DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
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REPLY TO
ATTENTION OF

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January 15, 2004

Planning, Programs, and
Project Management Division

SEE REPORT DISTRIBUTION LIST

The Rock Island District of the U.S. Army Corps of Engineers (Corps) has enclosed for your use the Post-Construction Performance Evaluation Report (PER) for the Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project (HREP) dated May 2002, 10-years after construction and the 11-Year Post Construction Addendum Report, dated September 2003. The 10-Year report is a product of post-construction field observations from September 1994 through December 2001. The 11-Year Addendum report is a supplemental product of post-construction observations from January thru December 2002.

Performance Evaluation Reports (PER), both initial and supplemental, are the Corps of Engineers primary mechanism for reviewing, documenting, and communicating the effectiveness of HREPs, which are a part of the Upper Mississippi River System Environmental Management Program (UMRS-EMP). The main purposes of PERs are to summarize project performance and operation and maintenance efforts, based on the goals/objectives, and to review the monitoring plan and performance criteria to aid in the design of future HREPs.

A draft of each report was provided to the project sponsors for their review and comment. Those comments were incorporated into the respective final PERs. If you have any questions regarding these reports, please contact Ms. Alaena Ensey in the Design Branch, Engineering Division, telephone 309/794-5265.

Sincerely,

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

2 Encls

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST CONSTRUCTION PERFORMANCE EVALUATION REPORT
(10-YRS AFTER CONSTRUCTION)

BERTOM AND McCARTNEY LAKES
HABITAT REHABILITATION AND ENHANCEMENT PROJECT

MAY 2002

US Army Corps
of Engineers
Rock Island District

POOL 11
UPPER MISSISSIPPI RIVER MILE 599-603
GRANT COUNTY, WISCONSIN

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
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CEMVR-PM-M

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POST-CONSTRUCTION PERFORMANCE EVALUATION REPORT (10-Yrs After Construction)

BERTOM AND McCARTNEY LAKES HABITAT REHABILITATION AND ENHANCEMENT PROJECT

MISSISSIPPI POOL 11, RIVER MILES (RM) 599 - 603 GRANT COUNTY, WISCONSIN

MAY 2002

ACRONYMS

Corps	U.S. Army Corps of Engineers, Rock Island District
DA	Damage Assessment
DPR	Definite Project Report
EMP	Environmental Management Program
HREP	Habitat Rehabilitation and Enhancement Project
LTRMP	Long-Term Resource Monitoring Program
O&M	Operation and Maintenance
PER	Performance Evaluation Report
RM	River Mile
SCS	Soil Conservation Service
SPER	Post-Construction Supplemental Performance Evaluation Report
UMESC	Upper Midwest Environmental Sciences Center
UMRS	Upper Mississippi River System
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
WHAG	Wildlife Habitat Appraisal Guide

Additional information about the Bertom and McCartney Lakes HREP and the UMRS-EMP is available via the Internet at the following addresses: www.mvr.usace.army.mil/EMP/default.htm , www.mvr.usace.army.mil, or http://www.mvr.usace.army.mil/EMP/hrep/bertom.htm

Executive Summary

Upper Mississippi River System Environmental Management Program Post Construction Supplemental Performance Evaluation Report

For

Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project (10-Yrs After Construction)

General. As stated in the 1989 Definite Project Report (DPR), the Bertom and McCartney Lakes project was initiated primarily because sedimentation was occurring in this backwater complex due to normal fluvial processes of the river and erosion from adjacent upland drainage systems. Sedimentation had decreased the extent and diversity of aquatic habitat in the project area. Turbidity associated with resuspension of recently deposited fine-grained sediments and substrate burial, combined with isolated spring-fed areas were resulting in less than optimal conditions for aquatic life.

Purpose. The purpose of this report is to provide a summary of the observations for the performance evaluation monitoring that has been ongoing since September 1994 and the completion of the last Performance Evaluation Report, dated May 1995.

Goals. There are two goals for this project and they are;

1) Enhance Aquatic Habitat, and
2) Enhance Migratory Waterfowl Habitat.

Observations and Conclusions. For the report period of September, 1994 to December, 2001, the objectives to meet each goal had the following observations and conclusions.

1) Enhance Aquatic Habitat:

a. Restore Deep Aquatic habitat. The goal of this project feature is to restore deep aquatic habitat ($\geq$ 6') that will be beneficial during low pool levels and winter months. Target fish sampling efforts indicate an increase in fish use in the project area.

