURES

A. Discharge Channel. The channel will be used to fill Rice Lake, Big Lake, and the Voorhees moist soil management units. The channel consists of both new and existing embankments (see Figure E-1). The deepest section of the channel will consist of cut sections that are approximately 12 ft below the existing ground surface and small embankments approximately two ft above the existing ground surface. Shallow sections of the drainage channel will contain embankments that are approximately four ft above the existing ground and ditches that are eight ft below existing ground.

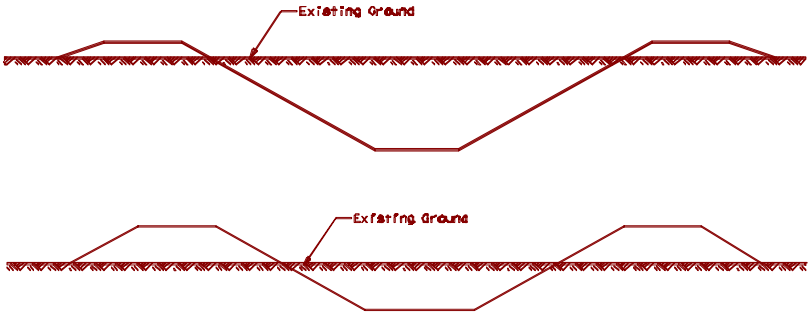

Figure E-1. Interior channel cross section

B. Perimeter Levee and Spillway. On the south end of Goose Lake, the damaged Hate Levee will

be repaired to elevation 442. The perimeter levee will contain an overflow section at elevation 440 that will allow the protected area to be completely filled with water during high water events. This will prevent significant flows over the non-overflow sections of the embankment during periods of flood. When the levees are overtopped, water levels will be equal on both sides of the levee, and flow velocities over the levees will be relatively slow. The levee will be approximately 14 ft high at its maximum height.

The perimeter levee will consist of a core constructed of dredged sand with topsoil placed over the sand. Placing the topsoil over the sand will cause significant pore pressures to develop in the soil at the interface of the topsoil and the sand. The slopes could become unstable if the pore pressures are not accounted for in the design.

C. Fish Egress between Gravel Pit and Rice Lake and between Goose Lake and Illinois River. The proposed connection between Rice Lake and the Gravel Pit on Duck Island and between Goose Lake and the Illinois River will consist of a 9 ft x 7 ft box culvert that will run through the narrow strip of land and connect the two main bodies of water. The invert elevation will be approximately 430 ft, which is 15 ft below the existing surface.

D. New Pump Station. Borings were taken at proposed locations to describe the foundation material present.

III. LOCATION

The Rice Lake EMP is located in Fulton County, Illinois, south of Banner, Illinois (see Plate 1). The site borders the Illinois River from river mile 132.0 to approximately river mile 138.0.

IV. PHYSIOGRAPHY

The project area is situated within the Dissected Till Plains Section of the Central Lowlands Province of the Interior Plains. The project area has little topographic relief and consists of shallow backwaters, bottomland, and islands that are subject to permanent high water tables and annual flooding.

V. GEOLOGY

With the exception of Duck Island, the entire Rice Lake project area falls on a deposit called the Cahokia Alluvium. Alluvium is river-deposited material generally consisting of clayey silt and sandy silt with lenses of silty sand and gravel. The thickness of the deposit is generally less than 40 ft in the Illinois River Valley but may be up to 60 ft deep in some locations. Directly below the alluvial material lies bedrock that is Pennsylvanian in age. The bedrock consists of layers of limestone, shale, and sandstones. The bedrock has a slight dip in the southeast direction of about 15 ft per mile.

VI. SURFICIAL SOILS

The United States Department of Agriculture (USDA) publishes soil surveys for most counties in the United States. Information contained in these reports pertains to soil within five ft of the surface. These soils are mapped by soil series. A soil series is a group of soils having almost identical profiles. All soils of a particular series have horizons that are similar in compositions, thickness, and arrangement. Information in a pre-published soil survey indicated that the types of soils that are present in and around Rice Lake generally fall into the Beaucoup soil series, which is described as a silty clay loam in the USDA classification system. Duck Island surficial soils fall into a different series that is not discussed in the pre-published survey. Generally, soils in the upper 35 in of the profile classify as low plasticity clay (CL) in the Unified Classification system. Soils from 35 to 60 in in depth classify as CL and CL-ML (low plasticity silt). The water table is said to vary from 0.5 ft above the ground surface to two ft below the ground surface. This soil series is frequently flooded.

With the exception of Duck Island, surficial soils of Rice Lake are fine-grained soils with over 80 percent passing the number 200 sieve. The soils generally classify as CL or ML in the Unified Classification System. Clay contents range from 15 percent to 35 percent. Soils on Duck Island contain more sand-sized material than the rest of the Rice Lake EMP site.

VII. SUBSURFACE EXPLORATIONS

The District conducted an extensive subsurface exploration to characterize the composition and engineering properties of soils present at Rice Lake. Borings were taken at locations shown on plate 28 of the Definite Project Report. A log for each boring was created; these logs are shown on plates 29, 30, and 31.

On each boring, samples were taken at sufficient intervals to classify all the strata encountered. Resistance to drive the split spoon sample was measured and recorded. Representative samples were taken for visual classification, compaction testing, and Atterberg limits on enough samples to verify classifications.

Borings RL-96-1 through RL-96-6 were used to characterize the foundation conditions at two proposed pump station locations (plate 28). Three borings were taken at each alternative. For each alternative, one boring approximately 50 ft deep was located at the proposed pump station site, one boring 50 ft deep was taken at the proposed head gate section, and one boring approximately 25 ft deep was taken between the head gate and pump station.

Borings RL-96-7 through RL-96-18 were used to identify soils and foundation conditions for the proposed discharge channel. Borings were approximately 25 ft deep, which made the bottom of the boring about three to five ft below the proposed bottom of the channel. Generally, the borings were taken approximately every 1,000 ft along the proposed alignment. Additionally, 50-ft-deep borings were taken at proposed water control structures.

Borings RL-96-19 through RL-96-23 were hand-auger borings taken from a boat to verify material types that have been deposited in the existing channel.

Borings RL-96-24 and RL-96-25 were taken within the Voorhees Unit.

Borings RL-96-26 through RL-96-29 were taken at 1,000-ft intervals along the perimeter levee. The borings were approximately 10 ft deep and were used for a slope stability and underseepage analysis of the proposed levee.

Boring RL-96-35 is located at the proposed closure between Big Lake and the Gravel Pit. Boring RL-96-34 is located at a proposed connection between Rice Lake and the Gravel Pit.

VIII. COMPACTION TESTING

Standard Proctor compaction testing was performed on samples obtained from both the upper and the lower ends of Rice Lake. Samples from the upper end were combined to develop one curve, and samples from the lower end were combined to develop another curve. Both samples produced similar results. DPR plates 29, 30, and 31 show the results from the compaction testing. The optimum densities on each of the tests were 101 and 105 lbs for the lower sample and upper sample, respectively. The optimum moisture content for both samples was around 20 percent. The *in situ* water contents of the soils are closer to 30 or 40 percent. Based on the proctor curves developed in the lab, the 30 percent moisture content will yield a density about 90 percent of the maximum density. If fills on the project are to be fully compacted, then extensive measures will have to be taken to dry materials, which is often time consuming and expensive. Therefore, fill material will be placed at natural moisture content and compacted with controlled movement of spreading and hauling equipment or a certain number of passes with a sheeps foot and/or rubber-tired rollers.

The strength parameters selected for analysis will be based upon semi-compacted fill materials. Therefore, conservative values of analysis will be used.

IX. STABILITY OF INTERIOR CHANNELS

The stability of the embankments was analyzed in accordance with EM 1110-2-1913 "Design and Construction of Levees." The UTEXAS-3 computer program was used to analyze the embankments and cuts proposed on the project. Both the discharge channel and the perimeter levee were analyzed for stability.

A. Geometry. Both the deep and the shallower channel sections were evaluated for stability. Borings RL-96-7 through RL-96-18 showed that the depth to sand varied between 15 and greater than 30 ft in depth. The soil profile was simplified to two conditions. One condition was modeled with soil profile shown in Figure E-2. In this profile, the sand is shallow at 15 ft below the surface.

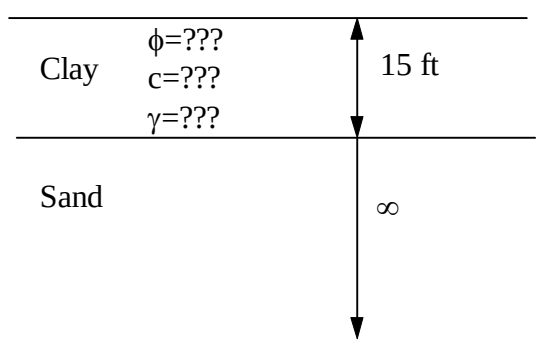

Figure E-2. Profile analyzed for interior channels

The second condition was modeled with the depth of the clay extending to approximately 30 ft and then the sand would begin. It is believed that sand any deeper than this would have no bearing on the stability of the interior channels.

B. Loading Conditions. EM-1110-2-1913 suggests that five different loading conditions be analyzed. Table E-1 below shows the cases that were analyzed for this project. Preliminary analysis indicated that the End of Construction (Case 1) and Rapid (or Sudden) Drawdown (Case 2) were the most critical design conditions. Slopes designed for Cases 1 and 2 would also be stable under the other design conditions. The earthquake loading was not analyzed because the probability of a serious earthquake is low in this area and the soil's susceptibility to liquefaction is low.

Table E-1. Suggested Loading Conditions in EM 1110-2-1913

Case No. [1]	**Design Condition**	**Slope Analyzed**	**Shear Strength**	**Minimum Factor of Safety**
I(I)	end of construction	riverside and landside [2]	Q or S [3]	1.3
II(II)	sudden drawdown	riverside	S where < R R where < S [4]	1.0
III(IV)	intermediate river stage	riverside	S where < R (R + S)/2 where R < S [4]	1.4
IV(V)	steady seepage from full flood stage	landside	S where < R (R + S)/2 where R < S [4]	1.4
IV(VII)	earthquake: Cases I, III, and IV with seismic loading	riverside and landside	[5]	1.0

[1] Numbers in parentheses are corresponding cases described in paragraph 1-1x of EM 1110-2-1902 (ref. A-3a (4)).
[2] If high water can occur while this case applies, the additional increase in driving forces due to the water must be included in analyzing the landside slope.
[3] In zones where no excess pore water pressures are anticipated, use S strength.
[4] Composite shear strength envelope.
[5] Use shear strength applicable for case analyzed.

C. Selection of Shear Strength Parameters. Strength parameters are major inputs to a slope stability analysis. The strength parameters are described as a ϕ, and c. ϕ is the angle of internal friction and c is the cohesion. Equation 1 below describes the shear strength.

Equation 1

$$S = c + \sigma \tan \phi$$

where: S = shear strength in (psi)
c = cohesion (psi)
σ = normal stress (psi)
ϕ = angle of internal friction

For the fine-grained soils, Figure 3-7 in EM 1110-2-1913 shows a correlation between Plasticity Index (PI) and ϕ, and the correlation between ϕ and the c/p ratio where p is the previous maximum overburden

pressure. Figure E-3 below shows Figure 3-7 from EM 1110-2-1913. The undrained shear strength was determined from a correlation published by the Virginia Polytechnic Institute in a document titled, *Shear Strength Correlations for Geotechnical Engineering*. The correlation relates undrained shear strength to the blow counts and PI and is shown in Figure E-4.

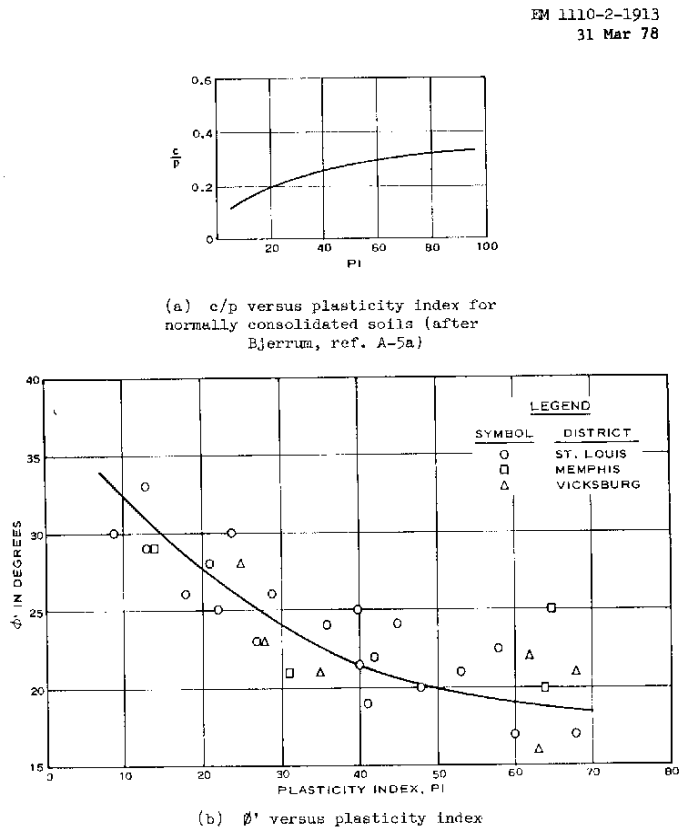

Figure E-3. Figure from EM 1110-2-1913 used to estimate drained phi and c

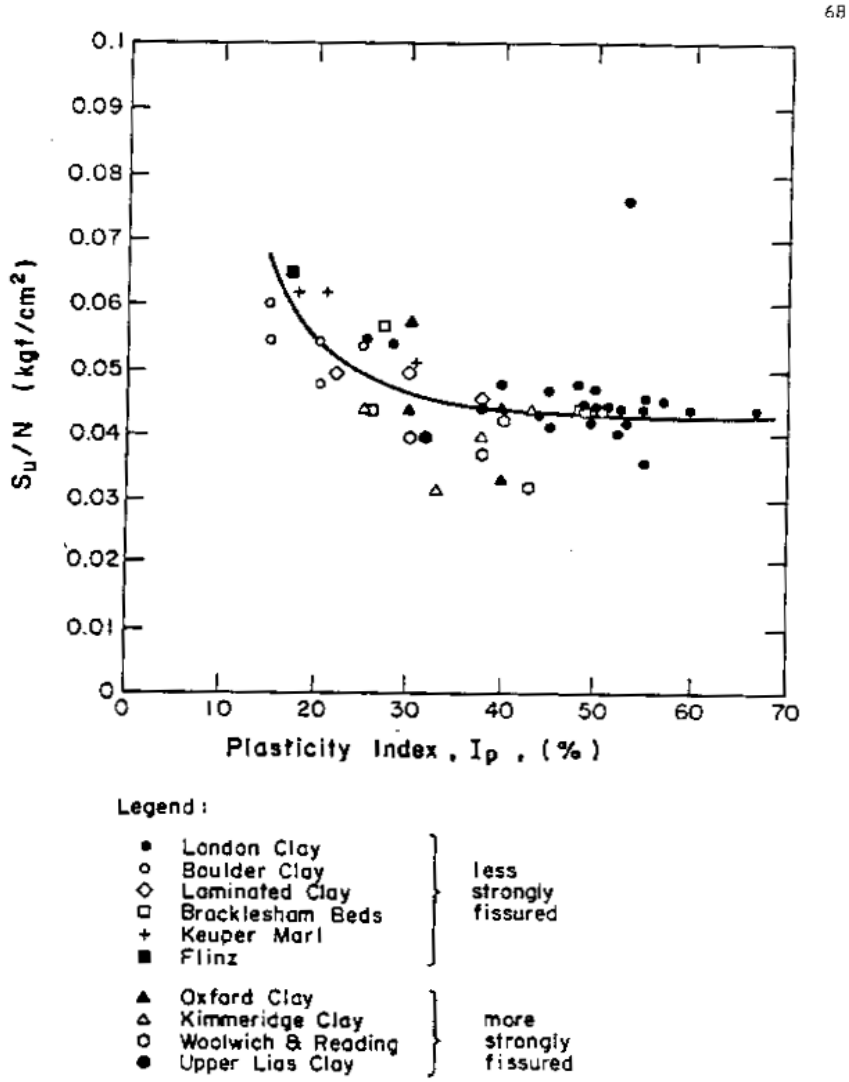

Figure E-4. Figure from EM 1110-2-1913 used to estimate undrained shear strength of soils

For the cohesionless soils, c was assumed to be zero. The angle of internal friction was estimated based upon Figure 3-5 in EM 1110-2-1913, which is shown in Figure E-5 on the following page.

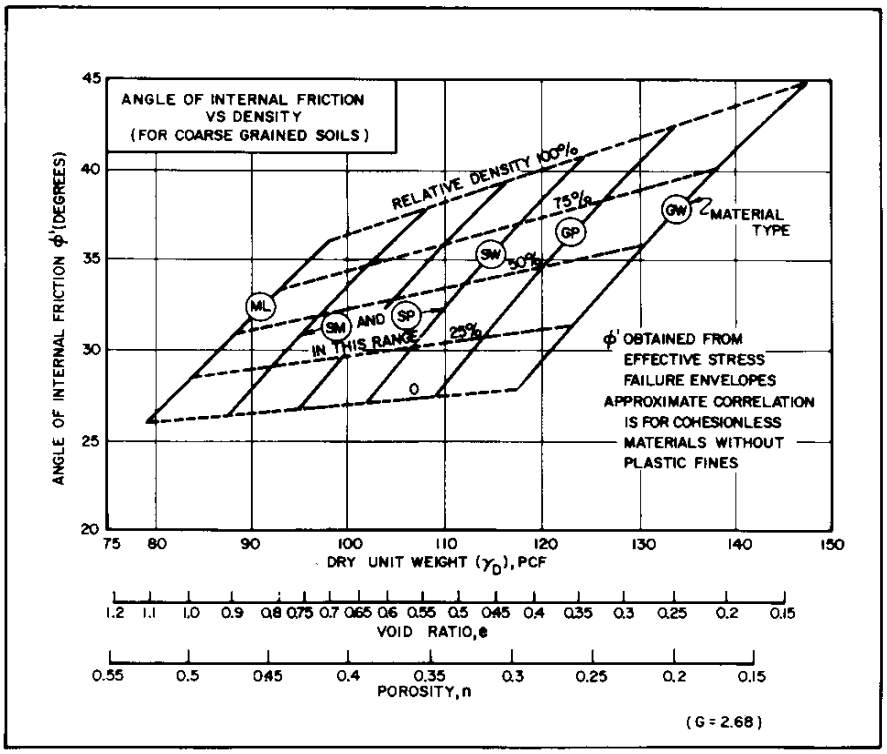

Figure E-5. Figure from EM 1110-2-1913 used to estimate angle of internal resistance for cohesionless soils

As shown in Table E-2, the standard penetration resistance ranged from 0 to 7 blows in the first 14 ft of depth for the soils. For design, the penetration resistance was selected to be 4. Also from the log, the Plasticity Index (PI) ranged from 17 to 44. For design, a PI of 30 was selected. Using Figure E-4, the undrained shear strength for design was selected to be 400 pounds per cubic ft (pcf).

Table E-2. Average Blow Counts Values for Discharge Channel

Penetration Rate -N (Blows/Ft)

Depth	RL-7-96	RL-8-96	RL-9-96	RL-10-96	RL-11-96	RL-13-96	RL-14-96	RL-15-96	RL-16-96	RL-17-96	RL-18-96
0	2	2	6	6	7	3	6	3	5	2	5
2.5	2	2	6	6	7	3	6	4	5	2	5
6	3	2	4	5	4	4	5	7	5	4	4
8	3	0	3	2	5	5	4	7	3	5	7
11	5	0	4	2	5	5	4	4	4	3	5
13	2	3	4	3	2	2	5	2	3	4	3
14	4										

The drained strengths of the material were selected using Figure E-3. Using the upper part of Figure E-3 with a design plasticity of 30, the c/p ratio was determined to be 0.225. The assumed overburden pressure

was assumed to be 450 psf (7.5 * (120-62.4)). Therefore, the estimated drained cohesion is determined to be approximately 100 psf. Using the lower part of Figure E-3, the drained phi was estimated to be 22.5 degrees.

It was felt that the stability of the structure was more dependent on the strength of the clay than on the shear strength of the sand. As a result, a conservative 30 degrees was selected of the ϕ of the sand. Most sand will have higher values of ϕ, but this was sufficient for the designs in this project. In the cases analyzed, the failure plane never passed through the sand. Therefore, the strength of the sand did not affect the factor of safety calculated.

Since the strength inputs were determined from correlation, the actual conditions could vary considerably from the estimated values. Therefore, a sensitivity analysis was performed to determine the sensitivity of proposed structures to design inputs.

D. Results of Slope Stability Analysis. The tabular results of the slope stability analysis are shown below.

Table E-3. Results Summary of Slope Stability Analysis

		Minimum Calculated Factor of Safety	
	Required Factor of Safety	2.5:1 Slopes	3:1 Slopes
End of Construction	1.3	1.42	1.45
Rapid Draw Down	1.0	0.99	1.12

The 2.5H to 1V slopes on the deep slopes have a marginal factor of safety for the rapid draw down case in the deep sections. These slopes may be susceptible to erosion and will require more maintenance.

The required factor of safety for the rapid drawdown analysis is determined in EM 1110-2-1913. This factor of safety assumes that the rapid drawdown is not going to occur often or the rapid drawdown is unlikely. With the interior channels, especially near the pump station, the rapid drawdown will likely be a common occurrence. Therefore, the required factor of safety may need to be slightly higher to ensure the stability of the slopes. Considering this, the recommended maximum slopes for the interior channels should be 3H:1V.

X. STABILITY OF PERIMETER LEVEE

Originally, the proposed structure of the perimeter levee consisted of a dredged sand core with topsoil placed on top to promote vegetation growth. However, the current design calls for a clay levee. The change was proposed because at certain locations the existing ground was not high enough to accommodate a sand core with a two-foot thick cover of topsoil. Using this new levee section, a new design analysis is being performed and new slope stability analysis is being completed.

Along the footprint of the old Hate Levee, it is anticipated that material would be excavated from Goose Lake using a large size bucket and side cast on top of the existing levee. This material would be placed without compaction and allowed to settle for approximately one year. After that time, the levee would be graded and shaped to the design cross section.

Borings RL-96-26 through RL-96-29 indicate that clay layers extend to depths of approximately 20 ft (elevation 420+/-). This would indicate that underseepage would not be a problem for the perimeter levee.

XI. EXCAVATION AT PUMP STATION

Borings RL-96-1 through RL-96-6 show the soil profile for the proposed pump station structures. RL-96-1 and RL-96-4 are located at proposed locations of the pump stations. RL-96-2 and RL-96-5 are located at the midpoint between the headgate and the pump station. Borings RL-96-3 and RL-96-6 are located at proposed pump stations.

Borings RL-96-1, RL-96-2, and RL-96-4 indicate that fine sands are present in the upper six ft of the soil. Under the sand layers, relatively soft clay layers are found which extend to approximately elevation 420. Then, sands and clayey sands are found until the bottom of the borings. Borings RL-96-3, RL-96-5, and RL-96-6 indicate lean clays until approximately elevation 420. Below, fine sands and clayey sands extend to the bottom of the boring. The borings indicate that the water table is within five ft of the surface.

While excavation for the structures will require no special equipment, precautions will have to be taken to maintain stable excavation slopes and a dewatered excavation. This may include shoring and/or pumping.

XII. EXCAVATION FOR CONNECTION OF QUARRY PIT TO RICE LAKE

Boring RL-96-34 was taken at the proposed location of the connection between the Quarry Pit and Rice Lake. Above elevation 430, the soil profile generally consists of sands, sandy clays, and clayey sands. Below elevation 430, the profile consists entirely of sands. Open excavation will require a dewatering system. Additionally, a temporary construction shoring will be required for the excavation of the culvert between the two lakes.

XIII. RECOMMENDATIONS

It is recommended that features adhere to the minimum requirements for slopes outlined in the above document.

- Interior Channels: Slopes should consist of 3H to 1V. Embankments should have 3H to 1V slopes with 10-ft minimum crown widths. Embankment material should consist of cohesive soils from the adjacent cut sections.

- Perimeter levee: The crown width should be 10-ft minimum. Adjacent to the river, slopes shall be at least 3H to 1V. Along the old Hate Levee, slopes shall be at least 4H to 1V. Embankment material would be excavated from the adjacent Goose Lake.

- Excavations for structures will be able to be accomplished using conventional construction methods. Precautions will be required to assure stable and dewatered excavations at some locations.

REFERENCES

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APPENDIX F

WATER QUALITY

UPPER MISSISSIPPI RIVER SYSTEM
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APPENDIX F
WATER QUALITY

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APPENDIX F
WATER QUALITY

PURPOSE

The purpose of this appendix is to discuss the results of baseline water quality monitoring performed at Rice Lake. Water quality monitoring was performed in an effort to define present water quality conditions and to identify potential problem areas.

GENERAL

Water quality at Rice Lake is dominated by the shallow nature of the lake coupled with lake management practices. Typically during the summer months, the lake is drawn down to allow for the production of moist soil vegetation that is utilized as a food source by waterfowl.

Preliminary discussions regarding the Rice Lake project called for construction of several islands throughout the Rice Lake complex for the purpose of improving water quality by reducing the resuspension of sediments due to wave action. In response to the construction proposal, a water quality monitoring program was implemented. Beginning in May 1987, Rice Lake water quality was monitored at site W-I135.4B. The location of this site is shown in the monitoring plan (see plate 32 of the main report). As the project evolved, it was determined that island construction was no longer a feasible alternative; therefore, the island component was dropped from further consideration. Because of this, the final sampling event occurred on February 15, 1994.

METHODS

The following paragraphs describe the methods used during pre-project water quality monitoring.

Corps of Engineers Water Quality and Sedimentation Section personnel collected samples on December 20, 1991; February 1, 1993; and February 15, 1994. Daily and Associates, Engineers, Inc., Peoria, Illinois, collected the remaining samples under contract to the Corps. On each sampling event, a water sample was collected just below the surface. Samples requiring laboratory analysis were placed on ice. Samples collected by Daily and Associates, Engineers, Inc., were analyzed by their in-house laboratory, while Corps samples were shipped to ARDL, Inc., Mt. Vernon, Illinois, for analysis. Turbidity and alkalinity samples collected by the Corps were

analyzed in-house. Sample collection/preservation and field/laboratory analytical procedures were performed according to the American Public Health Association, *et al*. (1985, 1989 or 1992) or the U.S. Environmental Protection Agency (1983). Sampling date, time, water depth, Secchi disk depth, water velocity, wave height, air temperature, percent cloud cover, wind speed and direction, pH, water temperature, dissolved oxygen (D.O.), and conductivity were recorded in the field.

In general, quality control procedures for the number of field duplicates, replicate analyses, spiked samples, control samples, and blanks run followed the guidelines of the U.S. Environmental Protection Agency (1979) or U.S. Environmental Protection Agency (1986).

RESULTS AND DISCUSSION

The results from baseline water quality monitoring at Rice Lake site W-I135.4B are given in Table F-1. Sampling commenced on May 27, 1987, and ended on February 15, 1994. The sampling site was often inaccessible during the summer months when the lake was drawn down.

The results from pH and D.O. measurements were compared against Illinois General Use Water Quality Standards. The acceptable pH range is 6.5 through 9.0. Values outside this range are acceptable when they are due to natural causes. Five pH values exceeded the maximum of 9.0; however, all appear to be due to natural causes. In each instance, D.O. and chlorophyll *a* concentrations were also relatively high, indicating the high pH values were probably a result of algal photosynthesis. The Illinois General Use Water Quality Standards state that D.O. concentrations shall not be less than 6.0 mg/l during at least 16 hours of any 24-hour period, nor less than 5.0 mg/l at any time. A review of the data indicates the D.O. concentration was below 5.0 mg/l on four occasions: July 10, 1990 (4.60 mg/l), September 7, 1990 (4.10 mg/l), October 17, 1990 (0.90 mg/l) and May 27, 1992 (0.40 mg/l). A combination of below average chlorophyll *a* concentrations, heavy cloud cover, and early sampling time appear to be responsible for the low D.O. concentrations. On all four sampling days, the chlorophyll *a* concentration was below the average value of 137.7 mg/m^3, with the highest concentration being 56 mg/m^3 on October 17, 1990. The cloud cover on July 10, 1990, and September 7, 1990, was 100 percent. Except for the September 7, 1990, sampling event, the sampling time was at or before 8:10 a.m.

Suspended sediment concentrations at Rice Lake were relatively high, averaging 62.60 mg/l. This is probably a result of resuspension of bed sediments due to wind-generated waves, with high algal concentrations also being a contributing factor.

CONCLUSIONS

Baseline water quality monitoring studies at Rice Lake have shown that on occasion, pH values exceed 9.0 and dissolved oxygen concentrations fall below 5 mg/l. Periodic extreme plant photosynthesis/respiration would appear to be the primary factors contributing to these events. The shallow nature of the lake, coupled with the aquatic vegetation present, most likely result in wide swings in pH values and D.O. concentrations during a typical summer day. A combination of resuspended bed material and algal biomass appear to be the factors resulting in the lake's relatively high suspended solids concentration.

Table F-1. Water quality monitoring results from samples collected at site W-I135.4B

	Water Depth (Ft)	Velocity (Ft/Sec)	Wave Height (Ft)	Air Temp (°C)	Cloud Cover (%)	Wind Speed (mph)
DATE						
5/27/1987	4.80	-	-	29	-	15
6/9/1987	4.80	-	-	23	-	10
6/23/1987	3.30	-	-	27	-	5
7/7/1987	1.90	-	-	29	-	10
9/15/1987	1.60	-	-	24	-	0
9/30/1987	2.60	-	-	21	-	10
10/13/1987	2.50	-	-	16	-	5
10/27/1987	3.10	-	-	8	-	5
6/26/1990	9.00	0.380	0.3	26	90	2
7/10/1990	7.00	0.400	0.2	27	100	2
7/25/1990	7.00	0.060	0.8	26	10	8
8/8/1990	5.00	0.120	0.0	26	40	2
8/23/1990	4.50	0.580	0.2	24	100	2
9/7/1990	5.50	0.040	0.8	28	100	8
9/19/1990	4.00	-	0.5	18	100	5
10/2/1990	4.00	0.030	0.5	28	0	2
10/17/1990	3.50	0.270	1.0	19	25	10
10/30/1990	4.00	0.250	0.5	22	0	8
5/21/1991	7.00	0.140	0.2	27	100	3
6/5/1991	8.00	-	2.0	26	0	20
6/18/1991	5.00	0.070	0.2	29	5	3
7/1/1991	2.00	0.150	0.5	29	5	8
12/20/1991	3.80	0.047	0.0	0	100	0
5/12/1992	3.00	0.110	0.5	31	80	2
5/27/1992	4.00	-	0.5	10	0	2
6/9/1992	3.00	-	0.5	30	80	8
8/5/1992	2.00	0.020	0.5	27	95	8
2/1/1993	10.00	0.152	*	3	0	2
2/15/1994	4.60	0.045	*	3	5	8
MIN	1.60	0.020	0.0	0	0	0
MAX	10.00	0.580	2.0	31	100	20
AVG.	4.50	0.168	0.5	22	49	6

* Not applicable, ice cover

Table F-1. Water quality monitoring results from samples collected at site W-I135.4B

	Wind Direction	Water Temp. (°C)	Dissolved Oxygen (mg/l)	Ph (su)	Total Alkalinity (mg/l as Caco3)
DATE					
5/27/1987	SW	24.0	14.00	9.40	-
6/9/1987	NE	25.0	10.50	9.50	-
6/23/1987	NE	32.0	7.10	9.30	-
7/7/1987	SW	27.0	11.50	9.20	-
9/15/1987	-	23.0	7.70	8.20	-
9/30/1987	NW	21.0	11.50	8.90	-
10/13/1987	SW	11.0	12.40	9.00	-
10/27/1987	SW	9.0	13.00	9.00	-
6/26/1990	SW	24.0	6.70	7.95	170
7/10/1990	NW	23.0	4.60	8.39	170
7/25/1990	S	26.0	12.60	8.60	180
8/8/1990	S	29.0	15.80	8.78	180
8/23/1990	SE	25.5	6.40	8.40	190
9/7/1990	NW	30.0	4.10	8.14	200
9/19/1990	N	18.0	8.60	8.53	200
10/2/1990	SE	21.0	7.40	8.56	190
10/17/1990	S	16.6	0.90	8.37	180
10/30/1990	SW	13.3	9.50	8.71	240
5/21/1991	SE	24.0	16.80	8.60	140
6/5/1991	N	26.0	8.80	8.70	150
6/18/1991	NW	28.0	15.40	9.00	170
7/1/1991	SW	32.0	13.30	9.30	150
12/20/1991	-	3.2	16.24	8.85	145
5/12/1992	N	27.0	12.70	8.40	110
5/27/1992	N	16.0	0.40	7.90	180
6/9/1992	NE	27.0	14.00	9.00	150
8/5/1992	N	23.0	5.90	8.80	120
2/1/1993	N	4.2	17.11	8.74	155
2/15/1994	NW	4.8	18.82	8.05	70
MIN	-	3.2	0.40	7.90	70
MAX	-	32.0	18.82	9.50	240
AVG.	-	21.2	10.47	-	164

Table F-1. Water quality monitoring results from samples collected at site W-I135.4B

DATE	Specific Conductance (µMHOS/cm @ 25°C)	Secchi Disk Depth (Ft)	Turbidity (NTU)	Suspended Solids (Mg/L)
5/27/1987	510	0.70	-	92.00
6/9/1987	520	0.50	-	71.00
6/23/1987	530	0.50	-	57.00
7/7/1987	550	0.30	-	210.00
9/15/1987	580	0.40	-	110.00
9/30/1987	480	0.40	-	110.00
10/13/1987	590	0.55	-	52.00
10/27/1987	520	0.70	-	40.00
6/26/1990	610	1.60	9	15.00
7/10/1990	580	1.05	12	29.00
7/25/1990	560	0.90	18	31.00
8/8/1990	590	0.60	26	49.00
8/23/1990	570	0.60	34	64.00
9/7/1990	590	0.80	90	62.00
9/19/1990	580	0.70	90	11.00
10/2/1990	560	0.90	62	50.00
10/17/1990	570	0.65	150	80.00
10/30/1990	650	0.90	74	8.00
5/21/1991	480	1.10	-	10.00
6/5/1991	580	0.90	13	28.00
6/18/1991	490	0.85	11	24.00
7/1/1991	510	0.40	56	120.00
12/20/1991	499	1.05	13	15.00
5/12/1992	630	0.30	81	99.00
5/27/1992	640	0.60	48	69.00
6/9/1992	610	0.55	38	89.00
8/5/1992	450	0.25	26	210.00
2/1/1993	484	*	7	5.30
2/15/1994	536	*	3	5.20
MIN	450	0.25	3	5.20
MAX	650	1.60	150	210.00
AVG.	553	0.69	43	62.60

* Not applicable, ice cover

Table F-1. Water quality monitoring results from samples collected at site W-I135.4B

DATE	Chlorophyll a (mg/m3)	Chlorophyll b (mg/m3)	Chlorophyll c (mg/m3)	Pheophytin a (mg/m3)
5/27/1987	450.0	<21	87.0	62.0
6/9/1987	320.0	7.0	62.0	100.0
6/23/1987	340.0	<4	48.0	62.0
7/7/1987	660.0	72.0	70.0	130.0
9/15/1987	290.0	<2	67.0	220.0
9/30/1987	250.0	16.0	38.0	110.0
10/13/1987	130.0	9.0	27.0	94.0
10/27/1987	210.0	15.0	23.0	29.0
6/26/1990	17.0	3.0	<2	<2
7/10/1990	20.0	8.0	7.0	8.0
7/25/1990	48.0	<2	5.0	27.0
8/8/1990	32.0	<2	<2	<2
8/23/1990	84.0	7.0	2.0	34.0
9/7/1990	8.0	5.0	<2	9.0
9/19/1990	111.0	9.0	2.0	27.0
10/2/1990	46.0	<2	<2	44.0
10/17/1990	56.0	<2	5.0	42.0
10/30/1990	16.0	<2	<2	25.0
5/21/1991	50.0	5.0	3.0	9.0
6/5/1991	28.0	3.0	3.0	42.0
6/18/1991	36.0	<2	3.0	2.0
7/1/1991	160.0	10.0	5.0	2.0
12/20/1991	120.0	3.8	21	32.0
5/12/1992	40.0	3.0	7.0	72.0
5/27/1992	4.0	4.0	3.0	80.0
6/9/1992	192.0	3.0	16.0	21.0
8/5/1992	240.0	5.0	23.0	12.0
2/1/1993	20.7	17.2	11.9	80.3
2/15/1994	13.2	<1.3	4.6	<2.7
MIN	4.0	<1.3	<2	<2
MAX	660.0	72.0	87.0	220.0
AVG.	137.7	-	-	-

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APPENDIX G

HYDROLOGY AND HYDRAULICS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

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HYDROLOGY AND HYDRAULICS

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APPENDIX G

HYDROLOGY AND HYDRAULICS

I. INTRODUCTION AND LOCATION

The project site is located along the west bank of the Illinois River between River Miles (RM) 132.0 and 138.0, see Plate 1. Plate 7 of the main report shows the approximate alignment of the proposed perimeter water control levee. Without the project, high ground and/or low levees protect the project site from the Illinois River during very low level flood events. The proposed changes make the levee uniform (elevation 442.0 ft) and improve habitat for fish and migratory waterfowl. The first hydrologic appendix was completed in 1996, but additional work due to design changes has been requested. Work summarized in this appendix covers work done for the 1996 version through Fiscal Year 2010.

