UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION PERFORMANCE
EVALUATION REPORT – YEAR 7 (2005)

PRINCETON REFUGE
HABITAT REHABILITATION
AND ENHANCEMENT PROJECT

SEPTEMBER 2005

US Army Corps
of Engineers
Rock Island District

POOL 14
MISSISSIPPI RIVER MILES 504.0-506.4R
SCOTT COUNTY, IOWA

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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REPLY TO
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UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POST-CONSTRUCTION PERFORMANCE EVALUATION REPORT – YEAR 7 (2005)

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JUNE 2005

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Many individuals of the Rock Island District, United States Army Corps of Engineers; the United States Fish and Wildlife Service; and the Iowa Department of Natural Resources contributed to the development of this Post-Construction Performance Evaluation Report for the Princeton Refuge Habitat Rehabilitation and Enhancement Project. These individuals are listed below with contact information provided in Appendix H. Additional information about the Princeton HREP is available at the following web site - http://www.mvr.usace.army.mil/EMP/hrep/Princeton.htm.

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EXECUTIVE SUMMARY

1. General. As stated in the Definite Project Report, the Princeton Refuge Habitat Rehabilitation and Enhancement Project (HREP) was initiated due to the inability to maintain desirable water levels as the result of a deteriorated levee system and limited water control. The levee surrounding the Princeton Wildlife Area was originally constructed in the late 1920s and early 1930s. A small capacity pump and outlet structure, installed in 1957, allowed some manipulation of water levels, but management was often compromised by limited pumping capability and levee overtopping during high water events. Levee improvements in 1982, in combination with the installation of a higher capacity pump in 1983, helped to overcome some of these difficulties. However, improved water level control was necessary to maximize and sustain wetland habitat quality and quantity for migratory birds.

2. Purpose. The purpose of this Performance Evaluation Report (PER) is to provide a summary of the monitoring data and field observations, as well as project operation and maintenance, since project completion in 1998.

3. Project Goals, Objectives, and Features. The goal with associated objectives and features for the Princeton HREP are as follows:

a. Enhance Wetland Habitat

(1) Provide reliable food source for migratory birds through construction of a levee system, pump station, and water control structures

(2) Increase overall vegetation diversity and availability of preferred wildlife foods through mast tree plantings

4. Observations and Findings. For the evaluation period since project completion, the objectives to meet the goal had the following observations and findings.

a. Provide Reliable Food Source for Migratory Birds

(1) Levee System. Following the Flood of 2001, the top of the overflow roadway (spillway) was found to be at approximately elevation 581.05 feet NGVD when the design grade is elevation 580.3 feet NGVD. As a result, a Stage IV contract was awarded, which consisted of lowering the overflow roadway to an elevation at or below 580.3 feet NGVD. The next profile survey of the overflow roadway would be required in September 2006. Therefore, the next PER should contain new survey data for the overflow roadway to ensure that an elevation at or below 580.3 feet NGVD is maintained.

It is recommended that the overflow roadway be closely monitored during the next flood event. As a minimum, it should be documented when the overflow roadway overtops, when the north perimeter levee overtops, and the interior water elevation of the WMU when the north perimeter levee begins to overtop.

(2) Pump Station. Overall, the pump station appeared to be in good condition. Actual fill times closely resemble design fill times. However, several recommendations were documented in the pump station inspection report (see Appendix F). The engine coolant system has a coolant leak on the radiator. This

leak needs to be repaired to prevent accidental engine over heat. The engine battery box had rodents living inside. This box needs to be rodent proof. A large submerged stone was lodged in the vicinity of the trash rack and is preventing it from being reinstalled. This stone needs to be removed. Approximately 8 inches of sand was measured outside the sump in front of the bulkhead, while 1-½ inches of silt was measured inside the sump behind the bulkhead. This material needs to be cleaned out prior to pumping operations to prevent wear to the pump and deposition within the WMU.

The next inspection of the pump station would be required in May 2006. Therefore, the next PER should contain a new pump station inspection report.

(3) Water Control Structures. The water control structures are functioning well by providing adequate water level control to the WMU. Both cells have been able to achieve the design water surface elevations of 576 and 575 feet NGVD for the NWMU and SWMU, respectively. The Princeton HREP has been successful in attracting waterfowl.

b. Increase Overall Vegetation Diversity and Availability of Preferred Wildlife Foods

Mast Tree Plantings. The mast tree plantings on the north-south berms were inspected. Trees on the east side of the berm are thriving despite competition from other vegetation (see Photo 25 in Appendix G). Trees that were planted on the west side were surrounded by reed canary grass and had a low survival rate. Very few trees were found alive; however, surrounding vegetation reduced the visibility of the surviving trees. Many of the trees still alive in the reed canary grass have sustained damage from deer browse and mice chewing the bark (see Photo 24 in Appendix G). These rows on the west side averaged 5 to 8 trees per row whereas the shorter rows on the east averaged over 10 trees per row. The remaining RPM trees, located southeast of the other mast tree plantings, were also inspected. The survival on these trees is about 50%. Most of the trees had been browsed or rubbed by deer and had re-sprouted several times. The herbaceous competition is dominated by reed canary grass. The majority of the weed barrier mats are still in place and seem to be helping to a limited extent.

It is recommended that both sites be treated with herbicide. Also, it may be beneficial to place weed barrier mats at the mast tree plantings on the north-south berms, which would require mowing or weed whipping.

5. Conclusions and Recommendations. For the evaluation period since project completion, the Princeton HREP had the following conclusions and recommendations.

a. Project Goals, Objectives, and Management Plan.

Based on data and observations collected since project completion, the goals and objectives evaluated for the Princeton HREP are being met (see Table 7-1).

b. Post-Construction Evaluation and Monitoring Schedules

In general, monitoring efforts for the Princeton HREP have been performed according to the Post-Construction Evaluation Plan in Appendix B and the Monitoring and Data Collection Summary in Appendix C. Starting with this PER, the Post-Construction Evaluation Plan and the Monitoring and Data Collection Summary were revised in order to better quantify and evaluate project objectives. See Table 7-2 for the former Post-Construction Evaluation Plan as presented in previous project documents. In summary, the levee system transects and profiles were revised and the vegetation transects were eliminated due to the resources, time, and money to complete these surveys. The next PER will be completed no later than FY 2010, following collection of field data for five years.

c. Project Operation and Maintenance

Project operation has been performed in accordance with the O&M Manual and the Annual Management Plan presented in Table 2-2. Project inspections have been conducted by the IADNR and have resulted in the following maintenance recommendations.

(1) Levee System. The bed of the overflow roadway (spillway) is lower than the shoulders. If the bed of the overflow roadway (spillway) is low, granular surfacing may be placed to an elevation not to exceed 580.3 feet NGVD. If the shoulders of the overflow roadway (spillway) are higher than 580.3 feet NGVD, they need to be re-graded. The perimeter levee just upstream from the gatewell structure near the pump station is too low. This area needs to be raised to the design grade as shown on Plate 9 of the O&M Manual.

(2) Pump Station. The river grating on the pump station inlet box will plug with debris and create a vortex during pumping operations. The Site Manager would prefer to leave the river grating off. It is not recommended that the river grating on the pump station inlet box be left off. However, it is recommended that a secondary fence be installed between the ends and along the top of the wingwalls. The grating on top of the pump station inlet box is heavy to remove and replace. If the grating is replaced with a lighter, hinged section, a padlock should be installed for safety reasons. One hydraulic fitting in the headwall leaks and requires a catch bucket to trap oil. This hydraulic leak needs to be fixed.

(3) Water Control Structures. The two CMP stoplog structures in the cross dike are silted in, which may have occurred during the Flood of 2001. It is recommended that the sediment be removed from the two CMP stoplog structures and the inlets and outlets be cleaned out.

d. Project Design Enhancement

Discussions with those involved in operation, maintenance, and monitoring activities at the Princeton HREP have resulted in the following lessons learned regarding project features that may affect future design of other HREP projects.

(1) Overflow Spillway. During the Flood of 2001, the granular surfacing on top of the overflow spillway was washed to the downstream slope and the geotextile fabric beneath the granular surfacing had been shifted to the downstream shoulder. It appeared that the geotextile fabric had acted as a slippage plane during the flood event for the granular surfacing to “peel” off the overflow spillway. Therefore, the geotextile fabric was not replaced when the overflow spillway was lowered during the Stage IV contract.

(2) Pump Station. During construction, the existing pump station was relocated from the downstream end to the middle of the perimeter levee. However, the existing pump station only consisted of a single pump. As a result, a portable pump with a diesel engine mounted on a highway trailer was supplied following construction.

(3) Water Control Structures. The concrete stoplog structure did not allow for complete drainage of the north cell into the south cell. As a result, a Stage III contract was awarded, which consisted of installing two CMP stoplog structures along the cross dike to provide water level control between the cells at lower elevations by gravity flow.

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1. INTRODUCTION

The Princeton Refuge Habitat Rehabilitation and Enhancement Project (HREP), hereafter referred to as the "Princeton HREP" is a part of the Upper Mississippi River System (UMRS) Environmental Management Program (EMP). The Princeton HREP is located in Pool 14 along the right descending bank of the Upper Mississippi River navigation channel between River Miles (RM) 504.0 and 506.4, or approximately 1 mile north of the City of Princeton, Iowa. The entire refuge encompasses approximately 1,129 acres, with 418 acres being State lands and the remaining 711 acres being Federal lands. The Princeton HREP is operated and maintained by the Iowa Department of Natural Resources (IADNR) under the terms of a Cooperative Agreement with the United States Fish and Wildlife Service (USFWS). Plate 1 in Appendix K contains the location plan, vicinity map, and general notes for the Princeton HREP.

a. Purpose. The purposes of this Performance Evaluation Report (PER) are as follows:

(1) Supplement monitoring results and project operation and maintenance discussed in the November 2001 Flood Damage Assessment (FDA);

(2) Summarize the performance of the Princeton HREP, based on the project goals and objectives;

(3) Review the monitoring plan for possible revision;

(4) Summarize project operation and maintenance (O&M) efforts to date; and

(5) Review engineering performance criteria to aid in the design of future HREPs.

b. Scope. This report summarizes available project monitoring data, inspection records, and field observations made by the United States Army Corps of Engineers (USACE), the USFWS, and the IADNR since project completion, including new data collected since the FDA.

2. PROJECT GOALS AND OBJECTIVES

a. General. As stated in the Definite Project Report (DPR), the Princeton HREP was initiated due to the inability to maintain desirable water levels as the result of a deteriorated levee system and limited water control. The levee surrounding Princeton was originally constructed in the late 1920's and early 1930's. A small capacity pump and outlet structure, installed in 1957, allowed some manipulation of water levels, but management was often compromised by limited pumping capability and levee overtopping during high water events. Levee improvements in 1982, in combination with the installation of a higher capacity pump in 1983, helped to overcome some of these difficulties. However, improved water level control was necessary to maximize and sustain wetland habitat quality and quantity for migratory birds.

b. Goals and Objectives. Goals and objectives, formulated during the project design phase, are summarized in Table 2-1. During the development of enhancement features, consideration was given to satisfying project goals and objectives while maximizing utilization of resource opportunities. Each project feature was constructed to satisfy at least one objective, either singularly or in combination with other enhancement features.

TABLE 2-1
Project Goals and Objectives

Goals	Objectives	Project Features
Enhance Wetland Habitat	Provide reliable food source for migratory birds	Levee System
		Pump Station
		Water Control Structures
	Increase overall vegetation diversity and availability of preferred wildlife foods	Mast Tree Plantings

c. Management Plan. As with more recently developed HREPs, a formal Annual Management Plan has been developed for the Princeton HREP. This plan was developed by the USACE, in coordination with the IADNR, as shown in Table 2-2. The Princeton HREP is maintained and operated by the IADNR under the terms of a Cooperative Agreement with the USFWS.

TABLE 2-2
Annual Management Plan

Month	Action	Purpose
April to July	Dewater area by gravity flow or portable pump	Expose and maintain mudflats to allow revegetation
August to November	Gradually increase water levels to correspond with growth of marsh plant community	Provide access to food plants for migratory waterfowl
December to April	Maintain water levels to maximum extent possible and then release water late during early spring	Maintain winter furbearer habitat and then prepare for aquatic plant germination through gradual water release

3. PROJECT DESCRIPTION

a. Project Features. The Princeton HREP consists of a 2-cell wetland management unit (WMU) to enhance wetland habitat. Plate 2 in Appendix K contains the site plan for the Princeton HREP. Project data have been collected for the perimeter levee, cross dike, overflow roadway (spillway), intake structure, pump engine building, reinforced stoplog structure, CMP stoplog structures (2), and the gatewell structure. Table 3-1 presents a quantitative summary of the project features.

TABLE 3-1
Summary of Project Data

Project Feature	Measurement or Quantity	Units of Measure
Perimeter Levee		
Length	16,400	Feet
Crown Width	10-12	Feet
Side Slopes	4:1	Horizontal:Vertical
Level of Protection	15	Year Event
Design Top Elevation	581.3-582.3	Feet NGVD 1912
Embankment Volume	100,000	Cubic Yards
Overflow Roadway		
Length	2,300	Feet
Crown Width	24	Feet
Side Slopes	4:1	Horizontal:Vertical
Level of Protection	10	Year Event
Design Top Elevation	580.3	Feet NGVD 1912
Embankment Volume	5,000	Cubic Yards
Cross Dike		
Length	5,158	Feet
Crown Width	10	Feet
Side Slopes	4:1	Horizontal:Vertical
Level of Protection	< 5	Year Event
Design Top Elevation	578	Feet NGVD 1912
Embankment Volume	18,500	Cubic Yards
Pump Station Intake Structure		
Concrete Top Elevation	578	Feet NGVD 1912
Concrete Sill Elevation	568	Feet NGVD 1912
Intake Pipe		
Diameter	24	Inches
Length (to centerline traverse)	27	Feet
Invert Elevation	570	Feet NGVD 1912
Riprap	182	Tons

TABLE 3-1 (Continued)
Summary of Project Data

Project Feature	Measurement or Quantity	Units of Measure
Pump Station Engine Building		
Length	28	Feet
Width	22	Feet
Concrete Floor Elevation	583.5-583.78	Feet NGVD 1912
Concrete Stoplog Structure		
Concrete Top Elevation	578.5	Feet NGVD 1912
Concrete Sill Elevation	574	Feet NGVD 1912
Length	16	Feet
Width	5	Feet
Discharge Pipe		
Diameter	24	Inches
Length (to centerline traverse)	90.5	Feet
Invert Elevation	575	Feet NGVD 1912
Riprap	20	Tons
CMP Stoplog Structures (2)		
Diameter	24	Inches
Invert Elevation West Structure	571.50	Feet NGVD 1912
Invert Elevation Middle Structure	572.10	Feet NGVD 1912
Gatewell Structure		
Concrete Top Elevation	582	Feet NGVD 1912
Concrete Floor Elevation	573	Feet NGVD 1912
Slide Gate	1	Each
RCP		
Diameter	36	Inches
Length	64	Feet
Landside Invert Elevation	573.25	Feet NGVD 1912
Riverside Invert Elevation	572.75	Feet NGVD 1912
Riprap	22	Tons

(1) General Description. The Princeton HREP consists of wetland habitat enhancement through the construction of a levee system, pump station, water control structures, and mast tree plantings as well as other project features. Water level control is provided by construction of low levees, which are used to impound water during seasonal waterfowl migrations. River water is provided to the Princeton HREP through use of a portable pump or by gravity flow. The two wetland cells can be managed independently through operation of stoplog structures located along the cross dike. Mast tree plantings provide vegetation diversity and availability of preferred wildlife foods. The project features discussed in more detail below include the water control plan, water source, perimeter levee, overflow roadway (spillway), cross dike, pump station, water control

structures, gatewell structure, mast tree plantings, site access, and borrow areas. These features and additional project components are shown in Appendix K.

(2) Water Control Plan. Over 700 acres of the Princeton HREP can be impounded by the constructed earthen levees and associated water control structures to create a 357-acre forested north WMU and a 344-acre non-forested south WMU as shown on Plate 2 in Appendix K. The basic operating plan for the Princeton HREP is to maintain a lower water elevation in the spring and summer and a higher water elevation in the fall and winter, as illustrated in Table 2-2. To manage for specific vegetation needs, it is best to be able to control water levels independently within two WMUs, hereafter referred to as the North Wetland Management Unit (NWMU) and South Wetland Management Unit (SWMU).

To accomplish independent filling of the WMUs, the pump station directly discharges into a reinforced concrete structure (located at the east end of the cross dike) where flow direction can then be controlled by placement or removal of stoplogs. To facilitate independent drainage of the WMUs, a new gatewell structure was constructed to gravity drain the NWMU. The existing gatewell structure at the downstream end of the project area is used to gravity drain the SWMU. Two CMP stoplog structures were added to the cross dike to increase capacity and facilitate drainage to a lower elevation. A portable pump may also be used to increase or decrease water elevations within the WMUs.

TABLE 3-2
Wetland Management Unit Water Control Plan

Water Elevation (Feet)	Area < 1' Deep (Acres)	Acres 1'-2' Deep (Acres)	Acres > 2' Deep (Acres)	Total Area Flooded (Acres)
SWMU				
574	167.1	9.8	0.0	177.0
575	167.0	167.1	9.9	344.0
576	98.0	167.0	177.0	442.0
577	33.0	98.0	344.0	475.0
NWMU				
574	36.0	0.0	0.0	36.0
575	181.0	36.0	0.0	217.0
576	140.0	181.0	36.0	357.0
577	97.0	140.0	217.0	454.0

Table 3-2 shows the surface areas of incremental water depths for various flooding heights for each WMU. The optimum water surface elevations are 576 feet NGVD in the NWMU and 575 feet NGVD in the SWMU. These elevations represent those that maximize the

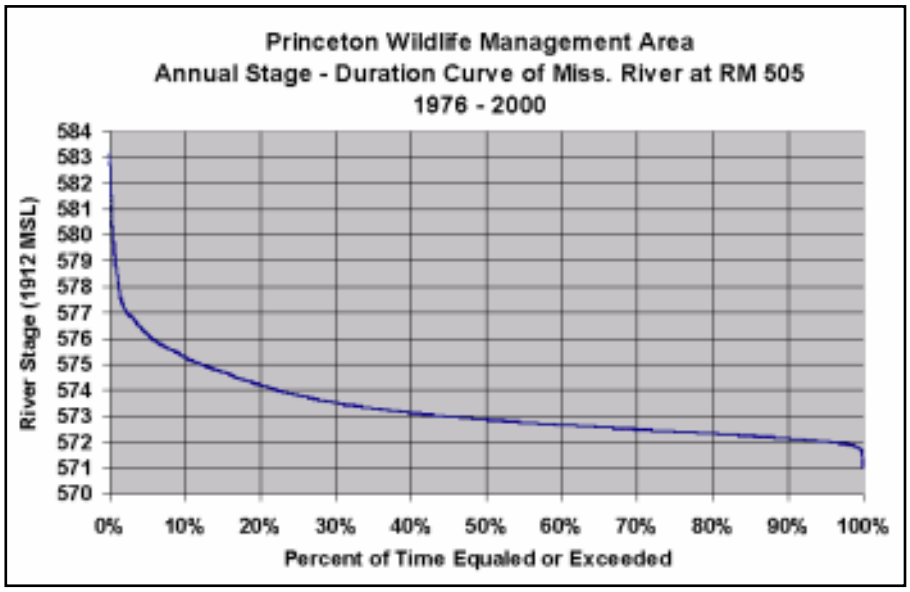
water surface area with water 1 to 2 feet deep. Migratory waterfowl, in particular dabbling ducks, require water depths of 12 to 18 inches for access to food plants. The optimum water surface elevations represent design levels; actual operating levels may vary.