The habitat loss per year due to sediment accumulation was predicted to be 1 ac-ft per year. The original created habitat volume, 290 ac-ft, was larger than designed, 250 ac-ft. The rate of volume loss has been greater than predicted, being 3.9 ac-ft/yr vs. 1 ac-ft/yr. Experience at other EMP-sponsored dredged channels shows that sediment accumulation in the channels is often at a higher rate compared to the surrounding area, at least in the time period immediately after construction. It is anticipated that this rate will decrease.

The original estimate of deep aquatic habitat volume present at the end of the project life (50 years) was 200 ac-ft. At the present rate of 3.9 ac-ft/yr, deep aquatic habitat volumes would be reduced to 200 ac-ft by the year 2014. Based on experience with other EMP projects, the deep aquatic habitat volume would be reduced to 225 ac-ft by the year 2014. This higher than expected sedimentation rate is a concern that requires further analysis.

Currently, the project is meeting its goal of providing deep aquatic habitat volume, but the rate of loss of aquatic habitat volume due to sediment deposition appears to be larger than anticipated based on the sediment transects collected in 1993 and 1998. To determine if the rate of loss is consistent, another set of sediment transects will be

collected in 2002 and further evaluation of the deep aquatic habitat volumes will be provided in the next performance evaluation report. Spatial surveys of the project area have been suggested by the Wisconsin DNR to better represent the bathymetry changes in the project area. After the next channel survey is performed the data will be examined from project initiation through project history. An attempt will be made at that time to quantify the amount of sediment deposition possibly attributable to channel side slope sloughing.

b. Restore Lentic Lotic Habitat Access Cross-Sectional Area. The measurement for analyzing this feature is hydrographic soundings and site observations. For the report period, no hydrographic soundings have been performed at the access areas where the dredged channels merge with the deeper, open water areas. However, observations by the USFWS (Mr. Clyde Male) note that no littoral zone development has occurred. Also, a channel leading to Area A has enlarged post-construction, probably due to high flows in 1993 and 1997. The channel size increase is suspected of increasing flow and affecting winter water quality for the overwintering aquatic habitat, thus impacting Areas A and C. According to the post construction monitoring, however, the dissolved oxygen concentrations appear to be acceptable most of the time. Further analysis is required to provide conclusions for this particular project feature.

c. Increase Rock Substrate Aquatic Habitat. The primary damage caused by the Flood of 1993 to the riprap protection wing for the partial closure structure was repaired in 1995. The USFWS Site Manager and representatives from the Corps visually checked the evidence of scour damage in the rock channel and new damage to the partial closing structure during a joint site inspection after the Flood of 2001. The requirements for repair are currently being developed. Factors such as feasible equipment access and availability of funds are instrumental to whether the repair work can be done. Cross-sections and surveys of the damaged areas are planned for the 2002 evaluation year to help detail the proposed repair. Further feature assessment requires a follow-up meeting and discussion with the project sponsors that will be scheduled during the next year once the survey of the damaged areas are complete. The results of this discussion will be provided in the next post-construction performance evaluation report. Damage from high flows/flood events will continue to be a challenge for the success of these features.

d. Establish Mussel Bed. The WDNR report that the fact that mussels were present is encouraging given the probability of a mussel infecting a fish, being transported to this location as a glochidia attached to the gill of a suitable host, being at a level of development to drop from the host into the habitat channel and surviving for up to 10 years for us to find it. However, although mussels have been reported in the rock substrate, it appears too soon to classify the habitat as a success, primarily due to the rock substrate gradations' inability to have a strong settlement of the desired native species of mussels. Future site observations will help determine the success of the rock substrate. Also, a study involving the WDNR is being done in conjunction with the St. Paul District to determine the best substrate for mussel habitats.

e. Reduce Movement of Bedload Sediment into Bertom Lake. Several flood events have left considerable sedimentation within project features that requires further follow-up with the project sponsors. The historical sedimentation rate in past years for Bertom Lake has been 0.70 in/yr. The project goal was to decrease this rate to 0.55 in/yr. Since project completion the sedimentation rate had shown a decrease to 0.46 in/yr, and was meeting and exceeding its project goal. Field observations tend to indicate delta formation greater than shown by the aerial photography. In summary, further assessment is required to determine the success of reducing the amount of bedload sediment entering Bertom Lake. Transect surveys will continue to be done as outlined in the Post-Construction Monitoring Plan.

f. Improve Dissolved oxygen Concentration During Critical Seasonal Stress Periods. Dissolved oxygen concentrations appear to have improved during both summer and winter at all monitoring locations since project construction. While post-construction concentrations below 5.0 mg/l are occasionally observed during the summer, this occurs at a reduced frequency compared to the pre-project period. During the winter months dissolved oxygen concentrations are consistently observed to exceed 5.0 mg/l at all sampling locations. Post-construction increases in catch per unit effort (CPUE) of targeted centrarchid species compared with pre-construction sampling efforts also indicate an increase in fish use of the project area.