The site is located upstream of the La Grange Lock and Dam (RM 80.1) where the flat pool elevation is 429.0 ft (ft) (1929 datum). All elevations used in this appendix are National Geodetic Vertical Datum 1929 (NGVD). The nearest operating gages are at Havana (RM 119.6), Copperas Creek (RM 136.9), and Kingston Mines (RM 145.4). River miles are taken from Reference 1. The drainage area of the Illinois River is 18,299 square miles (sq mi) at the Havana gage and 15,819 sq mi at the Kingston Mines gage (Reference 5).

II. CLIMATE

The National Weather Service at Havana, Illinois, recorded the climatological data used for the project site. The data shown in Table G-1 are from the period 1901-1966. The gage identification number is 3930.

The average annual daily minimum temperature was 42 degrees Fahrenheit (F), while the average annual daily maximum temperature was 64 degrees F. However, the temperatures in central Illinois can fluctuate over an extreme range. Average monthly temperatures range from a maximum of 89.2 degrees F in July to a minimum of 17.5 degrees F in January. The precipitation is moderate, with an average annual value of 34.0 inches (in). The average annual snowfall is 21.4 in.

Table G-1. Average and Extremes of Monthly Precipitation

	Precipitation					Snow		
	Average	**Maximum**		**Minimum**		**Average**	**Maximum**	
Month	(in)	(in)	Year	(in)	Year	(in)	(in)	Year
Jan.	1.83	9.74	1916	0.02	1919	5.58	22.9	1918
Feb.	1.49	4.35	1908	0.05	1947	4.70	14.2	1908
Mar.	2.78	7.30	1901	0.26	1910	4.43	23.5	1960
Apr.	3.62	7.68	1957	0.89	1901	0.68	11.5	1920
May.	3.76	9.82	1935	0.39	1934	0.00		
Jun.	4.05	9.68	1947	0.40	1933	0.00		
Jul.	3.50	10.95	1937	0.25	1916	0.00		
Aug.	3.12	7.16	1965	0.52	1935	0.00		
Sep.	3.61	13.14	1911	0.07	1940	0.00		
Oct.	2.42	12.22	1941	0.12	1964	0.13	3.05	1925
Nov.	2.14	6.78	1942	0.04	1914	1.07	9.70	1926
Dec.	1.68	5.82	1949	0.26	1919	4.71	15.2	1942

III. ILLINOIS RIVER

A. Flood Conditions. Although the project is not designed to operate during floods, it is useful to know flood conditions at the site. Plate G-1 shows the flood profiles on the Illinois River in the vicinity of the project site. Profiles were taken from Reference 4. It is noted here that the *Upper Mississippi River System Flow Frequency Study*: Hydrology and Hydraulics Appendix C by the Rock Island District (dated January 2004), resulted in slightly different flow frequency-elevation relationships at the project site. Reference 4 continues as the basis for the design of this EMP project.

B. Stage Hydrographs and Stage Duration. The stage hydrographs from 1960 through 2008 appear on Plates G-2 through G-18. Plate G-19 shows the stage-duration curve for daily data from 1960-1994. These daily stages were recorded at the Copperas Creek gage, elevations are in ft NGVD.

IV. NEW PUMP STATION AND DISCHARGE CHANNEL

During the fall season, pumps located along the Illinois River will be used to raise the water level of the lakes and moist soil units. Originally these pumps totaled 100,000 gallons per minute (gpm), but in 2004 the capacity was increased to 133,200 gpm to fill the lakes and moist soil units in 15 days. The project also consists of digging a new discharge channel between the pump station and the lakes, as well as the moist soil units, see Plate 19.

Plate G-20 lists the lowest and highest annual recorded stage on the Illinois River at Copperas Creek (1960 through 2008). Low stages often occurred during months when the pumps would be operating, September and October. The mean annual low water elevation for the 49-year period of record is 430.3 ft with a standard deviation of 0.7 ft. The elevation 430.3 ft was used as the low

water level to design the pump station. During the 49-year period, stages at Copperas Creek dropped below elevation 430.0 ft 27 times, for a total duration of 57 days. The durations lasted from one day (13 times) to six days (one time). The lowest observed stage was 429.2 ft. Several bottom widths were examined for the discharge channel from the pump station to the lakes. The design chosen was a dirt channel with a bottom width of 30 ft, side slopes of 3H to 1V, and a constant bottom at elevation 430.0 ft, see Plate 19. Maximum mean channel velocities recommended by *EM 1110-2-1601* for various channel materials are two ft per second for sandy silt, three and one half ft per second for silt clay, and six ft per second for clay. Table G-2 lists the depth, velocity, and Froude number for various discharges.

Table G-2. Discharge Channel Flow Conditions for Various Discharges

# of pumps	Discharge (gpm)	Velocity (ft/sec)	Froude #	Flow depth (ft)
1	33,300	.7	.09	2.66
2	66,600	.9	.1	3.79
3	99,900	1.0	.1	4.78
4	133,200	1.0	.1	5.95

Scour protection of the discharge channel at the outlet of the pump station is required to prevent erosion. Articulated Concrete Matting (ACM) was selected for scour protection because of the unique geometry and high discharge rates. See Plates 25 and 26 for pump station plan and profile. Several simplifying assumptions were necessary in determining coverage of the ACM. The pipe velocity (7.7 fps) for the highest discharge rate (133,200 gpm) and the assumption that the pump station outlet apron is a rectangular channel were used to calculate the length of the resulting hydraulic jump. The length of the hydraulic jump was calculated using Figure 6 from *Hydraulic Design of Stilling Basins and Energy Dissipators* (Reference 3). This length was used as the length to extend the scour protection downstream of the pump station outlet; however, in actuality, the jump will most likely occur on the concrete apron before it reaches the discharge channel. It is recommended that ACM be placed on the bed and to the top of the banks (approximately elevation 436.0 ft) of the discharge channel around the pump station outlet and extended 10 ft downstream of the pump station outlet.

V. ALTERNATIVES THAT FLOOD THE INTERIOR BEFORE THE ILLINOIS RIVER OVERTOPS THE LEVEE CREST

The levee will be overtopped many times during its project life. Damage to the proposed levee system can be reduced by raising the interior water level before the Illinois River flows over the levee crest. The adopted alternative for flooding the lakes consists of a spillway section in the perimeter levee. Other alternatives, making an overland flow corridor by eliminating a part of the levee and adding gates, were studied and are discussed later in this section. The alternatives were evaluated based on the interior water surface elevation being no more than one foot below the final river stage (442.0 ft) after a 48 hour flood.

A. Levee Spillway Section. This portion of the report summarizes work to verify the length of the proposed spillway section. The section is 2,500 ft long with a crest at elevation 440.0 ft. The approach consisted of developing an inflow hydrograph and routing it into the interior lakes. The inflow hydrograph was based on observed events on the Illinois River.

1. Discharges Through the Spillway Section. The spillway was evaluated using the same stage hydrograph discussed later under the flow corridor model. The stage was assumed to rise steadily from elevation 440.0 ft to elevation 442.0 ft in 48 hours. The discharge hydrograph into the interior area used in the HEC-1 model was computed using the weir equation:

$$Q = CLH^{1.5}$$

The weir coefficient (*C*) was initially 2.8 and was increased to 3.0 for depths above the weir crest greater than 1.5 ft. The coefficient was obtained from Reference 2 (page 5-43). Similar coefficients were also found in Reference 6 (2.7 for a head of one foot and 3.0 for a head of two ft). The weir length (*L*) is 2,500 ft. The height (*H*) is the difference between the Illinois River stage and the weir crest (elevation 440.0 ft).

After a trial HEC-1 run, the inflow hydrograph was modified. During the last 14 hours of the HEC-1 routing, the water level of Big Lake exceeded elevation 440.0 ft and submerged the spillway. A plot in Reference 2 (page 5-18) was used to estimate the reduction in discharge from the submerged condition. The plot related the ratio of the depths of water upstream and downstream of the weir to the ratio of the submerged discharge to the unsubmerged discharge. The submerged discharge varied from 0.98 to 0.65 of the unsubmerged discharge.

2. Maximum Interior Water Level with Spillway Section. The spillway HEC-1 model contained two routings. The discharge hydrograph (from the Illinois River) was routed into Unit 1 which simulates the combined areas of Goose Lake, Big Lake, Lower Slim Lake, and adjacent management units. The outflow from the Unit 1 was then routed into Unit 2 which simulates Rice Lake, the Duck Island Gravel Pit, and adjacent management units. Elevation-area data were obtained from Reference 1 (Table 4-1) and are repeated in Table G-3.

Table G-3. Elevation-Area Data Used in Spillway Model

Water Surface Elevation (ft)	Unit 1 Area (acres)	Unit 1 Outflow (cfs)	Unit 2 Area (acres)
434.0	1226		
435.0	1675		1136
436.0	2006		1199
437.0	2227		1294
438.0	2440		1441
439.0	2620		1906
439.25		378	
439.5		1516	
439.75		2786	
440.0	2800	4290	2485
441.0	2873	10000	2590
442.0	2941	10000	2693

When the level of Big Lake exceeds 439.0 ft, water will flow over the Narrows Dam and enter Rice Lake. This flow was estimated for various levels in Big Lake using the weir equation and entered in the outflow table of Unit 1 (see Table G-3). By the time the level in Big Lake reaches elevation 441.0 ft, the weir between Big Lake and Rice Lake is submerged. The discharge from Big Lake to Rice Lake for elevations 441.0 and 442.0 ft was decreased to reflect reduced flow due to

submergence. Otherwise, the weir coefficient varied from 2.6 to 2.8 and the weir length was 1,650 ft long.

The starting water level for Big Lake (Unit 1) was set at elevation 434.0 ft while the starting water level for Rice Lake (Unit 2) was set at 435.0 ft. The discharge hydrograph used a one-hour time interval; the same interval was used for the computation interval. The maximum computed interior water levels at the end of 48 hours, rounded to the nearest foot, can be seen in Table G-4.

Table G-4. Maximum Interior Water Surface Elevations with Spillway Section

Location	Water Level (ft)
Illinois River	442
Big Lake (Unit 1)	442
Rice Lake (Unit	441

3. Feasibility of Using Pumps to Reduce Spillway Length. The pumps used to regulate water levels in the fall could also be used to help flood the interior and thus reduce the spillway length. However, if the pumps were always operated when the river is predicted to overtop the emergency spillway, the spillway length would only be reduced from 2,500 ft to 2,450 ft. This calculation was based on a total pump capacity of 100,000 gpm. This rate can raise the interior water surface from elevation 435.0 ft to 437.0 ft in about 16 days. Although the capacity was later increased to 133,200 gpm, the influence of pumping would still be relatively insignificant. Pumping in preparation of levee overtop is not recommended.

B. Overland Flow Corridor Alternative. The overland flow corridor would be a gap in the proposed levee system. It would start at the southeast end of the Hate Levee and extend upstream along the northwest bank of the Illinois River. Several flow corridor widths were examined; however, the overland flow corridor is not an acceptable substitute for a spillway. The discharges into the interior area are too small to raise the interior water level in a timely manner.

The overland corridor was analyzed by determining an inflow hydrograph and then routing this hydrograph into the interior lakes. To be considered effective, the interior water level had to be within a foot of the levee crest when it was overtopped by the Illinois River.

1. Discharges Through the Overland Flow Corridor. Discharges through the corridor were calculated every six hours for a total period of 48 hours. The discharge is mainly a function of the corridor width and the elevation of the Illinois River since the water level of the lakes does not rise high enough to retard the discharge coming through the corridor. The elevation of the Illinois River at the project site was assumed to increase linearly from elevation 440.0 ft to elevation 442.0 ft in two days (48 hours). The maximum observed stage increase for the Illinois River to rise from elevation 440.0 to 442.0 ft was one and one half ft in one day and two ft in two days (see page 52 of Reference 1). The stage was assumed to rise steadily over two days since this would produce less inflow into the study area, a more conservative scenario, than if it rose one and one half ft the first day and one half ft the second day. The assumptions from Reference 1 were verified by examining stage data for Copperas Creek for the period 1990 through 1995.

Each point on the stage hydrograph was converted to a discharge value using a rating curve for the flow corridor. A HEC-RAS model was used to produce the rating curve. This water surface

profile model was composed of 10 cross sections and modeled the flow corridor from the edge of Goose Lake to the bank of the Illinois River (2,176 ft). The width of the cross section (corridor width) varied from 2,500 ft to 4,500 ft.

A Manning's n-value of 0.1 was used for the cross sections to simulate flow though dense woods. The water surface profiles were started at normal depth using the slope between the first two cross sections. The cross section with the highest ground elevations was at the bank of the river. Ground elevations varied between elevation 440.0 ft and 442.0 ft. Rating curves for three corridor widths appear on Plate G-21.

2. Maximum Interior Water Level Using the Overland Flow Corridor. The final interior water level was computed with a HEC-1 model using modified Puls routing. Computations started with an interior water elevation of 434.0 ft. The discharge hydrograph was entered at six-hour intervals. However, computations were made at one-hour intervals. The elevation-area data were taken from Reference 1 (Table 4-1). The areas (and volumes) used in the model appear in Table G-5.

Table G-5. Elevation-Area Data Used in Overland Flow Corridor Model

Elevation (ft)	Surface Area (acres)	Storage Volume (acres-ft)
434.0	1,220	0
434.5	1,450	667
435.0	1,650	1,443
435.5	1,790	2,302
436.0	1,920	3,230
437.0	2,070	5,225
438.0	2,195	7,358
439.0	2,326	9,618
440.0	2,475	12,018
441.0	2,533	14,522
442.0	2,594	17,086

Several existing features separate the combined area of Goose Lake, Big Lake, and Lower Slim Lake from the combined areas around Rice Lake and the Duck Island Gravel Pit. These features include high ground and the Narrows Dam. When the water level in Big Lake exceeds elevation 439.0 ft, it will start entering Rice Lake and the gravel pit. Since the overland flow corridor routings produced interior water levels below elevation 439.0 ft, the areas of Rice Lake and the gravel pit were not included in this model. A few of the Big Lake management units were inadvertently omitted. However, since the combined area of the management units is less than 10 percent of the area of Big, Goose, and Lower Slim Lakes, the runs were not revised. Adding this area would not have changed the results significantly, and the conclusions would not have changed.

The maximum computed interior water levels at the end of 48 hours have been rounded to the nearest foot and appear in Table G-6. This is the computed water level for the combined areas of Big, Goose, and Lower Slim Lakes. At the end of 48 hours, the water level in the Illinois River is

442 ft while the lake levels were below 441 ft for all corridor widths. Thus, none of the overland flow corridor widths meet the design criteria.

Table G-6. Maximum Interior Water Level for Various Overland Flow Corridors

Corridor Width (ft)	Interior Lake Elevation (ft)
2,500	436
3,500	437
4,500	438

C. Gate Alternative. The possibility of using gates similar to the three control structures built at Lake Chautauqua was also explored. Unfortunately, the volume required to flood the interior associated with the Rice Lake Project is substantially larger than Lake Chautauqua and would require 15 gates. Each gate would be 10 ft wide, 10 ft tall and have a sill at elevation 434.0 ft. Gates would be opened when the river elevation reached elevation 440.0 ft. The gates allow the interior water level to reach elevation 442.0 ft within two days, assuming that the river rises at a rate of one foot per day. As the interior water level rises, the gates become submerged; this reduces the inflow by about one half of the original rate. A volume-elevation plot is shown below in Figure G-1.

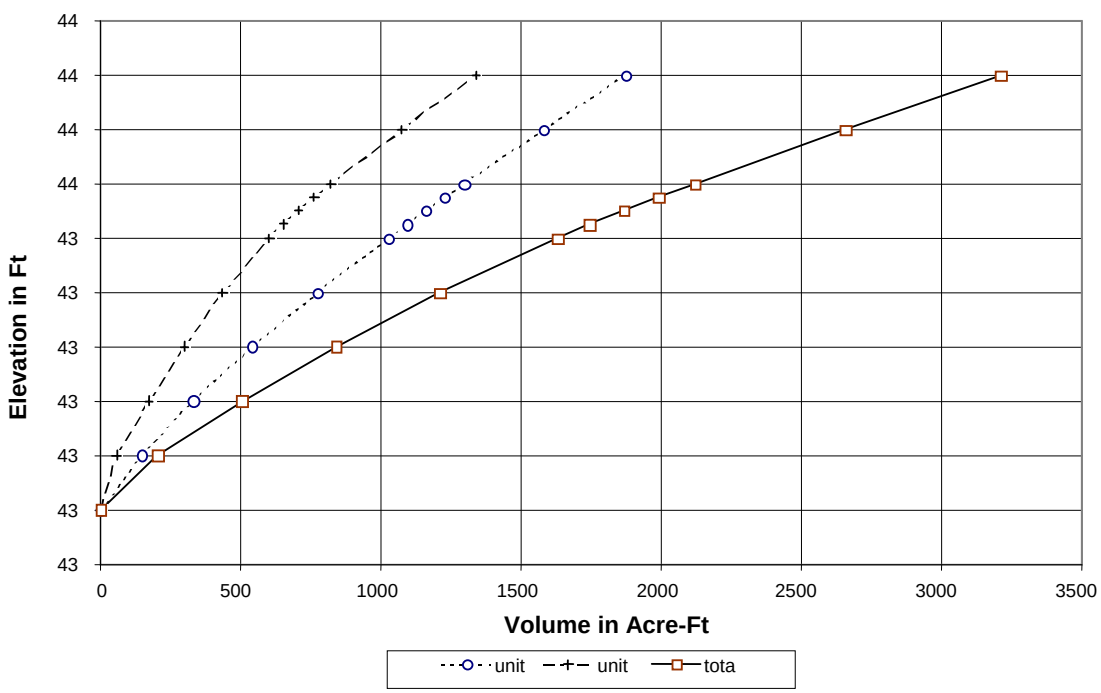

Figure G-1. Volume-Elevation for Rice Lake Interior Area

VI. LOWERING PROJECT LAKE LEVELS IN JUNE

A. Operation Criteria and Description of the Three Alternatives. In this section, the term *Big Lake Complex* refers to Big Lake, Goose Lake, Upper Slim Lake, the gravel pit, and adjacent moist soil units. The operating plan calls for lowering the water levels of Big Lake Complex and Rice Lake in 15 days. Drawdown will occur in June and be complete by July to allow for a moist soil plant growing season from July 1 to September 15. Big Lake Complex water surface would start at elevation 436.0 ft and Rice Lake at elevation 437.0 ft. It is desired that Big Lake Complex fall to elevation 434.0 ft and Rice Lake to elevation 435.0 ft.

The Big Lake Complex is designed to be lowered through Goose Lake by removing the stoplogs of two existing gatewell structures (see Plate 3) when Illinois River stages are favorable. Each gatewell structure is a corrugated metal pipe (CMP) with a diameter of five ft, a length of about 40 ft, and an invert elevation estimated at 431.3 ft. A dirt channel connects the culverts to Goose Lake. With the existing configuration, model results give a drawdown duration of 27.0 days for Big Lake Complex and Rice Lake given a river stage, or tailwater (TW) elevation, of 434.0 ft.

Therefore, to meet the drawdown criteria outlined in the first paragraph of this section, the outflow capacity must be increased. Three alternatives were examined. Alternative 1 adds the proposed fish egress structure, a nine ft by seven ft concrete box culvert (see Plates 16 and 17), parallel to the two existing gatewell structures. Alternative 2 adds an additional gatewell structure (see Plate 15) to Alternative 1. The additional gatewell structure has a diameter of five ft, a length of about 100 ft, and an invert at elevation 430.0 ft. The fish egress structure is 26 ft long and has an invert elevation of 430.0 ft. A third alternative (Alternative 3) abandons the existing gatewells and uses only the new gatewell and fish egress structure for drawdown. Alternative 2 was selected since it provides the most flexibility of operation. Furthermore, scour protection will be required at the inlets and outlets of the proposed gatewell and fish egress structures to prevent erosion.

B. Evaluation of Alternatives. Historic data was studied to gain insight into project operation. Table G-7 shows the maximum, minimum, and average Illinois River stage during the proposed drawdown period in June observed at Copperas Creek for selected years (1960-2008). The drawdown period for this analysis was selected by taking the lowest average river stage for 15 consecutive days in June. Table G-7 also presents the tailwater (TW) impact on drawdown; the maximum river stage in May; the approximate lake volume in May; the minimum possible drawdown elevation for partial drawdowns; and if the drawdown process will be a success. As mentioned earlier in this appendix, the project does not operate successfully every year. With the proposed overflow spillway at elevation 440.0 ft, there were 28 out of 49 years when the spillway would not have been overtopped later in the growing season July 1 - September 15). These 28 years furnished conditions for evaluating the two alternatives during the drawdown period. Success of drawdown was determined based on average river stage being at or below 434.0 ft. However, one drawdown (1966) was considered successful due to low river stages, which allow for faster drawdown, even though the average stage was slightly above 434.0 ft.

Table G-7. Stage Data at Copperas Creek and Lake Drawdown Data for June

	Ignore Year If Project Floods Later in Growing Season	Max. May Stage	Illinois River During Drawdown		Drawdown Avg. Stage	TW Impact On	Approx Lake Vol.-May	Drawdown Success	Min. Possible Drawdown Elev.
			Max. Stage	Min. Stage					
Year									
1960	Ignore	--	--	--	--	--	--	--	--
1961		439.4	435.0	432.1	433.1	Fast	Min	YES	--
1962		439.8	437.6	431.5	433.9	Fast	Min	YES	--
1963		436.9	432.0	430.8	431.3	Fast	Min	YES	--
1964		439.2	431.3	430.6	430.9	Fast	Min	YES	--
1965		443.5	432.8	431.0	431.7	Fast	Max	YES	--
1966		444.6	436.6	432.4	434.4	Fast	Max	YES	--
1967		441.6	437.2	432.8	434.0	Fast	Max	YES	--
1968	Ignore	--	--	--	--	--	--	--	--
1969		440.5	438.4	434.1	435.9	Slow	Max	Partial	434-435
1970	Ignore	--	--	--	--	--	--	--	--
1971		434	432.7	431.6	431.6	Fast	Min	YES	--
1972	Ignore	--	--	--	--	--	--	--	--
1973	Ignore	--	--	--	--	--	--	--	--
1974	Ignore	--	--	--	--	--	--	--	--
1975	Ignore	--	--	--	--	--	--	--	--
1976		442.9	434.2	433.2	433.8	Fast	Max	YES	--
1977		438.7	431.8	429.9	430.9	Fast	Min	YES	--
1978	Ignore	--	--	--	--	--	--	--	--
1979	Ignore	--	--	--	--	--	--	--	--
1980		439.1	443.8	438.0	440.9	Slow	Min	Fails	--
1981	Ignore	--	--	--	--	--	--	--	--
1982	Ignore	--	--	--	--	--	--	--	--
1983		446.4	437.2	433.9	435.5	Slow	Max	Partial	434-435

Table G-7 (Continued). Stage Data at Copperas Creek and Lake Drawdown Data for June

	Ignore Year if Project Floods Later in Growing Season	Max. May Stage	Illinois River During Drawdown		Drawdown Avg. Stage	TW Impact On Drawdown	Approx Lake Vol.-May	Drawdown Success	Min. Possible Drawdown Elev.
			Max. Stage	Min. Stage					
Year									
1984		440.0	441.6	437.7	439.5	Slow	Max	Fails	--
1985		438.9	432.9	431.8	432.3	Fast	Min	YES	--
1986	Ignore	--	--	--	--	--	--	--	--
1987		439.6	433.9	432.4	433.3	Slow	Min	Yes	--
1988		436.9	430.6	430.3	430.4	Fast	Min	YES	--
1989	Ignore	--	--	--	--	--	--	--	--
1990	Ignore	--	--	--	--	--	--	--	--
1991		443.4	438.9	432.0	434.7	Slow	Max	Partial	434-435
1992		437.2	432.7	430.9	431.4	Fast	Min	YES	--
1993	Ignore	--	--	--	--	--	--	--	--
1994		440.3	432.4	431.5	431.9	Fast	Max	YES	--
1995		451.7	443.4	438.1	440.2	Slow	Max	Fails	--
1996	Ignore	--	--	--	--	--	--	--	--
1997		437.2	439.1	434.5	437.2	Slow	Min	Fails	--
1998	Ignore	--	--	--	--	--	--	--	--
1999		445.1	441.2	439.7	440.3	Slow	Max	Fails	--
2000	Ignore	--	--	--	--	--	--	--	--
2001		437.9	443.0	435.6	440.5	Slow	Min	Fails	--
2002		451.1	442.8	438.6	441.0	Slow	Max	Fails	--
2003	Ignore	--	--	--	--	--	--	--	--
2004		440.5	443.8	440.3	442.6	Slow	Max	Fails	--
2005		435.0	431.7	430.0	430.8	Fast	Min	YES	--
2006		437.6	433.9	431.2	432.1	Fast	Min	YES	--
2007	Ignore	--	--	--	--	--	--	--	--
2008	Ignore	--	--	--	--	--	--	--	--

Complete drawdown of the lakes (Rice Lake and Big Lake Complex) would have been impossible eight of the 28 years the site is not flooded later in the growing season because the Illinois River remained above elevation 436.0 ft (1980, 1984, 1995, 1997, 1999, 2001, 2002, and 2004). Partial drawdown, average river stage between 434.0 ft and 436.0 ft, would have been possible three years (1969, 1983, and 1991). Of the remaining 17 years, 12 occurred with a tailwater at or below 433.0 ft and five occurred with a tailwater of about 434.0 ft. Complete success (complete drawdown of the lakes and no overtopping of the spillway later in the growing season) would have been possible 17 of the 49 years. This gives a "with-project" success rate of 35 percent, or about four out of every 10 years. Without the project, the lakes (Rice Lake and Big Lake Complex) could have been successfully managed (complete drawdown and no flooding later) only five years. This gives a "without-project" success rate of 10 percent, or one out of every 10 years.

1. Description of HEC-HMS models. The volume-elevation data used in the HEC-HMS models appears in Table G-8 and was generated using Crawford, Murphy, and Tilly (CMT) data. Two adjustments were made to the data: (1) the volume between elevations 435.0 ft to 434.0 ft only includes the volume of Big Lake Complex since Rice Lake is not drained below 435.0 ft; and (2) under normal operating conditions the volume drained from elevation 437.0 ft to 436.0 ft will include only Rice Lake since Big Lake Complex's water surface will not be above 436.0 ft. When the connection between Big Lake and Rice Lake is unblocked before starting the drawdown operation, the water level of both lakes will equalize at elevation 436.4 ft. This elevation was used as the starting water level for the normal operating condition. The second volume adjustment was ignored when computing the volumes above elevation 437.0 ft since Big Lake Complex will be at the same level as Rice Lake. The outflow-elevation data for each alternative was computed with HEC-RAS and appears in Table G-8. Two rating curves were generated for each alternative, one with a tailwater elevation of 434.0 ft and another with a tailwater elevation of 433.0 ft. It is important to note the outflows for lake levels below 434.0 ft were set to zero because the lake level will not be drawn down below 434.0 ft.

Table G-8. HEC-HMS Routing for Proposed Alternatives

		Alternative 1		**Alternative 2**		**Alternative 3**	
Lake Elevation (ft)	Total Lake Volume (acre-ft)	Outflow TW=434 ft (cfs)	Outflow TW=433 ft (cfs)	Outflow TW=434 ft (cfs)	Outflow TW=433 ft (cfs)	Outflow TW=434 ft (cfs)	Outflow TW=433 ft (cfs)
433.9	0	0	0	0	0	0	0
434.0	1	0	234	0	302	0	232
434.1	122	104	246	124	317	100	243
435.0	1,451	343	360	430	459	316	340
436.0	4,459	497	497	621	627	440	445
436.4	5,706	554	554	690	693	484	487
437.0	7,822	640	640	793	795	549	552
438.0	11,523	779	779	954	955	661	660
439.0	15,726	911	911	1,108	1,108	764	763
440.0	20,630	1,012	1,012	1,218	1,218	879	879

2. Results from HEC-RAS and HEC-HMS Models to Drawdown Lakes in June.

Drawdown times for the lakes were calculated using modified Puls routing in HEC-HMS based on the outflow-elevation data derived from the HEC-RAS model. Model results indicate all alternatives can meet the drawdown criteria for normal operating conditions. However, Alternative 2 drains the lakes in seven to nine days under normal operating conditions and can meet the drawdown criteria when lake levels are higher than normal as shown in Table G-9. Normal operating condition refers to Big Lake Complex and Rice Lake starting at elevation 436.0 ft at 437.0 ft, respectively. This case was simulated by starting both lakes at elevation 436.4 ft and using a half hour computation interval. Drawdown times were rounded to the nearest half-day. Alternative 2 is recommended due to its flexibility of operation.

Table G-9. Days Required to Drawdown Big Lake Complex and Rice Lake

	Alternative 1		**Alternative 2**		**Alternative 3**	
Initial Lake Level (ft)	TW= 434 ft (days)	TW= 433 ft (days)	TW= 434 ft (days)	TW = 433 ft (days)	TW= 434 ft (days)	TW = 433 ft (days)
439.0	18.0	15.0	14.5	15.5	20.0	17.0
438.0	15.5	12.5	12.5	10.5	17.0	14.0
437.0	13.0	10.0	10.5	8.0	14.0	11.0
Normal (436.4)	11.0	8.5	9.0	7.0	12.0	9.0

VII. MAINTENANCE CONCERNS

Most of the Corps of Engineers guidance leads one to conclude that if the interior water level is within one foot of the levee crest at the time of overtopping, the levee damage will be slight. However, the guidance for overtopping grass levees comes from observations and experiments on levees that rarely overtopped. The Rice Lake Project levees could be overtopped several times a year. The Rice Lake spillway was designed to produce an interior water level elevation of 442 ft at the same time the regular levee crest is overtopped. For this analysis, the crest of the emergency spillway is at elevation 440.0 ft and the Illinois River is assumed to rise at a rate of one foot per day. As the result of a past value engineering study, a combination of emergency spillway and natural overland flow corridor was evaluated.