(3) Water Source. The pump station intake is located in Grant Slough, which is a backwater of the Mississippi River. Water surface elevations in the slough fluctuate with those of the river, but overall a flat pool elevation of 572 feet NGVD is maintained for navigation. Therefore, the slough is considered to be a reliable water source and will accommodate the annual management plan.

TABLE 3-3
Elevation Frequency Relationships

Storm Frequency	RM 504.0 South End	RM 505.0 Cross Dike	RM 506.5 North End
5-Year	578.7	579.1	579.7
10-Year	580.3	580.7	581.3
25-Year	582.0	582.5	583.1
50-Year	583.3	583.8	584.4
100-Year	584.4	584.8	585.5
200-Year	585.6	586.0	586.7
500-Year	587.0	587.4	588.0

Figure 3-1. Stage-Duration Curve



Mississippi River discharge frequency relationships and corresponding water surface elevations were developed by USACE, Rock Island District, in cooperation with the St.

Paul and St. Louis Districts for the Upper Mississippi River Basin Commission. Table 3-3 illustrates the elevation frequency relationships, while Figure 3-1 presents the stage/duration curve for selected river miles adjacent to the Princeton HREP.

(4) Levee System.

(a) Perimeter Levee. The existing perimeter levee is approximately 3.1 miles in length. The maximum top elevation for the WMU perimeter levee is 582.3 feet NGVD (Station 0+00 to Station 56+00). To minimize damage potential, the perimeter levee profile parallel to the Mississippi River (Station 56+00 to Station 164+00) is sloped from elevation 582.3 feet NGVD at the upstream end to elevation 581.3 feet NGVD at the downstream end. This design provides for gradual overtopping during a 15-year flood event or greater. The levee top width is 12 feet in reaches having an access road and 10 feet in reaches without an access road. The levee side slopes are shaped to a minimum of 4 horizontal on 1 vertical. The plan, profile, and section drawings for the perimeter levee are located in the O&M Manual, Appendix L, Plates 7 through 10 and Plate 13.

(b) Overflow Roadway. To provide controlled overtopping of the levee system, a 2,300-foot overflow roadway (spillway) was constructed at elevation 580.3 feet NGVD or approximately 2 feet lower than the north end of the perimeter levee. This elevation provides for gradual overtopping during a 10-year flood event or greater. The top width is 24 feet with minimum side slopes of 4 horizontal on 1 vertical. The overflow roadway allows rapid filling of the WMU interior water surfaces prior to overtopping of the perimeter levee. An overtopping analysis is contained in Appendix H of the DPR. The plan, profile, and section drawings for the overflow roadway are presented in the O&M Manual, Appendix L, Plates 11 and 14.

To ensure proper function during flood events, it is critical that the overflow roadway maintain an elevation at or below the design grade of 580.3 feet NGVD. This elevation can be field verified through use of a benchmark located at the east end of the overflow roadway. The benchmark is a chiseled “X” on the northeast wingwall of the gatewell structure at elevation 577.28 feet NGVD.

(c) Cross Dike. To provide enhanced management capabilities, a 5,158-foot cross dike was constructed at elevation 578 feet NGVD. This elevation provides for gradual overtopping during a 5-year flood event or greater. The top width is 10 feet with minimum side slopes of 4 horizontal on 1 vertical. The plan, profile, and section drawings for the cross dike are presented in the O&M Manual, Appendix L, Plates 12 and 14.

(5) Pump Station. A pump station was constructed at the intersection of the perimeter levee and cross dike. The pump station is designed to fill the NWMU to elevation 576 feet NGVD in 7 days and the SWMU to elevation 575 feet NGVD in 5 days. The pump station consists of an intake structure and engine building. Equipment data for the pump station are contained in O&M Manual, Appendix F. Additional details for the

pump station are presented in the O&M Manual, Appendix L; Plates 17 through 19, Plates 28 through 41, and Plates 43 through 46.

(a) Intake Structure. The intake structure is located on the riverside slope of the levee and was constructed of reinforced concrete. The intake structure has a top elevation of 578 feet NGVD and a sill elevation of 568 feet NGVD. The intake pipe from this structure to the engine building is 24 inches in diameter and approximately 27 feet in length with an invert elevation of 570 feet NGVD. The base of the intake structure is protected with riprap.

(b) Engine Building. The engine building was constructed of reinforced concrete with a floor elevation of 583.5 feet NGVD. The size of the engine building is 28 feet long by 22 feet wide. This building provides weather-tight housing for the pump engine, trailer, an additional fuel tank, diesel engine generator, and miscellaneous supplies. A 16,000-gallon per minute hydraulic pump provides the necessary flow to fill the WMUs.

(6) Water Control Structures.

(a) Concrete Stoplog Structure. The stoplog structure is located at the east end of the cross dike in conjunction with the pump station discharge pipe. This pipe is 24 inches in diameter and approximately 90 feet long with an invert elevation of 575 feet NGVD. The stoplog structure was constructed of reinforced concrete with a top elevation of 578.5 feet NGVD and a sill elevation of 574 feet NGVD. The base of this structure is 16 feet long by 5 feet wide. The placement of aluminum stoplogs at either end of this structure directs the pumped water into the NWMU or SWMU as needed. Heavy-duty metal grating was provided across the top for vehicular access. Additional details are provided in O&M Manual, Appendix L, Plates 23 through 27 and Plate 42.

(b) CMP Stoplog Structures. In addition, two stoplog structures with 24-inch-diameter CMPs are located near the middle and west end of the cross dike. These structures provide water level control between the WMUs at lower elevations by gravity flow. The invert elevations for the middle and west structures are 572.1 and 571.5 feet NGVD, respectively. Further details are shown in the O&M Manual, Appendix L, Plates 47 through 51.

(7) Gatewell Structure. A gatewell structure with a 36-inch-diameter reinforced concrete pipe is located immediately upstream of the intake structure along the perimeter levee. Operation of this structure allows for filling or dewatering of the WMUs, whenever river levels will allow. Additional details are illustrated in the O&M Manual, Appendix L, Plates 20 through 22.

(8) Mast Tree Plantings. In the NWMU, approximately 21 acres of mast trees were planted. Two sites were selected for plantings, one near the mid-point of the north perimeter levee and one in the eastern half just south of the power line. The species selected consist of swamp white oak, pin oak, bur oak, pecan, hickory, and cedar.

(9) Site Access. Access to the project is by county road from U.S. Highway 67. There are three access areas to the Princeton HREP; south, middle, and north. Each area has a parking lot and security gate to control access. The IADNR operates these gates as necessary to prevent public vehicular access and minimize consequent disturbance. A crushed stone surface road, 10 feet in width, runs along the top of the perimeter levee from the south parking lot to the pump station. This road facilitates delivery of materials for the pump station. Plate 2 in Appendix K illustrates the site access areas, parking lots, and access road to the pump station.

(10) Borrow Areas/Potholes. Material for perimeter levee restoration came from the riverside slope and borrow areas located within the project boundaries. Material for cross dike construction came from the adjacent ditch excavation and was supplemented with the borrow areas. The excavated ditch along the south side of the cross dike serves as boat access from the west parking lot to the SWMU.

During construction, the contractor removed the material from the borrow areas in strips, rather than excavating one big hole. Therefore, if seepage of ground water occurred, it would be contained and not saturate the entire area. The strips are approximately 10 feet apart. Now these strips function as potholes, creating additional habitat benefits. The borrow areas are identified on Plate 2 in Appendix K and are shown on Photos 1 and 2 in Appendix G. The soil boring locations and logs are presented in the O&M Manual, Appendix L, Plates 3 through 6.

(11) Utilities. A transmission line running east-west crosses the north portion of the NWMU. The size of this line is approximately 345,000 Volts. The transmission line eventually crosses the Mississippi River. At all times, measures shall be taken to ensure electrical safety and to preserve the integrity of the transmission line foundations.

b. Project Construction. There were four construction phases for the Princeton HREP. The Stage I contract was awarded to Malco Steel Incorporated of Kansas City, Missouri, on September 13, 1996. This contract included the major project features. The existing access road was modified to work as a spillway. During high river levels, the overflow roadway (spillway) provides controlled filling, minimizing damage to the perimeter levee. The perimeter levee was reinforced and raised to provide reliable water control. The pump station was moved from the lower end of the WMU to the mid-point of the perimeter levee. This, along with the cross dike, provides independent water control to the two WMUs. Construction was essentially complete in November 1998, except for the mast tree plantings, which were conducted in the spring of 1999. A dedication ceremony was held in November 1999.

The Stage II contract was awarded to Kemp & Son Incorporated of Letts, Iowa. This contract consisted of cross dike ditch excavation and water control structure installation. Construction was complete in July 2000. The Stage III contract was awarded to Phoenix Corporation of the Quad Cities from Port Byron, Illinois. This contract consisted of

repairs to the north perimeter levee as a result of the Flood of 2001. Construction was complete in December 2001. The Stage IV contract was awarded to MPS Engineers, P.C. from West Des Moines, Iowa. This contract consisted of lowering the overflow roadway (spillway). Construction was complete in September 2002.

c. Project Operation and Maintenance. O&M of the Princeton HREP is the responsibility of the IADNR in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580. These functions are further defined in the O&M Manual. The project features were designed and constructed to minimize the O&M requirements. Project O&M generally consists of the following; (1) mowing and burning the perimeter levee and cross dike to ensure serviceability year round, (2) operating the pump station and water control structures to achieve desired water levels consistent with vegetative growth including opening the gates to minimize overtopping erosion when the river reaches elevation 582 feet NGVD with predicted stage to increase, (3) maintaining the access roads and overflow roadway (spillway), and (4) removing snags and other debris from the cross dike ditches.

4. PROJECT MONITORING

a. General. Appendix B presents the Post-Construction Evaluation Plan. This reference was developed during the design phase and serves as a guide for measuring and documenting project performance. The Post-Construction Evaluation Plan also outlines the monitoring responsibilities for each agency. Appendix C contains the Monitoring and Performance Evaluation Matrix and Monitoring and Data Collection Summary. The Monitoring and Performance Evaluation Matrix outlines the monitoring responsibilities for each agency. The Monitoring and Data Collection Summary presents the types and frequency of data needed to meet the requirements of the Post-Construction Evaluation Plan.

b. U.S. Army Corps of Engineers. The success of the project relative to original project objectives shall be measured by the USACE, USFWS, and IADNR through monitoring data, inspection records, and field observations. The USACE has overall responsibility to evaluate and document project performance. The USACE is also responsible for collecting field data as outlined in the Post-Construction Evaluation Plan at the specified time intervals. The USACE shall also perform joint inspections with the USFWS and IADNR in accordance with Engineer Regulation (ER) 1130-2-339. The purpose of these inspections is to assure that adequate maintenance is being performed as presented in the O&M Manual. Joint inspections should also occur after any event that causes damage in excess of annual O&M costs.

c. U.S. Fish and Wildlife Service. The USFWS does not have project-specific monitoring responsibilities. However, the USFWS Savanna District Manager should be present at the joint inspections with the USACE and IADNR as described in the previous paragraph.

d. Iowa Department of Natural Resources. The IADNR is responsible for O&M, as well as monitoring the project through field observations during inspections. Project inspections should be performed on an annual basis following the guidance presented in the O&M Manual. It is recommended that the inspections be conducted in May or June, which is representative of conditions after spring floods. Joint inspections with the USACE and USFWS shall also be conducted as described above. For each inspection, the IADNR should complete the checklist form as provided in the O&M Manual. This form should also include a brief summary of the overall condition of the project and any maintenance work completed since the last inspection. Once completed, a copy of the form shall be sent to the USACE.

5. EVALUATION OF WETLAND HABITAT ENHANCEMENT

a. Provide Reliable Food Source for Migratory Birds

(1) Monitoring Results. One of the objectives for enhancing wetland habitat is to provide a reliable food source for migratory birds by constructing a levee system, pump station, and water control structures. As shown in Appendix B, Table B-1, the first Year 50 Target for the levee system is to maintain a top elevation at or below elevation 580.3 feet NGVD for the overflow roadway (spillway). This feature will be measured by conducting a profile of the overflow roadway (spillway), which according to Table C-2 in Appendix C, is required every five years by the USACE. Field observations by the Site Manager are to describe any erosion and/or seepage effects. Field observations of the levee system were documented in July 2003 and are discussed in Section 6.b (1) (a).

During the Flood of 2001, the perimeter levee from Station 0+00 to Station 40+00 received moderate to severe damage; including several scour areas and a large breach (see Photos 3 and 4 in Appendix G). A Stage III contract was awarded to repair this damage. Stage III drawings are presented in the O&M Manual, Appendix L, Plates 52 through 59. Several factors were identified in the Flood Damage Assessment dated November 2001 as possible causes of the flood damage to the levee. One of the factors was the grade of the overflow roadway. The design for the overflow roadway was to be 2 feet lower than the north perimeter levee to ensure proper function during flood events. The as-built construction drawings show the final grade of the north perimeter levee at elevation 582.3 feet NGVD and the overflow roadway at elevation 580.3 feet NGVD, which provides the required 2-foot difference. However, 8 inches (minimum) of granular surfacing was then placed on the overflow roadway. This would place the top of the overflow roadway at approximately elevation 581 feet NGVD. A land survey performed in September 2001 verified that this was indeed the case. The average top elevation of the north perimeter levee was found to be 582.45 feet NGVD, while the overflow roadway showed an average top elevation of 581.05 feet NGVD. The result was a 1.4-foot difference between the two ends rather than the required 2-foot difference.

As a result, a Stage IV contract was awarded. This contract consisted of lowering the overflow roadway to an elevation at or below 580.3 feet NGVD (see Photos 5 through 23 in Appendix G). Construction was complete in September 2002. Stage IV drawings are illustrated in the O&M Manual, Appendix L, Plates 60 through 62. Since Stage IV completion, the overflow roadway has not been surveyed nor has a flood event occurred to test the functionality of this feature.

A second Year 50 Target is to maintain the pump station. This feature will be measured by conducting a pump station inspection, which according to Table C-2 in Appendix C, is required every five years by the USACE. Field observations by the Site Manager are to document pump and fuel usage.

The pump station inspection was performed on May 31, 2001 shortly after the Flood of 2001. The pump station consists of one hydraulic submersible M&W pump, set up for

one-way pumping from the river to the WMU with diversion to either the north or south cell. During the flood, the water elevation was 8 inches deep within the pump station building above elevation 583.6 feet NGVD. A large amount of wood debris was documented on the perimeter levee around the pump station from the flood. In addition, a low spot in the perimeter levee (approximately 100 feet long by 16 to 24 inches deep) was observed in the vicinity of the gatewell structure. The area had been sandbagged during the flood to prevent overtopping near the pump station building. This low spot was also documented by the Site Manager and is discussed in Section 6.b (1) (a).

It was documented in the pump station inspection report (see Appendix F) that the engine coolant system has a coolant leak on the radiator that needs repaired. The battery box for the engine had rodents living inside. The Site Manager installs the sump bulkheads when the pump is removed for winter storage. At this time, the trash rack is removed to facilitate pump removal. A large submerged stone was lodged in the vicinity and is preventing the trash rack from being reinstalled. The sump was measured for silt accumulation. Approximately 8 inches of sand was measured outside the sump in front of the bulkhead, while 1-½ inches of silt was measured inside the sump behind the bulkhead.

The IADNR provided records documenting pump and fuel usage, which are summarized in Table 5-1 and provided in Appendix D. Since project completion, the pump station has been used on average approximately 6 weeks per year. It appears that the pump has been operating at a constant efficiency as the fuel consumption has only varied from 6.6 to 7.0 gallons per hour.

TABLE 5-1
Pump and Fuel Usage Summary

Year	Pump Running Time (hrs)	Pump Usage (days)	Fuel Used (gallons)	Fuel Usage (gal/hr)
1998	456.4	23	3213	7.0
1999	1011.3	50	6971	6.9
2000	956.0	48	6426	6.7
2001	684.6	35	4501	6.6
2002	743.2	32	5060	6.8
2003	1075	56	7100	6.6
2004	1012.4	46	6924	6.8
Average	*848.4*	*41*	*5742*	*6.8*

A third Year 50 Target is to maintain a total number of 3 water control structures. This feature will be measured by evaluating the water levels in the two cells, which according to Table C-2 in Appendix C, is required every five years by the USACE using data provided by the IADNR. Field observations by the Site Manger are to estimate waterfowl use and list moist-soil vegetation present.

As discussed in Section 3.a (2), the design water surface elevations are 576 feet NGVD in the NWMU and 575 feet NGVD in the SWMU. These elevations represent those that maximize the water surface area with water 1 to 2 feet deep. Migratory waterfowl, in particular dabbling ducks, require water depths of 12 to 18 inches for access to food plants.

The design fill times are 7 days for the NWMU and 5 days for the SWMU. According to the pump station inspection report in Appendix F, the actual fill time for the NWMU is approximately 45 days to an elevation of 577 feet NGVD. (This elevation is one-foot higher than the design water surface elevation of 576 feet NGVD. It takes an additional 15 days of pumping to achieve this one-foot increase.) The actual fill time for the SWMU is approximately 30 days simultaneous with the filling of the NWMU.

The 45 days to fill the NWMU, as documented in the pump station inspection report, corresponds to the average pump usage of 41 days as seen in Table 5-1. However, this time period reflects several runs of the pump to maintain the water level at the optimum elevation. According to records provided by the IADNR and summarized in Table 5-2 (see also Appendix D), it takes approximately 6 to 7 days to fill the SWMU and 3 to 7 days to fill the NWMU to the design water surface elevations of 575 feet NGVD and 576 feet NGVD, respectively. These numbers closely resemble the design fill times of 5 days for the SWMU and 7 days for the NWMU.

TABLE 5-2
WMU Water Level Summary

Parameter	Year 1998	1999	2004
Pump Start Date	09/21	09/08	09/07
SWMU Initial Elevation (feet NGVD)	573.9	572.97	573.6
NWMU Initial Elevation (feet NGVD)	575.0	575.0	574.7
Time to Fill SWMU to Elevation 575 (days)	6	6	7
Time to Fill NWMU to Elevation 576 (days)	6	3	7
Pump End Date	11/05	11/15	11/26
SWMU Final Elevation (feet NGVD)	575.3	575.5	575.25
NWMU Final Elevation (feet NGVD)	576.9	576.75	576.85

From Table 5-2, it appears that the Site Manager has been able to achieve the design water surface elevations of 575 feet NGVD and 576 feet NGVD for the SWMU and NWMU, respectively. Water levels for the SWMU at the end of pumping season have varied from 575.25 to 575.5 feet NGVD or 3 to 6 inches above the design elevation. Water levels for the NWMU have varied from 576.75 to 576.9 feet NGVD or 9 to 11 inches above the design elevation.

The Site Manager has conducted waterfowl migration surveys on several occasions throughout each season. Table 5-3 summarizes these surveys with actual data provided in Appendix D. The types of waterfowl documented were ducks, coots, geese, swans, and

eagles. Ducks and coots have been the most prevalent, while geese were only documented in three of the five seasons of record. A handful of bald eagles and trumpeter swans were commonly found during each season.