2) Enhance Migrating Waterfowl Habitat:

Waterfowl Monitoring. The establishment of the perched wetland has created a waterfowl food source that was not anticipated during the pre-project phase; and field observations of waterfowl use and development of aquatic vegetation has been the primary source of evaluating this goal. Although monitoring was not completed for the fall 2000 season and pre-project monitoring was not done for comparison; the peak aerial waterfowl surveys done from 1996 to 1999 have shown the dredged material placement island is acting as a temporary migratory area for a number of species of waterfowl. Future observations will continue to analyze this feature.

Conclusions and Recommendations.

1) Project Goals, Objectives, and Management Plan. Based on field data and observations collected since project completion in 1992, it appears that many stated goals and objectives are generally being met; however, physical changes and flood events in the project areas have generated concern that has in turn prompted closer scrutiny and assessment of those impacted project areas. Further evaluation of the unexpected benefits of the confined placement site will help determine if a management plan is needed there. Further data collection will better define the degree of reduced movement of bedload sediment into Bertom Lake, improved dissolved oxygen concentration during critical seasonal stress periods, and increased migratory waterfowl habitat. The vegetation and fish/mussel surveys still need to be done. The next survey of sediment transects should be completed in FY02 for the assessment of bed load movement in the project area.

2) Post-Construction Evaluation and Monitoring Schedules. In general, most project monitoring efforts have been performed according to the Post-Construction Performance Evaluation Plan in Appendix A and the Resource Monitoring and Data Collection Summary in Appendix B except where flood conditions or other obstacles have prevented monitoring tasks. A Post-Construction Performance Evaluation Supplement will be prepared annually. The next Post-Construction Performance Evaluation will be completed for 2002, 11-years after construction, for distribution in March 2003.

3) Project Operation and Maintenance. Project operation and maintenance has been conducted in accordance with the O&M manual. Annual site inspections by the Site Manager will and have resulted in proper corrective maintenance actions since project completion. Noted areas of concern attributed to flood impacts are still be assessed for level of repair or continued monitoring.

4) Project Design Enhancement. Discussions with USFWS, WDNR and Corps personnel involved with operation, maintenance, and monitoring activities at the Bertom and McCartney Lakes project have resulted in the following general conclusions regarding project features that may affect future project design:

a. Littoral zone development has not been observable on the lee-side of the island in McCartney Lake. It is a function of water depth and the turbidity of the river. Future performance evaluations will continue to evaluate the Littoral zone development and establishment of an aquatic vegetation bed.

b. Further evaluation of the McCartney Lake and the associated wetland community that is developing on the dredged material containment facility is still required. The current habitat success of the island is likely attributable to the good water clarity in the lake. The wetland catches runoff from the island and the stable water levels in the lake allow it to function essentially independent of river levels. The perched wetland has low to non-existent water levels during dry periods, allowing the wetland area to fully dry out. Essentially, the wetland is functioning well with the development of excellent aquatic vegetation. Additionally, many willow and cottonwood trees have established themselves along the eastern shore of the island that provide habitat to wildlife as well.

c. The channel immediately below the Bertom Lake Boat Ramp, at approximately RM 601.5, has enlarged during post-construction. It is suspected that this is causing an increase in flow and affecting overwintering water quality of the dredged aquatic habitat areas A & C. Additional monitoring will be done to verify the effects to water quality in the dredged aquatic habitat areas. A notched partial closing structure has been proposed to reduce flows and prevent any further widening of the channel; and riprap along the banks of the slough has also been proposed to prevent further erosion in the event these habitat areas are degraded because of this channel.

d. After several flooding events, a lot of erosion and sediment deposition was noted along several areas of the project area. The Site Manager questions the function of the partial closing structure off the main channel since field observation identified

excessive sediment deposition into Coal Pit Slough from the main channel. The transect analysis from the 1993 surveys did show damage to the partial closing structure that had been repaired in 1995, but the 1998 surveys also show damage that has not been repaired. The requirements for repair are currently being developed. Factors such as feasible equipment access and availability of funds are instrumental to whether the repair work can be done. Also, even though physical damage or changes to the channels are noted, it is not clear if the aquatic habitats are adversely affected. Therefore, an assessment of whether the aquatic habitats are not meeting project objectives due to the flood damage and changes noted in the channels is scheduled for FY02. The sediment transport up Coal Pit Slough will continue to be monitored.