Riprap armor guidance for the emergency spillway comes from hydraulic modeling conducted at the Waterway Experiment Station (Reference 6). The design curves allow only a small water level difference (two ft to seven ft) across the levee and result in large stone sizes (300 to 3,000 pounds).

Levees providing low levels of protection will have high maintenance costs. Based upon observations of the spillway at Lake Chautauqua, trees and debris will collect on the spillway every time it is overtopped. If the Rice Lake Project is protected with riprap, the debris must **not** be burned in place since the fire would damage the riprap. Equipment and labor would be required to remove debris from the spillway. To quantify these events, the stage at Copperas Creek was examined for the 49 years from 1960-2008; a count was made of the number of times per year the spillway and the levee would have been overtopped. No stage adjustments were made to the Copperas Creek data. As shown in Table G-10, in 49 years there would have been 126 opportunities for debris to collect on the emergency spillway and 86 for it to collect along the levee.

Table G-10. Summary of Opportunities for Debris to Collect at Rice Lake (1960 - 2008)

Description	Spillway Crest - 440 ft	Levee Crest - 442 ft
Count of years when spillway or levee would not be overtopped (no debris possible)	2	8
Count of years when spillway or levee would be overtopped once during the entire year (debris possible from one event)	6	15
Count of years when spillway or levee would be overtopped twice during the year (debris possible from two events)	19	16
Count of years when spillway or levee would be overtopped three times during the year (debris possible from three events)	11	4
Count of years when spillway or levee would be overtopped four times during the year (debris possible from four events)	7	4
Count of years when spillway or levee would be overtopped five times during the year (debris possible from five events)	3	1
Count of years when spillway or levee would be overtopped six times during the year (debris possible from six events)	1	1

VIII. INFLUENCE OF PROJECT ON WATER SURFACE LEVELS IN THE ILLINOIS RIVER

The Rice Lake project is a combination of high ground and levee that increases the protection of Rice Lake, Big Lake, and Goose Lake from flooding by the Illinois River. The project lies west of the river and extends from RM 132.2 upstream to RM 136.7. The levee will be built with a design crest elevation of 442.0 ft from RM 132.2 upstream to about RM 134.9. The existing high ground from RM 134.9 upstream to RM 136.7 is generally above elevation 442.0 ft. There are six places below elevation 442 ft that range from about 35 to 260 linear ft (lf). These places will be built up to elevation 442.0 ft. Refer to Plate 7 of the main report for an approximate alignment of the line of protection.

The levee has a maximum influence on water levels in the Illinois River for a discharge of 34,000 cfs which has a recurrence interval of less than two years. Although the project is within the floodway of the Illinois River the impacts are minimal and were coordinated with the Illinois Department of Natural Resources in 1998. See Plates G-22 and G-23 for a copy of the 1998 letter.

REFERENCES

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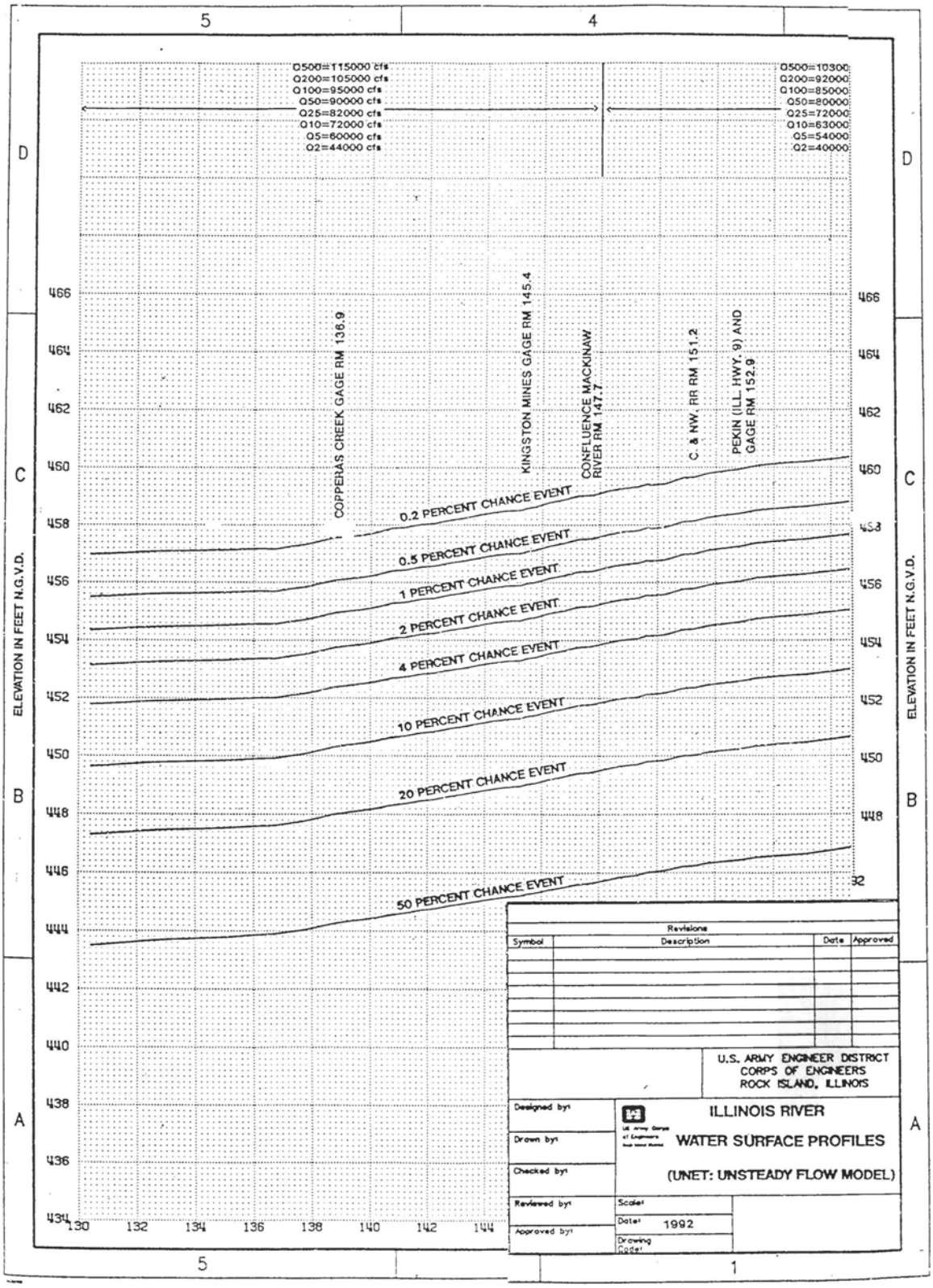
2. *Handbook of Hydraulics*, Brater and King, McGraw-Hill Book Company, St. Louis, Missouri, Sixth Edition, 1976.

3. *Hydraulic Design of Stilling Basins and Energy Dissipators*, A.J. Peterka, United States Department of the Interior, Bureau of Reclamation, Engineering Monograph No. 25: A Water Resources Technical Publication, 1984.

4. *Illinois River Water Surface Profiles - River Mile 80 to River Mile 190*, U.S. Army Corps of Engineers, Rock Island District, Letter Report, 1992.

5. *River Mileages and Drainage Areas for Illinois Streams - Volume 2*, R. W. Healy, U.S. Geological Survey, Champaign, Illinois, December 1979.

6. *Stability of Riprap and Discharge Characteristics, Overflow Embankments, Arkansas River, Arkansas*, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi, June 1964.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COPPERAS CREEK GAGE RM 136.9
KINGSTON MINES GAGE RM 145.4
CONFLUENCE MACKINAW RIVER RM 147.7
C. & NW. RR RM 151.2
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WATER SURFACE PROFILES
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Scale:
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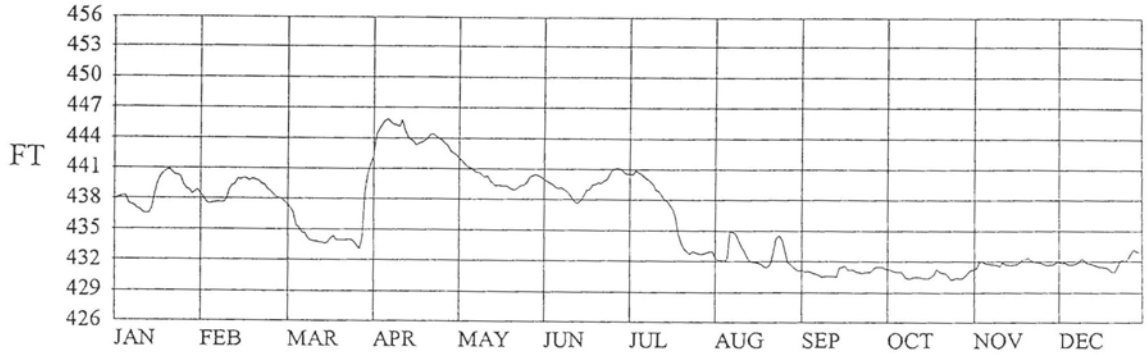
PLATE G-1



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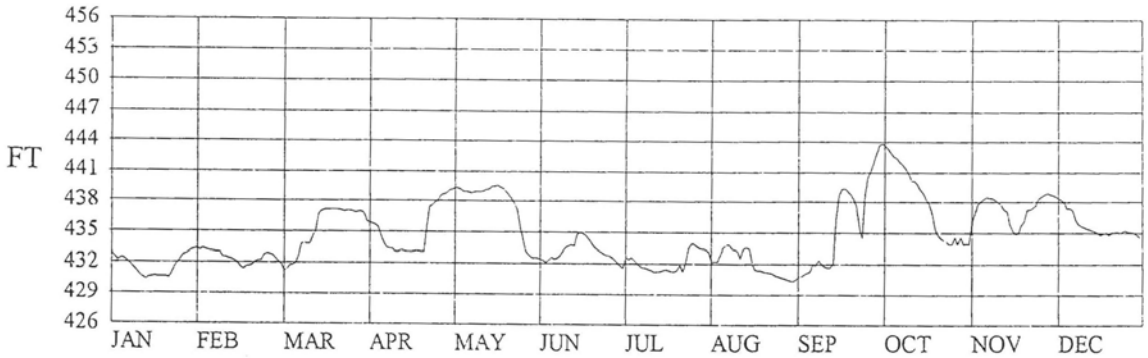

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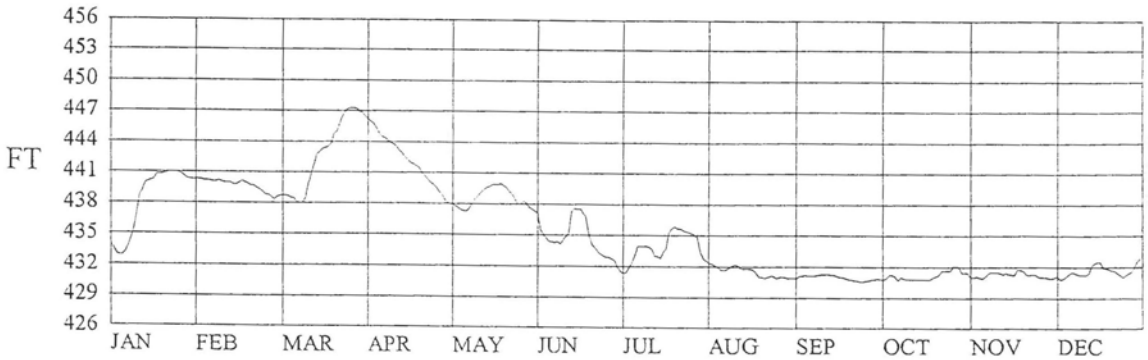

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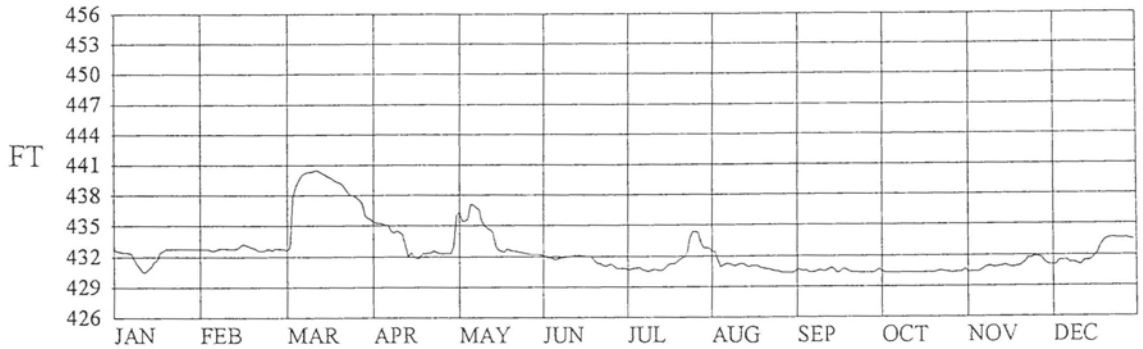
PLATE G-2



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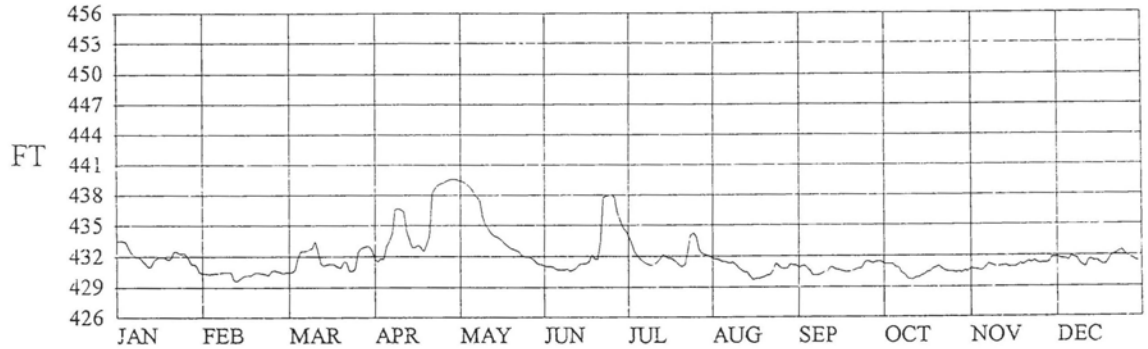

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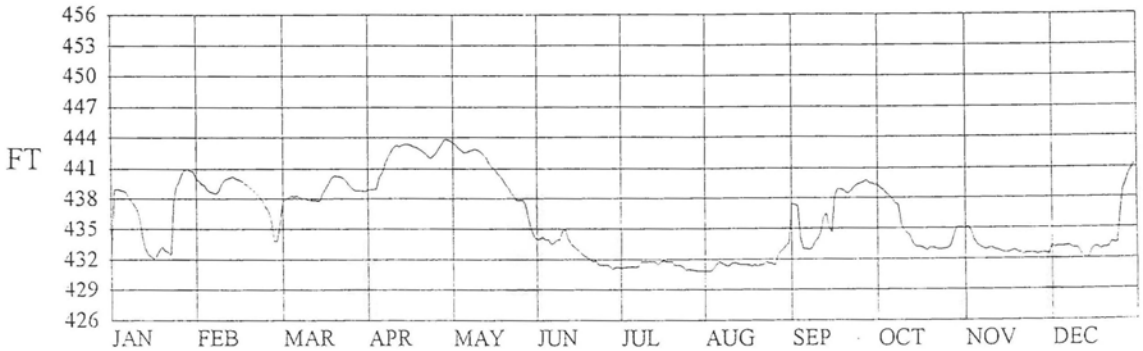

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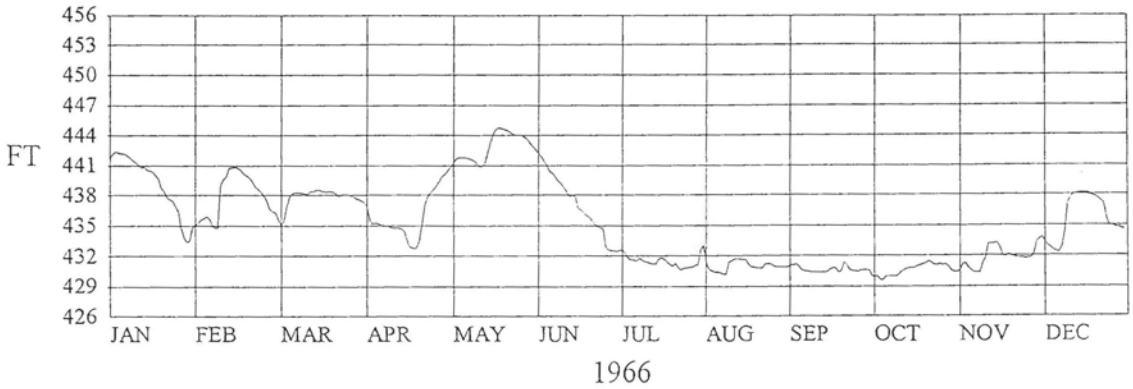
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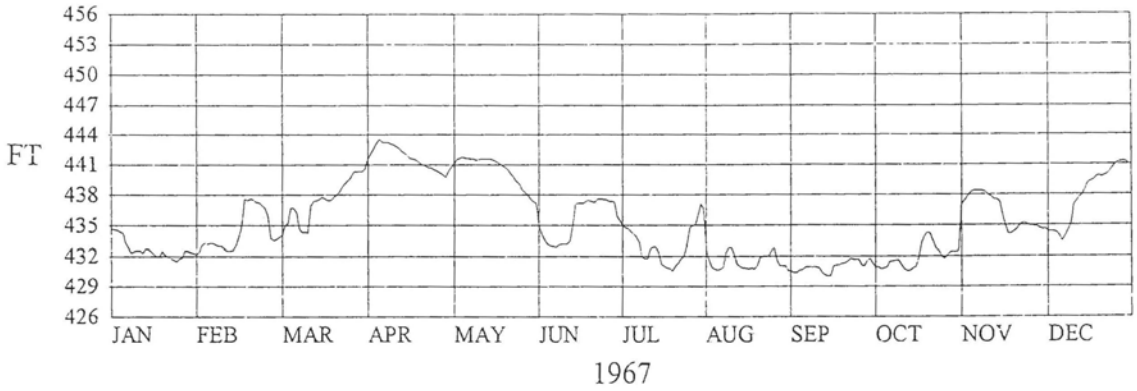
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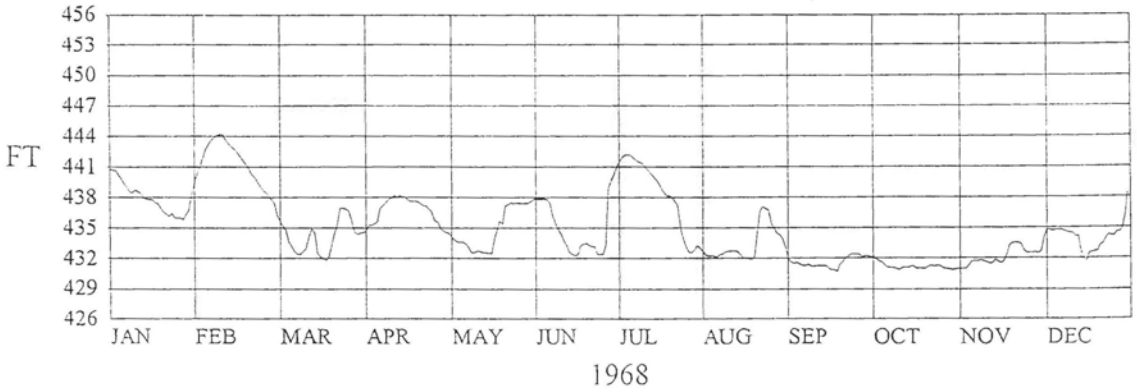
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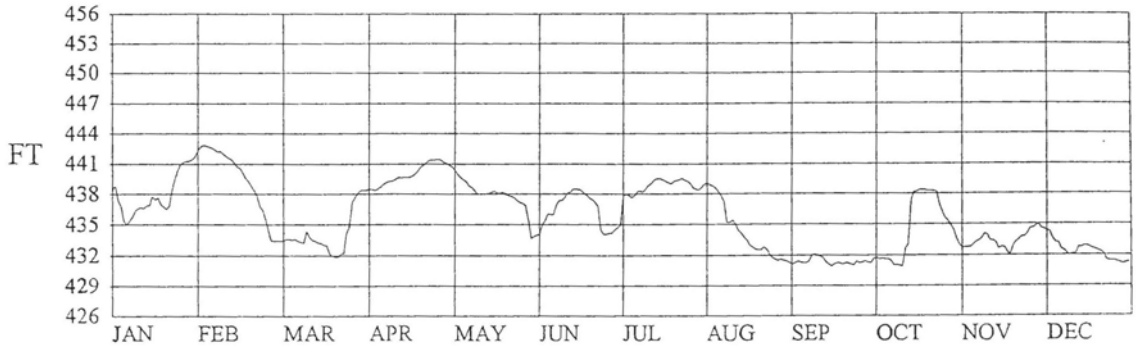

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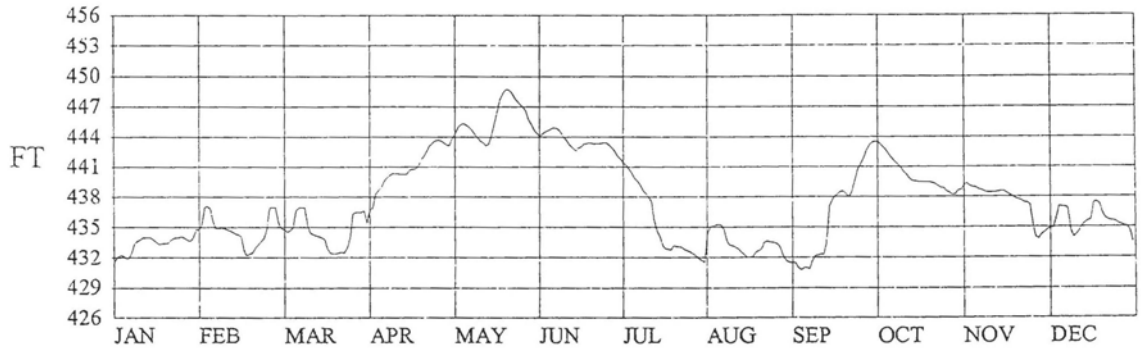

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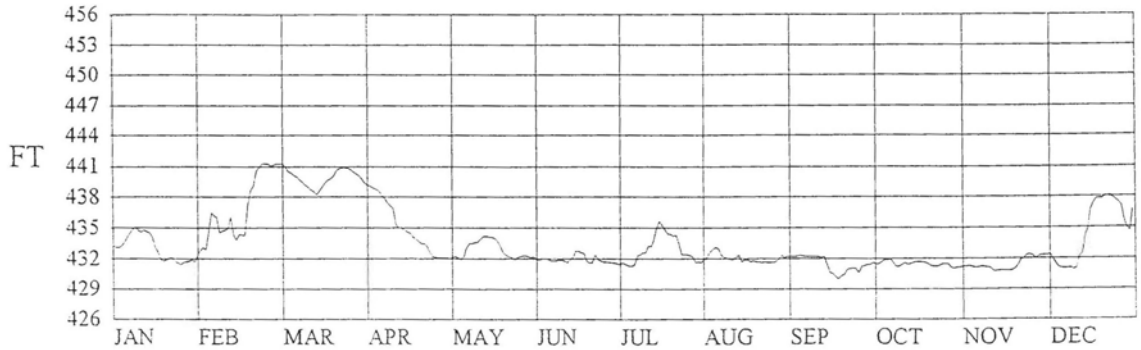

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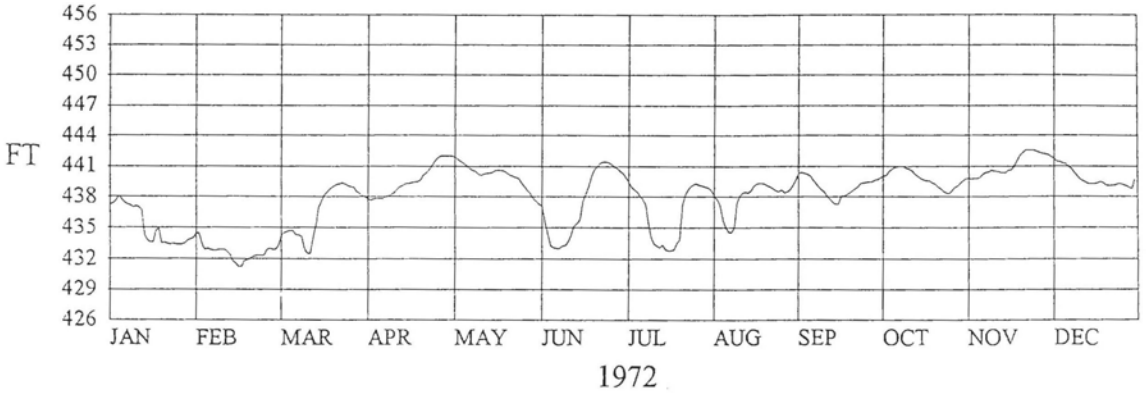
PLATE G-5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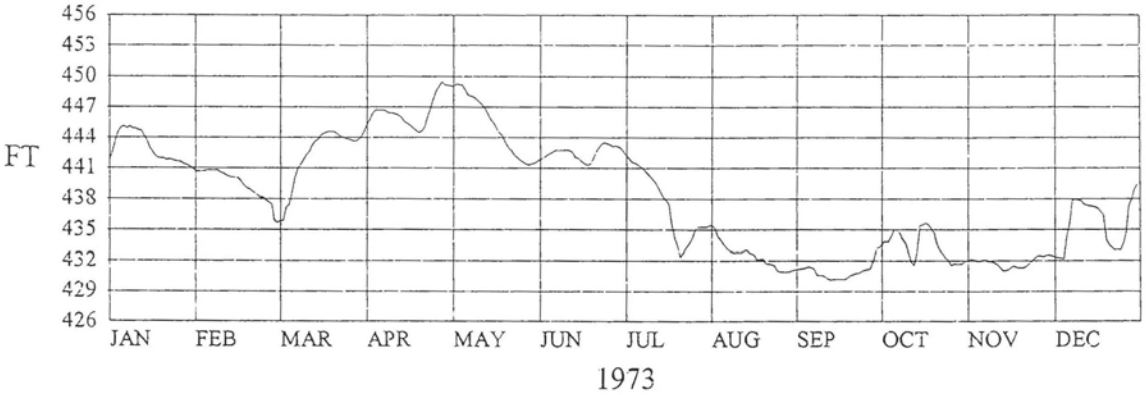
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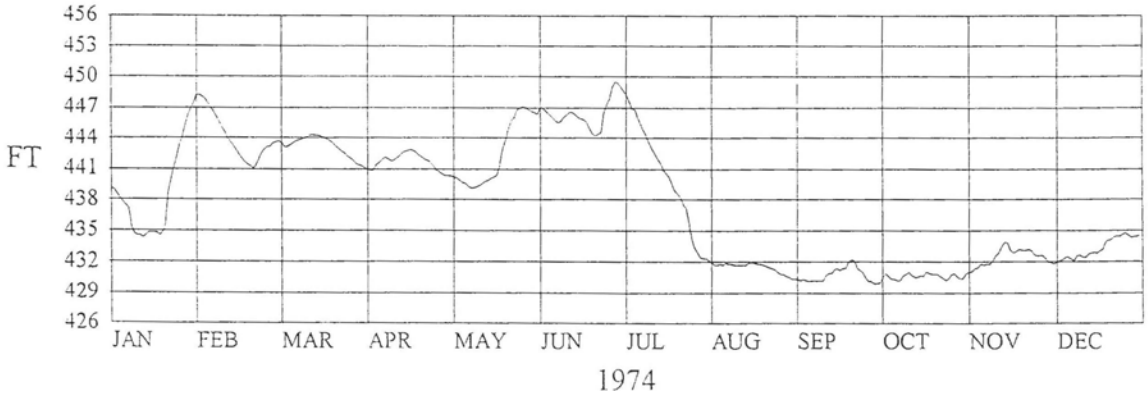
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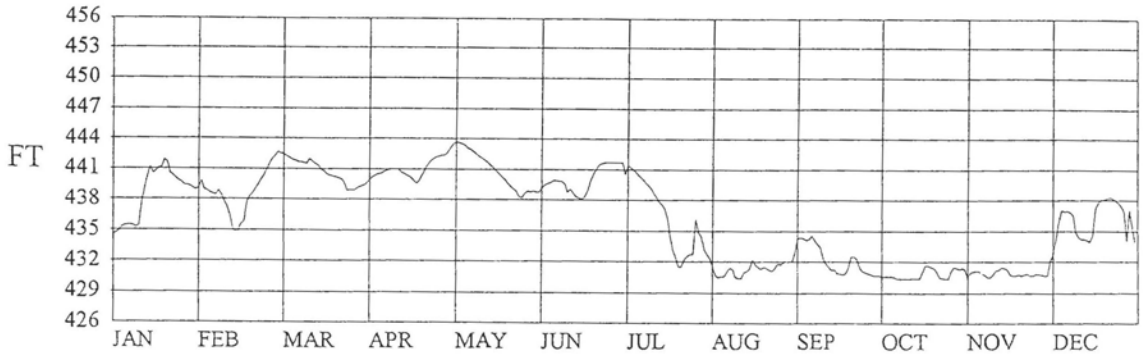
1974

PLATE G-6



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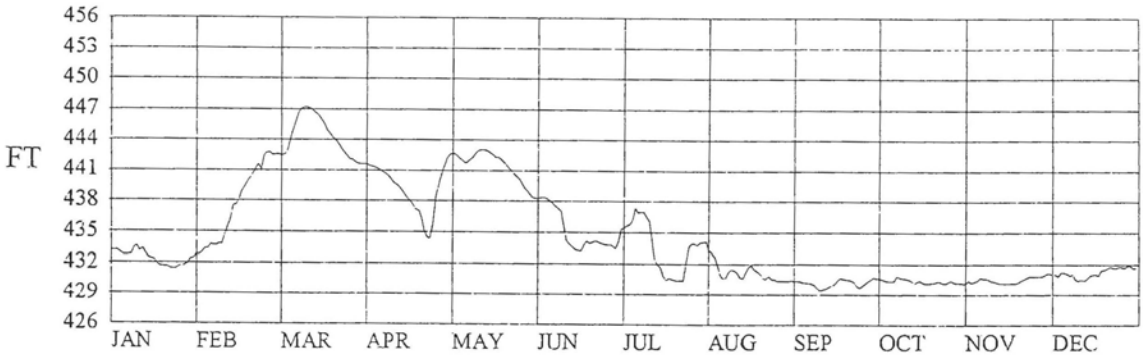

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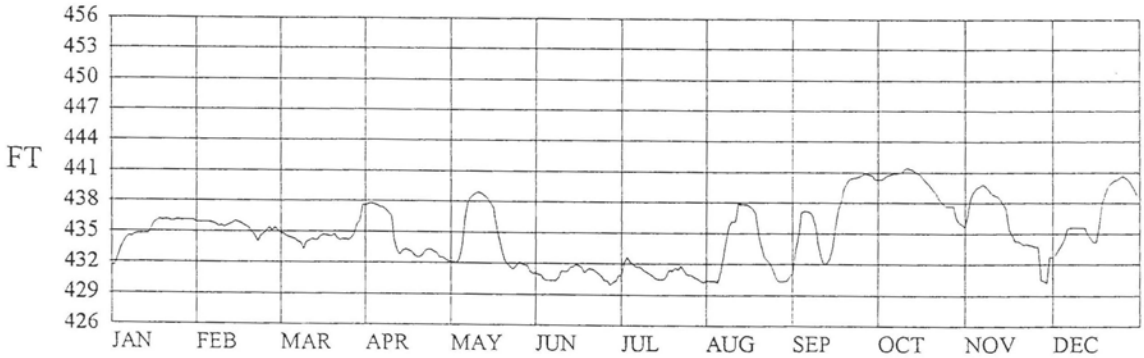