TABLE 5-3
IADNR Waterfowl Migration Surveys

Date	Ducks	Coots	Geese	Other
09/27/2000	100	400	0	0
10/04/2000	200	400	0	0
10/11/2000	97	400	0	0
10/24/2000	407	800	0	0
11/01/2000	372	350	0	0
11/08/2000	1452	500	0	0
11/15/2000	695	150	0	3 (Bald Eagle)
11/22/2000	0	0	0	0
11/29/2000	0	0	0	0
12/14/2000	4	0	0	0
09/13/2001	1135	0	251	1 (Bald Eagle)
09/26/2001	55	0	0	0
10/10/2001	299	600	0	0
10/31/2001	1125	1500	0	4 (Trumpeter Swan)
11/07/2001	912	700	0	0
11/14/2001	317	400	0	1 (Trumpeter Swan)
11/21/2001	326	350	0	1 (Trumpeter Swan)
12/13/2001	6304	100	0	0
12/19/2001	6721	100	0	2 (Tundra Swan) 5 (Trumpeter Swan) 5 (Bald Eagle)
09/11/2002	255	0	0	0
09/25/2002	45	10	0	1 (Trumpeter Swan)
10/02/2002	60	175	0	0
10/09/2002	515	600	0	1 (Trumpeter Swan)
10/16/2002	470	150	0	0
10/23/2002	1210	700	0	0
10/30/2002	1085	300	0	0
11/06/2002	1225	250	0	0
11/20/2002	2355	40	0	0
12/04/2002	7	0	0	0
12/13/2002	0	0	0	0
09/10/2003	405	0	50	0
09/17/2003	330	10	50	0
09/24/2003	100	0	50	0
10/08/2003	330	300	50	0
10/15/2003	340	300	50	2 (Trumpeter Swan)
10/29/2003	330	500	50	2 (Trumpeter Swan)
11/05/2003	1135	750	50	2 (Trumpeter Swan)
11/12/2003	2620	500	50	2 (Trumpeter Swan)
11/26/2003	2015	150	75	2 (Trumpeter Swan)
09/23/2004	80	0	0	0
10/07/2004	500	500	150	1 (Trumpeter Swan)
10/14/2004	1175	500	20	0
10/28/2004	255	250	20	0
12/23/2004	0	0	0	0

(2) Conclusions. The objective of providing a reliable food source for migratory birds through construction of a levee system, pump station, and water control structures is being met. The profile survey of the overflow roadway was conducted in September 2001. According to Table C-2 in Appendix C, a profile survey of the overflow roadway is required every 5 years by the USACE. The next profile survey of the overflow roadway would be required in September 2006. Therefore, the next PER should contain new survey data for the overflow roadway.

It is critical that the overflow roadway maintain an elevation at or below the design grade of 580.3 feet NGVD. This elevation can be field verified through use of a benchmark located at the east end of the overflow roadway. The benchmark is a chiseled "X" on the northeast wingwall of the gatewell structure at elevation 577.28 feet NGVD.

It is recommended that the overflow roadway be closely monitored during the next flood event. As a minimum, it should be documented when the overflow roadway overtops, when the north perimeter levee overtops, and the interior water elevation of the WMU when the north perimeter levee begins to overtop.

The recommendations for the levee system based on field observations by the Site Manager are discussed in Section 6.b (2) (a).

The pump station inspection was conducted in May 2001. According to Table C-2 in Appendix C, an inspection of the pump station is required every 5 years by the USACE. The next inspection of the pump station would be required in May 2006. Therefore, the next PER should contain a new pump station inspection report.

Overall, the pump station appeared to be in good condition. Actual fill times closely resemble design fill times. However, several recommendations were documented in the pump station inspection report (see Appendix F). The O&M Manual should include a pump curve for the pump. In addition to the required maintenance as outlined in the O&M Manual, the Site Manager should review the equipment manufacturers' manuals biannually for routine maintenance to be identified and performed as recommended.

All pump station maintenance should be documented in the operating log. The operating log should be in a notebook, 3-ring binder, or bound logbook and should be in neat tabular form. Entries in the operating log should indicate such items as date, water elevations, periodic lubrication, pump hours or running time, maintenance/repairs, and special events that are significant in nature. The operating log should be stored and protected in the pump station building. Protection provided shall be moisture and rodent proof.

The coolant leak needs to be repaired to prevent accidental engine over heat. The engine lubricant, filters, and hydraulic fluid should be replaced as recommended by the engine maintenance schedule. The engine battery box needs to be rodent proof. The large stone in the vicinity of the trash rack needs to be removed. The accumulated silt in the sump should be cleaned out prior to pumping operations to prevent wear to the pump and deposition within the WMU.

The water control structures are functioning well by providing adequate water level control to the SWMU and NWMU. Both cells have been able to achieve the design water surface elevations. The WMU has been successful in attracting waterfowl.

b. Increase Overall Vegetation Diversity and Availability of Preferred Wildlife Foods

(1) Monitoring Results. The other objective for enhancing wetland habitat is to increase overall vegetation diversity and availability of preferred wildlife foods through mast tree plantings. As shown in Appendix B, Table B-1, the Year 50 Target is to maintain a greater than or equal to 20% survival rate of the mast trees. This feature will be measured by conducting a mast tree survey, which according to Table C-2 in Appendix C, is required every five years by the USACE. Field observations by the Site Manager are to describe any rodent damage and/or weed competition.

OD-MN conducted two inspections of the mast tree plantings in August 2002. The mast tree plantings on the north-south berms were inspected first. Trees on the east side of the berm are thriving despite competition from other vegetation (see Photo 25 in Appendix G). Trees that were planted on the west side were surrounded by reed canary grass and had a low survival rate. Very few trees were found alive; however, surrounding vegetation reduced the visibility of the surviving trees. Many of the trees still alive in the reed canary grass have sustained damage from deer browse and mice chewing the bark (see Photo 24 in Appendix G). These rows on the west side averaged 5 to 8 trees per row whereas the shorter rows on the east averaged over 10 trees per row.

The remaining RPM trees, located southeast of the other mast tree plantings, were inspected next. These trees were planted by the IADNR and OD-MN. The survival on these trees is about 50%. Approximately 75 trees were found. Most of the trees had been browsed or rubbed by deer and had re-sprouted several times. A few were taller than 6 feet. The majority of the trees were found along the old road back where it cuts into the forest. The areas open to full sunlight had much fewer surviving trees. The herbaceous competition is all reed canary grass. The majority of the weed barrier mats are still in place and seem to be helping to a limited extent.

(2) Conclusions. The objective of increasing the overall vegetation diversity and availability of preferred wildlife foods through mast tree plantings is being met. Based on the OD-MN inspection of the mast tree plantings, it is recommended that both sites be treated with herbicide. Also, it may be beneficial to place weed barrier mats at the mast tree plantings on the north-south berms, which would require mowing or weed whipping.

6. OPERATION AND MAINTENANCE SUMMARY

a. Operation. Project operations are detailed in the O&M Manual and generally consist of the following; (1) mowing and burning the perimeter levee and cross dike to ensure serviceability year round, (2) operating the pump station and water control structures to achieve desired water levels consistent with vegetative growth including opening the gates to minimize overtopping erosion when the river reaches elevation 582 feet NGVD with predicted stage to increase, (3) maintaining the access roads and overflow roadway (spillway), and (4) removing snags and other debris from the cross dike ditches.

The project has been operated successfully in this manner since its completion. As described in the Annual Management Plan presented in Table 2-2, the WMUs are dewatered in April to July to allow re-vegetation. The WMUs are raised in August to November to provide access to food plants for migratory waterfowl. The WMUs are maintained at this elevation until April to control excessive plant growth if necessary.

b. Maintenance.

(1) Inspections. The IADNR has visited the Princeton HREP on various occasions since project completion. Inspections of the Princeton HREP are to be made by the IADNR Site Manager at least annually and follow inspection guidance presented in the O&M Manual. A copy of the completed project inspection checklist should be furnished to USACE. Other project inspections should occur as necessary after high water events or as scheduled by the IADNR Site Manager. Joint inspections of the Princeton HREP are to be conducted periodically by the IADNR, USFWS, and USACE. These inspections are necessary to determine maintenance needs.

The IADNR conducted an inspection of the Princeton HREP and documented its findings in a memo dated July 11, 2003 (see Appendix D), which are discussed below in paragraphs (a) through (e).

(a) Perimeter Levee, Overflow Roadway, and Cross Dike. The bed of the overflow roadway (spillway) is too low. The shoulders are higher and trap water. It appears that the bed needs to be raised approximately 8 inches.

The perimeter levee just upstream from the gatewell structure near the pump station is too low. The low section is about 150 feet long with the lowest point being approximately 2 feet below grade. Sandbags were placed along this section during the Flood of 2001 and some even remain along the shoulder.

The perimeter levee at the north end adjacent to the Wapsi River is 18 inches low. Future levee failures are inevitable due to this condition. Lowering the overflow roadway (spillway) helps equalize the water levels during flood events but excessive sedimentation from future levee failures will continue if this section of the levee is not raised.

(b) Pump Station. The river grating on the pump station inlet box has been a challenge. It will plug with debris and create a vortex during pumping operations. The pump impeller is deep enough in the pit to avoid plugging when the river grating is off. Debris will float on the surface and is not sucked beneath. The Site Manager would prefer to leave the river grating off.

The grating on top of the pump station inlet box is heavy to remove and replace. One hydraulic fitting in the headwall leaks and requires a catch bucket to trap oil. Daily removal and replacement of the heavy grating for maintenance is dangerous to the operator and hazardous to the public if left off.

Fishing line has been a challenge with the seals around the pump impeller head.

(c) Water Control Structures. The two CMP stoplog structures in the cross dike are silted in. It is believed that most of this sedimentation occurred during the Flood of 2001 when the north perimeter levee failed.

(d) Gatewell Structure. Nothing was reported by the IADNR Site Manager on the gatewell structure.

(e) Mast Tree Plantings. Nothing was reported by the IADNR Site Manager on the mast tree plantings.

(2) Recommendations Based on Inspections. In response to the IADNR's inspection memo dated July 11, 2003 (see Appendix D), the USACE has prepared the following recommendations.

(a) Perimeter Levee, Overflow Roadway, and Cross Dike. To ensure proper function during flood events, it is critical that the overflow roadway maintain an elevation at or below the design grade of 580.3 feet NGVD. This elevation can be field verified on occasion through use of a benchmark located at the east end of the overflow roadway. The benchmark is a chiseled "X" on the northeast wingwall of the gatewell structure at elevation 577.28 feet NGVD. If the bed of the overflow roadway (spillway) is low, granular surfacing may be placed to an elevation not to exceed 580.3 feet NGVD. If the shoulders of the overflow roadway (spillway) are higher than 580.3 feet NGVD, they need to be re-graded.

For the low section of perimeter levee just upstream from the gatewell structure near the pump station, it is recommended that this area be raised to the design grade as shown on Plate 9 of the O&M Manual. The sandbags should be removed and the low section should be stripped, filled in, and seeded. The topsoil should be stripped to a depth not less than 6 inches. Borrow material for embankment may come from any of the approved borrow areas as identified on Plate 2 in Appendix K and as seen on Photos 1 and 2 in Appendix G.

The as-built construction drawings show the final grade of the perimeter levee at the north end at elevation 582.3 feet NGVD. A land survey performed in September 2001 verified

that this is indeed the case. The average top elevation of the north perimeter levee was found to be 582.45 feet NGVD. Since the existing elevation is greater than the design grade, no work is recommended at this time.

(b) Pump Station. It is not recommended that the river grating on the pump station inlet box be left off. However, it is recommended that a secondary fence be installed between the ends of the wingwalls. This fence would then extend along the top of the wingwalls up to the top of the inlet box to keep debris out during flood events.

The grating on top of the pump station inlet box was designed to be heavy for safety reasons and to prevent vandalism. If the grating is replaced with a lighter, hinged section, a padlock should be installed. It is recommended that the hydraulic leak be fixed.

A trash rack cleaning apparatus could be utilized to help with the fishing line. This apparatus would have to be used on a regular basis and could be stored in the pump station engine building.

(c) Water Control Structures. It is recommended that the sediment be removed from the two CMP stoplog structures and the inlets and outlets be cleaned out.

(d) Gatewell Structure. Nothing is recommended for the gatewell structure.

(e) Mast Tree Plantings. See Section 5.b (2) for recommendations.

7. CONCLUSIONS AND RECOMMENDATIONS

a. Project Goals, Objectives, and Management Plan. Based on data and observations collected since project completion, the goals and objectives evaluated for the Princeton HREP are being met, as illustrated in Table 7-1. Continued data collection should better define the levels to which all goals and objectives are being met.

TABLE 7-1
Project Goals and Objectives

Goals	Objectives	Project Features	Unit	Year 7 (2005)	Target Year 50 (2048)	Status
Enhance Wetland Habitat	Provide reliable food source for migratory birds	Levee System	Feet NGVD	≤ 580.3	580.3	Met
		Pump Station	Each	1	1	Met
		Water Control Structures	Each	3	3	Met
	Increase overall vegetation diversity and availability of preferred wildlife foods	Mast Tree Plantings	% Survival	50	20	Met

b. Post-Construction Evaluation and Monitoring Schedules. In general, monitoring efforts for the Princeton HREP have been performed according to the Post-Construction Evaluation Plan in Appendix B and the Monitoring and Data Collection Summary in Appendix C. The next PER will be completed no later than Fiscal Year 2010, following collection of field data for five years.

Starting with this PER, the Post-Construction Evaluation Plan and the Monitoring and Data Collection Summary were revised in order to better quantify and evaluate project objectives, as shown in Table 7-1 above. The former Post-Construction Evaluation Plan as presented in previous project documents is shown in Table 7-2.

(1) Provide Reliable Food Source for Migratory Birds. One of the objectives for enhancing wetland habitat is to provide a reliable food source for migratory birds. Originally, this objective was to be accomplished through levee restoration and water control improvements. As shown in Table 7-2, the Year 50 Target for levee restoration was to maintain zero lineal feet of eroded levee. This feature would be measured by conducting levee system transects at 500-foot intervals and a profile of the perimeter levee, cross dike, and overflow roadway (spillway). Levee system transects and profiles were conducted at project completion to reflect as-built conditions. Since then,

additional transects have not been completed. According to Table 13-2 of the DPR, levee system transects and profiles were required every five years by the USACE. Preliminary cost estimates have indicated that a survey of this magnitude could run as high as $18,000. The survey alone would cost more than what is typically budgeted to prepare a complete PER. Therefore, it was decided to concentrate the survey on the overflow roadway (spillway) since its function is critical during flood events. It was also decided to eliminate the transects and to conduct a profile only.

As shown in Table 7-2, the Year 50 Target for water control improvements was to maintain greater than or equal to 300 acres of aquatic vegetation, to include areas of cropland or non-forested wetland conversion. This feature would be measured by a conducting vegetation transects as shown on the Monitoring Plan (see Plate 3 in Appendix K). Since project completion, vegetation transects have not been completed. According to Table 13-2 of the DPR, vegetation transects were required every five years by the USFWS. Vegetation transects have been identified as a way to measure feature performance for several HREPs. However, past experience has indicated that in very few cases do the sponsors have the resources, time, and money to complete these surveys. Therefore, it was decided that the USACE would monitor the functionality of the pump station and water control structures instead.

(2) Increase Overall Vegetation Diversity and Availability of Preferred Wildlife Foods. The other objective for enhancing wetland habitat is to increase overall vegetation diversity and availability of preferred wildlife foods through mast tree plantings. As shown in Table 7-2, the Year 50 Target originally was to maintain greater than or equal to 40 acres of mast trees. This feature would be measured by conducting vegetation transects as shown on the Monitoring Plan (see Plate 3 in Appendix K). Since project completion, vegetation transects have not been completed. According to Table 13-2 of the DPR, vegetation transects were required every five years by the USFWS. As discussed, vegetation transects have been identified as a way to measure feature performance for several HREPs. However, past experience has indicated that in very few cases do the sponsors have the resources, time, and money to complete these surveys. Therefore, it was decided that the USACE would conduct a mast tree survey where the percent survivability would be evaluated instead.

c. Project Operation and Maintenance. Project operation has been performed in accordance with the O&M Manual and the Annual Management Plan presented in Table 2-2. Project inspections have been conducted by the IADNR. See Section 6.b (2) for maintenance recommendations based on inspections.

d. Project Design Enhancement. Discussions with those involved in operation, maintenance, and monitoring activities at the Princeton HREP have resulted in the following lessons learned regarding project features that may affect future design of other HREPs.

(1) Overflow Spillway. The design for the overflow spillway was to be 2 feet lower than the north perimeter levee to allow for rapid filling of the MSMU interior

water surfaces prior to overtopping of the perimeter levee. The as-built construction drawings show the final grade of the north perimeter levee at elevation 582.3 feet NGVD and the overflow spillway at elevation 580.3 feet NGVD, which provides the required 2-foot difference. However, 8 inches (minimum) of granular surfacing was then placed on the overflow spillway. This would place the top of the overflow spillway at approximately elevation 581 feet NGVD. A land survey verified that this was indeed the case. The average top elevation of the north perimeter levee was found to be 582.45 feet NGVD, while the overflow spillway showed an average top elevation of 581.05 feet NGVD. The result was a 1.4-foot difference between the two ends rather than the required 2-foot difference. This discrepancy may have contributed to a large breach in the north perimeter levee during the Flood of 2001. During the flood event, the Site Manager observed that the north perimeter levee and overflow spillway overtopped at the same time, rather than the latter first. As a result, the overflow spillway was lowered 8 inches.

During the Flood of 2001, the granular surfacing on top of the overflow spillway was washed to the downstream slope and the geotextile fabric beneath the granular surfacing had been shifted to the downstream shoulder. It appeared that the geotextile fabric had acted as a slippage plane during the flood event for the granular surfacing to "peel" off the overflow spillway. Therefore, the geotextile fabric was not replaced when the overflow spillway was lowered during the Stage IV contract.

(2) Pump Station. During construction, the existing pump station was relocated from the downstream end to the middle of the perimeter levee. However, the existing pump station only consisted of a single pump. As a result, a portable pump with a diesel engine mounted on a highway trailer was supplied following construction.

The river grating on the pump station inlet box has been a challenge. It will plug with debris and create a vortex during pumping operations. It is recommended that a secondary fence be installed between the ends of the wingwalls. This fence would then extend along the top of the wingwalls up to the top of the inlet box to keep debris out during flood events.

The grating on top of the pump station inlet box is heavy to remove and replace. Removal and replacement of the heavy grating for maintenance is dangerous to the operator and hazardous to the public if left off. The grating on top of the pump station inlet box was designed to be heavy for safety reasons and to prevent vandalism. If the grating is replaced with a lighter, hinged section, a padlock should be installed.

(3) Water Control Structures. The concrete stoplog structure did not allow for complete drainage of the north cell into the south cell. As a result, a Stage III contract was awarded, which consisted of installing two CMP stoplog structures along the cross dike to provide water level control between the cells at lower elevations by gravity flow.

TABLE 7-2
(FORMER) Post-Construction Evaluation Plan

Goal	Objective	Enhancement Feature	Unit	Year 0 (1998) Without Project	Year 0 (1998) With Project	Year X (XXXX) With Project	Target Year 50 (2048) With Project	Feature Measurement	Annual Field Observations by IADNR Site Manager [2/]
Enhance Wetland Habitat	Provide reliable food source for migratory birds	Levee Restoration	Lineal feet of eroded levee	16,400	0	--	0	Levee system transects and profiles	Describe any erosion and/or seepage effects
		Water Control Improvements	Acres of aquatic vegetation	213	213	--	300 [1/]	Vegetation transects	Estimate effective acreage and wildlife use [3/]
	Increase overall vegetation diversity & availability of preferred wildlife foods	Mast Tree Planting	Acres of mast trees	7-10	28-31	--	40	Vegetation transects	Estimate area of established and/or regenerated vegetation

[1/] Includes areas of cropland or non-forested wetland conversion
[2/] To be submitted with annual Site Manager's Project Inspection and Monitoring Results (refer to the O&M Manual, Appendix C)
[3/] Includes annual waterfowl census data

APPENDIX A

ACRONYMS

ACRONYMS

CEMVR	Corps of Engineers, Mississippi Valley Division, Rock Island District
DPR	Definite Project Report
EMP	Environmental Management Program
ER	Engineer Regulation
GPM	Gallons per Minute
HREP	Habitat Rehabilitation and Enhancement Project
LTRMP	Long-Term Resource Monitoring Program
IADNR	Iowa Department of Natural Resources
NGVD	National Geodetic Vertical Datum
NWMU	North Wetland Management Unit
O&M	Operation and Maintenance
OD-MN	Operations Division – Mississippi River Project Natural Resources Management Section
PER	Performance Evaluation Report
PM-M	Programs and Project Management Division – Project Management Section
RM	River Mile
SWMU	South Wetland Management Unit
UMESC	Upper Midwest Environmental Sciences Center
UMRS	Upper Mississippi River System
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WMU	Wetland Management Unit

APPENDIX B

POST-CONSTRUCTION EVALUATION PLAN
AND
SEDIMENTATION TRANSECT PROJECT OBJECTIVES EVALUATION

TABLE B-1
Post-Construction Evaluation Plan

Goal	Objective	Enhancement Feature	Unit	Year 0 (1998) Without Project	Year 0 (1998) With Project	Year X (XXXX) With Project	Target Year 50 (2048) With Project	Feature Measurement	Annual Field Observations by IADNR Site Manager [1/]
Enhance Wetland Habitat	Provide reliable food source for migratory birds	Levee System	Feet NGVD	Varies	580.3	--	580.3	Overflow spillway profile	Describe any erosion and/or seepage effects
		Pump Station	Each	1	1	--	1	Pump station inspection	Document pump and fuel usage
		Water Control Structures	Each	0	3	--	3	Water level evaluation	Estimate waterfowl use, list moist-soil vegetation present
	Increase overall vegetation diversity & availability of preferred wildlife foods	Mast Tree Plantings	% Survival	0	100	--	20	Mast tree survey	Describe any rodent damage and/or weed competition

[1/] To be submitted with annual Site Manager's Project Inspection and Monitoring Results (refer to O&M Manual, Appendix C)

APPENDIX C

MONITORING AND PERFORMANCE EVALUATION MATRIX, RESOURCE MONITORING AND DATA COLLECTION SUMMARY, AND WATERFOWL MIGRATION SURVEYS

TABLE C-1
Monitoring and Performance Evaluation Matrix

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre-Project	Sedimentation Problem Analysis	System-wide problem definition; Evaluate planning assumptions	USGS	USGS (UMESC)	LTRMP	--
	Pre-Project Monitoring	Identify and define problems at HREP site; Establish need of proposed project features	Sponsor	Sponsor	Sponsor	--
	Baseline Monitoring	Establish baselines for performance evaluation	USACE	USACE/ Sponsor	HREP	See Table C-2
Design	Data Collection for Design	Include quantification of project objectives; Design of project; and Development of performance evaluation plan	USACE	USACE	HREP	See Table C-2
Construction	Construction Monitoring	Assess construction impacts; Assure permit conditions are met	USACE	USACE	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring	Determine success of project, as related to objectives	USACE/ Sponsor	USACE/ Sponsor	HREP	See Table C-2

TABLE C-2
Monitoring and Data Collection Summary [1/]

Type Measurement	Engineering Data			Natural Resource Data			Sampling Agency	Remarks
	Pre-Project Phase	Design Phase	Post-Const Phase	Pre-Project Phase	Design Phase	Post-Const Phase		
POINT MEASUREMENTS								
Geotechnical								
Soil Borings [2/]	1	1					USACE	
Inspection								
Pump Station [3/]			5Y				USACE	
Evaluation								
Water Level [4/]			5Y				USACE	Data provided by IADNR
TRANSECT MEASUREMENTS								
Cross Sections / Profile								
Levee System [5/]		1					USACE	
Profile								
Overflow Spillway [6/]			5Y				USACE	
AREA MEASUREMENTS								
Mapping								
Vegetation Monitoring [7/]					1		USACE	
Aerial Photography [8/]				1		5Y	Sponsor	
Land Topographic [9/]		1					USACE	
Survey								
Mast Tree [10/]			5Y				USACE	

LEGEND
Y = Yearly
nY = n-Yearly interval
1,2,3, --- = number of times data are collected within designated project phase

TABLE C-2 (Continued)
Monitoring and Data Collection Summary [1/]

[1/] Monitoring and Data Collection Summary – First monitoring activity to occur the first year following project completion

[2/] Soil Borings (Pre-Project Phase)

Boring Number	Date
PWA-90-1 to PWA-90-2	05-22-90
PWA-90-3 to PWA-90-6	05-23-90
PWA-90-7 to PWA-90-8	05-24-90
PWA-90-9 to PWA-90-11	05-15-90
PWA-90-12	05-24-90
PWA-90-13 to PWA-90-17	05-29-90
PWA-90-18 to PWA-90-19	05-30-90
PWA-90-20	05-31-90
PWA-90-21	05-05-90
PWA-90-21A	05-31-90
PWA-90-22 to PWA-90-24	06-01-90

Soil Borings (Design Phase)

Boring Number	Date
PWA-92-1 to PWA-92-4	01-29-92
PWA-92-5	02-10-92

[3/] Pump Station Inspection (Post-Construction Phase) – Inspection should be documented in the report format provided in Appendix F

[4/] Water Level Evaluation (Post-Construction Phase) – Evaluation should be conducted using information provided by the IADNR Site Manager

[5/] Levee System Cross Sections / Profile (Design Phase) – Cross sections at even 200-foot intervals; profile perimeter levee and cross dike

[6/] Overflow Spillway Profile (Post-Construction Phase) – Profile overflow spillway using the benchmark (chiseled “X”) on the northeast wingwall of the gatewell structure at elevation 577.28 feet NGVD

[7/] Vegetation Monitoring (Design Phase) – September 1990 aerial photography

[8/] Aerial Photography (Pre-Project and Post-Construction Phases) – Scale at 1:1250

[9/] Land Topographic (Design Phase) – Contours at 1-foot intervals

[10/] Mast Tree Survey (Post-Construction Phase) – Survey of the mast tree plantings at two locations in the NWMU

2004

WATERFOWL MIGRATION SURVEY

Survey Date: 9/23/2004 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	100	5					
Black Duck							
Gadwall							
Wigeon							
Pintail	20						
GW Teal							
BW Teal	40						
Shoveler							
Wood Duck	200	75					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	360	80	0	0	0	0	0
Coots							
Canada Geese	450						
Snow Geese							
WF Geese							
TOTAL GEESE	450	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)	W87.4E85.5 W-1.0E-.1	N75.3S75.3					

Weather: Sunny,80,SW10mph

Habitat conditions: Good-excellent both areas

Ice conditions: NA

Migration days:

Hunter numbers and success: Opener 120 vehicles, mostly Wood ducks

Comments:

2004

WATERFOWL MIGRATION SURVEY

Survey Date: 10/7/2004 Wildlife Unit: Maquoketa

Observer: Fromm,Ellingson,Robinson

	AREAS						
	Green Island	Princeton					
Mallard	2,200	100					
Black Duck	4						
Gadwall							
Wigeon							
Pintail	1000						
GW Teal							
BW Teal	20						
Shoveler	35						
Wood Duck	500	400					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3759	500	0	0	0	0	0
Coots	50	500					
Canada Geese	3400	150					
Snow Geese							
WF Geese							
TOTAL GEESE	3400	150	0	0	0	0	0
Tundra Swan							
Trumpeter Swan		1					
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W87.69E85.7 W-.6E+.1	N76.0S74.98 N-.9 S .52					

Weather: Cloudy, 70,S10mph

Habitat conditions: Good to excellent both areas

Ice conditions: Na

Migration days:

Hunter numbers and success:

Comments: 17 Sandhills

WATERFOWL MIGRATION SURVEY

Survey Date: 10/14/2004 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	2,500	150					
Black Duck	5						
Gadwall	20						
Wigeon							
Pintail	600	25					
GW Teal	40	600					
BW Teal	20						
Shoveler	20						
Wood Duck	500	400					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3705	1175	0	0	0	0	0
Coots	100	500					
Canada Geese	4200	20					
Snow Geese							
WF Geese							
TOTAL GEESE	4200	20	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	3						
Golden Eagle							
Water level (dif. from crest)	E85.7W88.2 E+.1W-.4	N76.6S75.27 N-.4S-.33					

Weather: Cloudy,55,NE10mph

Habitat conditions: Good to excellent Borh areas, Filling DU 2

Ice conditions: Na

Migration days:

Hunter numbers and success:

Comments: 19 Sandhills at G.I. Looks like it should be a fairly good opener.

WATERFOWL MIGRATION SURVEY

Survey Date: 10/28/2004 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	2,200	200					
Black Duck	10						
Gadwall	25	5					
Wigeon							
Pintail	350						
GW Teal							
BW Teal							
Shoveler	20						
Wood Duck	250	50					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	2855	255	0	0	0	0	0
Coots	200	250					
Canada Geese	4600	20					
Snow Geese	1						
WF Geese							
TOTAL GEESE	4601	20	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.52E85.8 W-.08E+.2	S75.55N76.65 S-.05N-.25					

Weather: 60,Cluody,Foggy,Drizzly,Rainy,Dreary

Habitat conditions: Excellent both areas,

Ice conditions: NA

Migration days: nope

Hunter numbers and success: Good numbers of hunters early in week, very slow success

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 12/23/2004 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island						
Mallard	10						
Black Duck							
Gadwall							
Wigeon							
Pintail							
GW Teal							
BW Teal							
Shoveler							
Wood Duck							
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	10	0	0	0	0	0	0
Coots							
Canada Geese	4200						
Snow Geese							
WF Geese							
TOTAL GEESE	4200	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle	5						
Golden Eagle							
Water level (dif. from crest)							

Weather:

Habitat conditions:

Ice conditions:

Migration days:

Hunter numbers and success:

Comments:

2003

Bob Sheets - migrept091003.xls **WATERFOWL MIGRATION SURVEY**

Survey Date: 9/10/03 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	50	25					
Black Duck							
Gadwall							
Wigeon							
Pintail		10					
GW Teal	10	75					
BW Teal	40	35					
Shoveler	5	10					
Wood Duck	500	250					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	605	405	0	0	0	0	0
Coots							
Canada Geese	200	50					
Snow Geese							
WF Geese							
TOTAL GEESE	200	50	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)	E85.3W86.8 E-.3W--1.7	N-0,S74.22 N-3.0S-1.78					

Weather: Sunny,85, Wind S 10mph

Habitat conditions Habitat excellent both areas, just need to add water

Ice conditions: NA

Migration days: none seen

Hunter numbers and success: Na

Comments: 13 Sandhills at G.I., All Canadas are large,

WATERFOWL MIGRATION SURVEY

Survey Date: 9/17/03 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	500	50					
Black Duck							
Gadwall	20	5					
Wigeon							
Pintail	250	5					
GW Teal	200						
BW Teal	150	150					
Shoveler	30	20					
Wood Duck	700	100					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1850	330	0	0	0	0	0
Coots		10					
Canada Geese	1000	50					
Snow Geese							
WF Geese							
TOTAL GEESE	1000	50	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W 87.64 E 85. W -1.0 E -.1	S 75.4 N 74.2 S -.1 N -2.7					

Weather: Sunny 80 degrees S 20 mph

Habitat conditions Excellent both areas, just need water

Ice conditions: NA

Migration days: 9/13- 9/14

Hunter numbers and success: 0

Comments: No small geese.

WATERFOWL MIGRATION SURVEY

Survey Date: 9/24/03 Wildlife Unit: Maquoketa

Observer: Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	800	30					
Black Duck	5						
Gadwall	30						
Wigeon							
Pintail	350	5					
GW Teal	100	15					
BW Teal	50						
Shoveler	50						
Wood Duck	300	50					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1685	100	0	0	0	0	0
Coots	500						
Canada Geese	1000	50					
Snow Geese							
WF Geese							
TOTAL GEESE	1000	50	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	2						
Bald Eagle							
Golden Eagle							
Water level	W587.48,E585.47		S 575.3, N574.6				
(dif. from crest)	W -1.02,E -0.13		S -0.2, N -2.3				

Weather: cloudy 70

Habitat conditions very good good

Ice conditions:

Migration days:

Hunter numbers and success: Hunter numbers slightly lower than last year, success generally poor.

Comments: Swan neck collars at GI are 8T3 and 5T2

WATERFOWL MIGRATION SURVEY

Survey Date: 10/8/03 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	2,500	100					
Black Duck							
Gadwall	100	10					
Wigeon	25	10					
Pintail	1300	5					
GW Teal	200	40					
BW Teal	50	15					
Shoveler	50						
Wood Duck	300	150					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	4525	330	0	0	0	0	0
Coots	250	300					
Canada Geese	2900	50					
Snow Geese	2						
WF Geese							
TOTAL GEESE	2902	50	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	4						
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W87.97E85.2 W-.5,E-.4	N75.2S75.0 N-1.7S-.5					

Weather: Sunny,80,wsw10-15

Habitat conditions Excellent both areas, filling sub 2 now

Ice conditions:

Migration days: Didn't notice but more ducks and small geese have shown up

Hunter numbers and success:

Comments: 13 Sandhills

WATERFOWL MIGRATION SURVEY

Survey Date: 10/15/03 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	2,000	100					
Black Duck	5						
Gadwall	50	10					
Wigeon	20	10					
Pintail	500	10					
GW Teal	100	50					
BW Teal	15						
Shoveler	100						
Wood Duck	250	150					
Redhead							
Canvasback		5					
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck		5					
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3040	340	0	0	0	0	0
Coots	200	300					
Canada Geese	2000	50					
Snow Geese							
WF Geese							
TOTAL GEESE	2000	50	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	4	2					
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	E85.45W88.4 E-.15W-.14	S75.53N7583 S-.07N-1.07					

Weather: Sunny,62,wnw5-10

Habitat conditions Good-Excellent both areas

Ice conditions: Na

Migration days: 10/12 ,small movement on10/15

Hunter numbers and success: Poor success on opener ,good success all week

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 10/29/2003 Wildlife Unit: Maquokeat

Observer:

	AREAS						
	Green Island	Princeton					
Mallard	3,800	100					
Black Duck	20						
Gadwall	100						
Wigeon	100	20					
Pintail	500						
GW Teal	200	50					
BW Teal		10					
Shoveler	100						
Wood Duck	200	150					
Redhead							
Canvasback							
Ring-neck	15						
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	5035	330	0	0	0	0	0
Coots	1000	500					
Canada Geese	2500	50					
Snow Geese	8						
WF Geese							
TOTAL GEESE	2508	50	0	0	0	0	0
Tundra Swan	1						
Trumpeter Swan		2					
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	E85.63W88.45 E+0.03W-0.05	S75.25N76.2 S-0.25N-0.7					

Weather: cloudy, 45 deg, Se wind 15 mph,

Habitat conditions: excellent both areas

Ice conditions: na

Migration days: na

Hunter numbers and success: GI avg 16 vehicles per AM, poor to OK success
Prin avg 5 vehicles per AM, success unk

Comments: GI small geese 1000

WATERFOWL MIGRATION SURVEY

Survey Date: 11/5/2003 Wildlife Unit: Maquoketa

Observer: Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	7,000	700					
Black Duck	25	15					
Gadwall	300	150					
Wigeon	150	20					
Pintail	500	30					
GW Teal	300	75					
BW Teal	35	10					
Shoveler	150						
Wood Duck	150	100					
Redhead							
Canvasback							
Ring-neck	30	30					
L. Scaup							
Goldeneye							
Ruddy Duck		5					
Merganser	5						
Bufflehead							
Other							
TOTAL DUCKS	8645	1135	0	0	0	0	0
Coots	1500	750					
Canada Geese	3600	50					
Snow Geese	65						
WF Geese							
TOTAL GEESE	3665	50	0	0	0	0	0
Tundra Swan	1						
Trumpeter Swan	1	2					
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.5,E86.0 both crest	N76.6,S75.3 N-0.3,S-0.2					

Weather: cloudy 38 degrees, NW 5-10

Habitat conditions: Both excellent

Ice conditions: na

Migration days: Oct. 31 and Nov. 1 seemed to be the most movement

Hunter numbers and success: average, hunter numbers up a bit today

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 11/12/2003 Wildlife Unit: Maquoketa

Observer: Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	5,000	2000					
Black Duck	25	15					
Gadwall	300	200					
Wigeon	150	35					
Pintail	500	75					
GW Teal	300	100					
BW Teal	35						
Shoveler	150	60					
Wood Duck	150	100					
Redhead							
Canvasback							
Ring-neck	50	35					
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	6660	2620	0	0	0	0	0
Coots	800	500					
Canada Geese	3700	50					
Snow Geese	5						
WF Geese							
TOTAL GEESE	3705	50	0	0	0	0	0
Tundra Swan	1						
Trumpeter Swan		2					
Bald Eagle	4						
Golden Eagle							
Water level (dif. from crest)	W88.28,E86.0 W-0.35,E+0.4	N76.4,S75.25 N-0.5,S0.25					

Weather: Started sunny and nice. Wind picked up during day gusting to 40 to 60 mph from NW, clouded up and ter

Habitat conditions: excellent

Ice conditions: na

Migration days: none observed

Hunter numbers and success: Many hunters showed up during day expecting a good day but not much success. Ducks l

Comments: Green Island had all time high of 32 sandhill cranes.

WATERFOWL MIGRATION SURVEY

Survey Date: 11/26/2003 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	3,000	1700					
Black Duck	5						
Gadwall	50	100					
Wigeon		25					
Pintail	25	50					
GW Teal	10	50					
BW Teal							
Shoveler	100	30					
Wood Duck	20	10					
Redhead							
Canvasback		5					
Ring-neck	25	35					
L. Scaup		10					
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3235	2015	0	0	0	0	0
Coots	100	150					
Canada Geese	5500	75					
Snow Geese							
WF Geese							
TOTAL GEESE	5500	75	0	0	0	0	0
Tundra Swan	1						
Trumpeter Swan		2					
Bald Eagle	11						
Golden Eagle							
Water level (dif. from crest)	W88.0E86.0 W-.6E+.4	N76.0S75.35 N-.9S-.25					

Weather: Partly cloudy,SE5-10,40Degrees

Habitat conditions: Good

Ice conditions: 90 percent but opening back up

Migration days: 11/23/2024

Hunter numbers and success: Good numbers both areas success spotty

Comments: 31 Sandhills

2002

WATERFOWL MIGRATION SURVEY

Survey Date: 9/11/02 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	200	15					
Black Duck							
Gadwall							
Wigeon							
Pintail							
GW Teal							
BW Teal	250	40					
Shoveler							
Wood Duck	650	200					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1100	255	0	0	0	0	0
Coots	250						
Canada Geese	175						
Snow Geese							
WF Geese							
TOTAL GEESE	175	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	4						
Golden Eagle							
Water level (dif. from crest)	W86.8E86.3	S74.0N74.0					

Weather: sunny, 70, NE 5-10

Habitat conditions Looking pretty good

Ice conditions:

Migration days: Blue-wings, some Green-wings, Shovellers, and 2 Pintails moved in and out about 2 weeks ago

Hunter numbers and success:

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 9/25/02 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island		Princeton				
Mallard	400		15				
Black Duck							
Gadwall							
Wigeon							
Pintail	50						
GW Teal	100						
BW Teal	30		10				
Shoveler	10						
Wood Duck	100		20				
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	690	0	45	0	0	0	0
Coots	250		10				
Canada Geese	875						
Snow Geese							
WF Geese							
TOTAL GEESE	875	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan			1				
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	E86.32W87.52 E+.72W-1.0		S75.3N74.3 S+-0,N-1.1				

Weather: Sunny,65, SW 10-15mph,

Habitat conditions GI good-exc, Princeton good

Ice conditions:

Migration days: Possibly 09/21-22

Hunter numbers and success: Car count on 09/21 at green Island 150 . 5-10 vehicles each morning rest of season. Succ

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 10/2/02 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	500	10					
Black Duck	2						
Gadwall							
Wigeon	10						
Pintail	100						
GW Teal	50						
BW Teal	25	10					
Shoveler	10						
Wood Duck	200	40					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck	2						
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	899	60	0	0	0	0	0
Coots	250	175					
Canada Geese	900						
Snow Geese							
WF Geese							
TOTAL GEESE	900	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	9						
Golden Eagle							
Water level (dif. from crest)	E86.2W87.8 E+.6W--.7	S75.1N75.3 S-.4N-1.5					

Weather: Cloudy,Rain 65

Habitat conditions G.I. Good-Exc. Princeton Good

Ice conditions: NA

Migration days:

Hunter numbers and success: Good success field hunting for Canadas

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 10/9/02 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	4,500	75					
Black Duck	8						
Gadwall	50						
Wigeon	60	25					
Pintail	900	10					
GW Teal	500	300					
BW Teal	40	20					
Shoveler	10	10					
Wood Duck	150	75					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	6218	515	0	0	0	0	0
Coots	3500	600					
Canada Geese	1350						
Snow Geese							
WF Geese							
TOTAL GEESE	1350	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	4	1					
Bald Eagle	3						
Golden Eagle							
Water level (dif. from crest)	E86.4W88.52 E+.8 W +-0	S75.15N76.35 S-.4 N-.5					

Weather: Sunny 65, calm

Habitat conditions G.I. Both sides good to exc. Princeton North pool starting to look really good, South pool just fair.