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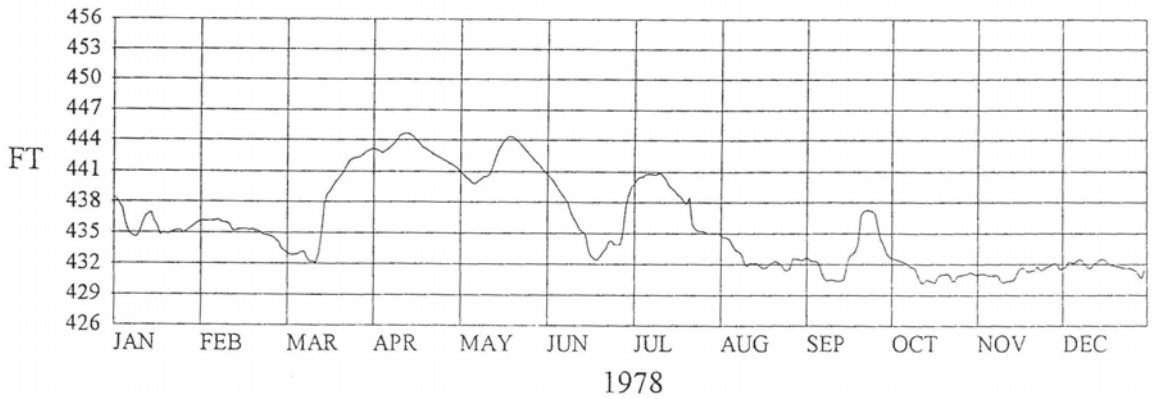
PLATE G-7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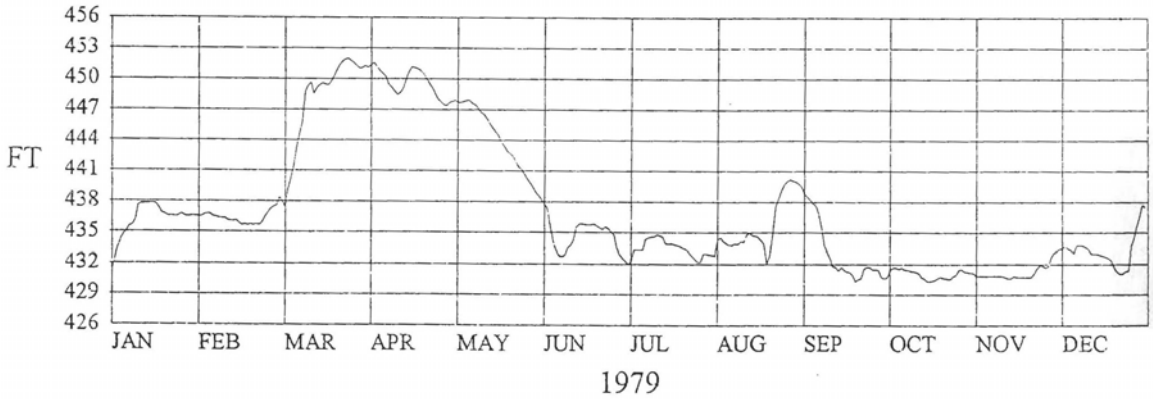
1978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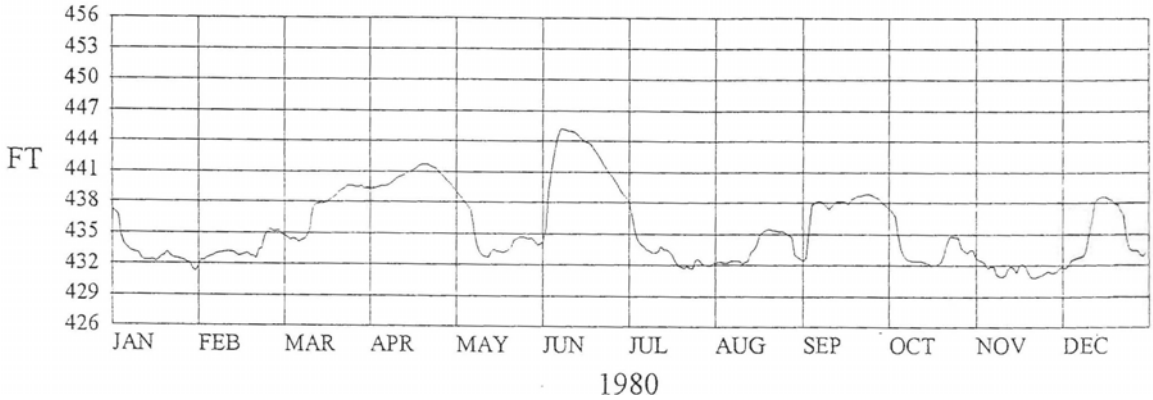
1979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OCT
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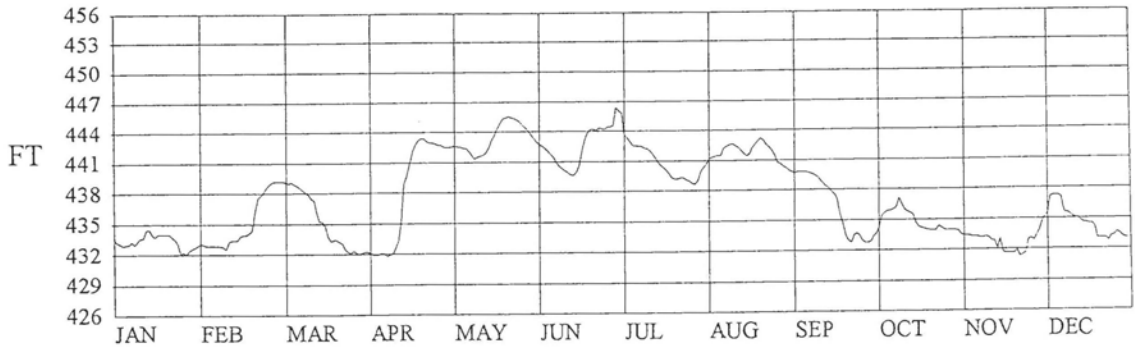
DEC
1980

PLATE G-8



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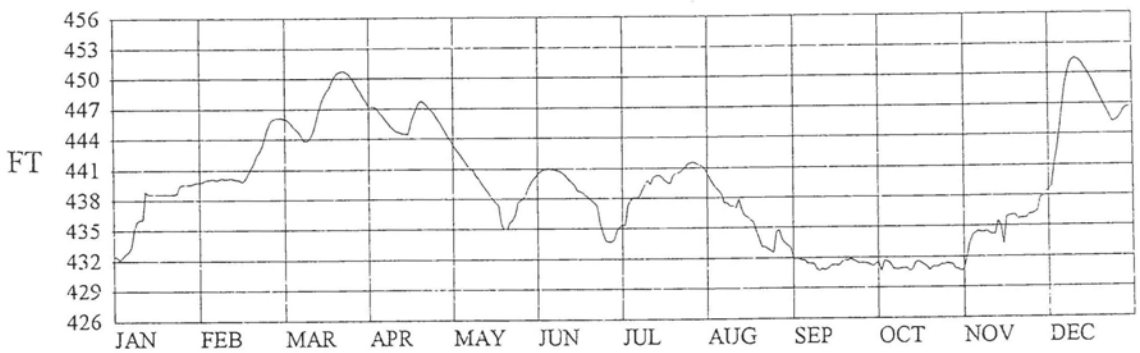

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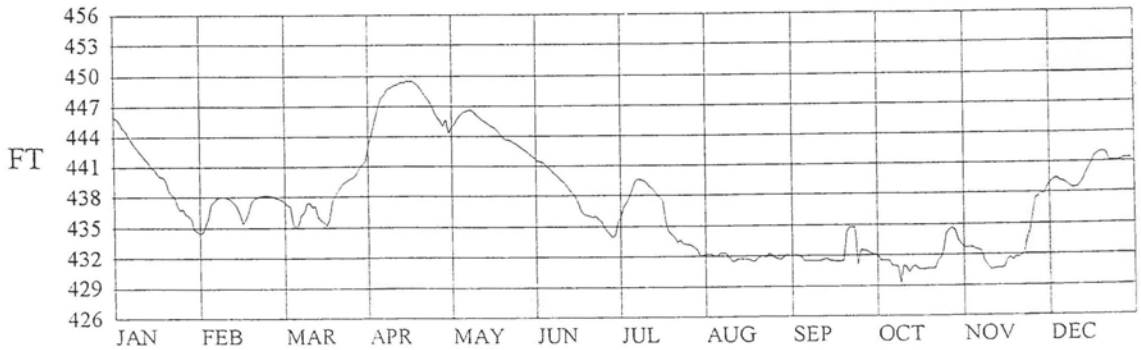
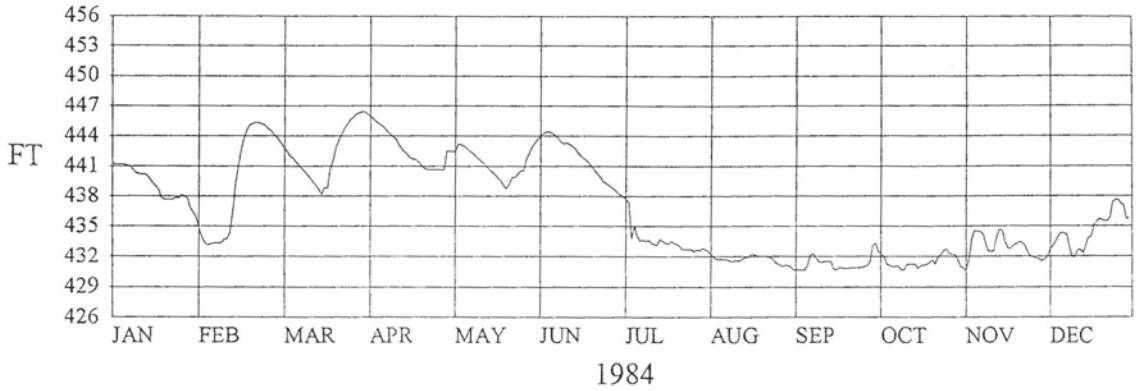


1983

PLATE G-9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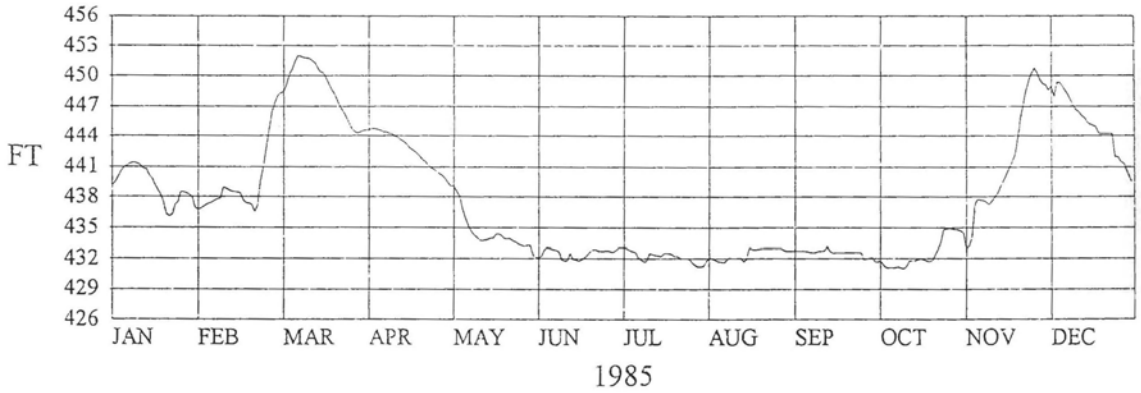
SEP
OCT
NOV
DEC
1984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JUN
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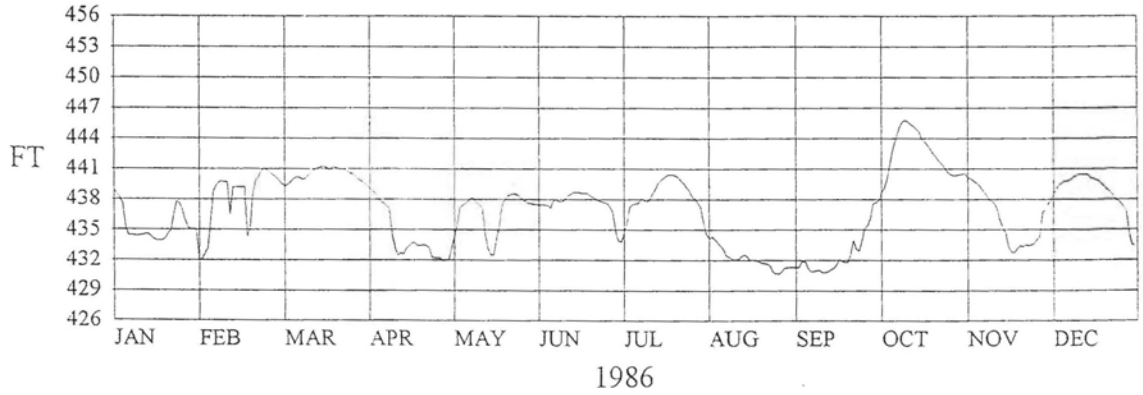
AUG
SEP
OCT
NOV
DEC
1985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APR
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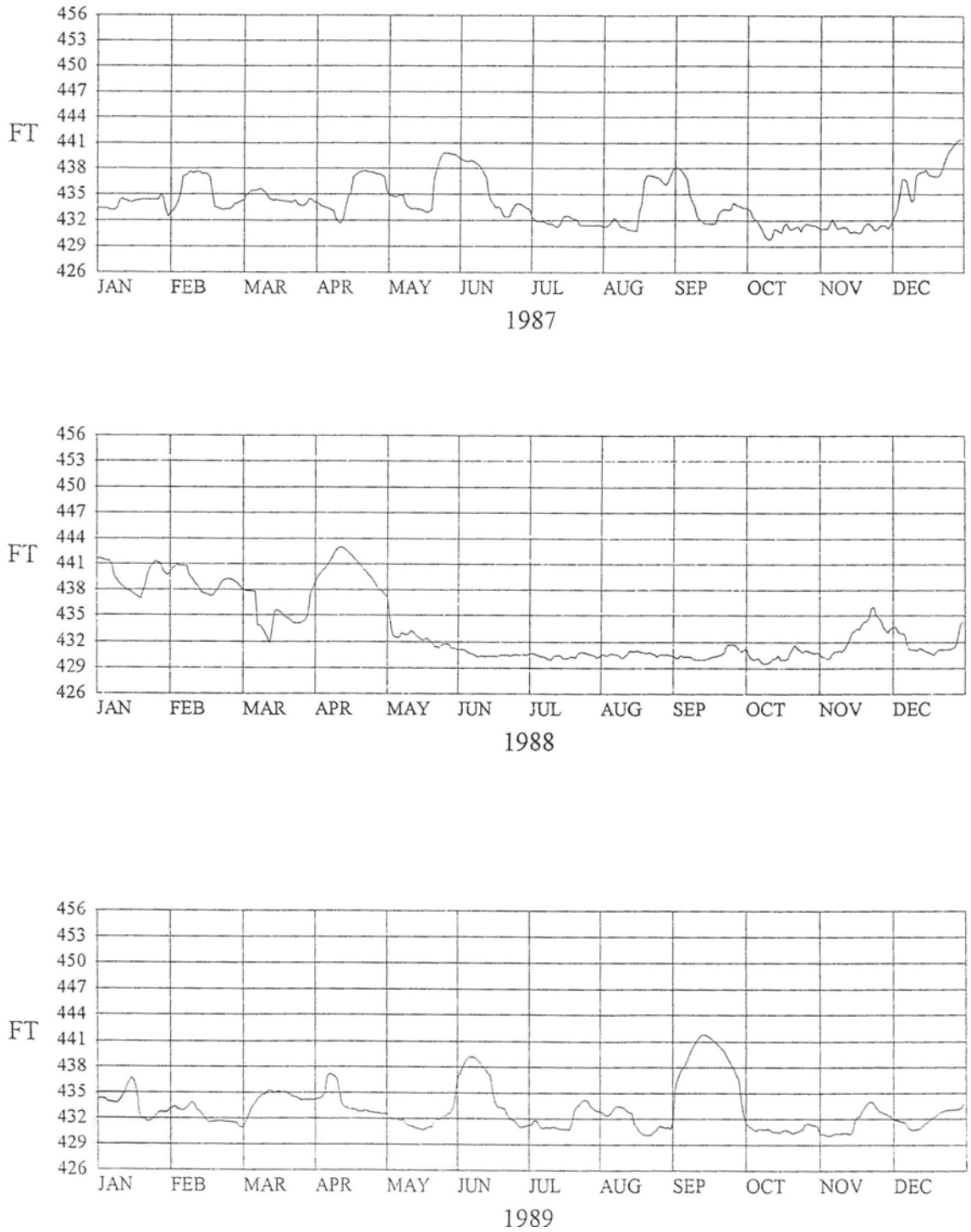
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1986

PLATE G-10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453
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435
432
429
426
FT
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1987
456
453
450
447
444
441
438
435
432
429
426
FT
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1988
456
453
450
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441
438
435
432
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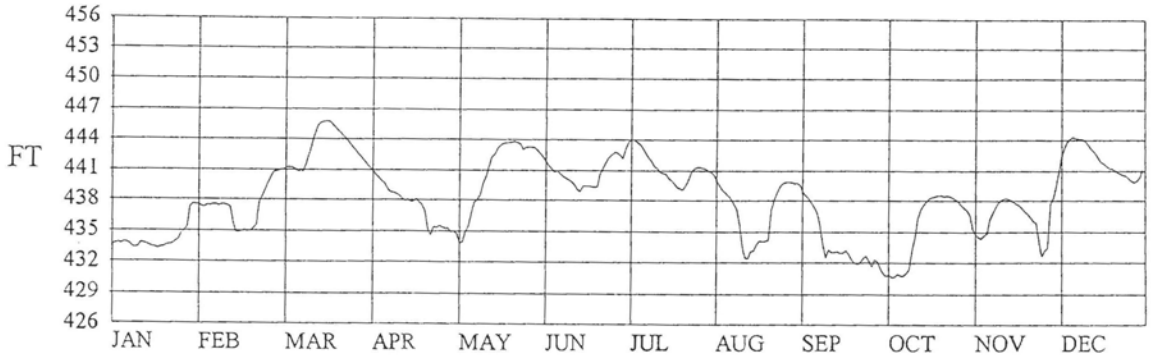
426
FT
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
1989

PLATE G-11



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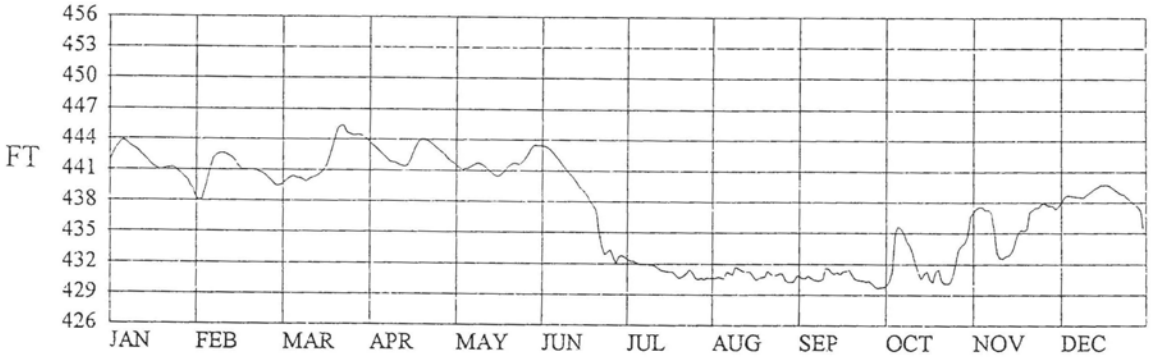

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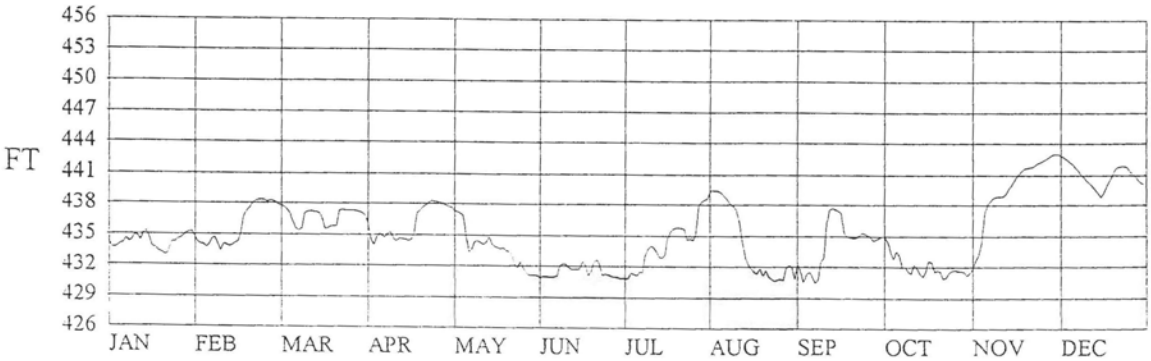
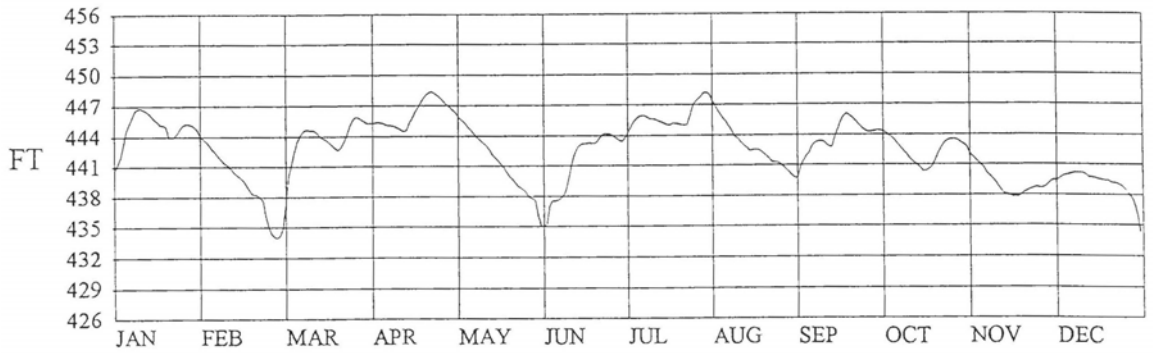


1992

PLATE G-12



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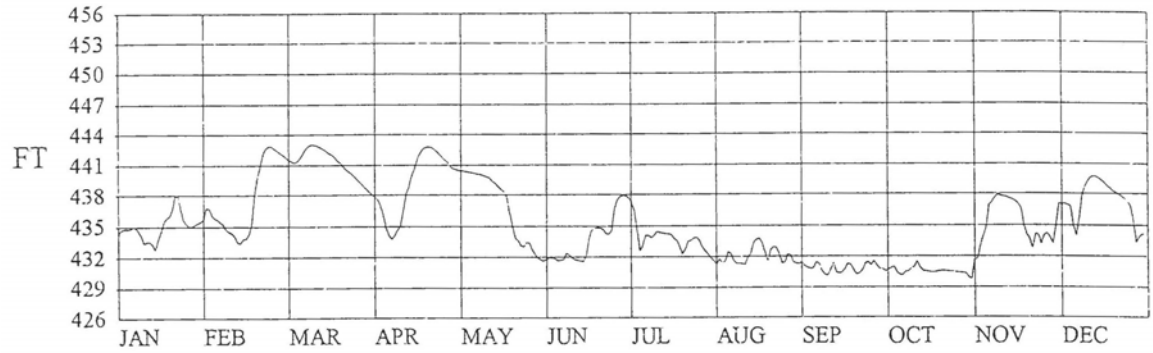
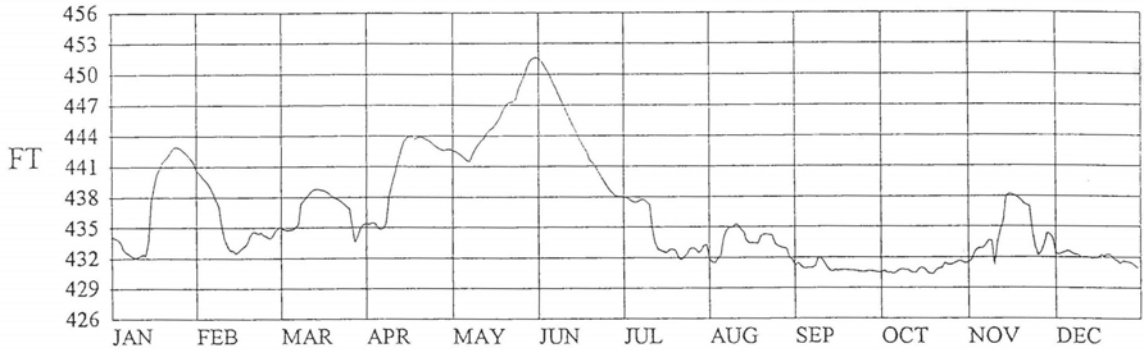
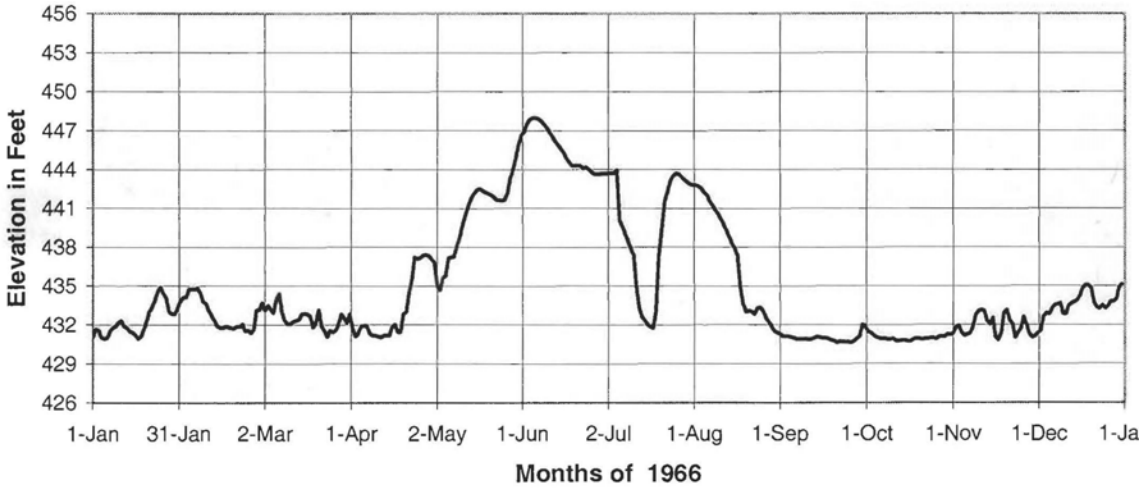


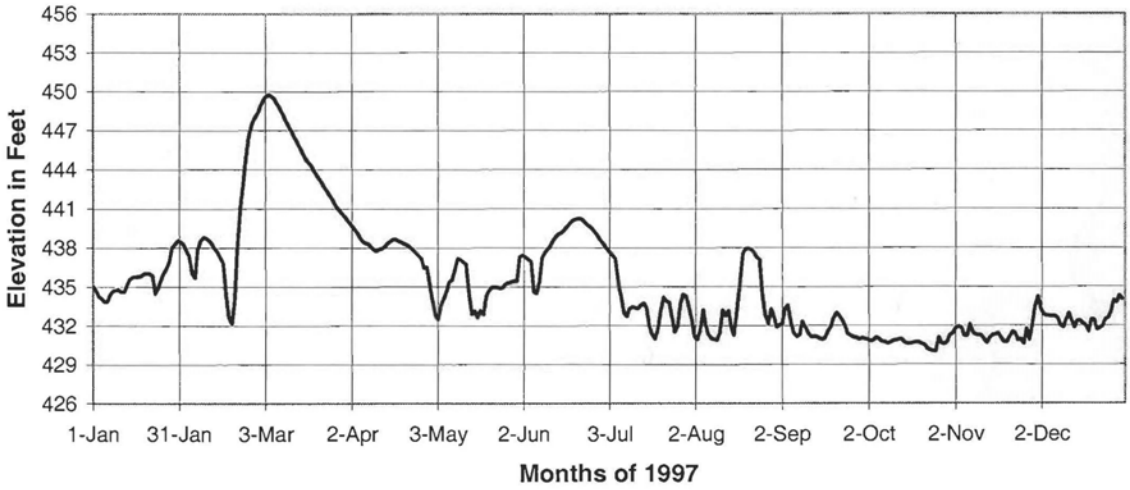
1994



1995

PLATE G-13


456
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
2-Mar
1-Apr
2-May
1-Jun
2-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Ja
Months of 1966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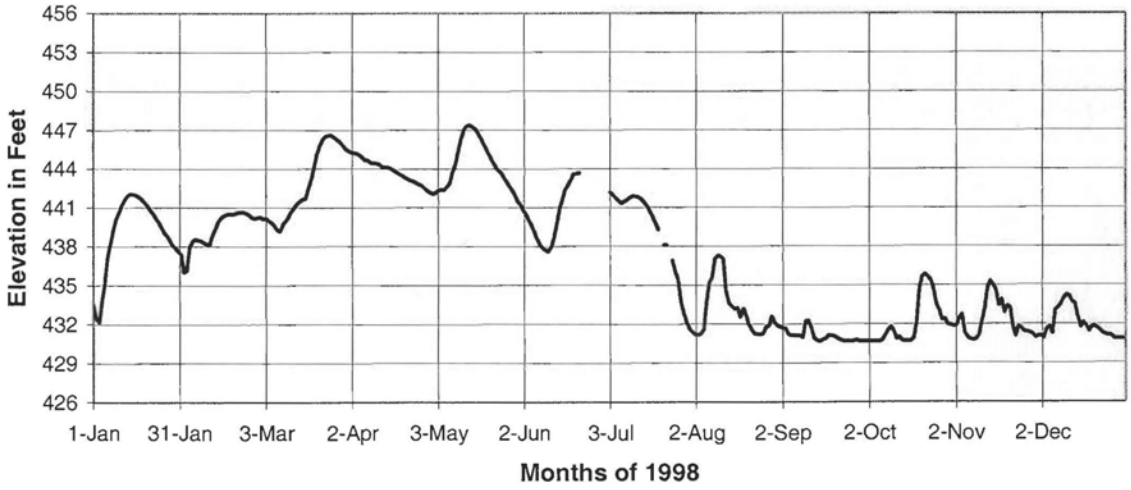
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 1997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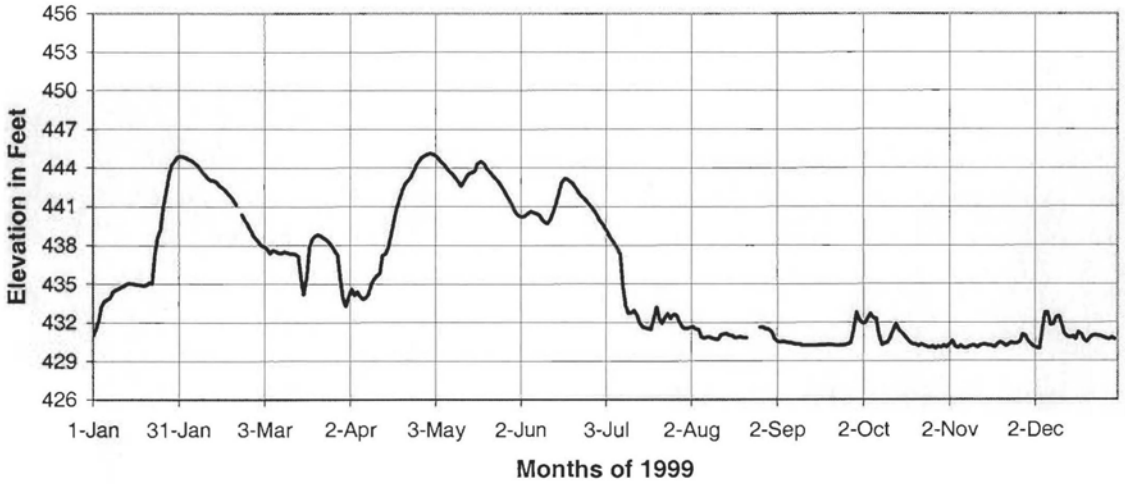
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 1998

PLATE G-14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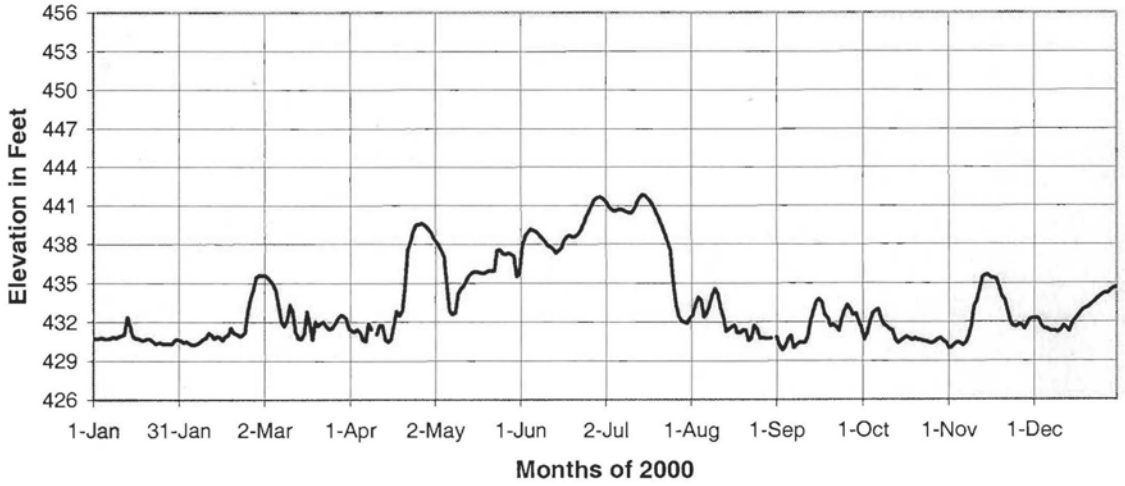
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 1999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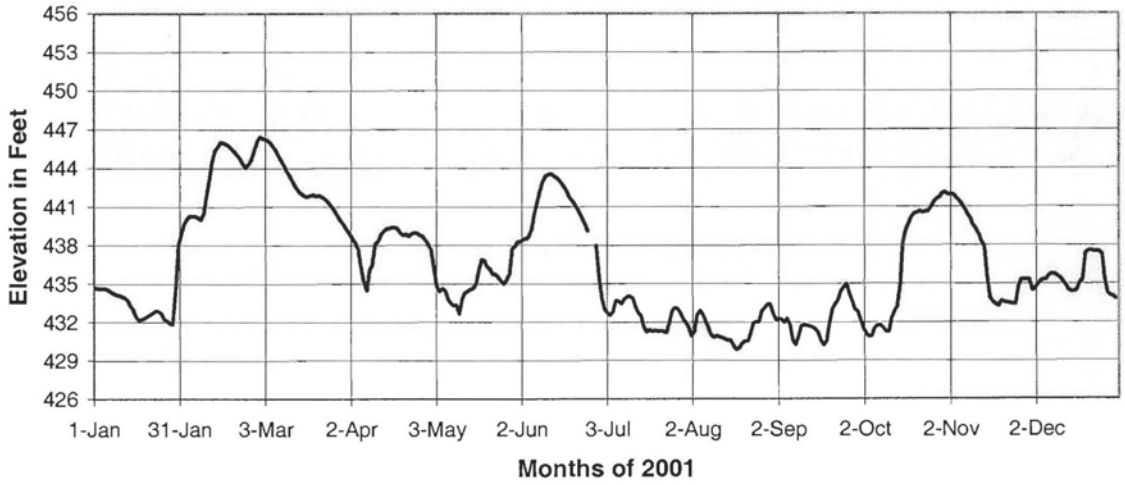
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
2-Mar
1-Apr
2-May
1-Jun
2-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
Months of 2000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453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 2001