Ice conditions:

Migration days: Small Canadas moved on 10/04 at G.I.

Hunter numbers and success:

Comments: 9 Sandhills at G.I. 4 at Prince eton. Of the 1350 Canadas at G.I. About 500 are small.

WATERFOWL MIGRATION SURVEY

Survey Date: 10/16/02 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	5,500	75					
Black Duck	20	4					
Gadwall	60	25					
Wigeon	40	5					
Pintail	600						
GW Teal	350	250					
BW Teal	25	10					
Shoveler		20					
Wood Duck	150	75					
Redhead							
Canvasback							
Ring-neck							
L. Scaup		5					
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead		1					
Other							
TOTAL DUCKS	6745	470	0	0	0	0	0
Coots	1000	150					
Canada Geese	1125						
Snow Geese	1						
WF Geese							
TOTAL GEESE	1126	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	7						
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W88.42E86.6 W-.08 E+1.05	S75.35N76.05 S-.15 N-.95					

Weather: Sunny,55 ,W 10 mph

Habitat conditions G.I. Good to excellent both sides, ducks are loving subs 2 and 3

Ice conditions:

Migration days:

Hunter numbers and success: Opener was spotty for success, 75 vehicles at G.I. Averaging 12 vehicles/morning. Princeton has been averaging 6/morning with good action this week-lots of shooting.

Comments: Of the 1125 canadas at G.I. About 400 are small.

WATERFOWL MIGRATION SURVEY

Survey Date: 10/23/02 Wildlife Unit: Maquoketa

Observer: Fromm, Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	5,000	700					
Black Duck	20	5					
Gadwall	100	35					
Wigeon	50	20					
Pintail	450	50					
GW Teal	350	150					
BW Teal	25	25					
Shoveler	50	20					
Wood Duck	200	200					
Redhead							
Canvasback							
Ring-neck	10	5					
L. Scaup	10						
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	6265	1210	0	0	0	0	0
Coots	4000	700					
Canada Geese	6500						
Snow Geese	1						
WF Geese							
TOTAL GEESE	6501	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	5						
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.36E86.9 W-.14E+1.4	N76.65S75.4 N-.25S-.1					

Weather: Cloudy 45,NE5-10

Habitat conditions GI good-exc west pool, Ducks love D.U. subs 1,2,3, No. 4 not filled yet

Ice conditions: Na

Migration days: Approx. 4000 small Canadas moved in sometime this week

Hunter numbers and success: Spotty succ. Ave about 15 vehicles/morning at G.I.

Comments: 14 sandhills at G.I.

WATERFOWL MIGRATION SURVEY

Survey Date: 10/30/02 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	10,000	700					
Black Duck	20	5					
Gadwall	75	20					
Wigeon	40						
Pintail	2000	40					
GW Teal	3000	200					
BW Teal							
Shoveler	50						
Wood Duck	150	100					
Redhead							
Canvasback							
Ring-neck	40	20					
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	15375	1085	0	0	0	0	0
Coots	2000	300					
Canada Geese	5300						
Snow Geese	1						
WF Geese							
TOTAL GEESE	5301	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.4E87.04 W-.1E+1.56	N76.8S75.5 N-+0S-+0					

Weather: Mostly sunny, 45, NE5-10

Habitat conditions G.I. Sub impoundments look excellent, Rest, good-exc. Princeton, corn food plots cleaned,WUSA sub lo

Ice conditions: Na

Migration days: None noticed this week

Hunter numbers and success: GI Ave. 12-15 parties in the AM, 6-10 in the PM, success spotty at best.

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 11/6/02 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	8,500	750					
Black Duck	20	5					
Gadwall	100	40					
Wigeon	20	75					
Pintail	500	20					
GW Teal	1000	250					
BW Teal							
Shoveler	150	10					
Wood Duck	50	50					
Redhead							
Canvasback	5						
Ring-neck	40	25					
L. Scaup	10						
Goldeneye							
Ruddy Duck	5						
Merganser							
Bufflehead	10						
Other							
TOTAL DUCKS	10410	1225	0	0	0	0	0
Coots	1500	250					
Canada Geese	5500						
Snow Geese							
WF Geese							
TOTAL GEESE	5500	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.26E86.9 W-.34E+1.4	N76.5S75.4 N-.3 S-.1					

Weather: Mostly cloudy,45, W10-15

Habitat conditions Good-exc G.I., Good at princeton in public area, exc. In refuge.

Ice conditions: Skim ice each morning 10/31-11/05

Migration days: Minor movement on 10/31

Hunter numbers and success: Numbers up until today for the week, success good on 10/31, spotty rest of week

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 11/20/02 Wildlife Unit: Maquoketa

Observer: Billerbeck,Fromm

	AREAS						
	Green Island	Princeton					
Mallard	4,000	2000					
Black Duck	10	5					
Gadwall	25	150					
Wigeon	10	25					
Pintail	100	10					
GW Teal	200	100					
BW Teal							
Shoveler	50						
Wood Duck	25	40					
Redhead							
Canvasback							
Ring-neck							
L. Scaup		25					
Goldeneye							
Ruddy Duck	5						
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	4425	2355	0	0	0	0	0
Coots	400	40					
Canada Geese	3000						
Snow Geese							
WF Geese							
TOTAL GEESE	3000	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	2						
Bald Eagle	3						
Golden Eagle							
Water level (dif. from crest)	W88.0E86.76 W-.6E+1.16	N76.1S75.25 N---.5S-.35					

Weather: Sunny,50,W0-5mph

Habitat conditions Good both areas

Ice conditions: Na

Migration days: Na

Hunter numbers and success: Low numbers,low success, some field hunting opportunities

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 12/4/02 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	2,500	5					
Black Duck	10						
Gadwall		2					
Wigeon							
Pintail							
GW Teal							
BW Teal							
Shoveler	5						
Wood Duck							
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	2515	7	0	0	0	0	0
Coots							
Canada Geese	1800						
Snow Geese							
WF Geese							
TOTAL GEESE	1800	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	12						
Golden Eagle							
Water level (dif. from crest)							

Weather: cloudy,20,NE 5 mph

Habitat conditions:

Ice conditions: 1 hole at Princeton, 4 holes at G.I.

Migration days: none seen

Hunter numbers and success: 20 boats on 11/30, little or no success. Some success field hunting Mallards and Canadas

Comments: 8 Sandhills still here

2002

WATERFOWL MIGRATION SURVEY

Survey Date: 12/13/02 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island						
Mallard	300						
Black Duck							
Gadwall							
Wigeon							
Pintail							
GW Teal							
BW Teal							
Shoveler							
Wood Duck							
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	300	0	0	0	0	0	0
Coots							
Canada Geese	3250						
Snow Geese							
WF Geese							
TOTAL GEESE	3250	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)							

Weather: Sunny, 40,sw 5mph

Habitat conditions:

Ice conditions: 2 holes left open,

Migration days:

Hunter numbers and success:

Comments: 2 Sandhills, Canadas all large.

2001

WATERFOWL MIGRATION SURVEY

Survey Date: 9/13/01 Wildlife Unit: Maquoketa

Observer: Fromm, Billerbeck

	AREAS						
	Princeton	Green Island					
Mallard	65	85					
Black Duck							
Gadwall							
Wigeon							
Pintail							
GW Teal		50					
BW Teal	120	650					
Shoveler							
Wood Duck	50	350					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	235	1135	0	0	0	0	0
Coots							
Canada Geese		250					
Snow Geese							
WF Geese		1					
TOTAL GEESE	0	251	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	5						
Bald Eagle		1					
Golden Eagle							
Water level (dif. from crest)	S-574.5 N---	W-585.4 E-585.4					

Weather: Cloudy, 65, NE 5-10

Habitat conditions: Just started pumping at Princeton on 09/12 so N pool is almost dry.
G.I. Not pumping yet, vegetation is variable, and changed from previous years due to flood

Ice conditions:

Migration days: Appears that some Blue-wings moved in sometime early this week.

Hunter numbers and success:

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 9/26/01 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	150	5					
Black Duck							
Gadwall							
Wigeon							
Pintail							
GW Teal							
BW Teal	40	15					
Shoveler							
Wood Duck	100	35					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	290	55	0	0	0	0	0
Coots	150						
Canada Geese	825						
Snow Geese							
WF Geese							
TOTAL GEESE	825	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W-87.48E85.9 W-1.1,E-+.38	N74.6S75.38 N-.1.4S-,12					

Weather: Sunny,60 ,NE 10 mph

Habitat conditions Both good

Ice conditions: NA

Migration days: 09/25 a few more small Canadas moved in

Hunter numbers and success: 153 vehicles at G. I. On Saturday, average 5-10 during week. Mostly Wood Ducks and a

Comments: Our 13 local Sandhills are still here.

WATERFOWL MIGRATION SURVEY

Survey Date: 10/10/01 Wildlife Unit: Maquoketa

Observer: Billerbeck, Fromm

	AREAS						
	Green Island	Princeton					
Mallard	500	10					
Black Duck	1						
Gadwall							
Wigeon	10	15					
Pintail	20	15					
GW Teal	100	25					
BW Teal	50	20					
Shoveler	20	10					
Wood Duck	400	200					
Redhead							
Canvasback							
Ring-neck							
L. Scaup		4					
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1101	299	0	0	0	0	0
Coots	250	600					
Canada Geese	1200						
Snow Geese							
WF Geese							
TOTAL GEESE	1200	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W87.54E85.9 W-.8E+.3	S75.14N75.88 S-.36N-1.12					

Weather: 62, SW10-15mph,Cloudy periods of showers

Habitat conditions Good Both areas, not great vegetation wise,

Ice conditions:

Migration days: None noticed but more Wood ducks are showing up

Hunter numbers and success:

Comments: 18 Sandhills

WATERFOWL MIGRATION SURVEY

Survey Date: 10/31/01 Wildlife Unit: Maquoketa

Observer: Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	3,500	600					
Black Duck	15						
Gadwall	50	75					
Wigeon	10	20					
Pintail	50	15					
GW Teal	600	250					
BW Teal	25	20					
Shoveler	40	35					
Wood Duck	150	100					
Redhead							
Canvasback							
Ring-neck		10					
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	4440	1125	0	0	0	0	0
Coots	2500	1500					
Canada Geese	2500						
Snow Geese	12						
WF Geese							
TOTAL GEESE	2512	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1	4					
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)							

Weather: 60 degrees, partly cloudy, sw wind 15-25

Habitat conditions both good

Ice conditions: na

Migration days: very good movement Oct. ~~18~~ 25 and ~~19~~ 26

Hunter numbers and success:

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 11/7/01 Wildlife Unit: Maquoketa

Observer: Billerbeck,Fromm

	AREAS						
	Green Island	Princeton					
Mallard	3,000	500					
Black Duck	5						
Gadwall	20	10					
Wigeon	10						
Pintail	20	10					
GW Teal	600	200					
BW Teal							
Shoveler	75	20					
Wood Duck	50	150					
Redhead							
Canvasback							
Ring-neck	20	20					
L. Scaup							
Goldeneye							
Ruddy Duck		2					
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3800	912	0	0	0	0	0
Coots	3500	700					
Canada Geese	3100						
Snow Geese	10						
WF Geese	36						
TOTAL GEESE	3146	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W87.92E86.0 W-.48E+.4						

Weather: Sunny, 68,S 10-15

Habitat conditions Green Island good, Princeton good,habitat in refuge at princeton is just fair due to to low water for levee r

Ice conditions: Na

Migration days: toooooooo nice

Hunter numbers and success: Slightly below average numbers, slow success

Comments: we need new ducks

WATERFOWL MIGRATION SURVEY

Survey Date: 11/14/01 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	2,500	200					
Black Duck	5						
Gadwall	10						
Wigeon	5						
Pintail	10						
GW Teal	500	35					
BW Teal	10						
Shoveler	100	10					
Wood Duck	25	50					
Redhead							
Canvasback	5						
Ring-neck	15	20					
L. Scaup							
Goldeneye							
Ruddy Duck	5	2					
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3190	317	0	0	0	0	0
Coots	2500	400					
Canada Geese	2400						
Snow Geese	13						
WF Geese	53						
TOTAL GEESE	2466	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1	1					
Bald Eagle	1						
Golden Eagle							
Water level (dif. from crest)	W87.83E86.0 W-..67E+.40	S75.5N76.0 S-.5N-.5					

Weather: Partly cloudy,S-SW 10-15 mph, 70 Degrees, Balmy,

Habitat conditions Just good both areas

Ice conditions: na

Migration days: Na

Hunter numbers and success: Below average hunters , poor to no success

Comments: Al, We need some of your ducks, Ours have all been educated. Please send us the ones you haven't sh

WATERFOWL MIGRATION SURVEY

Survey Date: 11/21/01 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	2,600	250					
Black Duck	5						
Gadwall	25	5					
Wigeon	25						
Pintail							
GW Teal	300	50					
BW Teal							
Shoveler	150	10					
Wood Duck	25	10					
Redhead		1					
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck	5						
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3135	326	0	0	0	0	0
Coots	600	350					
Canada Geese	3000						
Snow Geese	2						
WF Geese	10						
TOTAL GEESE	3012	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	2	1					
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W87.92E86.0 W-.68E+.4	N75.8S75.2 N-.8S-.8					

Weather: Sunny, 55, S-Sw 5-10mph, Nice

Habitat conditions Just good both areas

Ice conditions: Na

Migration days: 11/19 first 2 hrs of the season looked like a good flight day, but then it abruptly stopped.

Hunter numbers and success: Above average number of hunters since Monday with slow success at G.I.

Comments: Al, I read 2 of 4 orange collars on some small geese, they are J6U6, J8K1

WATERFOWL MIGRATION SURVEY

Survey Date: 12/13/01 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton	Wapsi St.Pk.	Monticello	Gomberts Pond		Pleasant Ck.
Mallard	19,320	6000	75				250
Black Duck	10	4					5
Gadwall	1100	75					900
Wigeon	85	25					
Pintail	20						
GW Teal	460	100					
BW Teal							
Shoveler	1380	40					
Wood Duck							
Redhead		10					
Canvasback	20						
Ring-neck	20	25					
L. Scaup	20	25					75
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	22435	6304	75	0	0	0	1230
Coots	600	100					
Canada Geese	5600		45 Large	8 Large	450L,50S		75L
Snow Geese							
WF Geese	14						
TOTAL GEESE	5614	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	2						
Bald Eagle	5						
Golden Eagle							
Water level (dif. from crest)	W87.72E86.32						

Weather: Cloudy 30, WNW 10-15 mph

Habitat conditions:

Ice conditions: No Ice anywhere, Only 1 day of ice this fall

Migration days: No major movements of Canada geese here since last week in October.

Hunter numbers and success:

Comments: Of the 5600 geese at G. I. 300 are small C Canadas. 11 Sand hills still here.
There are between 10-20,000 ducks coming in too roost at dusk.

WATERFOWL MIGRATION SURVEY

Survey Date: 12/19/01 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton					
Mallard	20,000	6000					
Black Duck	5	6					
Gadwall	750	250					
Wigeon		20					
Pintail							
GW Teal	250	50					
BW Teal							
Shoveler	1900	300					
Wood Duck	5	5					
Redhead		5					
Canvasback	20	25					
Ring-neck	50	50					
L. Scaup	10	10					
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	22990	6721	0	0	0	0	0
Coots	500	100					
Canada Geese	5600						
Snow Geese							
WF Geese	50						
TOTAL GEESE	5650	0	0	0	0	0	0
Tundra Swan	1	2					
Trumpeter Swan	1	5					
Bald Eagle	25	5					
Golden Eagle							
Water level (dif. from crest)							

Weather: Sunny, 37,NW 10-20

Habitat conditions Ok, Letting water drop at both areas

Ice conditions: None

Migration days: None so far this season

Hunter numbers and success: na

Comments: 11 Sandhills, 15,000 ducks coming in to roost at night at G.I.

2000

WATERFOWL MIGRATION SURVEY

Survey Date: 9/27/00 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	400						
Black Duck	1						
Gadwall							
Wigeon							
Pintail	25						
GW Teal							
BW Teal	200						
Shoveler							
Wood Duck	500	100					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1126	100	0	0	0	0	0
Coots	3000	400					
Canada Geese	745						
Snow Geese							
WF Geese							
TOTAL GEESE	745	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)	W87.65E85.9 W-1.0E+.3	S75.4-N75.9 S- N-1.1					

Weather: Sunny, N5-10, 68

Habitat conditions Good to excellent both areas

Ice conditions:

Migration days: 09/21 the Pintails moved out,

Hunter numbers and success: 176 vehicles on sat. Bag check of 38 parties showed 2.77 ducks per hunter,

Comments: 15 sandhills,

WATERFOWL MIGRATION SURVEY

Survey Date: 10/4/00 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	800	40					
Black Duck	1						
Gadwall							
Wigeon	10						
Pintail	20						
GW Teal	20						
BW Teal	50	10					
Shoveler							
Wood Duck	350	150					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1251	200	0	0	0	0	0
Coots	2500	400					
Canada Geese	2100						
Snow Geese							
WF Geese							
TOTAL GEESE	2100	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	4						
Golden Eagle							
Water level (dif. from crest)	E85.8W87.6 E+.2W-.8	S75.2N76.15 S-.3N-.85					

Weather: Sunny 60,N5-10

Habitat conditions Good - excellent both areas

Ice conditions:

Migration days: 10/02 some small Canadas showed up

Hunter numbers and success: Pretty good field hunting for Canadas for those who tried opening weekend

Comments: 17 sandhills

WATERFOWL MIGRATION SURVEY

Survey Date: 10/11/00 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	1,200	20					
Black Duck	1	0					
Gadwall	40	0					
Wigeon	20	0					
Pintail	15	0					
GW Teal	50	5					
BW Teal	20	20					
Shoveler	0	0					
Wood Duck	300	50					
Redhead	1	0					
Canvasback	5	0					
Ring-neck	0	2					
L. Scaup	2	0					
Goldeneye	0	0					
Ruddy Duck	0	0					
Merganser	0	0					
Bufflehead	0	0					
Other	0	0					
TOTAL DUCKS	1654	97	0	0	0	0	0
Coots	2500	400					
Canada Geese	2400	0					
Snow Geese	1	0					
WF Geese	0	0					
TOTAL GEESE	2401	0	0	0	0	0	0
Tundra Swan	0	0					
Trumpeter Swan	0	0					
Bald Eagle	5	0					
Golden Eagle	0						
Water level (dif. from crest)	W-88.13 E-85.78 W-.3 E+.18		S 75.3 N 75.95 S +-0 N -1.0				

Weather: 65 Degrees, South 5-10 Sunny

Habitat conditions Good to Excellent Both areas

Ice conditions:

Migration days: A few small geese showed up during the week

Hunter numbers and success: NA

Comments: 15 Sand Hills at Green Island, Princeton Pump guy said there was about 3000 ducks roosting on area at night

WATERFOWL MIGRATION SURVEY

Survey Date: 10/24/00 Wildlife Unit: Maquoketa

Observer: Haupert

	AREAS						
	Green Island	Princeton					
Mallard	1,000	200					
Black Duck	2						
Gadwall	20	5					
Wigeon	15	2					
Pintail	25	5					
GW Teal	25	20					
BW Teal	25	25					
Shoveler	20						
Wood Duck	150	150					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	1282	407	0	0	0	0	0
Coots	3200	800					
Canada Geese	3000						
Snow Geese	2						
WF Geese							
TOTAL GEESE	3002	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle	2						
Golden Eagle							
Water level (dif. from crest)	W88.36E85.6 W-.04E+ -	N76.6S75.06 N-.4S-.44					

Weather: Cloudy 65, sw5-10, Kind of Foggy

Habitat conditions Excellent G.I.,Good Princeton

Ice conditions: NA

Migration days: None noted

Hunter numbers and success: Still very slow, a few ducks being harvested by those with the robo ducks.