PLATE G-15

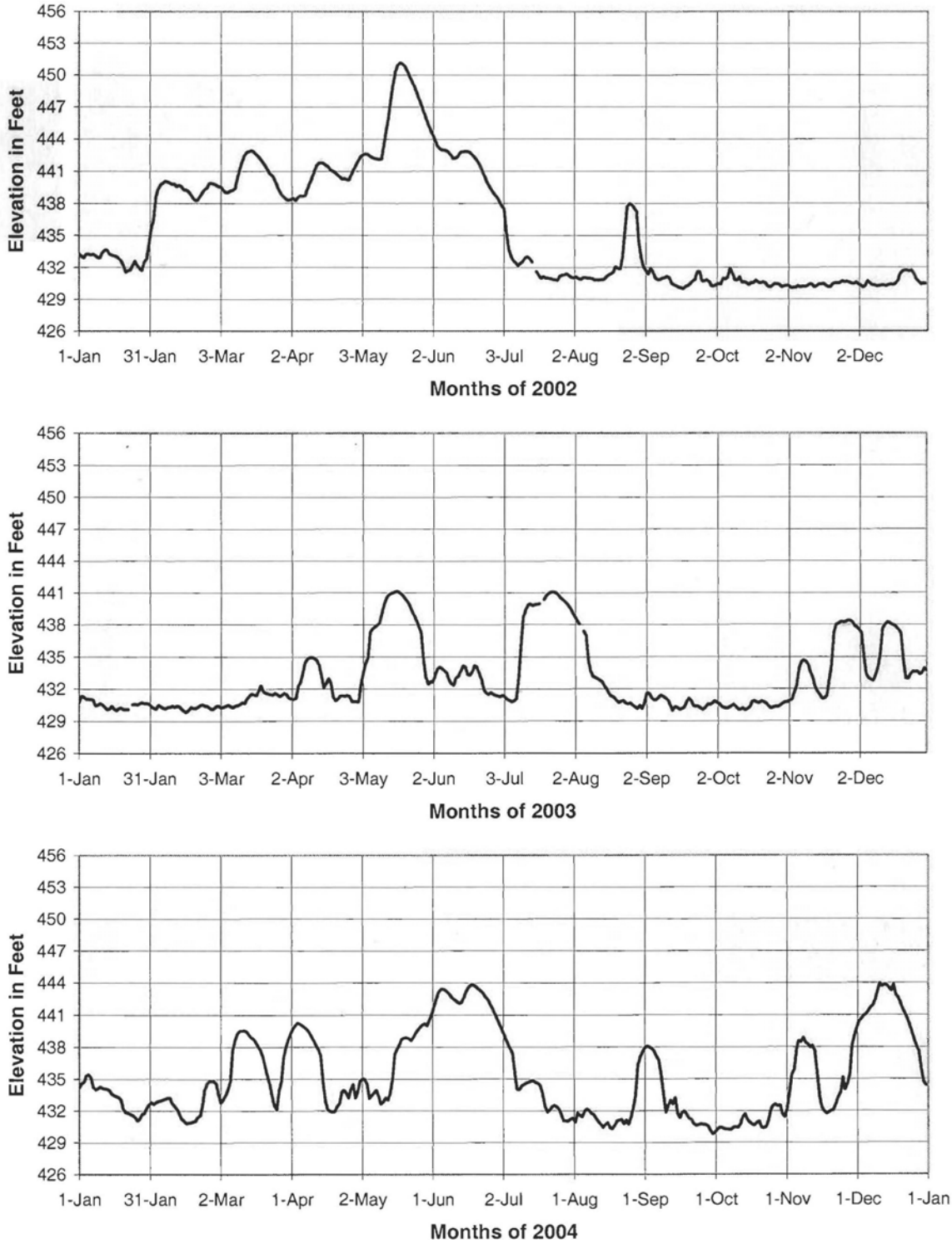
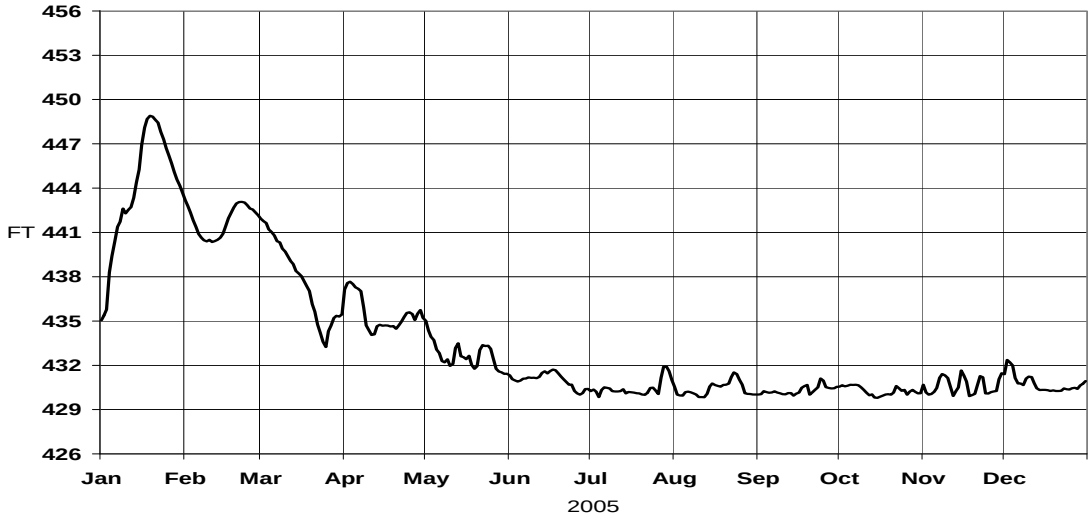
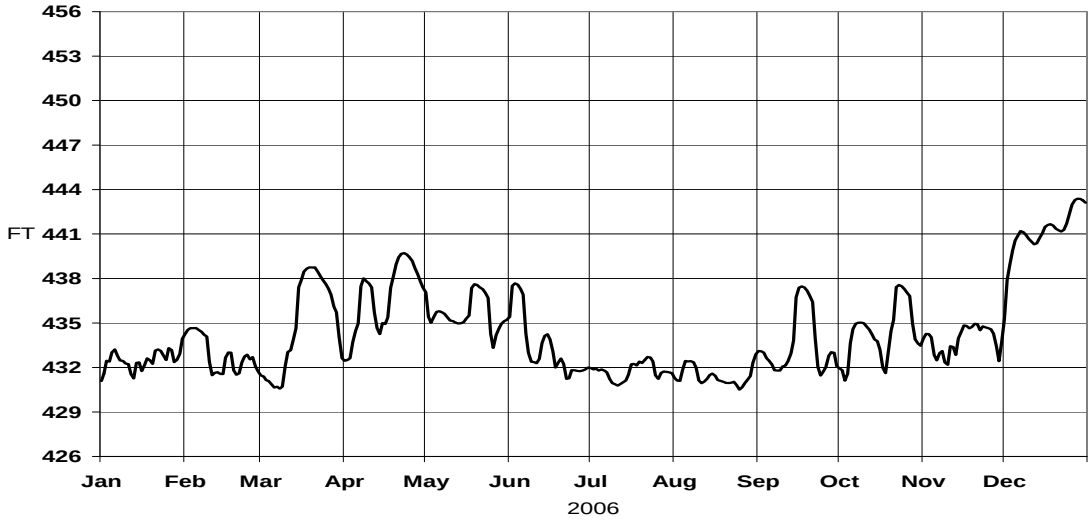
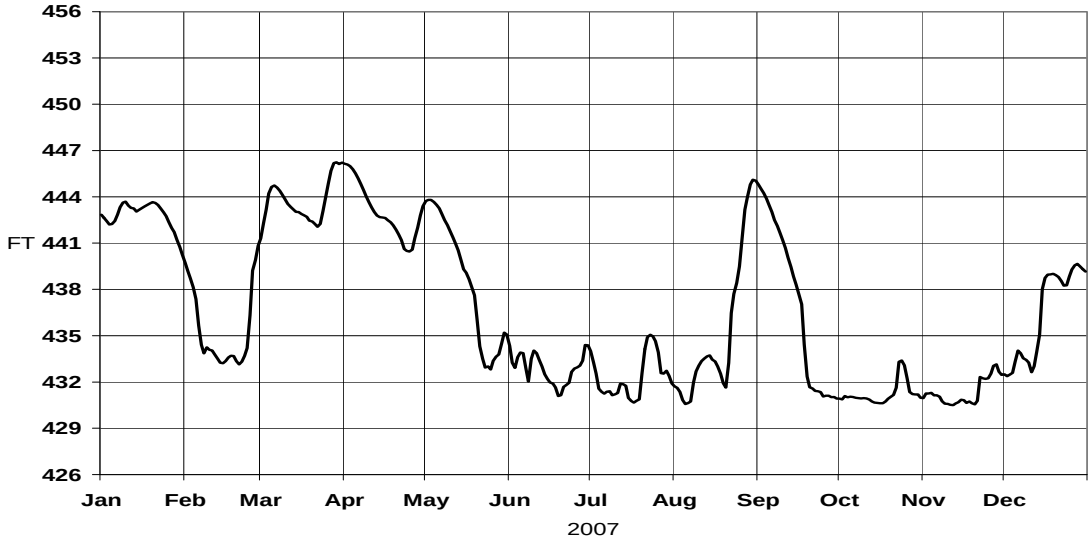

456
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 2002
456
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
3-Mar
2-Apr
3-May
2-Jun
3-Jul
2-Aug
2-Sep
2-Oct
2-Nov
2-Dec
Months of 2003
456
453
450
447
444
441
438
435
432
429
426
Elevation in Feet
1-Jan
31-Jan
2-Mar
1-Apr
2-May
1-Jun
2-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
1-Jan
Months of 2004

PLATE G-16


456
453
450
447
444
FT 441
438
435
432
429
426
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005


456
453
450
447
444
FT 441
438
435
432
429
426
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2006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450
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FT 441
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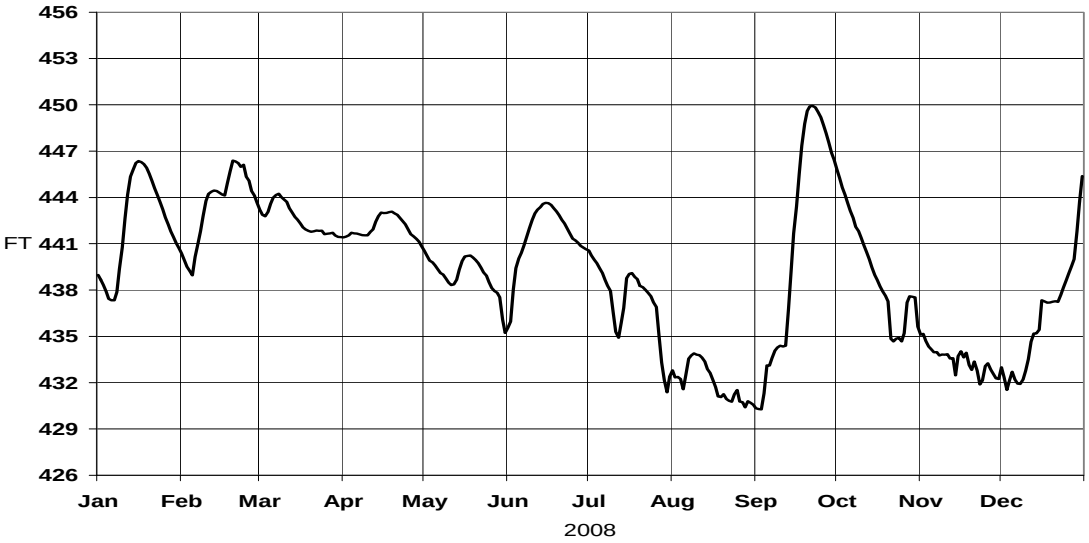
426
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2007

PLATE G-17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453
450
447
444
FT 441
438
435
432
429
426
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2008

PLATE G-18

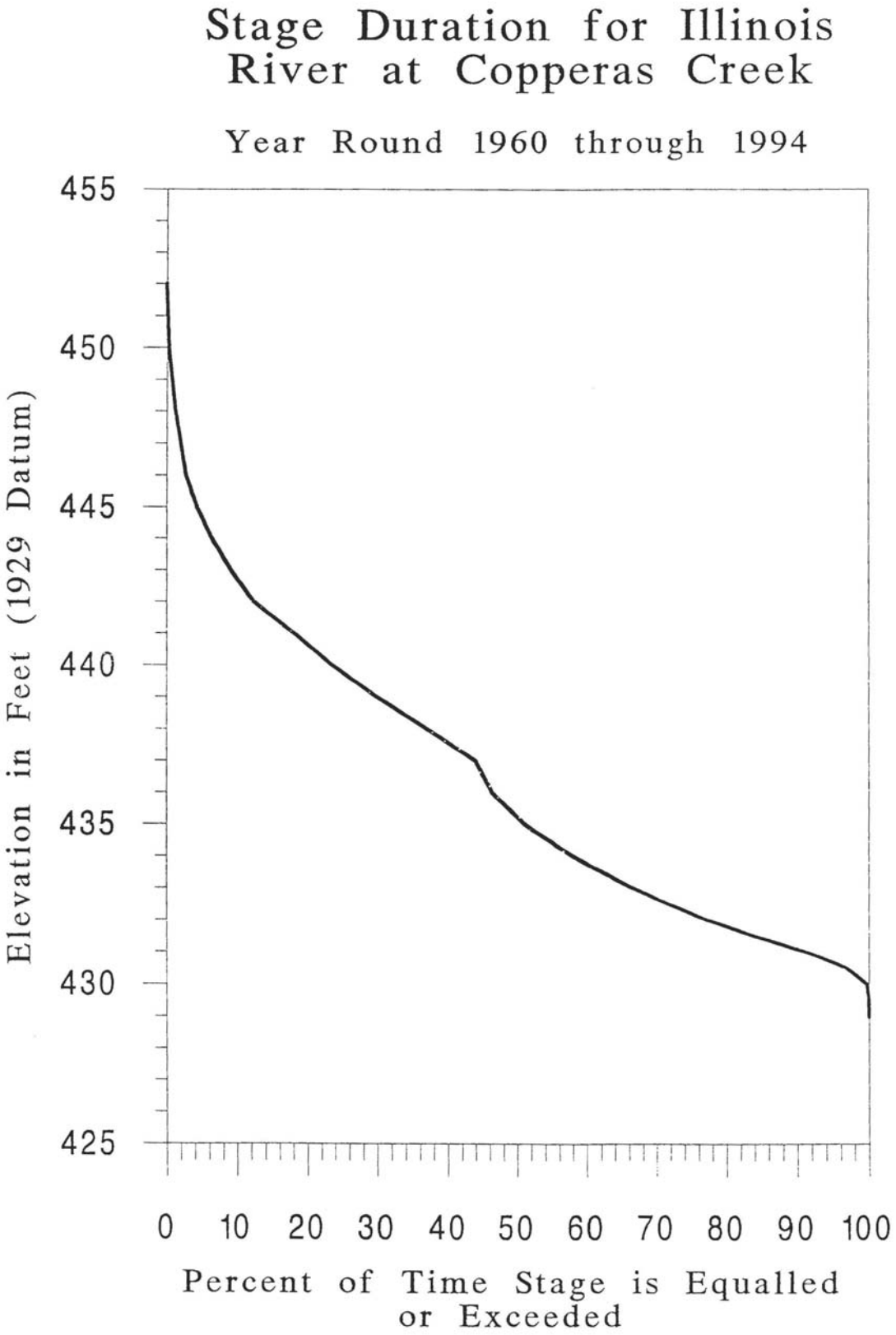
Stage Duration for Illinois River at Copperas Creek
Year Round 1960 through 1994
455
450
445
440
435
430
425
Elevation in Feet (1929 Datum)
0
10
20
30
40
50
60
70
80
90
100
Percent of Time Stage is Equalled or Exceeded

PLATE G-19

Yearly High and Low Stages at Copperas Creek Gage 1960-2008 (2003 omitted)

YEAR	Highest Stage (ft)	Stage (ft)	Lowest Date Mo-Day	Days Below Elev. 430	Other Occurrences Below Elev. 430 Days (Date)	
1960	445.9	430.2	10-22	0		
1961	443.9	430.3	1-13	0		
1962	447.3	430.6	9-23	0		
1963	440.5	430.3	6-26	0		
1964	439.6	429.6	2-13	3	4 (8-14)	
1965	443.8	430.8	7-28	0		
1966	444.8	429.6	10-3	2		
1967	443.6	430.0	9-14	0		
1968	444.2	430.7	9-17	0		
1969	442.9	430.9	9-15	0		
1970	448.7	430.8	9-4	0		
1971	441.3	430.0	9-18	0		
1972	442.6	431.2	2-16	0		
1973	449.5	430.1	9-13	0		
1974	449.5	429.9	9-28	2		
1975	443.7	430.3	10-8	0		
1976	447.2	429.4	9-9	6	3 (9-22)	1 (10-30)
1977	441.4	429.9	6-27	1		
1978	444.7	430.2	10-11	0		
1979	452.0	430.3	9-19	0		
1980	445.2	430.8	11-20	0		
1981	446.4	431.3	11-21	0		
1982	450.8	430.6	10-2	0		
1983	449.5	429.2	10-9	1		
1984	446.4	430.6	10-31	0		
1985	452.0	431.0	10-9	0		
1986	445.8	430.7	8-24	0		
1987	441.5	429.8	10-10	1		
1988	443.0	429.5	10-7	5		
1989	441.79	430.1	11-4	0		
1990	445.73	430.6	10-2	0		
1991	445.4	429.7	9-28	5		
1992	443.05	430.5	9-6	0		
1993	448.35	433.9	2-28	0		
1994	443.04	429.8	10-30	2		
1995	451.66	430.4	10-18	0		
1996	447.97	430.9	9-11	0		
1997	449.75	430.03	10-25	0		
1998	447.37	430.66	9-15	0		
1999	445.1	429.95	12-4	1	1 (10-28)	1 (11-8)
2000	441.83	429.85	9-3	1		
2001	446.44	429.86	8-18	1		
2002	451.13	430.0	9-18	0		
2003	441.14	429.86	2-16	2		
2004	443.94	429.81	9-30	2		
2005	448.9	429.8	10-14	4	1 (7-4), 2 (8-3), 3 (8-10), 1 (9-14)	1 (10-12), 1 (11-12), 2 (11-18)
2006	443.38	430.51	8-25	0		
2007	446.24	430.5	11-12	0		
2008	449.94	430.27	9-3	0		

PLATE G-20

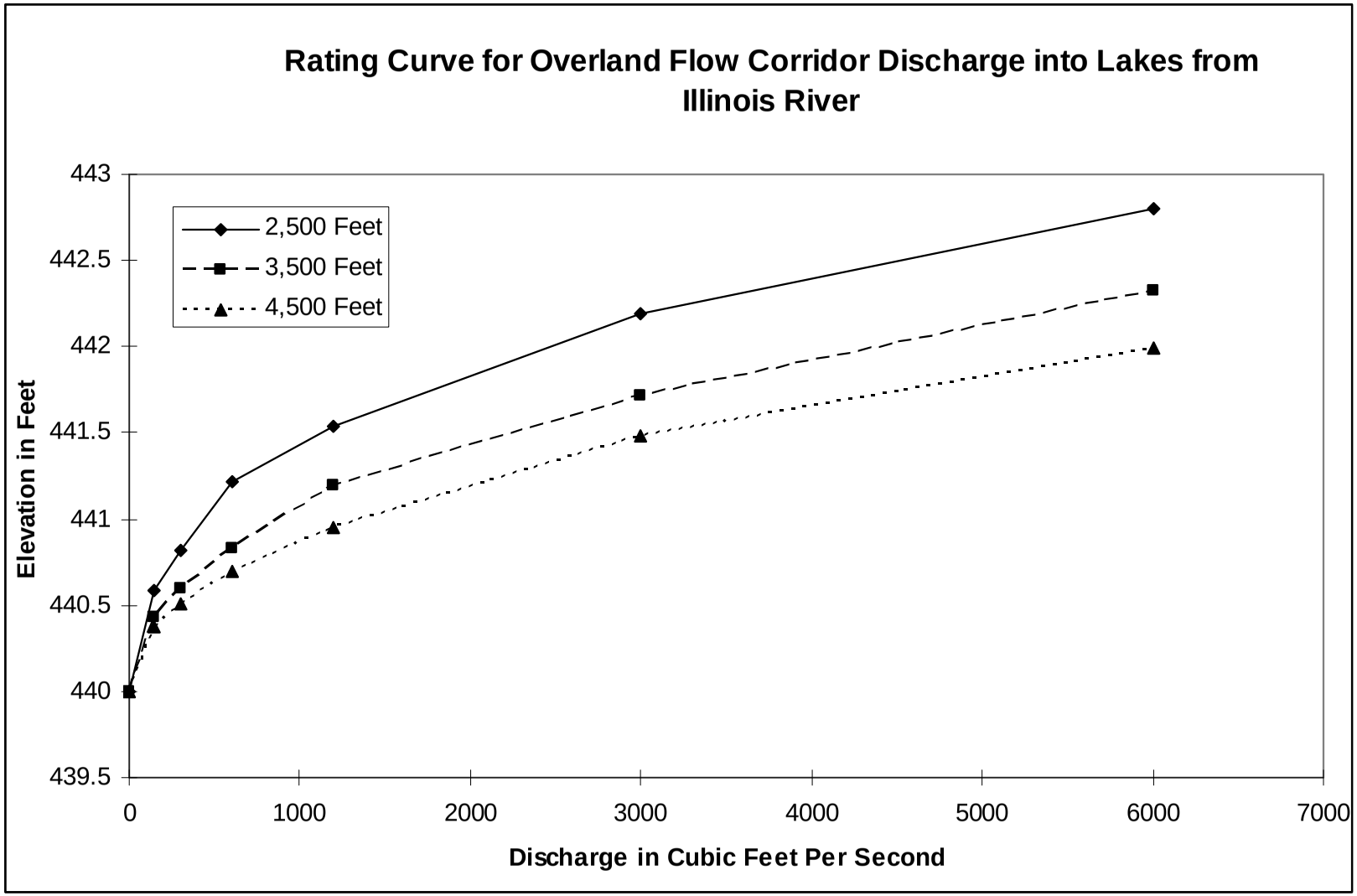
Rating Curve for Overland Flow Corridor Discharge into Lakes from Illinois River
2,500 Feet
3,500 Feet
4,500 Feet
Elevation in Feet
443
442.5
442
441.5
441
440.5
440
439.5
0
1000
2000
3000
4000
5000
6000
7000
Discharge in Cubic Feet Per Second

PLATE G-21

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES
Office of Water Resources

524 South Second Street, Springfield 62701-1787 Jim Edgar, Governor ● Brent Manning, Director

March 10, 1998

SUBJECT: Rice Lake State Fish and Wildlife Area
Habitat Rehabilitation and Enhancement

Mr. Darron Niles
U.S. Army Corps of Engineers
Rock Island District
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

ATTN: Planning Division

Dear Mr. Niles:

Thank you for the November 3, 1997 transmittal of your September 1997 Definite Project Report (R-17D) for the subject project. Please accept our apologies for the delay in providing this response. Our review indicates that an Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) permit will be required and the work will need to comply with our Part 700 Floodway Construction, Part 702 Dam Safety and Part 704 Public Water rules. Copies of each of these sets of rules are enclosed. Our comments concerning the proposal are as follows:

FLOODWAY CONSTRUCTION REQUIREMENTS

Although almost the entire area is located within the floodway of the Illinois River, it appears that impacts on floodway conveyance and storage capacities will be minimal. However, plans for the disposal of future maintenance dredging of the proposed water conveyance channels should be provided with your permit application.

DAM SAFETY REQUIREMENTS

Although the primary purpose of the proposed water dike is to provide protection from minor river floods, it appears that the structure will also be used to impound water in the lakes. The dike will apparently have a maximum height in excess of 6 feet and an impounding capacity in excess of 50 acre feet. If so, the structure will need to comply with IDNR/OWR dam safety rules. The structure is provisionally classified as an intermediate size Class III (low hazard) dam. Since the Illinois Department of Natural Resources (IDNR) will own the structure and be responsible for its operation and maintenance, IDNR should be included as a co-applicant for the project.

[printed on recycled and recyclable paper]

PUBLIC WATER REQUIREMENTS

Most of the backwater lakes involved in this project are apparently connected by water to the Illinois River and are, therefore, public bodies of water. Since the proposed project is to be located on public property and is designed to enhance the natural resources of public waters, we anticipate that the project will comply with our public water requirements. However, it appears that an access channel between Goose Lake and the West River channel at River Mile 134.5 may be blocked. Your application should indicate if this is the case and, if so, include a discussion of measures that would be taken to minimize and/or mitigate the impact on access to the river.

Please feel free to contact Mike Diedrichsen of my staff at 217/782-3863 if you have any questions or comments concerning this matter.

Sincerely,

Dennis L. Kennedy, P.E.
Senior Water Resources Engineer

DLK:MLD:crw
Enclosures
cc: IDNR/Rice Lake State Fish & Wildlife Area (Bill Douglass)
IDNR/OREP (Bob Schanzle)

PLATE G-23

APPENDIX H

STRUCTURAL CONSIDERATIONS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX H
STRUCTURAL CONSIDERATIONS

GENERAL

This appendix presents the design of the structures in the project to illustrate typical calculations that will be undertaken to complete the structural design for final plans and specifications. Computations are shown for the pump station and fish egress structure.

CRITERIA

The reinforced concrete hydraulic structures in the project will be designed following the current ACI Building Code and ETL 1110-2-312, *Strength Design Criteria for Reinforced Concrete Hydraulic Structures*. The few miscellaneous structural steel items in the project will be designed in accordance with EM 1110-1-2101, *Working Stresses for Structural Design.*

MATERIAL SELECTION

Concrete structures will be designed for 28-day compressive strength of 4,000 psi. Concrete reinforcement will be deformed billet-steel bars conforming to ACI 615, grade 60 requirements. Structural steel will meet ASTM-A36, and steel sheet piling will meet ASTM-A328.

PUMP STATION

The pump station is designed to pump from the Illinois River. Trash racks and bulkheads will be provided on the river side to protect the pumps. The operating level will be below the one-year flood elevation. The electrical control panels will be protected inside a concrete block building located on the landside of the road. The bulkheads will be operated by a backhoe; therefore the pump station is designed to handle such loading. The preferred four-pump station scenario is presented on plates 25, 26, and 27 of the main report. This will be verified during Plans and Specifications.

FISH EGRESS STRUCTURE

The same design will be applied to the Rice Lake and the Goose Lake locations. Design consists of a nine ft by seven ft box culvert to connect Rice Lake to the Duck Island gravel pit and Goose Lake to the Illinois River. Both will include a stop log structure and guardrails. Design computations are on the following pages. Final configuration will be made during plans and specifications.

Design Reinforced Concrete Box Culvert, Wingwall, and Stop Log Structure for Rice Lake

Design Reinforced Concrete Box Culvert:

$EL_{top} := 442 \cdot ft$ — Road Top Elevation

$EL_{bot} := 430 \cdot ft$ — Rock in Culvert Elevation

$fill := 4 \cdot ft$ — Fill on top of culvert

$skew := 0 \cdot deg$ — Skew of culvert

$L_{road} := 27 \cdot ft + 10 \cdot in$ — Width of Roadway

$L := L_{road} + (2 \cdot 8 \cdot ft) + (2 \cdot 12 \cdot in)$ $\quad L = 45.833\ ft$ — Length of Culvert

From Table for 9' clear span by 7' clear height in the IDOT Culvert Manual for 4' fill:

$T := 8 \cdot in$ — Top Slab Thickness

$W := 7 \cdot in$ — Sidewall Thickness

$h_i := 7 \cdot ft$ — Inner height dimension

$w_i := 9 \cdot ft$ — Inner Width dimension

$T_{bot} := T + 1 \cdot in$ — Bottom Slab Thickness

$h_o := h_i + T + T_{bot}$ $\quad h_o = 8.417\ ft$ — Outer Height dimension

$w_o := w_i + W + W$ $\quad w_o = 10.167\ ft$ — Outer Width dimension

$EL_{invert} := EL_{top} - fill - h_o + T_{bot}$

$EL_{invert} = 430.333\ ft$ — Invert Elevation

Reinforcement bars: Use Fig. 2.2.2-1 Top Slab Section - C and Fig. 2.2.2-2 Typical Cross Section A

a1 bars (transvers bars - bottom of top slab and top of bottom slab):

7 at 6.5" c-c $\quad L_{a1} := 11 \cdot ft + 6 \cdot in$

Hook Dimension: $A_{a1} := 10 \cdot in$

Out to Out Dimension: $B_{a1} := L_{a1} - 2 \cdot A_{a1}$ $\quad B_{a1} = 9.833\ ft$

Inside to Inside of Headwalls: $L_{hw} := L - 2 \cdot 12 \cdot in$ $\quad L_{hw} = 43.833\ ft$

$bars_{a1} := \frac{L_{hw}}{6.5 \cdot in}$ $\quad bars_{a1} = 80.923$

$bars_{a1} := round(bars_{a1})$ $\quad bars_{a1} = 81$

$tot_{a1bars} := 2 \cdot bars_{a1}$ $\quad tot_{a1bars} = 162$

a2 bars - #4 bars at 2' c-c

$bars_{a2} := \frac{L_{hw}}{2 \cdot ft}$ $\quad bars_{a2} = 21.917$

$bars_{a2} := round(bars_{a2})$ $\quad bars_{a2} = 22$

Use 22 bars in bottom of bottom slab, and one in each end of cutoff wall for a total of 24 # 4 bars

h bars (longitudinal bars - bottom of top slab when T < 12"):

6 at 15" c-c; 10 required $\quad Lap_{hmin} := 2 \cdot ft$

Use 8 bars in bottom of top slab, and two on the top of the top slab for a total of 10 # 6 bars

$lengths := \frac{L}{36 \cdot ft}$ $\quad lengths = 1.273$ $\quad$ 2 lengths

$L_h := \frac{L + Lap_{hmin}}{2}$ $\quad L_h = 23.917\ ft$ $\quad$ Use length of 23'-11" with 2' lap

Total number required:

Bottom of Top Slab: $num_{hb} := 2 \cdot 8$ $\quad num_{hb} = 16$

Top of Top Slab: $num_{ht} := 2 \cdot 2$ $\quad num_{ht} = 4$

Total Required Bars: $num_h := num_{hb} + num_{ht}$ $\quad num_h = 20$

h1 bars (longitudinal bars - top and bottom of bottom slab):

4 a 12" c-c; 20 required $\quad Lap_{h1min} := 1 \cdot ft + 4 \cdot in$

Use 10 bars in bottom of bottom slab, and 10 on the top of the bottom slab for a total of 20 # 4 bars

$lengths := \frac{L}{36 \cdot ft}$ $\quad lengths = 1.273$ $\quad$ 2 lengths

$L_h := \frac{L + Lap_{h1min}}{2}$ $\quad L_h = 23.583\ ft$ $\quad$ Use length of 23'-7" with 1'-4" lap

Total number required:

Bottom of Bottom Slab: $num_{h1b} := 2 \cdot 10$ $num_{h1b} = 20$

Top of Bottom Slab: $num_{h1t} := 2 \cdot 10$ $num_{h1t} = 20$

Total Required Bars: $num_{h1} := num_{h1b} + num_{h1t}$ $num_{h1} = 40$

h2 bars (longitudinal bars - inside face of sidewalls only when W < 12"):

5, 14 required (7 in each sidewall) $Lap_{h2min} := 1 \cdot ft + 8 \cdot in$

$lengths := \frac{L}{36 \cdot ft}$ $lengths = 1.273$ 2 lengths

$L_h := \frac{L + Lap_{h2min}}{2}$ $L_h = 23.75\ ft$ Use length of 23'-9" with 1'-4" lap

Total number required:

Left Sidewall: $num_{h2l} := 2 \cdot 7$ $num_{h2l} = 14$

Right Sidewall: $num_{h2r} := 2 \cdot 7$ $num_{h2r} = 14$

Total Required: $num_{h2} := num_{h2l} + num_{h2r}$ $num_{h2} = 28$

v bars (vertical reinforcement in sidewalls):