Comments: 16 Sandhills,

WATERFOWL MIGRATION SURVEY

Survey Date: 11/1/00 Wildlife Unit: Maquoketa

Observer: Haupert, Fromm

	AREAS						
	Green Island	Princeton					
Mallard	1,800	200					
Black Duck	2	2					
Gadwall	30	5					
Wigeon	20	30					
Pintail	25	10					
GW Teal	25	75					
BW Teal	25	0					
Shoveler	10						
Wood Duck	125	50					
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	2062	372	0	0	0	0	0
Coots	4000	350					
Canada Geese	3700						
Snow Geese	13						
WF Geese	4						
TOTAL GEESE	3717	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)	W88.10E85.6 W-.3 E+ -	N77.05S75.0 N + -0S-.5					

Weather: Sunny 75, s-se 10-15,

Habitat conditions Excellent at G.I. Good to Excellent at Princeton

Ice conditions: NA

Migration days: 10/28/00 just a few new birds not very many

Hunter numbers and success: Pretty Slow still

Comments: 16 Sandhills here

WATERFOWL MIGRATION SURVEY

Survey Date: 11/8/00 Wildlife Unit: Maquoketa

Observer: Haupert

	AREAS						
	Green Island	PR/Maquoketa					
Mallard	6,500	400					
Black Duck	2	2					
Gadwall	250	150					
Wigeon	200	75					
Pintail	50	25					
GW Teal	25	750					
BW Teal	25						
Shoveler	125						
Wood Duck	25	50					
Redhead							
Canvasback							
Ring-neck	225						
L. Scaup	75						
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	7502	1452	0	0	0	0	0
Coots	4000	500					
Canada Geese	5500						
Snow Geese	16						
WF Geese	4						
TOTAL GEESE	5520	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle							
Golden Eagle							
Water level (dif. from crest)	W88.13E85.6 W-.27 E + -	N76.7S75.48 N-.3 S- .02					

Weather: Partly Cloudy, w - 5-15 45 degrees

Habitat conditions Excelent at both areas

Ice conditions: NA

Migration days: 11/2, 11/3, 11/6,11/7 These four days, seemed to move a decent number of birds in

Hunter numbers and success: There has been quit a few hunters at GI, there success depends on what spot there hunti

Comments: only seen 6 sand hills at G.I. This week

WATERFOWL MIGRATION SURVEY

Survey Date: 11/22/00 Wildlife Unit: Maquoketa

Observer: Fromm, Robinson

	AREAS						
	Green Island	Princeton					
Mallard	3,500						
Black Duck	10						
Gadwall	100						
Wigeon	20						
Pintail							
GW Teal							
BW Teal							
Shoveler	20						
Wood Duck							
Redhead							
Canvasback	2						
Ring-neck							
L. Scaup	30						
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	3682	0	0	0	0	0	0
Coots	40						
Canada Geese	5000						
Snow Geese	2						
WF Geese							
TOTAL GEESE	5002	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle	11						
Golden Eagle							
Water level (dif. from crest)	E86.0W88.2 E+.4W-.4						

Weather: sunny 25,W5-10

Habitat conditions good-ex

Ice conditions: 99.9% frozen, 2 open holes in the refuge at G.I. Princeton all frozen

Migration days: 8/23 some movement

Hunter numbers and success: Good numbers of hunters until 11/20 success spotty

Comments: 16 sandhills still here

WATERFOWL MIGRATION SURVEY

Survey Date: 11/15/00 Wildlife Unit: Maquoketa

Observer: Fromm

	AREAS						
	Green Island	Princeton					
Mallard	12,000	650					
Black Duck	10						
Gadwall	200	20					
Wigeon	100	5					
Pintail	10						
GW Teal	10	20					
BW Teal	5						
Shoveler	50						
Wood Duck	50						
Redhead							
Canvasback							
Ring-neck	20						
L. Scaup	20						
Goldeneye							
Ruddy Duck	30						
Merganser	1						
Bufflehead	10						
Other							
TOTAL DUCKS	12516	695	0	0	0	0	0
Coots	450	150					
Canada Geese	5000						
Snow Geese	2						
WF Geese							
TOTAL GEESE	5002	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	9	3					
Golden Eagle							
Water level (dif. from crest)	W88.33E85.8 W-.27E+.2	S75.6N76.55 S-.4N-.45					

Weather: Partly Sunny SW 5-10 30 degrees

Habitat conditions Good-Excellent both areas

Ice conditions: 50% both areas

Migration days: 11/14/00, 11/09/00

Hunter numbers and success: 30-50 vehicals a day at green Island, success pretty good, lots of mallards in the bag

Comments: 16 Sandhills at Green Island

WATERFOWL MIGRATION SURVEY

Survey Date: 11/29/00 Wildlife Unit: Maquoketa

Observer: Haupert

	AREAS						
	Green Island	Princeton					
Mallard	4,500						
Black Duck	2						
Gadwall	60						
Wigeon	150						
Pintail							
GW Teal							
BW Teal							
Shoveler	50						
Wood Duck							
Redhead							
Canvasback							
Ring-neck	50						
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser							
Bufflehead							
Other							
TOTAL DUCKS	4812	0	0	0	0	0	0
Coots							
Canada Geese	7700						
Snow Geese	1						
WF Geese							
TOTAL GEESE	7701	0	0	0	0	0	0
Tundra Swan							
Trumpeter Swan	1						
Bald Eagle	5						
Golden Eagle							
Water level (dif. from crest)	W86.27E85.7 W-2.13E+-						

Weather: Cloudy, NW wind 5-15, snow off an on

Habitat conditions Good but mostly frozen

Ice conditions: 90% frozen at green Island, Princeton is 100% Frozen

Migration days:

Hunter numbers and success: Low due to everything being frozen, those who are getting are having little success

Comments:

WATERFOWL MIGRATION SURVEY

Survey Date: 12/14/00 Wildlife Unit: Maquoketa

Observer: Fromm,Billerbeck

	AREAS						
	Green Island	Princeton	Stamps Pond	Wapsi St. Pk.	J.Deere Pond		
Mallard	20		60	150			
Black Duck				1			
Gadwall				3			
Wigeon							
Pintail							
GW Teal							
BW Teal							
Shoveler	1						
Wood Duck				2			
Redhead							
Canvasback							
Ring-neck							
L. Scaup							
Goldeneye							
Ruddy Duck							
Merganser		4					
Bufflehead							
Other							
TOTAL DUCKS	21	4	60	156	0	0	0
Coots	1						
Canada Geese	144		50	2100	100		
Snow Geese							
WF Geese							
TOTAL GEESE	144	0	50	2100	100	0	0
Tundra Swan							
Trumpeter Swan							
Bald Eagle	3						
Golden Eagle							
Water level (dif. from crest)							

Weather: Partly Sunny 15, sw5-10

Habitat conditions:

Ice conditions: frozen

Migration days: 1500 Canadas were at G.I. On 12/12/00 plus our 1 Swan

Hunter numbers and success:

Comments: 725 mediums,1669 Large

APPENDIX D

COOPERATING AGENCY CORRESPONDENCE

PRINCETON FIX LIST
7-11-03

1. South access road bed is too low. Road shoulders remain higher and trap water. Entire road grade between shoulders needs to be raised 8".

2. River grating on pump station inlet box creates more trouble than it is worth. It will plug with debris and create vortex during pumping operation. Pump impeller is deep enough in pit to avoid plugging when river grate is off. Debris floats on surface and is not sucked beneath. Prefer to leave river grating off.

3. Grating on top of pump station inlet box is heavy to remove. One hydraulic fitting in headwall leaks and requires a catch bucket to trap oil. Daily removal and replacement of one heavy grating section is dangerous to the operator and dangerous to the public if left off. Suggest repair of fixture and replacement of grating section with lighter hinged section.

4. Fishing line has been found to be a problem with seals around pump impeller head. No remedy on horizon for this. We will live with it.

5. A 150' long low section of levee remains just above the gravity flow structure immediately above the pump station. The low section grades down approximately 2'. Old sandbags remain along the levee shoulder at this point.

6. Two drop outlet structures in the cross dike are silted in. No permanent fix for this problem is known. Most of the siltation occurred during the 2001 North levee break. The structures need to be hydraulically flushed out.

7. The North Wapsi river levee segment remains 18" low. Future north levee breaks are inevitable due to this condition. Lowering the South access road will help equalize water levels during flood stage but excessive siltation from North levee breaks will continue if this levee is not raised. Two solutions are proposed:

   A. Use earthen fill from adjacent corn field on IDNR property to raise levee 18"

   B. Use contractor to place dredge spoil on levee. Material would be piped from chronic main channel dredging site near Princeton beach 1-2miles Southeast of levee.

BOB SHEETS WILDLIFE BIOLOGIST
Iowa Department of Natural Resources
Courthouse 201 W. Platt St.
Maquoketa, IA 52060

APPENDIX E

TECHNICAL COMPUTATIONS

No technical computations were performed for this PER.

APPENDIX F

PUMP STATION INSPECTION REPORT
AND
PUMPING HISTORY

PUMP STATION INSPECTION REPORT

Name of Project and Program (EMP, 1135, Etc.):
Princeton Wildlife Management Area, EMP
Pool 14, River Miles 504.0-506.5, Scott County, Iowa

Date/Hour Inspection Began/Ended:
Date: 5/31/01 Time: 1030

Inspectors:
Corps Representatives: Mark Clark, Rachel Fellman, John Behrens
Local Sponsor Officials: Bob Sheets, Randy Robinson, Mike Griffin, IADNR

River/Forebay Elevations:
River El.: 575.0 Stage El.: N/A Zero Gage El.: N/A
North Management Unit El.: 576.25 Stage El.: N/A Zero Gage El.: N/A
South Management Unit El.: 576.25 Stage El.: N/A Zero Gage El.: N/A
Note: The North Management Unit was flowing into the South Management Unit and both cells were flowing into the river through the gravity outlets.

Project Data:
Pumping Arrangement and Configuration: One (1) hydraulic submersible M&W pump set up for one-way pumping with diversion to either management unit.

Size of Moist Cell Unit(s) (Acres): North Management Unit = 357 Acres at water surface elevation 576.0
South Management Unit = 344 Acres at water surface elevation 575.0

Fill Time (Days): Actual: North Management Unit = 45 days fill time to elevation 577.0. (1' above Corps design) It takes an additional 15 days of pumping to achieve the 1' increase.
South Management Unit = Approximately 30 days simultaneous with the filling of the North Management Unit.
Design: The design was to take 7 days for the North Unit and 5 days for the South Unit.

Empty Time (Days): Actual: Depends on the fluctuating river. IADNR tries to lower the management units as low as possible.
Design: Approximately elevation 574.0

General Comments:
1. The inspection was performed shortly after the 2001 Flood.
2. The river reached a level of 8" water depth within the pump station building above elevation 583.6.
3. A large amount of wood debris was on the levee around the pump station from the flood.
4. A low spot in the levee (approx. 100' long by 16"-24" deep) was observed in the vicinity of the gravity outlet gatewell. The area had been sandbagged during the flood fight to prevent overtopping near the pump station structure.
5. Overall the pump station appeared to be in good condition.

PUMP STATION MAINTENANCE INSPECTION GUIDE

RATED ITEM	A	M	U	EVALUATION	REMARKS
SECTION I				***FOR INTERNAL USE AND EVALUATION***	
1. Pump Station Size	A			Pump station has adequate capacity (considering pumping capacity, ponding areas, Compare Fill/Empty times with Design, etc.). (A or U.)	An 8" portable Godwin pump (2800 GPM @ 20' TDH) was provided to the IADNR in October 1999 to supplement pumping between the WMUs. The actual filling time for the WMUs is greater than the design filling times.
SECTION II				***FOR LOCAL SPONSOR USE***	
2. O&M Manual	A			O&M Manual is present and adequately covers all pertinent areas. (A or U.)	A draft Corps Operations and Maintenance Manual is dated April 1999 and was used internally to assist with this inspection. All equipment O&M manuals are kept at the Green Island project office. Recommendation: The O&M information should include a pump curve for the pump. The pump station operators and maintenance personnel should review the manuals biannually for routine maintenance to be identified and performed as recommended by the equipment manufacturers. Identify such review and maintenance in the operation logbook. Maintain good record keeping and perform the required maintenance as outlined in the operation and maintenance manuals.
3. Operating Log	A			Pump Station Operating Log is present and being used. (A or U.)	A daily log is maintained during pumping periods. The operating hours, filter/oil changes, problems, and quantity of fuel used is recorded. Recommendation: The logbook should be in a notebook, 3-ring binder or bound logbook and should be in neat tabular form. Entries in the logbook should indicate such items as date, water elevations, and periodic lubrication, pump hours or running time, maintenance/repairs, and special events that are significant in nature. The logbook should be stored and protected in the same location and manner as operation and maintenance manuals. Protection provided shall be moisture and rodent proof. The logbook should also include sections for pump performance testing, pump overhaul or service work performed, sump maintenance, pump discharge outlet work, and forebay cleaning (dredging), etc. Include in the logbook brief descriptions of any service work or maintenance. These descriptions could possibly be located in their own section that could be separate from the daily entries if space does not allow for it.

PUMP STATION MAINTENANCE INSPECTION GUIDE

RATED ITEM	A	M	U	EVALUATION	REMARKS
4. Annual Inspection	A			Annual inspection is being performed by the local sponsor. (A or U.)	The pump is removed annually to prevent winter ice damage and is stored in the pump station building. The pump is inspected at that time. Recommendation: The local sponsor should perform routine maintenance in accordance with the operation and maintenance manuals for the equipment. Annual inspection dates, discrepancies that are found and actions taken should be entered into the logbook. Recommend that a written checklist be developed for the annual inspection to ensure it is performed in accordance with manufacturer's recommendations as described in the operation and maintenance data.
5. Plant Building	A			A Plant building is in good structural condition. No apparent major cracks in concrete, no subsidence, roof is not leaking, etc. Intake louvers clean, clear of debris. Exhaust fans operational and maintained. Safe working environment. M Spalling and cracking are present, or minimal subsidence is evident, or roof leaks, or other conditions are present that need repair but do not threaten the structural integrity or stability of the building. U Any condition that does not meet at least Minimum Acceptable standard.	The electric generator for the pump station building electrical is stored off site at the Green Island project office. The building is made of concrete and is in good condition.
6. Pumps	A			A All pumps are operational. Preventive maintenance and lubrication are being performed. System is periodically subjected to performance testing. No evidence of unusual sounds, cavitation, or vibration. M All pumps are operational and deficiencies/minor discrepancies are such that pumps could be expected to perform through the next period of usage. U One or more primary pumps are not operational, or noted discrepancies have not been corrected.	The pump and impeller were visually inspected and appeared to be in good condition. The IADNR recently replaced a hydraulic seal on the pump. Recommendation: Continue annual maintenance and inspection of the pump.

PUMP STATION MAINTENANCE INSPECTION GUIDE

RATED ITEM	A	M	U	EVALUATION	REMARKS
7. Motors, Engines and Gear Reducers	A			A All items are operational. Preventive maintenance and lubrication being performed. Systems are periodically subjected to performance testing. Instrumentation, alarms, and auto shutdowns operational. M All systems are operational and deficiencies/minor discrepancies are such that pumps could be expected to perform through the next expected period of usage. U One or more primary motors are not operational, or noted discrepancies have period of usage.	A oil-sending unit was replaced on the engine driver in 2000. The engine coolant system has a coolant leak on the radiator that needs repaired. Recommendation: Repair the coolant leak to prevent accidental engine over heat. Perform operation and maintenance to the engine driver and hydraulic system in accordance with the operation and maintenance manuals. Replace engine lubricant, filters and hydraulic fluid as recommended by the engine maintenance schedule.
8. Sumps/Trash Racks		M		**SPECIAL INSTRUCTIONS:** *Measure silt accumulation in sumps and trash racks. Measure water depth at inlet and outlet.* A Sumps/Trash Racks are free of concrete deterioration, protected from Permanent damage by corrosion and free of floating and sunken debris. Sumps are clear of Accumulated silt. Passing debris is minimized by spacing of trash rack bars. Periodic maintenance performed on trash racks and removal of accumulated silt in sumps is performed. M Trash racks and sumps have some accumulated silt or debris but are not currently inhibiting the pump(s) performance. No periodic maintenance has been performed. Present condition could be expected to perform through the next expected period of usage provided removal of floating debris is accomplished. U Proper operation can not be ensured through the next period of usage. Possible damage could result to the pumping equipment with continued operation.	The IADNR installs the sump bulkheads when the pump is removed for winter storage. The trash rack is also removed to facilitate pump removal. A large submerged stone is currently lodged in the vicinity of the trash rack and is preventing the trash rack from being reinstalled. The sump was measured for silt accumulation. 8” of sand was measured outside the bulkhead and 1 1/2” of silt was measured inside the sump behind the bulkhead. Recommendation: Remove the large stone to reinstall the trash rack when the pump is reinstalled. Clean the sump of accumulated silt and sand prior to pumping operations to prevent wear to the pump and deposition within the WMUs. Dates of any maintenance or cleaning performed should be logged into the operation logbook.

PUMP STATION MAINTENANCE INSPECTION GUIDE

RATED ITEM	A	M	U	EVALUATION	REMARKS
9. Other Metallic Items	A			A All metal parts in plant/building are protected from permanent damage by corrosion. Equipment anchors and grout pads show no rust or deterioration. M Corrosion on metallic parts (except equipment anchors) and deterioration period of usage. U Any condition that does not meet at least Minimum Acceptable standards.	Engine ductwork and louvers were in good condition.
10. Ancillary Equipment i.e. Compressed Air Siphon Breakers Fuel Supply Vacuum Priming Pump Lubrication Heating/Ventilation Engine Cooling Engine Oil Filtering		M		A All equipment operational. Preventive and annual maintenance being performed. Equipment operation understood and followed by pump station operators. M Ancillary equipment is operational and deficiencies/minor discrepancies are such that equipment could be expected to perform through the next period of usage. U One or more of the equipment systems is inoperable. The present condition of the inoperable equipment could reduce the efficiency of the pump station or jeopardize the pump station's role in flood protection.	Bulk fuel tank and trailer-mounted day tank were in good condition. Engine cooling system has a small leak as previously noted. The pump station operators should be reminded to perform pumping with the valve, next to the door of the pump station building, open for increased pumping capacity. The battery box for the engine had rodents living in it. Recommendation: Repair coolant leak in radiator. Rodent proof the engine battery box.
11. Backup Ancillary Equipment	A			A Adequate, reliable, and enough capacity to meet demands. Backup units/equipment are properly sized, operational, periodically exercised, and in an overall well maintained condition. M Backup ancillary equipment is operational and deficiencies/minor discrepancies are such that equipment could be expected to perform through the next period of usage. U Backup ancillary equipment not considered reliable to sustain operations during flooding conditions.	Not Applicable
12. Pump Control System	A			A Operational and maintained free of damage, corrosion, or other debris. M Operational with minor discrepancies. U Not operational, or uncorrected discrepancies noted from previous inspections.	Pump station is operated manually.