4 at 9.5" c-c $L_v := 7 \cdot ft + 11 \cdot in$

$bars_{a1} := \frac{L}{9.5 \cdot in}$ $bars_{a1} = 57.895$

$bars_{a1} := round(bars_{a1})$ $bars_{a1} = 58$

$tot_{a1bars} := 2 \cdot bars_{a1}$ $tot_{a1bars} = 116$

d bars

4 at 12" c-c

$bars_d := \frac{w_i + 1 \cdot ft}{12 \cdot in}$ $bars_d = 10$

Total Required Bars: $num_d := 2 \cdot bars_d$ $num_d = 20$

Design of Wingwall:

$H_L := h_i + T + 9 \cdot in$ $H_L = 8.417\ ft$ Top of Headwall to invert

$\alpha := \frac{90 \cdot deg - skew}{2}$ $\alpha = 45\,deg$ Variable for fig. 3.1.5-2

$\beta := \frac{90 \cdot deg + skew}{2}$ $\beta = 45\,deg$ Variable for fig. 3.1.5-2

$L_{wing} := 11 \cdot ft + 3 \cdot in$ Length of Wingwall from Fig. 3.1.5-2 in IDOT Culvert Manual

Use 14 ft for Vertical cantilever T-type wingwall

$H_d := h_i + T + 4 \cdot ft + 9 \cdot in$ $H_d = 12.417\ ft$ Design height of wingwall

Use $H_d := 12 \cdot ft + 6 \cdot in$

From IDOT Culvert Manual - Vertical Cantilever T-Type Wingwall Design Tables

Use Fill of 5 feet

$T := 10 \cdot in$ Stem Thickness at Top

$T_1 := 10 \cdot in$ Stem Thickness at Bottom

$T_f := 1 \cdot ft + 6 \cdot in$ Footing Thickness

$b := 6 \cdot ft + 8 \cdot in$ Footing Width

$X := 2 \cdot ft + 2 \cdot in$ Toe Dimension

$b - T - X = 3.667\ ft$

$3 \cdot ft + 8 \cdot in = 3.667\ ft$

Can have Horizontal cantilever wall since length of wingwall is < 14 ft

$D := \frac{H_L}{2} - 6 \cdot in$ $D = 3.708\ ft$ Drop of the end of wingwall below top of headwall

$h := h_i + t$ $h =$

From IDOT Culvert Manual - Horizontal Wingwall Design Chart (fig. 3.2.2-3)

$t_{ww} := 11 \cdot in$

$A_s := .82$ Use # 8 reinforcing bar

h3 bars

8 bars at 12" c-c

Back Face:

$bars_{h3b} := \frac{D}{12 \cdot in}$ $\quad bars_{h3b} = 3.708$

$bars_{h3b} := round(bars_{h3b})$ $\quad bars_{h3b} = 4$

Front Face:

$bars_{h3f} := \frac{H_L}{12 \cdot in}$ $\quad bars_{h3f} = 8.417$

$bars_{h3f} := round(bars_{h3f})$ $\quad bars_{h3f} = 8$

Total number required:

Back Face: $num_{h3b} := 4 \cdot bars_{h3b}$ $\quad num_{h3b} = 16$

Front Face: $num_{h3f} := 4 \cdot bars_{h3f}$ $\quad num_{h3f} = 32$

Total Required Bars: $num_{h3} := num_{h3b} + num_{h3f}$ $\quad num_{h3} = 48$

h8 bars

8 bars at 12" c-c

$bars_{h3b} := \frac{H_L + 3 \cdot ft - (3 \cdot ft + 8 \cdot in)}{12 \cdot in}$ $\quad bars_{h3b} = 7.75$

$bars_{h3b} := round(bars_{h3b})$ $\quad bars_{h3b} = 8$

Total Required Bars: $num_{h8} := 4 \cdot bars_{h3b}$ $\quad num_{h8} = 32$

h4 bars (headwall)

6 bar - 2 in each head wall

$L_{h4} := w_o - (2 \cdot 2 \cdot in)$ $\quad L_{h4} = 9.833\ ft$

v1 bars

4 bars

$L_{v1} := H_L + 3 \cdot ft - (2 \cdot 2 \cdot in)$ $\quad L_{v1} = 11.083\ ft$

Design Stoplog Structure:

$pcf := \frac{lb}{ft^3}$ $kip := 1000 \cdot lb$ $ksi := \frac{kip}{in^2}$

$\gamma_w := 62.5 \cdot pcf$ $F_y := 19 \cdot ksi$ $E := 10100 \cdot ksi$

Stoplog Properties:

Try Aluminum Association Standard I-Beam I-6x4.03 Section

$t_f := .29 \cdot in$ $\omega := 4.03 \cdot \frac{lb}{ft}$ $A := 3.43 \cdot in^2$ $I_x := 22.0 \cdot in^4$ $t_w := .19 \cdot in$

$S_x := 7.33 \cdot in^3$ $b := 4 \cdot in$ $d := 6 \cdot in$ $r_y := .951 \cdot in$ $L_b := 9 \cdot ft$

$$W := \frac{\left[\left(EL_{top} - EL_{bot}\right) \cdot \gamma_w\right] + \left[\left(EL_{top} - EL_{bot} - b\right) \cdot \gamma_w\right]}{2} \cdot b$$

$$W = 246.528 \frac{lb}{ft}$$

From Aluminum Design Manual, Part VII, Table 2.21, 6061-T6 Aluminum

$F := 19 \cdot ksi$

$$\frac{L_b}{r_y} = 113.565$$

$$F_c := \begin{cases} 21 \cdot ksi & \text{if } \frac{L_b}{r_y} \le 23 \\ 23.9 \cdot ksi - .124 \cdot ksi \cdot \frac{L_b}{r_y} & \text{if } 23 < \frac{L_b}{r_y} < 79 \\ \frac{87000 \cdot ksi}{\left(\frac{L_b}{r_y}\right)^2} & \text{if } \frac{L_b}{r_y} \ge 79 \end{cases}$$

$F_c = 6.746 ksi$

$F := \min(F, F_c)$ $F = 6.746 ksi$

$M := \frac{W \cdot w_o^2}{8}$ $\quad M = 38.222\,kip \cdot in$

$f := \frac{M}{S_x}$ $\quad f = 5.214\,ksi$

$F = 6.746\,ksi$ $\quad f < F$ OK

Web Shear:

$h := d - 2 \cdot t_f$ $\quad h = 5.42\,in$

$\frac{h}{t_w} = 28.526$

$$F_s := \begin{cases} 12 \cdot ksi & \text{if } \frac{h}{t_w} \le 36 \\ 15.6 \cdot ksi - .099 \cdot ksi \cdot \frac{h}{t_w} & \text{if } 36 < \frac{L_b}{r_y} < 65 \\ \frac{39000 \cdot ksi}{\left(\frac{h}{t_w}\right)^2} & \text{if } \frac{L_b}{r_y} \ge 65 \end{cases}$$

$F_s = 47.926\,ksi$

$V_{all} := F_s \cdot A$ $\quad V_{all} = 164.387\,kip$

$V := \frac{W \cdot w_o}{2}$ $\quad V = 1.253\,kip$

$V < V_{all}$ $\quad$ OK

$\delta := \frac{5 \cdot W \cdot w_o^4}{384 \cdot E \cdot I_x}$ $\quad \delta = 0.267\,in$

$\frac{\delta}{w_o} = 2.186 \times 10^{-3} \quad < \quad \frac{1}{200} = 5 \times 10^{-3}$

2 Aluminum L 4x4x.75 anchored onto each side of the culvert to hold the stoplogs

APPENDIX I

MECHANICAL AND ELECTRICAL CONSIDERATIONS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
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RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX I

MECHANICAL AND ELECTRICAL CONSIDERATIONS

PURPOSE AND SCOPE

The purpose of this appendix is to present a preliminary design for the new pumping station at the Rice Lake State Fish and Wildlife Area. EM 1110-2-3105 entitled, "Mechanical and Electrical Design of Pumping Stations" and pump manufacturers' engineering information were used to develop the design and layout presented in this appendix. An initial design based on efficient operation of the station, ease of normal maintenance, was done in 1996. Since then there have been some modifications. These modifications were based on sponsor needs and pump designs for other projects and will be reevaluated during the plans and specifications phase.

GENERAL

A new pump station housing the four submersible propeller-type pumps is proposed for the Rice Lake project. Stations containing two and three pumps providing 100,000 gpm were evaluated in 1996. The four pump options will provide 133,200 gpm giving the sponsor a more desirable filling time and operational flexibility.

The functions of the new pump station will be to discharge river water into the protected Big and Rice Lakes during waterfowl migration season for the purposes of creating a maintained flooded marsh.

The pumping station will be located upstream of the old Copperas Creek Lock at river mile 137.0. The pump station will be constructed approximately 400 ft from the levee and will pump water from the river through coated steel pipes.

STATION FEATURES

The pumps will provide approximately 133,200 total gpm and are sized to fill Rice and Big Lakes to the desired management water elevation of 436.0 in 14 days. A hand-cleanable trash rack will be provided to protect the pump propellers from large debris.

The pump station structure will consist of a two-level, reinforced concrete structure and sump. The 1996 design system head computations and pump curves are shown on plates I-1 through I-7. These computations are still applicable to the 133,200 gpm design.

OPERATION

The pump unit will be manually activated and when in the automatic mode, will shut off by float switches when the wildlife management area reaches elevation 436.0. In addition, a provision for complete manual operation will allow for manual shutoff when pumping is supervised.

ELECTRICAL

Each pump unit will be operated by a directly attached electric motor. Power will be provided by a 12.5 kV power line owned and maintained by Central Illinois Public Service Company (CIPS).

The 12.5 kV power line will be transformed down to 480V to run the four approximately 215 HP pumps.

The electrical analysis shown on plates I-8 through I-38 was done for a 1996 design. Although the design currently calls for four pumps, the analysis is still applicable. Three topics are covered in the electrical calculations: (1) the choices of utility payments, (2) the sizing of the conductors, and (3) the size and cost of the motor control centers.

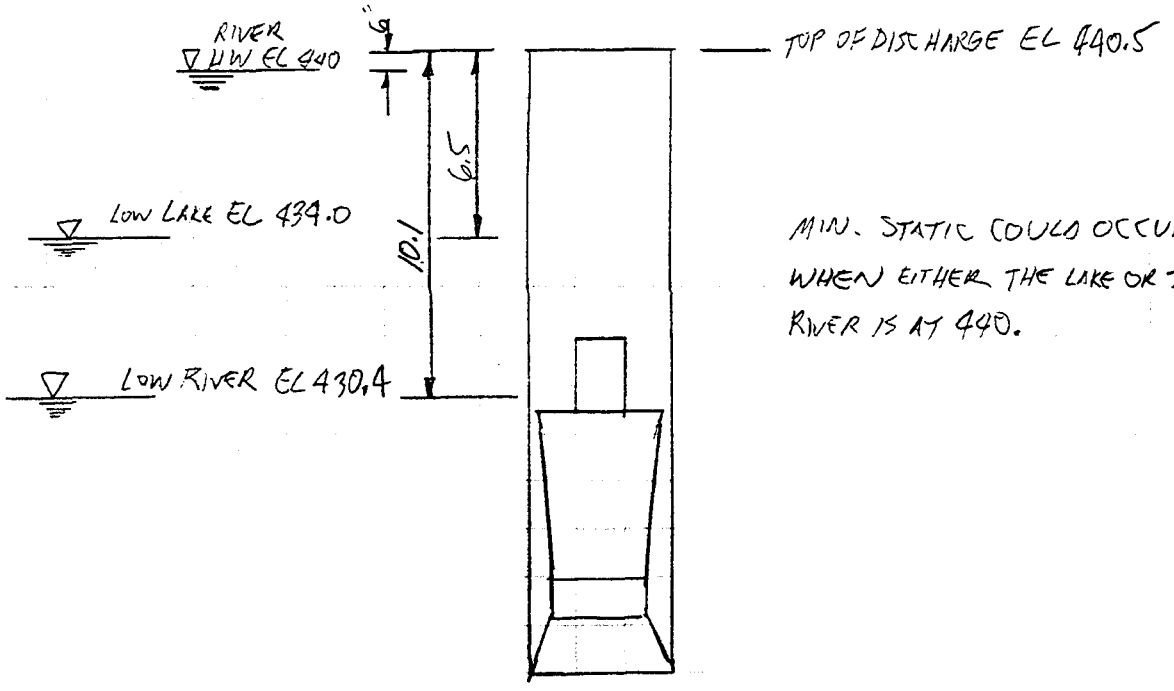
The choices of utility payments compare several billing scenarios for a pump station containing two approximately 525 HP pumps and one containing the three 215 HP pumps. Running the three 215 HP pumps using Time-of-Day metering, pumping only during off-peak times, is the least expensive billing scenario. A timer may be considered to control the hours at which the pumps will operate so they can be programmed to run automatically during off-peak hours only.

Conductor sizes were calculated for the 525 HP pumps and the 215 HP pumps for both the incoming power to the pump station and the feeder conductors from the controller to each pump. Each size of pump requires relatively large conductor and conduit sizes. It becomes more cost effective to utilize smaller parallel conductors.

The size and costs of the motor control centers (MCC) were based on information from Square-D and Allen-Bradley. Due to the large size of the motors and pumps, reduced voltage starting or soft starting will be provided. The information in this appendix includes price estimates and MCC component arrangements for outdoor use (NEMA 3R rating minimum) and indoor use (NEMA 12 rating). If the MCC is mounted inside a building, the components can be separated and positioned at convenient locations throughout the inside of the MCC building. The storage spaces can be eliminated. An added advantage of locating the MCC inside a building is that the MCC are better protected from vandalism.

Subject Rice Lake DPR Pumps		Date 10/96
Computed by	Checked by	Sheet 1 of

STATIC HEAD DIAGRAM



MIN. STATIC COULD OCCUR WHEN EITHER THE LAKE OR THE RIVER IS AT 440.

PUMPING FACILITY MUST BE ABLE TO PUMP FROM RIVER TO LAKE AND VICE VERSA

MAX. STATIC = 10.1 ft

MIN. STATIC = 440.5 - 440 = 0.5 ft

CALCULATE RIVER INTAKE LOSSES - TWO PUMPS @ 50,000 GPM EA

TWIN 66 INCH DIA. CMP BOTH PIPES FLOWING FULL FROM RIVER

$L \approx 400$ ft

Q = 100,000 GPM OR 50,000 GPM PER PUMP = 111.4 CFS

USE MANNING EQUATION

$$S = h_f = \left(\frac{Vn}{1.486\, r^{2/3}}\right)^2$$

n = COEFFICIENT OF ROUGHNESS = 0.012 FROM CONTECH CATALOG FOR LINED CORRUGATED METAL PIPE

r = HYDRAULIC RADIUS = D/4

$$V = \left(111.4\ ft^3/s\right)\left(\frac{4}{\pi(5.5)^2}\right) = 4.69\ ft/s$$

Subject RICE LAKE DPR PUMPS		Date 10/96
Computed by	Checked by	Sheet 2 of

$$h_f = \left(\frac{(4.69)(0.012)}{1.486\,(1.375)^{2/3}}\right)^2$$

$$h_f = 0.00094 \text{ ft/ft} \times 400 \text{ ft}$$
$$h_f = 0.376 \text{ ft}$$

FROM EM 1110-2-3105, ASSUME TRASHRACK LOSSES AS 0.5 ft

FROM ROBINEY HUNT SLUICE GATE MANUAL

THE FOLLOWING APPLIES:

$$Q = C_d A \sqrt{2 g H_L}$$

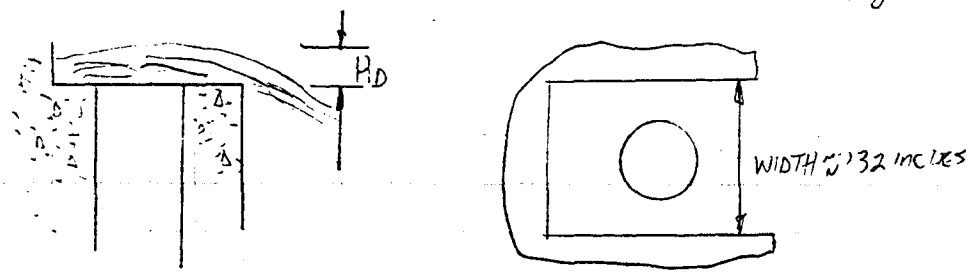
WHERE Q = FLOW (CFS)
C_d = DISCHARGE COEFFICIENT USE 0.70 SUBMERGED FLOW
A = AREA ft^2 (5.5X5.5)
g = GRAVITY (32.2 ft/s^2)
H_L = DIFFERENTIAL HEAD

$$111.4 \text{ CFS} = (0.7)(30.25 \text{ ft}^2)\sqrt{2(32.2)H_L}$$

$$H_L = 0.429 \text{ ft}$$

Subject RICE LAKE DPR PUMPS		Date 10/96
Computed by	Checked by	Sheet 3 of

FROM FLYGT DESIGN RECOMMENDATION FOR PUMPING STATIONS WITH LARGE SUBMERSIBLE PROPELLER PUMPS pg 16



FOR Q = 50,000 GPM

$H_D \approx 2.3$ ft

TOTAL SYSTEM LOSSES = $H_{STATIC} + H_{INTAKE} + H_{TRASH} + H_{GATE} + H_{DISCHARGE}$

$H_{TDH\,MAX} = 10.1 + 0.376 + 0.5 + 0.429 + 2.3$

$H_{TDH\,MAX} = \underline{\underline{13.71 \text{ ft}}}$

$H_{TDH\,MIN} = .5 + 0.376 + 0.5 + 0.429 + 2.3$

$H_{TDH\,MIN} = \underline{\underline{4.11 \text{ ft}}}$

SELECT FLYGT PL-7140-355 SUBMERSIBLE PROPELLER PUMP
11" PROP ANGE 514 HP
Q = 55,000 GPM AT 13.9 TDH 82% EFF
$NPSH_R$ = 23 ft MIN. SUBMERGENCE 5.8 ft
64" DIA TUBE

Subject RICE-LAKE DPR PUMPS		Date 10/6
Computed by	Checked by	Sheet 4 of

ALTERNATIVE OF THREE PUMPS AT 33,000 GPM EACH

33,000 ⇒ 73.5 CFS

USING MANNING EQUATION

$$h_f = \left(\frac{3.1(.012)}{1.486(1.375)^{2/3}}\right)^2$$

$$h_L = 0.163 \text{ ft}$$

$$h_{TRASHRACK} = 0.5 \text{ ft}$$

GATE LOSSES

$$73.5 \text{ CFS} = (0.70)\, 36 \text{ ft}^2 \sqrt{2(32.2) H_L}$$

$$H_L = 0.132 \text{ ft}$$

EXIT LOSS FOR Q = 33,000 FROM FLYGT MANUAL

$$H_D \approx 2.0 \text{ ft}$$

$$H_{TDH_{MAX}} = 10.1 + 0.163 + 0.5 + 0.132 + 2.0$$

$$H_{TDH_{MAX}} = \underline{\underline{12.896 \text{ ft}}}$$

$$H_{TDH_{MIN}} = \underline{\underline{3.296 \text{ ft}}}$$

SELECT FLYGT PL 7101-590 SUBMERSIBLE PUMP

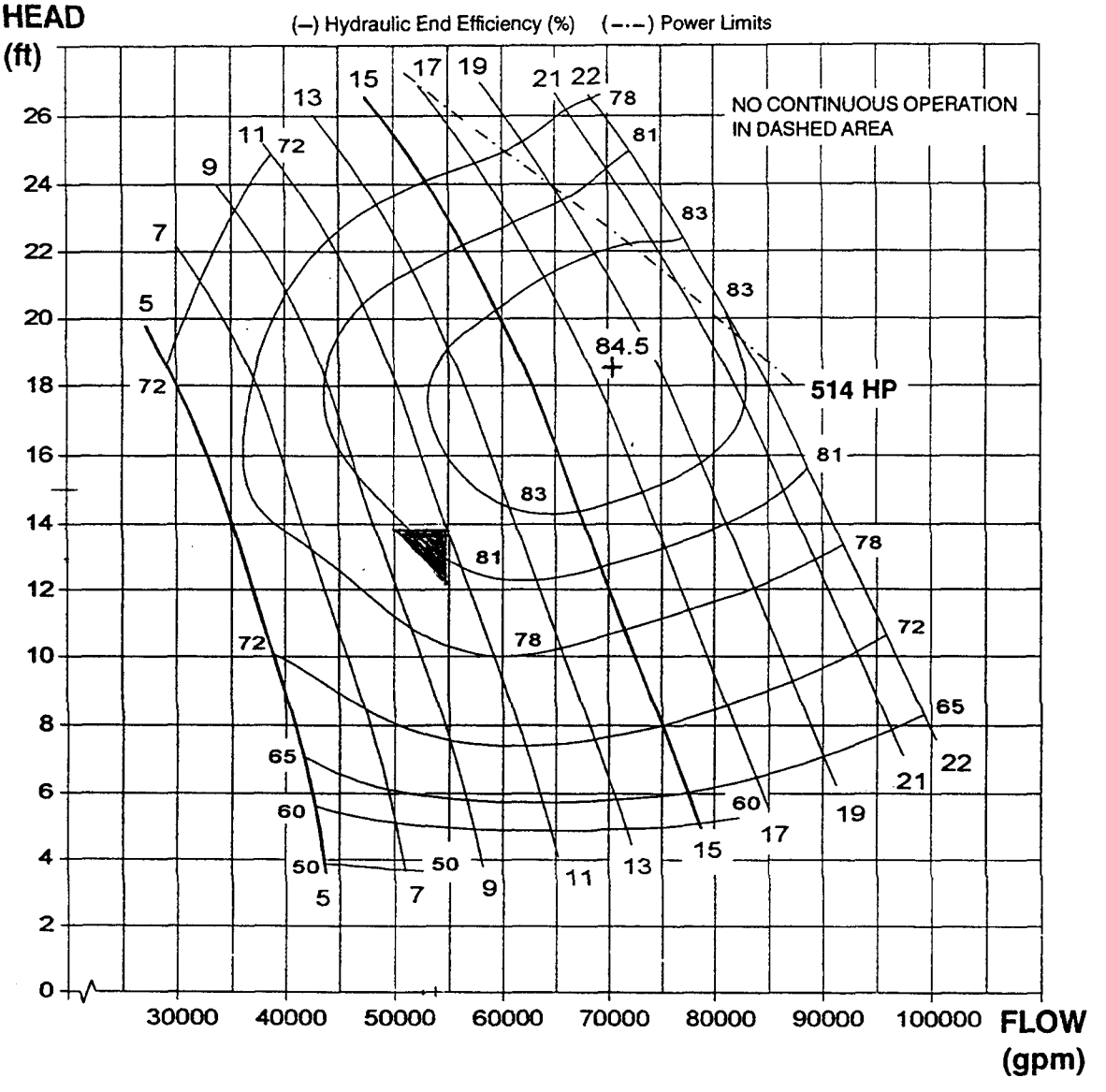
14° PROP ANGLE 215 HP

Q = 34,000 GPM @ 13.0 TDH 81.5% EFF

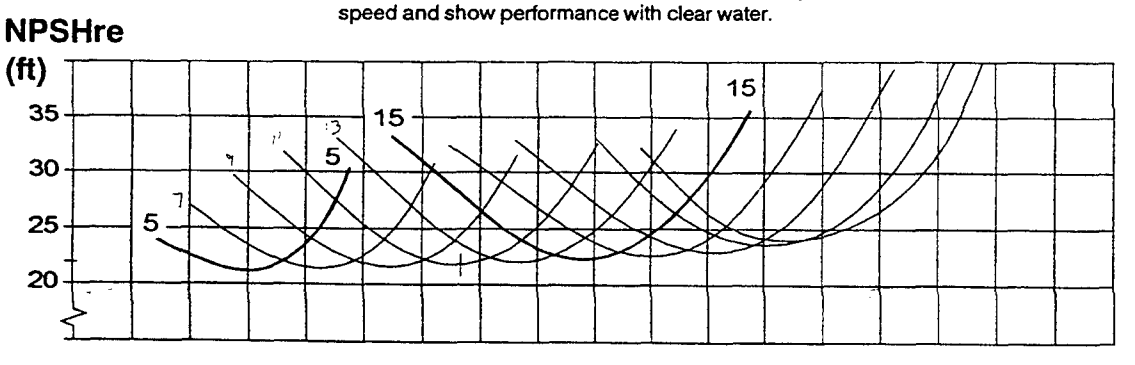
$NPSH_R$ = 18 ft MIN. SUBMERGENCE = 4.8 ft

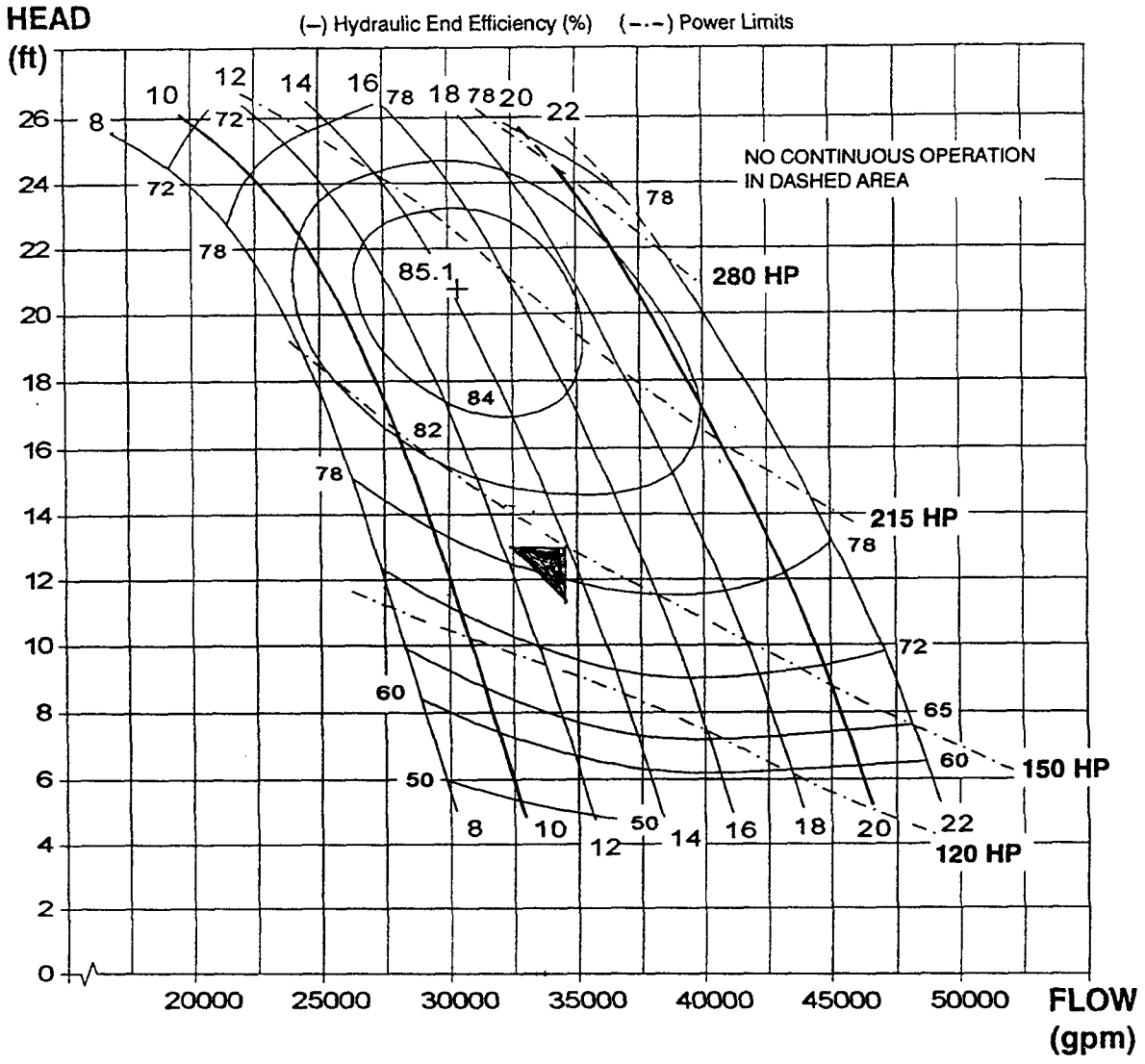
48" DIA TUBE

FREQ.	CONFIG.		SECTION	PAGE
60 HZ	PL	**PL-7140-355**	4	1
PHASE	BLADES	**Performance Field**	SUPERSEDES	ISSUED
3	B4			10/94

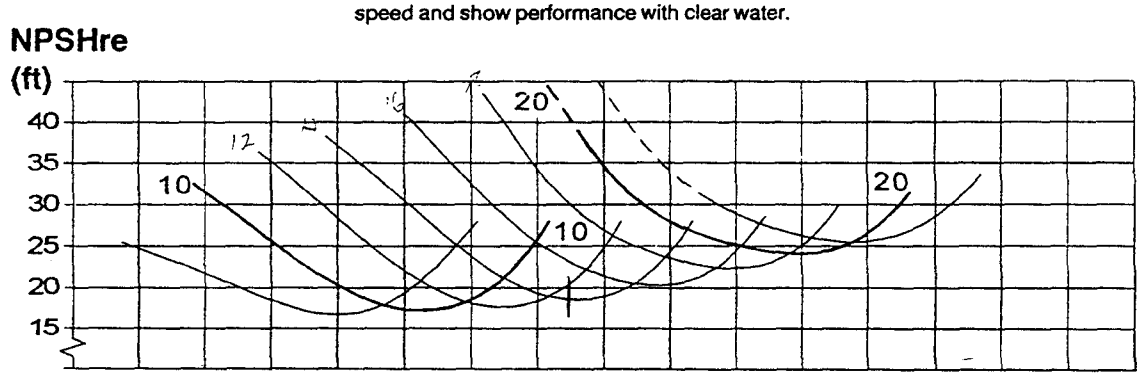


NOTE: Curves are based on nominal constant hydraulic-end speed and show performance with clear water.





NOTE: Curves are based on nominal constant hydraulic-end speed and show performance with clear water.



Rice Lake Pump Requirements

Rice Lake Submersible Pumps - open discharge

- @ River EL 429.0; HW @ EL. 440.0; Low Lake EL. 434.0

Top of Discharge Tube @ EL 440.5

Twin 66" RCP intakes ~400 ft long

GPM	Intake Dia. ft	Intake V ft/s	HL Intake 1/	Gate Size ft	HL Sluice Gate 2/	HL Discharge 3/	Trsh rck Add .5'	Min Total HD (.5st)	Max Total HD (11.5st)
50000	5.5	4.689	0.375	5.500	0.430	2.3	0.5	4.105	13.705
33000	5.5	3.095	0.163	6.000	0.132	2.0	0.5	3.296	12.896

1/ Manning Equation n=0.012

2/ From Rodney Hunt Q=Cd*A*SQRT(2gHL) Cd=0.7

3/ From Flygt Design Recommendations for Pump Stations with Large Submersible Pumps

RICE LAKE ELECTRICAL POWER CALCULATIONS

The following are sample calculations for electrical charges for this pump station. These sample calculations, called Rate Structures, incorporate the following variables:

a) Two 525 HP pumps Vs three 215 HP pumps.
b) CIPS rates 9T, 2B, and Rider 13.
c) Summer Vs winter rates.
d) On-peak Vs Off-peak run time.
e) 20 day fall run and a 10 day spring/summer run scenario.

Our design constraint was to pump 100,000 GPM. This lead to a choice of two 525 HP or three 215 HP pumps.

CIPS offers the 9T and 2B rates and Rider 13. Under 9T and 2B, there is the choice of summer Vs winter rates. The summer billing months are June, July, August, and September. The winter months are all the others. Rate 9T also offers On-peak and Off-peak rates. Rider 13 is an economic development rider which can be applied to either rate 9T or 2B which allows the billing demand charge to be cut by 50% for 5 years.

The plan is to run the pumps approximately 20 days in the fall to maintain the proper water levels. An additional run period may be needed in the spring or summer for approximately 10 days.

On-peak rates are 10AM to 10PM Monday through Friday. Off-peak rates are 10PM to 10AM Monday through Friday, all day Saturday, Sunday, and holidays. All calculations were done using the year 2001 as the sample year. The month and days used are specified in each Rate Structure. Holidays and weekends were taken as they fell on the days of operation for the year 2001. No attempt was made shift the operating schedule to optimize or minimize weekends and holidays. Hence, the On-peak Vs Off-peak operating times could vary by a day or two from year to year, and as the operator shifts the operation schedule from the dates specified in the Rate Structures. The trend of how one rate compare to another will still remain the same.

The Fuel Adjustment Clause (FAC), Demand-Side Adjustment Clause (DSAC), and Electrical Environmental Adjustment Charge (EEAC) are variables which I listed as an additive number called X. CIPS claims that the DSAC and EEAC are around $ 0. If the FAC cost is around $ .010 to $ .015 per KWH, then the FAC for 480 hours of pumping with two 525 HP motors will be 393,600 KWH times $ .010 to $ .015 per KWH which equals $ 3936.60 to $ 5904.00. The FAC for 480 hours of pumping with three 215 HP motors will be 247,680 KWH times $ .010 to $ .015 per KWH which equals $ 2476.80 to $ 3715.20.

CIPS says that the Rice Lake pump station is exempt from Federal taxes. Interstate Commerce Commission (ICC) taxes are based on a rate of 0.1% of the Subtotal of the bill. The State taxes are based Power Consumption in KWH times .0032 or the Subtotal times .05, which ever is the smaller of the 2 numbers. Note the taxes should include the number X represents, but since X can not be calculated, I ignored including this value in the calculations. One can still get a feel for how the power bills are calculated and an order of magnitude of the numbers.