PUMP STATION MAINTENANCE INSPECTION GUIDE

RATED ITEM	A	M	U	EVALUATION	REMARKS
13. Intake and Discharge Outlets	A			Functional. No damaging erosion evident. Opening/closing devices for vertical gates, flap gates, etc. are functional in a well-maintained condition. (A or U.)	Gaskets for the aluminum stoplogs were glued and screwed to the aluminum. The flap gate was in good condition. The gravity outlet gatewell appeared to be in good condition.
14. Insulation Megger Testing (For pump stations with Electric pumps only)				A Megger test has been performed within the last 36 months. Results of megger test show that insulation of primary conductors and electric motor meet manufacturer's or industry standard. M Results of megger test show that insulation resistance is lower than manufacturer's or industry's standard, but can be expected to perform satisfactorily until next testing or can be corrected. U Insulation resistance is low enough to cause the equipment to not be able to meet its design standard of operation.	Not Applicable.

15. Final Remarks

GENERAL INSTRUCTIONS

1. All items on this guide must be addressed and a rating given.
2. The lowest single rating given will determine the overall rating for the pump station.
3. Additional areas for inspection will be incorporated by the inspector into this guide if the layout or physical characteristics of the pump station warrant this. Appropriate entries will be made in the REMARKS block.
4. Rating Codes:
   - A - Acceptable
   - M - Minimally Acceptable
   - U - Unacceptable

SPECIFIC INSTRUCTIONS

SECTION I. Actual fill and emptying times for the project shall be compared with design data and size of management unit to assess adequacy of design.

Princeton Pumping for 2004

date	hours	S water level	N water level	oil/fuel	rain/other
7-Sep	129.9	573.6	574.7		
8-Sep	159.3	573.9	574.7		try repair exhaust
9-Sep	177.4	574.19	574.7	298 gal	
10-Sep	202.5	574.45	574.7	191 gal	
11-Sep	230	574.64	574.7		
12-Sep	253.7	574.78	574.7		
13-Sep	274.2	574.9	574.7	463 gal; oil change	
14-Sep	298.3	575	574.7		
15-Sep	323.1	575.2	574.75	371 gal	
16-Sep	347.1	575.32	574.8		
17-Sep	377.6	575.4	574.8	403 gal	shut down for 1st season
21-Sep	403.5	575.3	575.25		filling N pool, small amt to S pool
22-Sep	427.6	575.28	575.42	410 gal; oil, fuel filter, lubrifiner change	
23-Sep	452.6	575.25	575.6		
24-Sep	476.8	575.28	575.8	364 gal	
25-Sep	495.6	575.28	575.9		shut down
4-Oct	501.1	575.05	575.62	0.4 in rain	
5-Oct	522.2	575	575.85		
6-Oct	550.2	575	576	464 gal; oil change	
7-Oct	570.1	574.98	576.05		
8-Oct	602.7	575.05	576.15	0.5 in rain; 335 gal	
9-Oct	620.6	575	576.3		
10-Oct	645.4	575	576.4		
11-Oct	664.5	574.98	576.45	431 gal	
12-Oct	688.7	574.98	576.5	oil, fuel filter, lubrifiner change	fill S pool only
13-Oct	711.9	575.1	576.55	359 gal	
14-Oct	735.3	575.25	576.5		
15-Oct	759.7	575.38	576.52	374 gal	fill N pool only
16-Oct	780.6	575.38	576.55		
17-Oct	808.6	575.32	576.6		
18-Oct	831.1	575.31	576.68	431 gal	
19-Oct	854.6	575.3	576.7		
20-Oct	879.8	575.28	576.75	388 gal	
21-Oct	904.4	575.24	576.8	oil change	fill S pool only
22-Oct	905.8	575.25	576.8	381 gal	
23-Oct	924	575.48	576.82	0.75 in rain	
24-Oct	948.1	575.54	576.82		shut down
19-Nov	971.8	575.32	576.3	770 gal	fill N pool only
20-Nov	998.8	575.3	576.35		
21-Nov	1023.7	575.3	576.4		
22-Nov	1045.2	575.28	576.55	414 gal	
23-Nov	1070.6	575.28	576.62		
24-Nov	1094.6	575.28	576.65	346 gal	
25-Nov	1118.6	575.25	576.75		
26-Nov	1142.3	575.25	576.85	oil change and pull pump head	shut down

total run hours - 1012.4	oils cost - $196.90	cost/hour operation - $11.93
fuel purchased - 6924 gal	other service cost - $480.00	pumped water on 46 days
fuel cost -$10987.71	Total cost - $12072.39	raise south pool 2.35 feet in 3 runs
parts, labor cost - $407.78	gal fuel/hour operation - 6.84	raise north pool 2.26 feet in 4 runs
kwh electricity for **ALCOA marsh additions** - 37349		**sub impoundment pump** fuel - 239 gal
cost electricity for ALCOA marsh additions - $3066.15		sub impoundment pump fuel cost - $394.12
cost repairs ALCOA marsh well pump - $3600		

From: randy robinson
To: Dolan, Robert
Date: 1/24/03 4:24PM
Subject: water pump costs

you asked for a report on water pump costs we had been paying for through R. Bishops cost center that we paid through ag lease deductions this year. this is it

$6715.79 - fuel for G.I.pumps
$5588.50 - fuel for Princeton pumps
$395.41 - parts for CAT engine at G.I.
$211.10 - parts, filters for G.I. and Princeton engines
$423.90 - oil for G.I. and Princeton engines
$935.00 - excavator to set Princeton pump and clean out delivery channels
$340.00 - excavator to remove Princeton pump at end of season

$14609.70

in addition to the above we spent $176.06 on CAT parts paid through our cost center
in addition to the above we spent $1109.09 on electricity for the ALCOA marsh water pump at Princeton paid through our cost center

CC: Sheets, Bob

			Princeton Pumping for 1999		
date	hours	S water le	N water le	oil/fuel	fill south end only
8-Sep	1789.1	72.97	75		
9-Sep	1810.4	73.4			
10-Sep	1833.9	74.02		308 gal fuel	
11-Sep	1856.9	74.3			
12-Sep	1880.6	74.54			
13-Sep	1905.5	74.72		421 gal fuel, oil change	
14-Sep	1935.8	75			
15-Sep	1959.3	75.1		343 gal fuel	
16-Sep	1983.2	75.25			
17-Sep	2008.5	75.35		329 gal fuel	
27-Sep	2010.7	75.1		oil change	start fill north end
28-Sep	2034.9	75.31			2" rain, south pool full, filling north pool only
29-Sep	2059.5	75.33		322 gal fuel	
30-Sep	2082.3	75.34	76.3		
1-Oct	2108.5	75.31	76.35	351 gal fuel	0.5" rain
4-Oct	2117.2	75.3	76.3	17 gal fuel, oil change	
5-Oct	2138.4	75.3	76.31		
6-Oct	2165.1	75.3	76.31	328 galk fuel	
7-Oct	2186.5	75.29	76.31		
8-Oct	2209.7	75.28	76.32	342 gal fuel	
11-Oct	2215	75.17	76.2	oil change	
12-Oct	2237	75.16	76.22		
13-Oct	2263	75.12	76.35	369 gal fuel	
14-Oct	2287.1	75.1	76.37		
15-Oct	2310.8	75.08	76.48	338 gal fuel	
18-Oct	2315.1	75	76.4	oil change	intake trash rack plugging with leaves
19-Oct	2338.6	75	76.4		
20-Oct	2356	75	76.5	384 gal fuel	
21-Oct	2357	75	76.48	fuel filters plugged, changed	
23-Oct	2404.5	75	76.5	174 gal fuel	
25-Oct	2411.7	75	76.5		
26-Oct	2433.4	75	76.57	oil change	
27-Oct	2442.3			461 gal fuel	Murphy switch shutdown
28-Oct	2442.3				restart
29-Oct	2471.5	74.9	76.6	208 gal fuel	Murphy switch shutdown
1-Nov	2475.2	74.9	76.5	fuel filters plugged, changed	restart, trash rack taken off intake
2-Nov	2499.3	75	76.42		filling south and north pools
3-Nov	2522.2	75.13	76.4	339 gal fuel, oil change	
4-Nov	2546.7	75.28	76.5		
5-Nov	2569.2	75.35	76.35	329 gal fuel	filling north pool only
6-Nov	2592.6	75.32	76.52	138 gal fuel	
7-Nov	2618.1	75.3	76.53		
8-Nov	2641.3	75.3	76.63	359 gal fuel	
9-Nov	2664.2	75.29	76.78	oil change	
10-Nov	2687.8	75.25	76.84	330 gal fuel	
11-Nov	2712.3	75.21	76.91		
12-Nov	2737.1	75.21	77	356 gal fuel	switched to fill south pool only
13-Nov	2760.8	75.35	76.9		
14-Nov	2783.5	75.48	76.8		
15-Nov	2800.4	75.5	76.75	425 gal fuel, oil change	trash rack replaced
				tank full end pump year	pump head removed from intake
total run hours - 1011.3					
fuel purchased - 6971 gal				raised water 3.08 ft south pool in 3 runs	
fuel cost - $5778.96				raised water 2.0 ft north pool	
parts cost - $181.72				gal fuel/hour operation - 6.89	
oils cost - $174.9				pumped water on 50 days	
other service cost - $490				cost/hour of operation - $6.55	

			Princeton Pumping for 1998		
date	hours	S water leve	N water leve	oil/fuel	other
21-Sep	1328.5	573.9	575		
22-Sep	1348.8	574.04		374 gal	
23-Sep	1373.4	574.2	575.2		0.5" rain, hydraulic oil leak
24-Sep	1397	574.43			shut down, massive Brevini unit failure
12-Oct	1398.4	574.45			rebuilt Brevini unit, restart
13-Oct	1423.9	574.46	575.5	engine oil change	small hydraulic oil leak
14-Oct	1445	574.46	575.64	452 gal	3" rain, shut down, lower seal failure
21-Oct		574.9	575.9		restart, pumping water to N end only
22-Oct	1467.8	574.8			
23-Oct	1493.3	574.9	576.6	318 gal	
24-Oct	1518	574.9	576.5		
25-Oct	1543.2	574.9	576.6		
26-Oct	1560.1	574.9	576.4	472 gal, engine oil change	
27-Oct	1588	575	576.6		
28-Oct	1613.3	575	576.6	305 gal	
29-Oct	1631.8	575	576.7		
30-Oct	1652	575	576.6	360 gal, engine oil change	
31-Oct	1679	575	576.7		
1-Nov	1707.4	575	576.8		
2-Nov	1730.2	575	576.8	466 gal	small hydraulic oil leak
3-Nov	1749.5	575	576.9		pumping water to S end only
4-Nov	1776.1	575.1	576.9	366 gal, engine oil change	
5-Nov	1784.9	575.3	576.9		quit
12-Nov				100 gal	pull pump, another hydraulic leak to fix
total run hours =456.4				raised water 1.4 ft south pool	
fuel purchased = 3 213 gal				raised water 1.9 ft north pool	
fuel cost = $2165.56				gal fuel/ hour operation = 7.04	
parts cost = $2422.26				pumped water on 23 days	
repair service cost = $1821.1				cost/ hour of operation = $15.58	
other service cost = $700					
total costs = $7108.92					

Princeton Pump History

Year	Total Hours Run	Days	Gal Fuel	Cost Fuel	Other Cost	Total Cost
1990	306	12	1905	$2079.84	$1288.85	$3368.69
1991	541	26	3282	2403.31	251.25	2654.56
1992	228	20	2161	1705.03	655.63	2360.66
1993	Flood					
1994	841	37	5538	3915.37	1472.89	5688.26
1995	692	32	4715	3234.03	3315.64	6549.67
1996-97	Construction					
1998	456	23	3213	2165.56	4943.36	7108.92
1999	1011.3	50	6971	5778.96	846.62	6625.58
2000	956	48	6426	8540.17	1700.41	10240.58
2001	684.6	35	4501	5221.16	893.79	6114.95
2002	743.2	32	5060	5206.74	1501.98	6708.72
2003	1075	56	7100	7505.27	1981.42	9486.69
2004	1012.4	46	6924	10987.71	1084.68	12072.39

History of Princeton Pumping

Year	Water Level Rise / Ending Level adjusted to COE survey	Total Hours	Days	Gal Fuel	Cost Fuel	Total Other Costs	Total Cost	$/hour	Hrs/ft Water raise	Gal fuel / Hour
1990	0.32 ft / 75.56	306	12	1905	2079.84	1288.85	3368.69	11.00	956	6.23
1991	1.78 ft / 75.58	541	26	3282	2403.31	251.25	2654.56	4.91	304	6.06
1992	0.44 ft / 75.46	228.	20	2161	1705.03	655.63	2360.66	10.35	518	9.47
1994	2.50 ft / 75.9	841	37	5538	3915.37	1472.89	5388.26	6.41	336	6.58
1995	1.63 ft / 75.93	692	32	4715	3234.03	3315.64	6549.67	9.47	425	6.81
1998	1.4 ft S 1.9 ft N / 75.3 S 76.9 N	456	23	3213	2165.56	4943.36	7108.92	15.58	138	7.04
1999	3.08ft S 2.0ft N / 75.5 S 77.0 N	1011.3	50	6971	5778.96	846.62	6625.58	6.55	199.	6.89

Notes:
1990 - replaced hydraulic oil
1992 - fuel oil spill, vandalism
1993 - Great Flood, no pumping
1994 - underwater hydraulic oil leak, replace some hydraulic oil
1995 - rebuild hydraulic pump, replace hydraulic oil
1998 - rebuild Brevini and propeller drive units, 1st start after EMP project
1999 - very dry fall - intake trash rack plugs with leaves and must be removed

APPENDIX G

PHOTOGRAPHS OF PROJECT FEATURES

Photo 1

Photo 2

Photo 3

Photo 4

Photo 1 – October 2, 2001 – NWMU borrow area south of transmission line
Photo 2 – October 2, 2001 – NWMU borrow area in northwest corner
Photo 3 – October 2, 2001 – Northeast corner NWMU before Stage III construction
Photo 4 – December 19, 2001 – Northeast corner NWMU after Stage III construction

Photo 5

Photo 6

Photo 7

Photos 5, 6, & 7 – Stage IV initiation, geotextile fabric removal and roadway excavation

Photo 8

Photo 9

Photo 10

Photo 11

Photo 12

Photos 8 & 9 – Stage IV, placement of excavated material along interior slope and shaping
Photos 10 & 11 – Stage IV, placement of granular surfacing along roadway & compacting
Photo 12 – Stage IV, entrance to parking lot near west end of overflow roadway

Photo 13

Photo 14

Photo 15

Photo 16

Photo 17

Photo 18

Photos 13 through 18 – Stage IV seeding, fertilizing, and mulching

Photo 19

Photo 29

Photo 21

Photo 22

Photo 23

Photos 19 through 23 – Stage IV completion

Photo 24 – Mast trees, rodent damage

Photo 25 – Mast trees, weed competition

APPENDIX H

PROJECT TEAM MEMBERS

TABLE H-1 Princeton HREP PDT Members							
POC	**Position**	**Agency**	**Address**	**City, State Zip Code**	**Telephone Number**	**FAX Number**	**Email Address**
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APPENDIX I

REFERENCES

REFERENCES

Published reports relating to the Princeton HREP or which were used as references in the production of this document are presented below.

(1) *Definite Project Report (R-10F) with Integrated Environmental Assessment, Princeton Wildlife Management Area, Upper Mississippi River System Environmental Management Program, Pool 14, Mississippi River Miles 504.0 – 506.5, Scott County, Iowa, February 1995*. The report marks the conclusion of the planning process and serves as a basis for approval of the preparation of final plans and specifications and subsequent project construction.

(2) Shop Drawings, October 1999. These documents were submitted to provide detailed O&M instructions for specific pieces of equipment as recommended by the manufacturer.

(3) Plans and Specifications, *Upper Mississippi River System, Environmental Management Program, Pool 14, River Miles 504.0 thru 506.4, Princeton Wildlife Management Area, Stage II, November 2000*, Solicitation No. DACW25-00-T-0003. These documents were prepared to provide sufficient detail for construction of the cross dike ditch and water control structures.

(4) *Draft Operation and Maintenance Manual, Princeton Wildlife Management Area, Upper Mississippi River Environmental Management Program, Pool 14, River Miles 504.0 - 506.4, Scott County, Iowa, March 2001*. This manual was prepared to serve as a guide for the O&M of the Princeton HREP. O&M instructions for major features of the project are presented.

(5) Plans and Specifications, *Upper Mississippi River System, Environmental Management Program, Pool 14, River Miles 504.0 thru 506.4, Princeton Wildlife Management Area, May 2001*, Solicitation No. DACW25-95-R-0024. These documents were prepared to provide sufficient detail for construction of the wetland management unit, which consisted of levee restoration, water control improvements, and mast tree planting.

(6) *Post-Construction Performance Evaluation Report – Year 3 (2001) and Flood Damage Assessment (2001), Upper Mississippi River System, Pool 14, Mississippi River Miles 504.0-506.4R, Scott County, Iowa, November 2001*. This report provides a summary of the monitoring data, field observations, and O&M, as well as an assessment of the spring 2001 flood damages.

(7) Plans and Specifications, *Upper Mississippi River System, Environmental Management Program, Pool 14, River Miles 504.0 - 506.4, Scott County, Iowa, Princeton Wildlife Management Area, Stage III, Emergency Levee Repairs, Lease of Equipment, January 2002*. These documents were prepared to provide sufficient detail for

construction of a setback levee and repair of scour areas along the north perimeter levee from the flood of 2001.

(8) Plans and Specifications, *Upper Mississippi River System, Environmental Management Program, Pool 14, River Miles 504.0 - 506.4, Scott County, Iowa, Princeton Wildlife Management Area, Stage IV, Repair Overflow Roadway*. These documents were prepared to provide sufficient detail for the construction of the setback levee and repair of the scour areas along the overflow roadway (spillway) from the flood of 2001.