All prices used in the following calculations are Fall 1996 prices.

As of 1996, CIPS is willing to supply and connect up the transformers and supply a neutral to the pump station free of charge. This can change at any future time if we do not enter into an agreement to lock it in.

RATE STRUCTURE #1-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 13 HALF DAYS = 156 HRS
OFF-PEAK RUN TIME: 7 FULL DAYS + 13 HALF DAYS = 324 HRS
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK = (156 HRS) x (410 KW) x 2 → (127,920 KWH) x ($ .0398/KWH) =	$ 5091.22
OFF-PEAK = (324 HRS) x (410 KW) x 2 → (265,680 KWH) x ($ .0105/KWH) =	$ 2789.64
ON-PEAK DEMAND = (410 KW) x 2 x ($ 13.20/KW) =	$ 10,824.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 18,731.81
FEDERAL TAX =	$ 0
ICC TAX = ($ 18,731.81) x (.001) =	$ 18.73
STATE TAX = ($ 18,731.81) x (.05) =	$ 936.59
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 19,687.13 + X

RATE STRUCTURE #2-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: SEP. 1-30, 2001 = 29 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 10 FULL DAYS + 20 HALF DAYS = 480 HRS
KWH FOR 29 1/2 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (393,600 KWH) x ($ .0105/KWH) =	$ 4132.80
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 4291.75
FEDERAL TAX =	$ 0
ICC TAX = ($ 4291.75) x (.001) =	$ 4.29
STATE TAX = ($ 4291.75) x (.05) =	$ 214.59
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
T0TAL =	$ 4510.63 + X

RATE STRUCTURE #3-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 15 HALF DAYS = 180 HRS
OFF-PEAK RUN TIME: 5 FULL DAYS + 15 HALF DAYS = 300 HRS
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK = (180 HRS) x (410 KW) x 2 → (147,600 KWH) x ($ .0199/KWH) =	$ 2937.24
OFF-PEAK = (300 HRS) x (410 KW) x 2 → (246,000 KWH) x ($ .0105/KWH) =	$ 2583.00
ON-PEAK DEMAND = (410 KW) x 2 x ($ 10.71/KW) =	$ 8782.20
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 14,329.39
FEDERAL TAX =	$ 0
ICC TAX = ($ 14,329.39) x (.001) =	$ 14.33
STATE TAX = ($ 14,329.39) x (.05) =	$ 716.47
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 15,060.19 + X

RATE STRUCTURE #4-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: OFF PEAK
TOTAL RUN TIME: OCT. 1-NOV. 1, 2001 = 31 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 8 FULL DAYS + 24 HALF DAYS = 480 HRS
KWH FOR 31 1/2 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (393,600 KWH) x ($ .0105/KWH) =	$ 4132.80
ON-PEAK DEMAND = (10 KW) x ($ 10.71/KW) =	$ 107.10
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 4266.85
FEDERAL TAX =	$ 0
ICC TAX = ($ 4266.85) x (.001) =	$ 4.27
STATE TAX = ($ 4266.85) x (.05) =	$ 213.34
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 4484.46 + X

RATE STRUCTURE #5-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

KWH CHARGE = (393,600 KWH) x ($ .0880/KWH) =	$ 34,636.80
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 34,648.40
FEDERAL TAX =	$ 0
ICC TAX = ($ 34,648.40) x (.001) =	$ 34.65
STATE TAX = (393,600 KWH) x ($.0032/KWH) =	$ 1259.52
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 35,942.57 + X

RATE STRUCTURE #6-TWO 525 HP PUMPS RUNNING IN FALL

RATE: 2B WINTER
PERIOD: N/A
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (410 KW) x 2 = 393,600 KWH

CHARGES

KWH CHARGE, FIRST 1000 KWH = (1000 KWH) x ($ .0755/KWH) =	$ 75.50
KWH CHARGE, OVER 1000 KWH = (393,600 KWH - 1000 KWH) x ($ .0642/KWH) =	$ 25,204.92
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 25,292.02
FEDERAL TAX =	$ 0
ICC TAX = ($ 25,292.02) x (.001) =	$ 25.29
STATE TAX = (393,600 KWH) x ($.0032/KWH) =	$ 1259.52
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 26,576.83 + X

These pumps may have to run 10 days during June and /or July. These are summer months. The calculations for this 10 day period would be covered under Rate Structures # 1, 2, and 5. The On-peak and Off-peak charges or KWH charges will be approximately half of those given in these Rate Structures. The On-peak Demand Charges and Customer Charges will remain unchanged. Hence, these 3 Rate Structures are listed below for the spring/summer runs.

RATE STRUCTURE #1-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: 6 HALF DAYS = 72 HRS
OFF-PEAK RUN TIME: 4 FULL DAYS + 6 HALF DAYS = 168 HRS
KWH FOR 10 DAYS: (240 HRS) x (410 KW) x 2 = 196800 KWH

CHARGES

ON-PEAK = (72 HRS) x (410 KW) x 2 → (59,040 KWH) x ($ .0398/KWH) =	$ 2349.79
OFF-PEAK = (168 HRS) x (410 KW) x 2 → (137,760 KWH) x ($ .0105/KWH) =	$ 1446.48
ON-PEAK DEMAND = (410 KW) x 2 x ($ 13.20/KW) =	$ 10,824.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 14,647.22
FEDERAL TAX =	$ 0
ICC TAX = ($ 14,647.22) x (.001) =	$ 14.65
STATE TAX = ($ 14,647.22) x (.05) =	$ 732.36
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 15,394.23 + X

RATE STRUCTURE #2-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: JUN. 1-16, 2001 = 15 1/2 DAYS = 240 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 4 FULL DAYS + 12 HALF DAYS = 240 HRS
KWH FOR 15 1/2 DAYS: (240 HRS) x (410 KW) x 2 = 196,800 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (196,800 KWH) x ($ .0105/KWH) =	$ 2066.40
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2225.35
FEDERAL TAX =	$ 0
ICC TAX = ($ 2225.35) x (.001) =	$ 2.23
STATE TAX = ($ 2225.35) x (.05) =	$ 111.27
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 2338.85 + X

RATE STRUCTURE #5-TWO 525 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 10 DAYS: (240 HRS) x (410 KW) x 2 = 196,800 KWH

CHARGES

KWH CHARGE = (196,800 KWH) x ($ .0880/KWH) =	$ 17,318.40
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 17,330.00
FEDERAL TAX =	$ 0
ICC TAX = ($ 17,330.00) x (.001) =	$ 17.33
STATE TAX = ($ 17,330.00) x (.05) =	$ 866.50
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 18,213.83 + X

Three 215 HP pumps rated at 172 KW each.

RATE STRUCTURE #1-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 13 HALF DAYS = 156 HRS
OFF-PEAK RUN TIME: 7 FULL DAYS + 13 HALF DAYS = 324 HRS
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK = (156 HRS) x (172 KW) x 3 → (80,496 KWH) x ($ .0398/KWH) =	$ 3203.74
OFF-PEAK = (324 HRS) x (172 KW) x 3 → (167,184 KWH) x ($ .0105/KWH) =	$ 1755.43
ON-PEAK DEMAND = (172 KW) x 3 x ($ 13.20/KW) =	$ 6811.20
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 11,797.32
FEDERAL TAX =	$ 0
ICC TAX = ($ 11,797.32) x (.001) =	$ 11.80
STATE TAX = ($ 11,797.32) x (.05) =	$ 589.87
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 12,398.99 + X

RATE STRUCTURE #2-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: SEP. 1-30, 2001 = 29 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 10 FULL DAYS + 20 HALF DAYS = 480 HRS
KWH FOR 29 1/2 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (247,680 KWH) x ($ .0105/KWH) =	$ 2600.64
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2759.59
FEDERAL TAX =	$ 0
ICC TAX = ($ 2759.59) x (.001) =	$ 2.76
STATE TAX = ($ 2759.59) x (.05) =	$ 137.98
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 2900.33 + X

RATE STRUCTURE #3-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: 15 HALF DAYS = 180 HRS
OFF-PEAK RUN TIME: 5 FULL DAYS + 15 HALF DAYS = 300 HRS
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK = (180 HRS) x (172 KW) x 3 → (92,880 KWH) x ($ .0199/KWH) =	$ 1848.31
OFF-PEAK = (300 HRS) x (172 KW) x 3 → (154,800 KWH) x ($ .0105/KWH) =	$ 1625.40
ON-PEAK DEMAND = (172 KW) x 3 x ($ 10.71/KW) =	$ 5526.36
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 9027.02
FEDERAL TAX =	$ 0
ICC TAX = ($ 9027.02) x (.001) =	$ 9.03
STATE TAX = ($ 9027.02) x (.05) =	$ 451.35
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 9487.40 + X

RATE STRUCTURE #4-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 9T WINTER
PERIOD: OFF PEAK
TOTAL RUN TIME: OCT. 1-NOV. 1, 2001 = 31 1/2 DAYS = 480 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 8 FULL DAYS + 24 HALF DAYS = 480 HRS
KWH FOR 31 1/2 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (247,680 KWH) x ($ .0105/KWH) =	$ 2600.64
ON-PEAK DEMAND = (10 KW) x ($ 10.71/KW) =	$ 107.10
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 2734.69
FEDERAL TAX =	$ 0
ICC TAX = ($ 2734.69) x (.001) =	$ 2.73
STATE TAX = ($ 2734.69) x (.05) =	$ 136.73
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 2874.15 + X

RATE STRUCTURE #5-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: SEP. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

KWH CHARGE = (247,680 KWH) x ($ .0880/KWH) =	$ 21,795.84
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 21,807.44
FEDERAL TAX =	$ 0
ICC TAX = ($ 21,807.44) x (.001) =	$ 21.81
STATE TAX = ($ 21,807.44) x (.05) =	$ 1090.37
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 22,919.62 + X

RATE STRUCTURE #6-THREE 215 HP PUMPS RUNNING IN FALL

RATE: 2B WINTER
PERIOD: N/A
TOTAL RUN TIME: OCT. 1-20, 2001 = 20 DAYS = 480 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 20 DAYS: (480 HRS) x (172 KW) x 3 = 247,680 KWH

CHARGES

KWH CHARGE, FIRST 1000 KWH = (1000 KWH) x ($ .0755/KWH) =	$ 75.50
KWH CHARGE, OVER 1000 KWH = (247,680 KWH - 1000 KWH) x ($ .0642/KWH) =	$ 15,836.86
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 15,923.96
FEDERAL TAX =	$ 0
ICC TAX = ($ 15,923.96) x (.001) =	$ 15.92
STATE TAX = ($ 15,923.96) x (.05) =	$ 796.20
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 16,736.08 + X

These pumps may have to run 10 days during June and /or July. These are summer months. The calculations for this 10 day period would be covered under Rate Structures # 1, 2, and 5. The On-peak and Off-peak charges or KWH charges will be approximately half of those given in these Rate Structures. The On-peak Demand Charges and Customer Charges will remain unchanged. Hence, these 3 Rate Structures are listed below for the spring/summer runs.

RATE STRUCTURE #1-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: ON/OFF PEAK
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: 6 HALF DAYS = 72 HRS
OFF-PEAK RUN TIME: 4 FULL DAYS + 6 HALF DAYS = 168 HRS
KWH FOR 10 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

ON-PEAK = (72 HRS) x (172 KW) x 3 → (37,152 KWH) x ($ .0398/KWH) =	$ 1478.65
OFF-PEAK = (168 HRS) x (172 KW) x 3 → (86,688 KWH) x ($ .0105/KWH) =	$ 910.22
ON-PEAK DEMAND = (172 KW) x 3 x ($ 13.20/KW) =	$ 6811.20
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 9227.02
FEDERAL TAX =	$ 0
ICC TAX = ($ 9227.02) x (.001) =	$ 9.23
STATE TAX = ($ 9227.02) x (.05) =	$ 461.35
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 9697.60 + X

RATE STRUCTURE #2-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 9T SUMMER
PERIOD: OFF PEAK
TOTAL RUN TIME: JUN. 1-16, 2001 = 15 1/2 DAYS = 240 HRS
ON-PEAK RUN TIME: 0
OFF-PEAK RUN TIME: 4 FULL DAYS + 12 HALF DAYS = 240 HRS
KWH FOR 15 1/2 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

ON-PEAK =	$ 0
OFF-PEAK = (123,840 KWH) x ($ .0105/KWH) =	$ 1300.32
ON-PEAK DEMAND = (10 KW) x ($ 13.20/KW) =	$ 132.00
CUSTOMER CHARGE =	$ 26.95
SUBTOTAL =	$ 1459.27
FEDERAL TAX =	$ 0
ICC TAX = ($ 1459.27) x (.001) =	$ 1.46
STATE TAX = ($ 1459.27) x (.05) =	$ 72.96
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 1533.69 + X

RATE STRUCTURE #5-THREE 215 HP PUMPS RUNNING IN SPRING/SUMMER

RATE: 2B SUMMER
PERIOD: N/A
TOTAL RUN TIME: JUN. 1-10, 2001 = 10 DAYS = 240 HRS
ON-PEAK RUN TIME: N/A
OFF-PEAK RUN TIME: N/A
KWH FOR 10 DAYS: (240 HRS) x (172 KW) x 3 = 123,840 KWH

CHARGES

KWH CHARGE = (123,840 KWH) x ($ .0880/KWH) =	$ 10,897.92
CUSTOMER CHARGE =	$ 11.60
SUBTOTAL =	$ 10,909.52
FEDERAL TAX =	$ 0
ICC TAX = ($ 10,909.52) x (.001) =	$ 10.91
STATE TAX = ($ 10,909.52) x (.05) =	$ 545.48
FUEL ADJUSTMENT CLAUSE	
DEMAND-SIDE ADJUSTMENT CLAUSE	$ X
ELECTRICAL ENVIRONMENTAL ADJUSTMENT CHARGE	
TOTAL =	$ 11,465.91+ X

COMMENTS ON ABOVE RATE STRUCTURES

1. Rate Structure #1 (summer rate) is more expensive than Rate Structure #3 (winter rate).

2. Rate Structures #2 and 4 (Off-peak rates) are much cheaper than Rate Structures #1 and 3 (On-peak/Off-peak rates), although about 1/3 more time is needed to pump the same number of hours.

3. Rate Structures #5 and 6 demonstrate a straight price/KWH (rate 2B). This is the most expensive of all the rates.

4. Rider 13 to Rate 9T is available to be applied to this pump station billing if power is connected before January 1, 2000, unless CIPS is willing to extent it. This rate applies to Rate Structure # 3, the 9T winter rate. It says that we can cut the On-peak Demand charge by 50% for the first 5 years. This means that the On-peak Demand of $ 8782.20 can be cut in half to $ 4391.10. This means that this total bill will come out to $ 9911.34. Note that even with this break, the Off-peak rates, Rate Structures #2 and 4, are still cheaper than Rate Structure #3 with this Rider applied.

5. The three 215 HP pumps are cheaper to run than the two 525 HP pumps.

6. A prorated demand option may be available for the 9T rate. What this says is that if the On-peak usage is for 10 days or less during a billing period, then the demand rate will be broken down on a per day bases (up to 10 days maximum) and billed accordingly. If there is an On-peak usage for more than 10 days in a month, the regular 9T rate would apply. With the scenarios used in the Rate Structures, the pumps are run too many days a month to get any benefit from this option, although it should be open to consideration if plans change.

7. When on the 9T rate, (Rate Structures 1,2,3, and 4) on the months when the pump station is not in use, there will be a minimum billing for 10 KW for the On-peak Demand and the Customer Charge, plus the taxes, FAC, DSAC, and EEAC. An example is as follows:

On-peak =	$ 0
Off-peak =	$ 0
On-peak Demand = (10 KW) x ($ 13.20/KW) =	$ 132.00
Customer charge =	$ 26.95
Taxes =	$ 8.11
FAC, DSAC, & EEAC =	$ X
Total =	$ 167.06 + X

The above example is for summer rate. For winter rate, the $ 13.20 is replaced with $ 10.71. This leads to a total of $ 140.88.

For the 2B rate, the minimum charge is the Customer Charge which is $ 11.60 plus taxes, FAC, DSAC, and EEAC.

RECOMMENDATIONS

1. Since Rate Structures #2 and 4 (Off-peak rates) are so much cheaper than the other Rate Structures, installation of rate 9T Time-of -Day metering is recommended. If these pumps are to be operated in automatic mode, a timer may be installed to lock out On-peak running time.

2. It is cheaper and more versatile to operate three 215 HP pumps rather two 525 HP pumps for the following reasons:

    a) The total HP or KW per 100,000 GPM of water pumped is less for the three 215 HP pumps Vs the two 525 HP pumps.
    b) The three 215 HP pumps offer the ability to pump in smaller increments when compared to the alternative. That is, if a small quantity of pumping needs to be done, only 1 or 2 of the three pumps need to be activated.
    c) If one pump needs to be taken out of service, the pump station is still 66.67% functional with three 215 HP pumps and only 50% functional with two 525 HP pumps.

2001

January 2001

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

March 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

April 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

May 2001

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

June 2001

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

July 2001

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August 2001

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

September 2001

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

October 2001

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

November 2001

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

December 2001

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

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Subject	RICE LAKE	Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 1 of

TWO 525 HP PUMPS

MOTOR FLA = 475A

SAFETY FACTOR = 475A x 125% = 593.75A

CONDUCTORS: ONE 1500 MCM/Ø WILL CARRY 625A

$\frac{593.75A}{2}$ = 296.88A → TWO 350 MCM/Ø WILL CARRY 310A ea.

$\frac{593.75A}{3}$ = 197.92A → THREE 3/0 CONDUCTORS/Ø WILL CARRY 200A ea.

RGS CONDUIT: USING XHHW CONDUCTORS.

THREE 1500 MCM AND ONE 1500 MCM GND → 6" DIA.

THREE 350 MCM AND ONE 350 MCM GRN → 3" DIA. x 2

THREE 3/0 AND ONE 3/0 GRN → 2" DIA. x 3

TO FEED EACH MOTOR FROM THE CONTROLLER:

GO WITH TWO 350 MCM CONDUCTORS/Ø. POWER FEED WILL BE TWO 3" RGS CONDUITS, EACH CONDUIT CONTAINING 3Ø AND 1 GND.

Subject	RICE LAKE	Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 2 of

THREE 215 HP PUMPS

MOTOR FLA = 345 A

SAFETY FACTOR = 345A x 125% = 431.25 A

CONDUCTORS:

ONE 700 MCM/Ø WILL CARRY 460A

$\frac{431.25A}{2}$ = 215.63A → TWO 4/0 WILL CARRY 230A ea.

RGS CONDUIT: USING XHHW CONDUCTORS.

THREE 700 MCM AND ONE 700MCM GND → 3½" DIA.

THREE 4/0 AND ONE 4/0 GND → 2" DIA. x 2

TO FEED EACH MOTOR FROM THE CONTROLLER:

GO WITH TWO 4/0 CONDUCTORS/Ø. POWER FEED WILL BE TWO 2" RGS CONDUITS, EACH CONDUIT CONTAINING 3Ø AND 1 GND.

NCR Form 1 Aug 80 381b

Subject	RICE LAKE	Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 3 of

PUMP STATION SERVICE FROM METER TO MAIN DISCONNECT

2 - 525 HP PUMPS

FLA = 475A x 2 = 950A

SAFETY FACTOR = 950A x 125% = 1187.5A

CONDUCTORS:

2 - 1500 MCM/Ø = 1250A

2 - 1250 MCM/Ø = 1180A

3 - 600 MCM/Ø = 1260A

4 - 350 MCM/Ø = 1240A

CONDUIT = XHHW CONDUCTORS.

2 RGS CONDUITS - EA CARRIES 3-1500MCM + 1-1500 MCM GND = 6" DIA.

3 RGS CONDUITS - EA CARRIES 3-600MCM + 1-600 MCM GND = 3 1/2" DIA.

4 RGS CONDUITS - EA CARRIES 3-350 MCM + 1-350 MCM GND = 3" DIA

SUGGEST GOING WITH 4 - 350 MCM's/Ø.
RUN 4 - 3" TO 4" DIAMETER RGS CONDUIT,
EACH CONDUIT CONTAINS 3 Ø + 1 GND.

Subject	RICE LAKE	Date OCT. 29, 1996
Computed by RJW	Checked by	Sheet 4 of 1

PUMP STATION SERVICE FROM METER TO MAIN DISCONNECT

3 – 345 HP PUMPS

FLA = 345A x 3 = 1035 A

SAFETY FACTOR = 1035A x 125% = 1293.75 A

CONDUCTORS:

2 – 1750 MCM/Ø = 1300A

3 – 700 MCM/Ø = 1380 A

4 – 400 MCM/Ø = 1340 A

CONDUIT = XHHW CONDUCTORS

2 RGS CONDUITS – EA CARRIES 3 – 1750 MCM + 1-1750 MCM GND = 6" DIA.

3 " " – " " 3 – 700 MCM + 1-700 MCM GND = 3½" DIA.

4 " " – " " 3 – 400 MCM + 1-400 MCM GND = 3" DIA.

SUGGEST GOING WITH 4-400 MCM's/Ø.
RUN 4 – 3" TO 4" DIAMETER RGS CONDUIT,
EACH CONDUIT CONTAINS 3 Ø + 1 GND.

RATE 2B — GENERAL SERVICE
(Bill/Rate Code 520)

AVAILABILITY

Available for any Customer within territory served by Company.

*NET RATE PER MONTH

Customer Charge
$11.60

Energy Charge

Summer Rate (1)	Winter Rate (2)
8.80 cents per kwh for all kwh used	7.55 cents per kwh for the first 1,000 kwh used 6.42 cents per kwh for all over 1,000 kwh used

Subject to "Fuel Adjustment" Sheet No. 36.

(1) The summer rate shall apply during the monthly billing period ending about June 1st (billing cycle 6) of each year and the following three consecutive monthly billing periods.

(2) The winter rate shall apply during all other monthly billing periods.

DISCOUNT

When the Customer agrees to accept delivery of energy at the available primary voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reduction, if any, a discount equal to 4 percent of the amount of the Customer's net energy charges will be allowed.

MINIMUM BILL

The customer charge each month.

*UNMETERED SERVICE

Upon request, the Company will provide unmetered service for connected loads not exceeding 2 kilowatts where operation of the customer's equipment is continuous or is regularly scheduled on an annual basis. For the purposes of billing in such cases, the monthly kwh shall be determined by multiplying the rated wattage (based upon nameplate or other appropriate data) of the connected loads by one-twelfth of the annual hours of operation and dividing by 1,000. The first 70 kwh so determined shall be included in the Customer Charge. The energy charges stated above will apply to all kwh in excess of 70 kwh.

TERMS OF PAYMENT

Customer's bills will be computed at the net rates, and there will be added to any portion of such bill remaining unpaid fourteen days from the date of issue of the bill a sum equivalent to one and a half (1½) percent of the unpaid balance.

TERMS AND CONDITIONS

Service hereunder is subject to the general "Terms and Conditions" and "Tax Additions" of this Schedule, and the following further conditions:

Loads to be served under this schedule may be subject to special contract arrangements as set forth under the "Customer Facilities Charges" section of the Terms and Conditions of this Schedule.

A written service agreement may be required to take service for a period of years as agreed to by and between Customer and Company

Three phase service may be available to Customers under the "Rural Extension Policy" or the "Customer Facilities Charges" provisions of the Terms and Conditions Section of this Schedule.

*RATE 9T — LIGHT AND POWER

*TIME-OF-USE SERVICE

AVAILABILITY

Available for any Customer within territory served by Company.

*NET RATE PER MONTH

Customer Charge $26.95

	Summer Rate (1)	Winter Rate (2)
Demand Charge per KW of billing demand:	$13.20	$10.71
Energy Charge for all KWH used during:		
On-peak periods (3)	3.98 cents per KWH	1.99 cents per KWH
Off-peak periods (3)	1.05 cents per KWH	1.05 cents per KWH

Provided that the sum of the Demand and Energy charges above divided by the number of KWH used shall not be greater than 10 cents per KWH in a winter billing period, nor greater than 12 cents per KWH in a summer billing period.

Subject to "Fuel Adjustment" Sheet No. 36.

(1) The summer rate shall apply during the monthly billing period ending about June 1st (billing cycle 6) of each year and the following three consecutive monthly billing periods.

(2) The winter rate shall apply during all other monthly billing periods.

(3) "On-peak" periods, for purposes hereof, shall be the hours of 10:00 A.M. to 10:00 P.M. on Monday through Friday, except on days on which the following holidays are observed in Illinois: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. "Off-peak" hours shall be all other hours.

Monthly Maximum Demand:

*The monthly maximum demand shall be the highest rate of energy use during any 15 consecutive minutes occurring in such month. The Company may determine the average lagging power factor each month, and if found to be less than 90 per cent, the demand charge in such month shall be increased by an amount equal to 20 cents for each kilovoltampere, or fraction thereof, of capacitors required to correct the power factor from the per cent to 90 per cent lagging.

Billing Demand:

The billing demand for each month shall be the highest demand established during on-peak hours in such month, or 10 KW, whichever is greater.

DISCOUNT

*When the Customer agrees to accept delivery of energy at the available primary voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reductions, if any, a discount equal to 6 percent of the amount of the Customer's net demand charge will be allowed. If such service is unregulated the total discount shall be equal to 7 percent of the net demand charge.

When the Customer agrees to accept delivery of energy at the available transmission voltage (a) without additional expense to the Company and (b) the Customer assumes the responsibility and expense of subsequent voltage reduction, if any, a discount equal to 10 percent of the amount of the Customer's net demand charges will be allowed.

*RATE 9T — LIGHT AND POWER

*TIME-OF-USE SERVICE

(Continued from Sheet No. 13.5)

*MINIMUM BILL

The sum of the Customer and Demand Charges each month, provided, however, the total of the payments to the Company by Customer for services hereunder shall be not less than $70.00 per kilowatt for each yearly contract period based on the highest summer monthly billing demand which has occurred in said yearly period.

TERMS OF PAYMENT

Customers' bills will be computed at the net rates and there will be added to any portion of such bill remaining unpaid fourteen days from the date of issue of the bill a sum equivalent to one and a half (1½) percent of the unpaid balance.

TERMS AND CONDITIONS

Service hereunder is subject to the general "Terms and Conditions" and "Tax Additions" of this Schedule, and the following further conditions:

Loads to be served under this schedule may be subject to special contract arrangements.

A written service agreement may be required to take service for a period of years as agreed to by and between Customer and Company.

.M cornell

CIPS

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

September 30, 1994

#Name
#Title
#DD
#Address1
#Address2
#csz

Dear Sir:

CIPS is offering a prorated demand for drainage districts that are now on, or might like to consider being on, time of day rates. What this means is that instead of the entire demand charge being billed for onpeak usage after 15 minutes of use, the demand rate will be broken down on a per day basis (up to 10 days maximum) and billed accordingly. If there is onpeak usage for more than 10 days in a month, the regular 9T rate would apply.

An example of this concept is as follows:

9T Summer Demand = $13.20/KW

Assume a 200 horsepower motor, the billing presently 200 h.p. x .746 KW/h.p. x $13.20 => $1,969.44 for a demand set during any 15 minutes on peak.

While the proposed billing, for say a 3 day onpeak period, will be 200 h.p. x .746 KW/h.p. x $13.20/20 days x 3 days => $295.42.

As you can readily see, the savings for onpeak use can be substantial. The energy usage in KWH will still be billed at the present rate. I've enclosed a 9T rate sheet for your reference.

To be able to determine the number of days pumping was done onpeak, an electronic recorder will need to be installed and either a telephone line or cellular phone will also be needed. This service would involve an additional monthly charge of approximately $27.00 per month from CIPS plus you will possibly have either telephone or cellular service charges as well.

DIVISION OFFICE 104 E. THIRD STREET BEARDSTOWN, ILLINOIS 62618 217/323-2173

If you are interested in this service or would like more information, please call me at 1-800-543-2477 or write me at 104 East Third Street, Beardstown, IL 62618.

Sincerely,

J. K. McKinney
Customer Services Supervisor

JKM/cad

bxc: SEBradshaw
SPine
GHazel
AAustin
VPerry
DBuck
LSmith
JFowler
SHeikes
MCornell
DO'Brien
TRawlins

APPENDIX J

COST ESTIMATE

UPPER MISSISSIPPI RIVER SYSTEM

ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA HABITAT REHABILATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY RIVER MILES 132.0 - 138.0

APPENDIX J
COST ENGINEERING

1. General

A detailed estimate was developed for the recommended plan using the Micro Computer Aided Cost Estimating System (MCACES). The level of detail for the estimate is consistent with the level of design. This detailed estimate was prepared using preliminary project plans, information gathered from site visits and discussions with design team members and the local sponsor, and review of similar construction projects.

2. Price Level

The estimates are prepared to a January 2010 price level. These costs are considered to be fair and reasonable to a well-equipped and capable contractor and include overhead and profit. Calculation of the Fully Funded Estimate (FFE) was done in accordance with guidance from EM 1110-2-1304, Civil Works Construction Cost Index System (CWCCIS), updated January 2010. The midpoint of construction was used to determine the FFE.

3. Contingency Discussion

After review of project documents and discussion with engineering and construction personnel involved in the project, cost contingencies were developed with reflect the uncertainty associated with the construction work. These contingencies are based on qualified cost engineering judgment of the available design data, type of work involved, and uncertainties associated with the work and schedule. The contingency for the cost estimate is 25%. The basis for the selection of the contingency factor is primarily due to the level of design of a project feature, unknown quantities, and unknown site conditions. Many of the project features can be constructed using conventional methods and are similar to previous Rock Island District Projects.

4. Recommended Plan

The MCACES estimate incorporated local wage and equipment rates. Costs, including appropriate contingencies are presented in accordance with ER 1110-2-1302, Civil Works Cost Engineering and EC 110-2-538, Civil Works Project Cost Estimating – Code of Accounts. The

attached MCACES sheets show the Current Working Estimate (CWE) (contract amount plus contingency) and the FFE amount (CWE plus escalation).

Description	UOM	Quantity	ContractCost	Contingency	Escalation	ProjectCost
Project Owner Summary			17,536,542	1,861,642	339,452	19,737,636
Lands and Damages	LS	1	7,653,000	0	0	7,653,000
Fish and Wildlife Facilities	LS	1	7,446,568	1,861,642	301,320	9,609,531
(Note: Option B and D items)						
Perimeter Control Dike	LS	1	2,373,128	593,282	96,408	3,062,818
(Note: Perimeter dike constructed to elevation 442 ft.)						
Access Road Improvement	LS	1	130,772	32,693	5,313	168,778
(Note: The access road will be constructed through an area that is currently wooded.)						
Overflow Spillway	LS	1	389,093	97,273	15,807	502,173
Articulated Concrete Block Mat	SF	116,100	879,150	219,788	35,715	1,134,653
Perimeter Control Dike	CY	55,000	974,113	243,528	39,573	1,257,214
(Note: The contractor is required to excavate material from the southern edge of Goose Lake to construct the perimeter control dike. The dike consists of two segments, A and B. The total estimated quantity of excavation is 55,000 CY. A crane supported by timber mats will be used to dredge. Off highway trucks will be used to move dredged material to places where the crane with bucket can not dump. The dredged material will be placed for the dike in one construction season and the material will be compacted and finished the following construction season to allow the material to settle and let excess water drain from the material.)						
(Note: Consists of levee from Station 100+00 to Station 150+35. The total amount of material to be placed from Goose Lake on this area of the levee is 16,224 CY.)						
(Note: Consists of levee from Station 00+00 to Station 100+00. The total amount of material to be placed from Goose Lake on this area of the levee is 38,776 CY.)						
Pump Station	LS	1	2,254,395	563,599	91,585	2,909,578
(Note: Pump station costs are taken from an average of the bid abstract costs for DACW 25-95-B-0003 West Des Moines LFP which used a design similar to the Rice Lake Project. This average cost was indexed to current levels with an ENR factor. An additional factor was used to adjust this cost to account for an increase in station capacity. This total cost was then adjusted to a direct cost and input as such. Option D pump station includes 4 each 42" discharge pipes from 4 pumps (33300 gpm size each).)						
Pump Station	LS	1	1,373,900	343,475	55,815	1,773,190
(Note: 4 pump Pump Station)						
Added Pipe Length Costs	LS	1	800,849	200,212	32,535	1,033,596
Access Road to Pump Station	LS	1	57,943	14,486	2,354	74,782
(Note: Access road to pump station from existing asphalt road.)						
Pavement Replace Over Pipe Trench	LS	1	21,703	5,426	882	28,010
Discharge Channel	LS	1	1,299,718	324,929	52,801	1,677,448
Clearing and Grubbing	ACR	33	26,931	6,733	1,094	34,758
Channel Excavation	CY	100,000	992,398	248,099	40,316	1,280,813
Dewatering at Slim Lake	LS	1	8,558	2,139	348	11,045
(Note: Dewater Slim Lake area to allow for construction of discharge channel embankments and to install a water control structure at the same location.)						
Seeding	ACR	33	61,895	15,474	2,514	79,883
Riprap Erosion Protection	LS	1	186,776	46,694	7,588	241,058
Articulated Concrete Block Mat	SF	3,000	23,160	5,790	941	29,890
Water Control Structures	LS	1	274,789	68,697	11,163	354,650
2 - 24" Control Voorhees	EA	2	46,653	11,663	1,895	60,211
2 - 24" Agridrain Slimlake	EA	2	28,333	7,083	1,151	36,567
3 - 48" Control Rice Lake	EA	3	98,971	24,743	4,021	127,735
3 - 48" Control Big Lake	EA	3	98,971	24,743	4,021	127,735
Riprap Scour Protection at outfl	LS	1	1,861	465	76	2,402
Fish Egress for Rice Lake	LS	1	154,712	38,678	6,285	199,675
Culvert Fish Egress	LS	1	152,434	38,109	6,193	196,736
Granular Surfacing Road Repair	LS	1	2,277	569	93	2,939
Fish Egress for Big Lake	LS	1	156,131	39,033	6,343	201,506
Culvert Fish Egress	LS	1	156,131	39,033	6,343	201,506
Gravity Outlet (Gatewell) Struct	LS	1	126,586	31,647	5,143	163,375
Excavation	LS	1	1,112	278	45	1,435
Slidegate Structure	LS	1	71,827	17,957	2,918	92,701
60" RCP	LS	1	52,435	13,109	2,130	67,674

FOUO

Description	UOM	Quantity	ContractCost	Contingency	Escalation	ProjectCost
Backfill & Compaction	LS	1	1,212	303	49	1,565
(Note: This structure is to be included in the levee to be constructed as part of this project.)						
Terrestrial Vegetation	LS	1	533,819	133,455	21,686	688,960
Mast Tree Plantings	ACR	352	457,261	114,315	18,576	590,152
Warm Season Grass Plantings	ACR	57	76,558	19,139	3,110	98,808
Existing Voorhees Pump Station Work	LS	1	50,698	12,674	2,060	65,432
(Note: The work at the existing pump station consists of installation of a new slide gate, a new flap gate, and removal of the existing pump. The pump removal is to be done by the IL DNR and becomes the property of the DNR. A credit is allowed for this work.)						
New 36" Slide Gate	LS	1	10,836	2,709	440	13,985
New 36" Flap Gate	LS	1	8,029	2,007	326	10,363
Pump Removal	LS	1	4,141	1,035	168	5,344
Riprap Protection	LS	1	14,282	3,571	580	18,433
Remove Existing 36" Pipe	LF	100	3,117	779	127	4,023
Install New 36" Pipe	LF	100	10,293	2,573	418	13,284
Mob & Demob	LS	1	193,133	48,283	7,846	249,263
Existing Rice Lake Pump Station Work	LS	1	29,460	7,365	0	36,825
(Note: For the pump station removal, it is assumed that the structure will be removed to 2 feet below ground. The pumps will be removed and the structure filled with sand. A concrete cap will be placed over the top of the filled in structure.)						
Building Removal	LS	1	4,566	1,141	0	5,707
Electrical Removal	LS	1	11,909	2,977	0	14,887
Pump Removal	LS	1	3,499	875	0	4,374
Cap 36" pipes	LS	1	4,357	1,089	0	5,447
(Note: The pipes to be capped are the 36" CMP pipes that served as the discharge from the pumping station.)						
Fill and cap Pump Station	LS	1	5,129	1,282	0	6,411
PED	LS	1	1,670,359	0	13,217	1,683,576
Plans and Specifications	LS	1	300,000	0	7,680	307,680
Engineering During Construction	LS	1	170,359	0	5,537	175,896
DPR	LS	1	1,200,000	0	0	1,200,000
Construction Management	LS	1	766,615	0	24,915	791,530
Construction Management	EA	1	766,615	0	24,915	791,530

FOUO

APPENDIX K

LITERATURE CITED

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-17PR)

RICE LAKE STATE FISH AND WILDLIFE AREA
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

LA GRANGE POOL, ILLINOIS WATERWAY
RIVER MILES 132.0 THROUGH 138.0
FULTON COUNTY, ILLINOIS

APPENDIX K

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APPENDIX L

REAL ESTATE PLAN

A Real Estate Plan will be included in the Final report.

APPENDIX M

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE DOCUMENTATION REPORT

CEMVR-EC-DN

January 8, 2010
S. Gustafson

MEMORANDUM FOR RECORD

SUBJECT: Hazardous, Toxic, and Radiological Waste (HTRW) Assessment Update for the Rice Lake Habitat Rehabilitation and Enhancement Project (HREP), La Grange Pool, Illinois Waterway River Miles 132 to 138.

1. Summary. An Environmental Site Assessment (ESA) Transaction Screening Process was completed on January 7 and 8, 2010 for Rice Lake HREP in general conformance with ASTM Practices E 1527-00, E 1527-05 and E 1528-00, ER 1165-2-132, and MVD DIVR 1165-2-9. The inquiry consisted of a review of the November 2002 HTRW Documentation Report for the same project location, an interview with Bill Douglass of the Illinois Department of Natural Resources (DNR), and review of state and federal records. This assessment revealed no evidence of hazardous substances, HTRW, or other regulated contaminants in connection with the project area.

2. Location. The 6,800-acre Rice Lake HREP lies on the right descending bank of the Illinois Waterway between River Miles (RM) 132.0 and 138.0, near Banner, Illinois. The project is located on the east side of U.S. Highway 24 in Fulton County, Illinois, approximately 24 miles southwest of Peoria, Illinois. The Rice Lake project area is located adjacent to, and immediately downstream from, the Banner Marsh SFWA, which is also a HREP. The Rice Lake project area encompasses the land and water areas that comprise the Rice Lake SFWA (5,600 acres) and Duck Island peninsula (1,200 acres).

3. Records Review. An environmental review of the area within ½ mile of the proposed project area was conducted on January 7, 2010. The U.S. EPA Enviromapper Database, the National Response Center Database, Illinois EPA Site Remediation Program Database, Illinois EPA Leaking Underground Storage Tank (LUST) Database, Illinois DNR Coal Mine Database, and US EPA Cleanups In My Community Database. One LUST site was noted along the western edge of Rice Lake. Coal surface mining has taken place north and west of the project area. Aggregate surface mining is taking place on the southern end and northeastern corner of Duck Island.

4. Current and Historical Use. The project area is currently part of the Rice Lake State Fish and Wildlife Area owned and operated by the Illinois DNR. The area is used for recreation for the general public. To the south of the project area is an aggregate mining facility (southern end of Duck Island). The north end of Duck Island is used for agricultural crop production. To the north is a historical coal mining area. The project area is bounded to the east by the Illinois River. The project area has been used for recreation and agriculture since 1900.

5. Interviews. Bill Douglass of the Illinois DNR (Rice Lake Fish and Wildlife Area manager) was interviewed on January 8, 2010. Mr. Douglass stated that to the best of his knowledge, no spills or dumping of hazardous substances occurred in the subject work area. A LUST site was present at the Rice Lake offices, but this is outside of the subject work area.

6. Site Reconnaissance. The interview with DNR personnel and a review of past project reports and photographs indicated no visual indications of recognized environmental conditions.

7. Conclusions and Recommendations. While there may be *de minimus* recognized environmental conditions on target properties due to trace amounts of fertilizers, pesticides, and herbicides because of agricultural activities upstream of the project area, there are no physical signs, records, or specialized knowledge indicating a significant recognized environmental condition concern for the project.

The LUST site is a significant distance from the project area, and the aggregate mining operations do not appear to be a significant source of HTRW concerns and are located outside of the project work area. It is recommended that no further HTRW assessments be conducted for this project.

8. The assessment was investigated and documented by Steve Gustafson, P.G., Environmental Engineering Section, Engineering and Construction Division.

Heather Anderson, P.E.
Chief, Environmental Engineering
Section

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT WITH INTEGRATED ENVIRONEMNTAL ASSESMENT

RICE LAKE HABITAT REHABILITATION AND ENHANCEMENT LA GRANGE POOL, ILLINOIS WATERWAY RIVER MILES 132.0-138.0

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW) DOCUMENTATION REPORT

1. Purpose and Scope.

The specific purpose of a Hazardous, Toxic, and Radioactive Waste (HTRW) Documentation Report or Phase I Environmental Site Assessment (ESA) is to adequately document an appropriate inquiry into HTRW activities or recognized environmental conditions on potential project properties. The report is required in order to minimize Federal liability through the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) due diligence audit process and to reduce any threats to project workers and avoid costly delays associated with environmental abatement activities. This particular inquiry concerns the properties for the Habitat Rehabilitation and Enhancement Project (HREP) at the Rice Lake State Fish and Wildlife Area and is in accordance with ER 1165-2-132, HTRW Guidance for Civil Works Projects, DIVR 1165-2-9, HTRW Policy for Civil Works Projects, and ER 405-1-12, Real Estate Handbook. The report was performed in conformance with the scope and limitations of ASTM Standards E 1527-00 and E 1528-00.

The policies and authorities outlined in ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects and DIVR 1165-2-9, HTRW Policy for Civil Works Projects were developed to facilitate the early identification and the appropriate consideration of HTRW problems in all of the various phases of water resources studies or projects. Construction of civil works projects in HTRW contaminated areas should be avoided where practicable.

ASTM Standards E1527-97 and E1528-96 provide a comprehensive guide to conducting Phase I HTRW Environmental Site Assessments. Not every property warrants the same level of assessment. Consistent with good commercial or customary practice, the appropriate level of inquiry will be guided by the type of property subject to assessment, the expertise and risk tolerance of the user, and the information developed in the course of the inquiry. Screening methods and tools have been selected based on the location, physical setting, surrounding land uses, and particular nature of the project. Intrusive field sampling and lab analysis are not used for this investigation, but are reserved for additional investigation as when required. The following documented resources were used to evaluate the existence of recognized environmental conditions within target properties as well as any recognized environmental conditions on properties within an

approximate minimum search distance from the target properties: (1) Site Specific Information, (2) Preliminary Information Review, (3) Records Review, (4) Site Reconnaissance, (5) Interviews. The complete summary of these resources can be found in the full report on file at Rock Island District Headquarters.

2. Findings.

This section summarizes known or suspect environmental conditions associated with the property, and may include current recognized environmental conditions, historical recognized environmental conditions, *de minimus* environmental conditions, and other environmental conditions.

(1) Aggregate Mining Facility. As indicated in the site-specific information, records review, site reconnaissance, and interviews, an aggregate mining facility is located at the south end of Duck Island. Specifically, site reconnaissance indicated rusting drums, rusting storage tanks and the potential of PCB-containing equipment existing on facility property. Small spills of hazardous substances such as gasoline used for the heavy equipment were reported in an interview with a quarry manager.

(2) Agriculture and Crop Production. As indicated in the site-specific information, records review, and site reconnaissance, target properties exist on or adjoin crop production fields and a farmstead.

(3) Public Recreation. As indicated in the site-specific information and preliminary information review, approximately 150,000 people visit the Rice Lake State Fish and Wildlife Area annually.

(4) Hunting Club. As indicated in the site-specific information, records review, and site reconnaissance, there have been several hunting clubs in the project area. Specifically, site reconnaissance revealed the existence of a propane tank and the potential existence of a septic system at “The Red Nose” Hunting Club, located at the north end of Duck Island.

(5) Coal Mining. As indicated in the site-specific information, records review, and interviews, extensive coal mining has occurred on land adjoining the project area.

(6) Copperas Creek Lock and Dam. As indicated in the site-specific information and records review, the State of Illinois operated a lock and dam along the Illinois Waterway on the project area.

(7) Flotsam. During site reconnaissance, flotsam was observed on the project area. Typical flotsam included small refuse items and a rusty 55-gallon barrel.

3. Opinion.

The section shall include the environmental professional's opinion(s) of the impact on the property of known or suspect environmental conditions identified in the findings section. The logic and reasoning used by the environmental professional in evaluating information collected during the course of the investigation related to known or suspect environmental conditions shall be discussed. The opinion shall specifically include the environmental professional's rationale for concluding that a known or suspect environmental condition is or is not currently a recognized environmental condition. Known or suspect environmental conditions identified by the environmental professional as recognized environmental conditions currently shall be listed in the conclusions section of the report.

(1) Aggregate Mining. The primary threat of HTRW from the aggregate mining facility would be to groundwater and surface water in the project area. Since there is substantial coal mining activity in the area surrounding Rice Lake, it is possible that at one time, the aggregate mining facility was mined for coal. Research into local geology showed that there was a stream that terminated in the area of the aggregate mine, deposing sediments in an alluvial fan. This deposited alluvial material is the source for the aggregate that is currently mined. There is no evidence of coal mining ever occurring at the facility, and an interview with the manager of the quarry verified that to the best of his knowledge, coal has never been mined from his quarry.

The small amount of hydraulic fluid that may have leaked from machinery is not a significant source of PCBs. The primary concern with PCB contamination would be a site where used hydraulic fluid was regularly dumped. Site reconnaissance and information obtained from interviews revealed no signs of a habitual disposal site. Since this quarry is down gradient of the project area, and there is not a significant source of HTRW released into the environment as a result of the quarry's current or historical operations, this facility is a *de minimus* environmental condition.

(2) Agriculture and Crop Production. Site reconnaissance did not reveal any fertilizer, pesticide, or herbicide mixing areas on or adjacent to target properties. Fertilizers, pesticides, and herbicides applied to lands during the course of normal agricultural activities, not including mixing and cleaning activities, are exempt from CERCLA and RCRA regulations. Additionally, application of pesticides and fertilizer for normal agricultural activities is generally not the subject of government enforcement action and is therefore considered a *de minimus* environmental condition.

(3) Public Recreation. Public recreation is not considered a meaningful source of HTRW, hazardous substance, or other regulated materials. Public recreation is therefore a *de minimus* environmental condition.

(4) Hunting Club. The hunting club has existed at the site since at least the 1930s. It is likely that hunters utilized some land for target practice, which could potentially lead to high concentrations of lead in the soil. Currently, waterfowl ammunition is manufactured

with bismuth or tungsten, which was mandated in order to protect wetland areas from lead contamination. However, since the hunting club existed before the waterfowl ammunition laws were in existence, there may be elevated concentrations of lead in the soil surrounding the hunting lodge. The lead concentrations are most likely within maximum contaminant levels, and extensive soil sampling would be necessary to determine the exact concentrations. The risk of contamination from lead ammunition is minimal and does not warrant the expense that extensive soil sampling would require. Lead ammunition is therefore a *de minimus* environmental condition.

(5) Coal Mining. Although there is no evidence of coal mining within the project area, several sites in the vicinity have been extensively mined and may or may not pose an environmental threat to the project area. Contamination from coal mining in the bluffs should be contained within the confines of Duck Creek (both the historic and recent channeled form) and its tributaries, as well as any fluvial deposits associated with the creek. Contamination from coal mining immediately north of the Voorhees moist soil management units is expected to be contained within the confines of the reclaimed mine area, lower Copperas Creek, and recent fluvial deposits associated with the creek or Illinois River flooding events. Therefore, *de minimus* contamination may exist in the vicinity around the Voorhees moist soil management units and the private duck hunting club lands north of the conservation area. When excavating the borrow material from south of Goose Lake, construction workers should cease work and notify the Project Engineer if ore-bearing rocks are exposed.

(6) Copperas Creek Lock and Dam. During the normal course of operation of the lock and dam, it is possible that barges would have passed through the lock and may have accidentally leaked or spilled hazardous substances. However, the discovery of such contamination by means other than interviews, record searches, and visual site inspection would require exhaustive site characterization measures to reduce uncertainty. At this time, reducing this uncertainty is not reasonably ascertainable within time and cost constraints, nor is the threat of a release necessarily preventable. Historic records did not indicate any significant spills, and no lingering stresses to the environment were observed, therefore the Copperas Creek Lock and Dam can be considered a *de minimus* environmental condition.

(7) Flotsam. Site reconnaissance did not reveal any signs of intentional dumping or historical dumping sites. Solid waste concerns including small refuse items and an empty 55-gallon barrel appear to be flotsam that was washed ashore from the river during high water events. These findings are not considered a meaningful source of hazardous substances, HTRW, or other regulated materials, and therefore are *de minimus* environmental conditions.

4. Conclusions.

This assessment has revealed no evidence of HTRW or recognized environmental conditions in connection with the Rice Lake Habitat Rehabilitation and Enhancement Program. The full report is on file at Rock Island District Headquarters.

No HTRW documentation report or Phase I ESA can wholly eliminate uncertainty regarding the existence of recognized environmental conditions concerning a property. This assessment is intended to reduce, but not eliminate, uncertainty regarding the existence of HTRW or recognized environmental conditions in connection with a property with reasonable limits of time and cost. Continuing the Environmental Due Diligence Audit process beyond this Phase I ESA to a Phase II ESA may reduce uncertainty or reveal unidentified environmental liabilities, but is not deemed necessary at this time.

5. Recommendations.

Additional HTRW investigation is not expected for the properties identified in this report. If any previously unidentified HTRW or recognized environmental condition should arise, this investigation will be revisited.

APPENDIX N

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ROB HILSABECK IL DEPT OF NATURAL RESOURCES 13921 W RTE 150 BRIMFIELD IL 61517	1	1/0	1/0			1	
KEN LITCHFIELD OFC OF REALTY AND ENVIRON PLANNING IL DEPT OF NATURAL RESOURCES ONE NATURAL RESOURCES WAY SPRINGFIELD IL 62702-1271		1/0					
BARRIE MC VEY IL DEPT OF NATURAL RESOURCES PO BOX 335 FL 001 MACOMB IL 61455		1/0					
MARC MILLER DIRECTOR IL DEPT OF NATURAL RESOURCES ONE NATURAL RESOURCES WAY SPRINGFIELD IL 62702-1271		1/0					
RICK MOLLAHAN CORPS OF ENGRS ECOSYS PROG OFFICE OF RESOURCE CONSERVATION IL DEPT OF NATURAL RESOURCES ONE NATURAL RESOURCES WAY IL STATE FAIRGROUNDS SPRINGFIELD IL 62702-1271	1	1/1	1/1			1	

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ARTHUR NEAL IL DEPT OF NATURAL RESOURCES ONE NATURAL RESOURCES WAY SPRINGFIELD IL 62702-1271		1/0	1/0				
DAN SALLEE FISHERIES ADMINISTRATOR REG I IL DEPT OF NATURAL RESOURCES 2317 E LINCOLN WAY STE A STERLING IL 61081	1	1/0	1/0			1	
MICHELLE SIMONE IL DEPT OF NATURAL RESOURCES 215 N 5TH PEKIN IL 6154	1	1/0	1/0			1	
PAUL VEHLOW IL DEPT OF NATURAL RESOURCES ONE NATURAL RESOURCES WAY SPRINGFIELD IL 63703-2372		1/0					
MIKE WEFER OFFICE OF WILDLIFE/MARSHALL SFWA IL DEPT OF NATURAL RESOURCES 215 N 5TH PEKIN IL 61554		1/0					
TOM BEISSEL IL DEPT OF NATURAL RESOURCES - WILDLIFE 2317 E LINCOLNWAY STE A STERLING IL 61081		1/0	1/0				

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IL DEPT OF TRANSPORTATION 401 MAIN ST PEORIA IL 61602		1/0					
JOEL CROSS PLANNING SECT - BUR OF WATER MC#15 IL ENVIRONMENTAL PROTECTION AGENCY 1021 N GRAND AVE E SPRINGFIELD IL 62794-9276		1/0					
BRUCE YURDIN MANAGER WATERSHED MANAGEMENT SECTION IL ENVIRONMENTAL PROTECTION AGENCY 1021 N GRAND AVE E SPRINGFIELD IL 62794-9276	1	1/0	1/0			1	
ANNE HAAKER DEPUTY STATE HIST PRESERVATION OFCR IL HISTORIC PRESERVATION AGENCY 1 OLD STATE CAPITOL PLAZA SPRINGFIELD IL 62701		1/0					
DR GREG SASS DIRECTOR IL RIVER BIOLOGICAL STATION IL NATURAL HISTORY SURVEY 704 N SCHRADER HAVANA IL 62644	1	1/0	1/0			1	
LEE ALBRIGHT IL RIVER NWR 19031 E CR 2110 N HAVANA IL 62644		1/0					

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DAVID GROSS IL STATE GEOLOGICAL SURVEY 615 E PEABODY DR CHAMPAIGN IL 61820		1/0					
DR NANI BHOWMIK PRINCIPAL SCIENTIST EMERITUS CENTER FOR WATERSHED SCIENCE IL STATE WATER SURVEY 2204 GRIFFITH DR CHAMPAIGN IL 61820-7495		1/0					
THOMAS BUTTS IL STATE WATER SURVEY PO BOX 697 PEORIA IL 61652	1	1/0	1/0				
DR MICHAEL DEMISSIE PRINCIPAL SCIENTIST IL STATE WATER SURVEY 2204 GRIFFITH DR CHAMPAIGN IL 61820		1/0					
TIM SCHLAGENHAFT MN DEPT OF NATURAL RESOURCES 1801 S OAK ST LAKE CITY MN 55041	1	1/0	1/0			1	
JANET STERNBURG CHIEF POLICY COORDINATOR POLICY COORDINATION SECTION MO DEPT OF CONSERVATION 1704 N 24TH ST PO BOX 180 JEFFERSON CITY MO 65109	1	1/0	1/1			1	

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GRETCHEN BENJAMIN THE NATURE CONSERVANCY (TNC) 5605 MEIR COURT LA CROSSE WI 54601	1	1/0	1/0			1	
JIM FISCHER MISSISSIPPI RIVER PLANNER WI DEPT OF NATURAL RESOURCES 3550 MORMON COULEE RD 108 STATE OFC BLDG LA CROSSE WI 54601	1	1/0	1/0				
JEFF JANVRIN HABITAT PROJECTS COORDINATOR WI DEPT OF NATURAL RESOURCES 3550 MORMON COULEE RD LA CROSSE WI 54601	1	1/0	1/1			1	
HONORABLE GEORGE SHADID IL SENATE REPRESENTATIVE DIST 46 IL STATE SENATOR 121C CAPITOL BLDG SPRINGFIELD IL 62706		1/0					
HONORABLE MICHAEL SMITH IL REPRESENTATIVE DIST 91 IL HOUSE OF REPRESENTATIVES 45 E SIDE SQUARE STE 301 CANTON IL 61520		1/0					
HONORABLE JOHN TURNER ILLINOIS REPRESENTATIVE-90TH DIST ILLINOIS HOUSE OF REPRESENTATIVES 2140-0 STRATTON BLDG SPRINGFIELD IL 62706		1/0					

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KAREN WITTER EXECUTIVE DIRECTOR GOVERNOR'S SCIENCE ADVISORY COMMITTEE 2010 S WAILLEMORE AVE SPRINGFIELD IL 62704		1/0					
MARY SOLECKI IL NATURE PRESERVE COMMISSION PO BOX 497 SIDNEY IL 61877		1/0					
PAM GIBSON IL COUNCIL OF WATERSHEDS 866 DOOLIN JACKSONVILLE IL 62650		1/0					
COUNTY ATTORNEY 100 N MAIN ST PO BOX 226 LEWISTOWN IL 61542		1/0					
WILLIAM KUHN COUNTY ENGINEER FULTON COUNTY 430 E OAK ST CANTON IL 61520-3155		1/0					
JAMES "JIM" NELSON COUNTY CLERK FULTON COUNTY 100 N MAIN ST PO BOX 226 LEWISTOWN IL 61542		1/0					

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EDWARD KETCHAM CHAIRPERSON FULTON COUNTY BOARD 100 N MAIN ST PO BOX 226 LEWISTOWN IL 61542		1/0					
SANDRA MONARI FULTON COUNTY BOARD 100 N MAIN ST PO BOX 226 LEWISTOWN IL 61542		1/0					
MARY LOU ROUNDS SUPERVISOR BANNER TOWNSHIP 26369 E BROWN RD CANTON IL 61520		1/0					
HONORABLE KENNETH FULLER MAYOR CITY OF BANNER PO BOX 701 360 S FULTON ST CANTON IL 61520-9803		1/0	1/0				
NANCY ERICKSON IL FARM BUREAU 1701 TOWANDA AVE PO BOX 2901 BLOOMINGTON IL 61702-2901		1/0					
LARRY JAMISON PARAGON MARINE SERVICE INC/CONSOLIDATED GRAIN & BARGE PO BOX 290 BLUFFS IL 62621		1/0					

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JAMES BULL CHAIRMAN-COMMISSIONER EAST LIVERPOOL DRAINAGE & LEVEE DIST 21583 E US HWY 24 LEWISTOWN IL 61542		1/0					
MICHAEL KLINGNER PRESIDENT (VICE CHAIRMAN - UMIMRA) KLINGNER & ASSOCIATES 616 N 24TH ST QUINCY IL 62301-2797		1/0					
WARREN WOLF CHAIRMAN-COMMISSIONER LIVERPOOL DRAINAGE & LEVEE DIST 20544 E US RTE 24 LEWISTOWN IL 61542		1/0					
THOMAS WATSON COMMISSIONER PEKIN & LAMARSH DRAINAGE & LEVEE DIST 13388 N MANITO RD MANITO IL 61546		1/0					
RALPH GUENGERICH CHAIRMAN-COMMISSIONER SPRING LAKE DRAINAGE & LEVEE DIST 7360 SKY RANCH RD MANITO IL 61546		1/0					
TODD SHELABARGER CHAIRMAN SPRING LAKE DRAINAGE & LEVEE DIST 7538 BASS RD MANITO IL 61546		1/0					

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EAST PEORIA EXTENSION CENTER UNIV OF ILLINOIS COOP EXTENSION SVC 727 SABRINA DR EAST PEORIA IL 61611		1/0					
DR JOHN BRADEN DIRECTOR - WATER RESOURCES CENTER 278 ENVIRONMENTAL & AG SCIENCES BLDG UNIVERSITY OF ILLINOIS 1101 W PEABODY DR URBANA IL 61801		1/0					
DIRECTOR ALPHA PARK LIBRARY DIST 1609 W GARFIELD AVE BARTONVILLE IL 61607		1/0	1/0				
DIRECTOR LEWISTOWN CARNEGIE LIBRARY 321 W LINCOLN AVE LEWISTOWN IL 61542-1304		1/0	1/0				
DIRECTOR PARLIN-INGERSOLL LIBRARY 205 W CHESTNUT CANTON IL 61520		1/0	1/0				
LAURIE HARTSHORN REFERENCE LIBRARIAN PEKIN PUBLIC LIBRARY 301 S 4TH ST PEKIN IL 61554		1/0	1/0				

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DIRECTOR PEORIA PUBLIC LIBRARY 107 NE MONROE ST PEORIA IL 61602-1021		1/0	1/0				
THOMAS TINCHER EXECUTIVE DIRECTOR HEARTLAND WATER RESOURCES COUNCIL 416 MAIN ST STE 828 PEORIA IL 61612		1/0					
DARLENE J BRUCE NATURAL RESOURCES CHAIRPERSON GREENWAYS BOARD LEAGUE OF WOMEN VOTERS 505 W CRESTWOOD DR PEORIA IL 61614		1/0					
MILDRED BRYANT ILLINOIS RIVER VALLEY RESIDENTS 3120 N CALIFORNIA PEORIA IL 61603		1/0					
JOYCE BLUMENSHINE HEART OF ILLINOIS SIERRA CLUB 2419 E RESERVOIR BLVD PEORIA IL 61614		1/0					
DOUG BLODGETT CHAIRMAN/COMMISSIONER THOMPSON LAKE DRAINAGE & LEVEE DIST IL RVR PROJECT DIR-THE NATURE CONSERVANCY 11304 N PRAIRIE RD LEWISTOWN IL 61542		1/0	1/0				

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PAUL HANSEN EXECUTIVE DIRECTOR MIDWEST OFFICE IZAAK WALTON LEAGUE OF AMERICA 1619 DAYTON AVE #202 ST PAUL MN 55104-6206		1/0					
TOM EDWARDS RIVER RESCUE 902 W MOSS AVE # I PEORIA IL 61606-1800		1/0	1/0				
JENNIFER FEYERHERM SIERRA CLUB - MIDWEST OFFICE 122 W WASHINGTON AVE STE 830 MADISON WI 53703		1/0					
MIKE REUTER CHIEF CONSERVATION OFFICER ILLINOIS CHAPTER THE NATURE CONSERVANCY PO BOX 9637 PEORIA IL 61602		1/0					
BARB NARAMORE UPPER MISSISSIPPI RIVER BASIN ASSOC (UMRBA) 415 HAMM BLDG 408 ST PETER ST ST PAUL MN 55102		1/0					
VALERIE DECARLO HISTORIC PRESERVATION SPECIALIST ADVISORY COUNCIL ON HISTORIC PRESERVATION 1100 PENNSYLVANIA AVE NW #809 WASHINGTON DC 20004		1/0					

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KAREN SORENSEN ASST CITY EDITOR PEORIA JOURNAL STAR - NEWS ROOM 1 NEWS PLAZA PEORIA IL 61643		1/0	1/0				
ELAINE HOPKINS PEORIA STAR JOURNAL ONE NEWS PLAZA PEORIA IL 61643		1/0	1/0				
WBYS RADIO STATION BOX 600 CANTON IL 61520		1/0	1/0				
NEWS EDITOR NEWS ROOM WIRL RADIO NEWS 331 FULTON ST STE 1200 PEORIA IL 61602		1/0	1/0				
GARY MOORE NEWS ROOM WXCL RADIO 4234 N BRANDYWINE DR PEORIA IL 61614		1/0	1/0				
NEWS ROOM WEEK-TV CHANNEL 25 - NEWS ROOM 2907 SPRINGFIELD RD EAST PEORIA IL 61611		1/0	1/0				

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WHOI-TV - NEWS ROOM 500 N STEWART ST CREVE COEUR IL 61622		1/0	1/0				
NEWS EDITOR NEWS ROOM WMBD TV NEWS 3131 N UNIVERSITY ST PEORIA IL 61604		1/0	1/0				
NEWS DIRECTOR NEWS ROOM WTVP-TV CHANNEL 47 1501 W BRADLEY AVE PEORIA IL 61625		1/0	1/0				
JOHN BALL 12777 N BALL RD LEWISTOWN IL 61542		1/0					
DICK BALL 120 S FULTON CANTON IL 61520		1/0					
AL - LINDA BEHM 89 SALDANA WAY HOTSPRINGS VILLAGE AR 71909-7401		1/0					

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RANDY BOHM 350 MAPLE WOOD CREVE COEUR IL 61610		1/0					
MERL COTTON 10220 W LAKE CAMELOT DR MAPLETON IL 61547		1/0					
DANNY DAVID 10225 REED CITY RD MAPLETON IL 61547		1/0					
BUD GRIEVES 26715 E BROWN RD CANTON IL 61520		1/0					
JOHN GRIGSBY 19942 N US HWY 24 CANTON IL 61520		1/0	1/0				
RANDY JAEGLE PO BOX 174 KINGSTON MINES IL 61539		1/0					

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RICE LAKE, IL 10Y 13 JAN 10	I	II	III	IV	V	VI	1/
LARRY OVERCASH 300 W QUEEN WOOD RD MORTON IL 61550		1/0					
WILLIAM PEAK 270 N 2ND AVE CANTON IL 61520		1/0					
RANDY READER 1610 E MYRTLE APT 206 B CANTON IL 61520		1/0					
GARY THOMAS 6205 S HOLLIS RD BARTONVILLE IL 61607		1/0					
TOM WILLIAMS JR 1311 E SCIOTA AVE PEORIA HEIGHTS IL 61616		1/0					

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RICE LAKE 10Y 13 JAN 10	I	II[1]	III	IV	V	VI [2]
INTERNAL DISTRIBUTION:						
CEMVR-CT	1	1/0	1/0	1		
CEMVR-EC	1	1/0	1/0	1	1	1
CEMVR-EC-C	1	1/0	1/0	1	1	1
CEMVR-EC-D	1	1/0	1/0	1	1	1
CEMVR-EC-DE	1	1/0	1/0	5		
CEMVR-EC-DN	3	3/3	3/3	1	1	1
CEMVR-EC-DN (FELLMAN)	1	1/0	1/0	1	1	1
CEMVR-EC-DS	1	1/0	1/0	1	1	1
CEMVR-EC-G	1	1/0	1/0	1	1	1
CEMVR-EC-H	1	1/1	1/0	1	1	1
CEMVR-EC-HH	1	1/0	1/0	1	1	1
CEMVR-EC-HQ	1	1/0	1/0	1	1	1
CEMVR-EC-T	1	1/0	1/0	1	1	1
CEMVR-EM			1/0		1	
CEMVR-IM-CL	1	1/1	2/2		2	2
CEMVR-OC	1	1/0	1/0	1		
CEMVR-OD	1	1/0	1/0	1	1	1
CEMVR-OD-IV (PATRIDGE)	1	1/0	1/0			
CEMVR-OD-IV (CROSS)	1	1/0	1/0			
CEMVR-OD-MN	1	1/0	1/0	1	1	1
CEMVR-OD-MN (LUNDH)	1	0/1	1/0	1	1	1
CEMVR-OD-P	1	1/0	1/0	1	1	1
CEMVR-OD-PP (HANNEL)	1	1/0	1/0			
CEMVR-OD-T (KLINGMAN)	1	1/0	1/0	1	1	1
CEMVR-PA	1	1/0	1/0			1
CEMVR-PD-A	1	3/3	3/3	1	1	2
CEMVR-PD-A (CARMACK)	1	3/3	3/3	1	1	2
CEMVR-PD-F	1	1/0	1/0	1	1	1
CEMVR-PD-F (NILES)	3	3/3	3/3	1	2	2
CEMVR-PM-M (HUBBELL)	1	1/1	1/1	1	1	1
CEMVR-PM-M (GOETZMANN)	2	2/2	2/2		2	2
CEMVR-RE	1	1/0	1/0			
CEMVR-RE-P	1	1/0	1/0			

[1] Number of copies of CD's and number of paper copies to distribute (CD/Paper)

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