APPENDIX J

DISTRIBUTION LIST

DISTRIBUTION LIST

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INTERNAL DISTRIBUTION:
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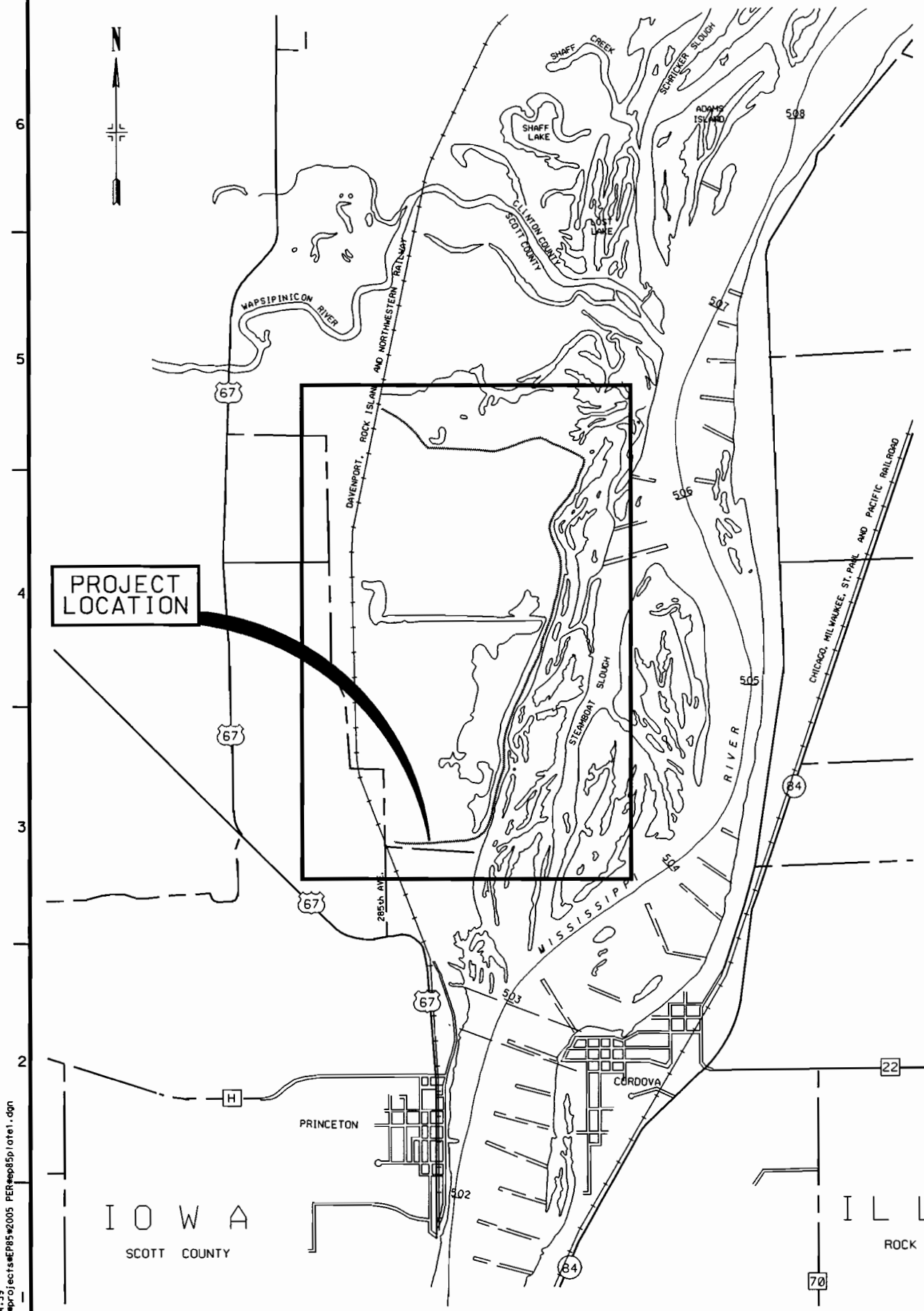
CEMVR-CD
CEMVR-CD-C
CEMVR-ED
CEMVR-ED-D
CEMVR-ED-DN (2)
CEMVR-ED-DG (Fellman)
CEMVR-ED-H
CEMVR-ED-HQ
CEMVR-ED-HQ (Bierl)
CEMVR-ED-G
CEMVR-OD-M
CEMVR-OD-MN
CEMVR-OD-MN (Swenson)
CEMVR-IM-CL (2)

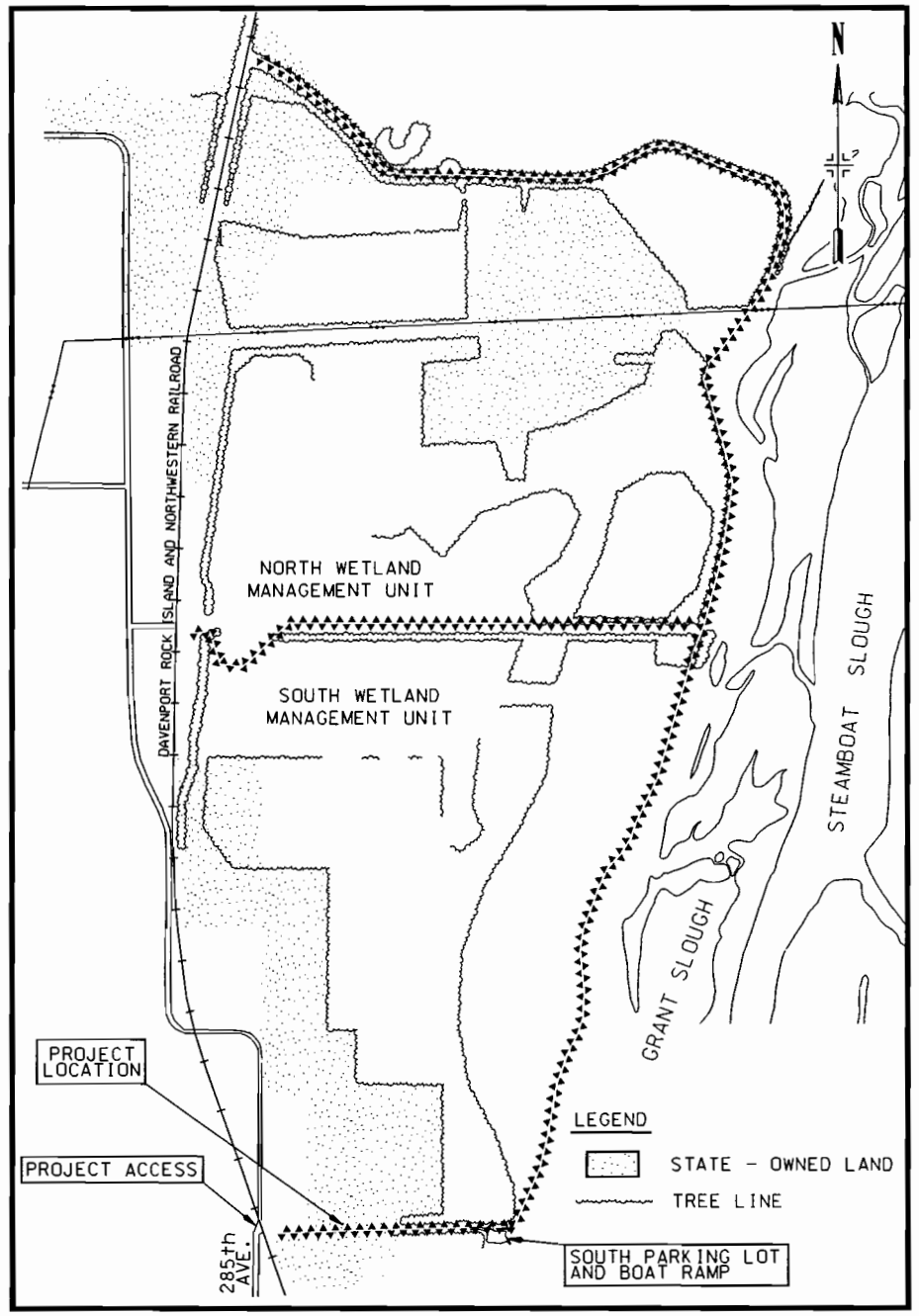
APPENDIX K

PLATES



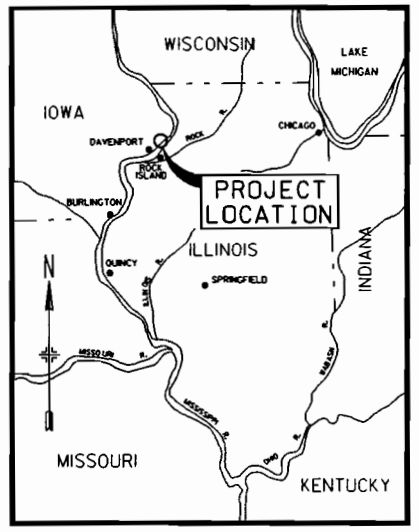
LOCATION MAP

½ mi 0 ½ mi 1 mile
SCALE IN MILES



SITE MAP

¼ MI ⅛ MI 0 ¼ MI ½ MI
SCALE IN MILES



VICINITY MAP

25 0 25 50 75
SCALE IN MILES

GENERAL NOTES:

1. THE SCOPE OF WORK GENERALLY CONSISTS OF, BUT IS NOT LIMITED TO:
   A. LOWER APPROXIMATELY 2300 FEET OF OVERFLOW ROADWAY.
   B. PLACE APPROXIMATELY 3 INCHES OF GRANULAR SURFACING.
2. THE ENTIRE INTERIOR OF THE CONSTRUCTION SITE IS PROTECTED BY LEVEES, AND THE GROUNDWATER LEVELS ARE HIGHLY INFLUENCED BY VARYING RIVER STAGES.
3. THE LAYOUT OF THE PROJECT FEATURES AND CONSTRUCTION WORK LIMITS AS SHOWN SHALL BE FIELD STAKED AND APPROVED BY THE CONTRACTING OFFICER PRIOR TO CONSTRUCTION.
4. THE MAJORITY OF THE TOPOGRAPHICAL CONTOURS SHOWN WERE DEVELOPED FROM FIELD AND AERIAL SURVEYS TAKEN PRIOR TO THE FLOOD OF 1993. ACTUAL CONTOURS MAY VARY.

INDEX

US Army Corps of Engineers Rock Island District

Revisions				
Description	Date	Approved		

Designed By: RCF
Drawn By: RLC
Checked By: KJD
Reviewed By: KJS
Dates: 12 SEP 05
Scale: AS SHOWN
Project Code: EP85
Solicitation Number: DACW25-04-R-xxxx

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

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 14 - RIVER MILES 504.0-506.4
SCOTT COUNTY, IOWA

LOCATION MAPS, GENERAL NOTES, AND INDEX

Sheet Reference Number: X2
Sheet 2 of xx

PLATE 1

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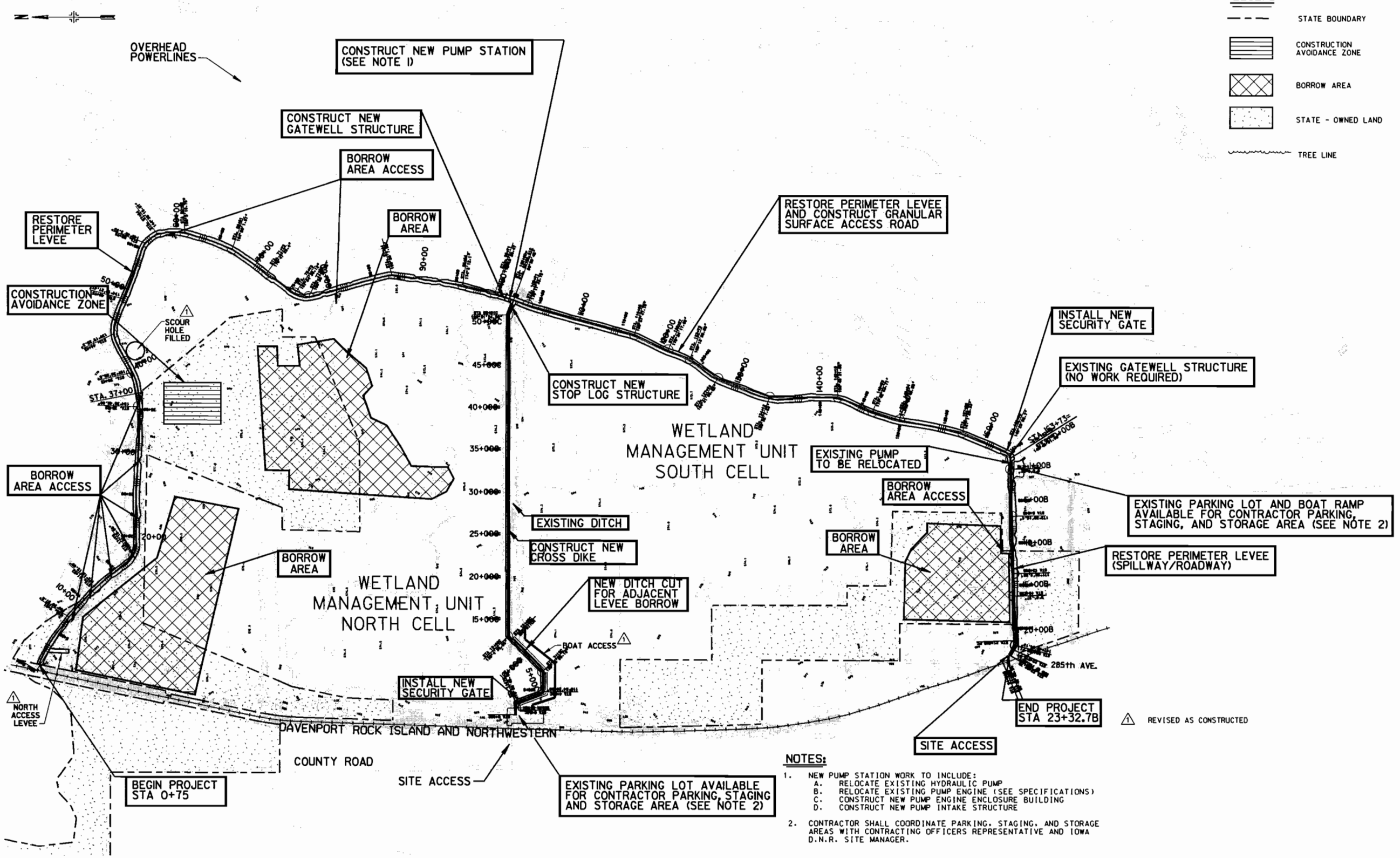

LEGEND

- STATE BOUNDARY
- CONSTRUCTION AVOIDANCE ZONE
- BORROW AREA
- STATE - OWNED LAND
- TREE LINE

⚠1 REVISED AS CONSTRUCTED

NOTES:

1. NEW PUMP STATION WORK TO INCLUDE:
   - A. RELOCATE EXISTING HYDRAULIC PUMP
   - B. RELOCATE EXISTING PUMP ENGINE (SEE SPECIFICATIONS)
   - C. CONSTRUCT NEW PUMP ENGINE ENCLOSURE BUILDING
   - D. CONSTRUCT NEW PUMP INTAKE STRUCTURE
2. CONTRACTOR SHALL COORDINATE PARKING, STAGING, AND STORAGE AREAS WITH CONTRACTING OFFICERS REPRESENTATIVE AND IOWA D.N.R. SITE MANAGER.

SITE PLAN

US Army Corps of Engineers Rock Island District

Revisions	Description	Date	Approved
Symbol			

Designed By: XXX	Date: 12 SEP 05		
Drawn By: XXX	Scale: AS SHOWN		
Checked By: XXX	Project Code: EP85		
Reviewed By: XXX	Solicitation Number: DACW25-04-R-XXXX		

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

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POOL 14 - RIVER MILES 504.0-506.4 SCOTT COUNTY, IOWA

SITE PLAN

Sheet Reference Number: C1
Sheet 4 of XX

PLATE 2

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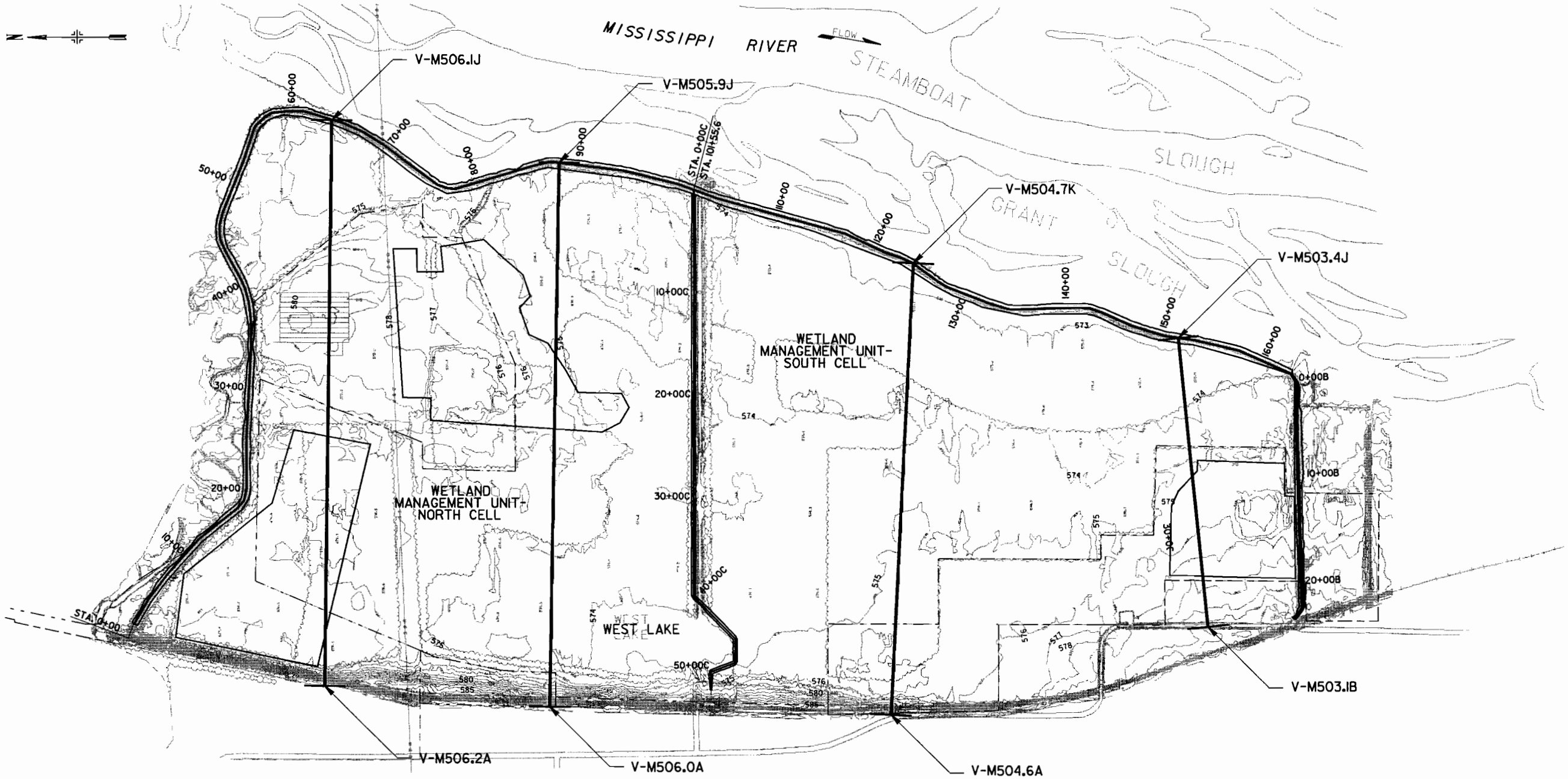

TYPE OF MEASUREMENT

TRANSECT — V=VEGETATION

LOCATION CODE

-M —— =MISSISSIPPI RIVER
-.545.8 =RIVER MILE
- —— H =ALPHA DESIGNATOR
Z =LEFT DESCENDING BANK
A =RIGHT DESCENDING BANK

500 250 0 500 1000FT
SCALE: 1" = 500

MONITORING PLAN

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US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: XXX		Date: 12 SEP 05	
Drawn By: XXX		Scale: AS SHOWN	
Checked By: XXX		Project Code: EP85	Solicitation Number: DACW25-04-R-XXXX
Reviewed By: XXX			

U.S. ARMY ENGINEER DISTRICT
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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
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MONITORING PLAN

Sheet Reference Number:
MP-1
Sheet 24 of XX

PLATE 3