ACKNOWLEDGMENT

The following personnel of the Rock Island District of the United States Army Corps of Engineers; the United States Fish and Wildlife Service; and the Wisconsin Department of Natural Resources are acknowledged for their contribution to the development of this Post-Construction Performance Evaluation Report for the Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project. Additional information about the Bertom and McCartney Lakes HREP project is available at the following web site - www.mvr.usace.army.mil. These individuals are listed below:

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TABLE OF CONTENTS

LIST OF APPENDICIES

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

1. INTRODUCTION

The Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project, hereafter referred to as "the Bertom and McCartney Lakes Project," is an ongoing part of the Upper Mississippi River System (UMRS) Environmental Management Program (EMP). The Bertom and McCartney Lakes Project is located on the east bank of Pool 11, approximately 3 river miles south of Cassville, Wisconsin. The project features lie entirely within an area of the Upper Mississippi River National Wildlife and Fish Refuge. Figure 1-1 and Plates 1 and 2 in Appendix G contain the vicinity map and site plans.

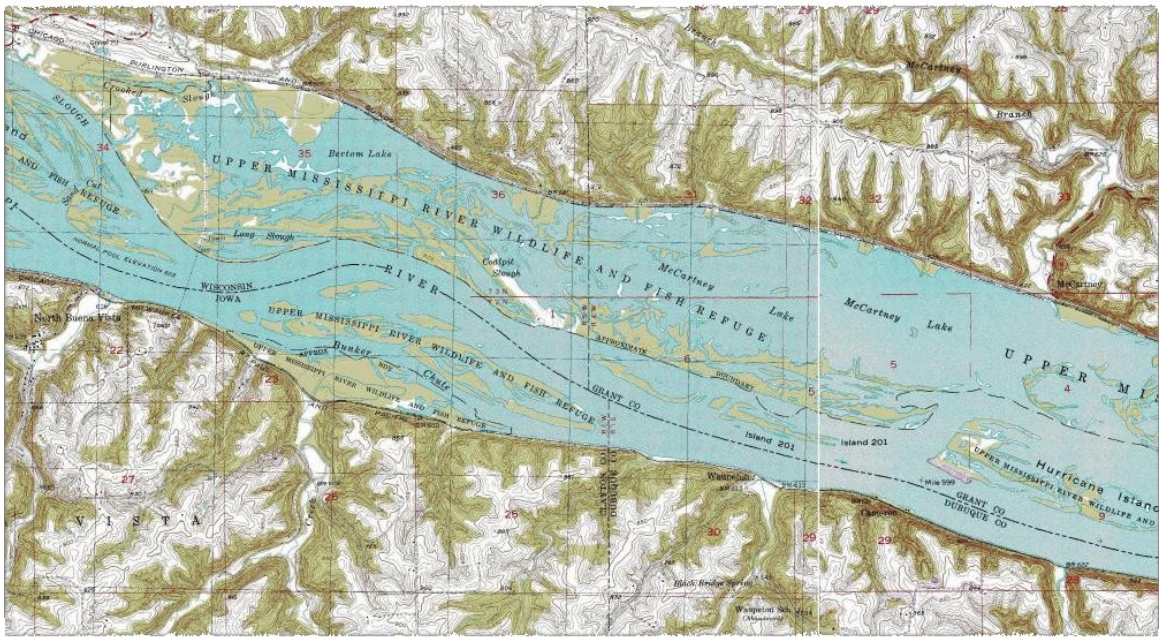


Figure 1 - 1. Vicinity Map.

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

(1) Summarize the performance of the Bertom and McCartney Lakes project, based on the project goals and objectives (see Table A-1);

(2) Review the monitoring plan for possible revision;

(3) Summarize project operation and maintenance efforts to date;

(4) Review engineering performance criteria to aid in the design of future projects.

b. Scope. This report summarizes available project monitoring data, inspection records, and observations made by the U.S. Army Corps of Engineers (Corps), the U.S Fish and Wildlife Service (USFWS), and the Wisconsin Department of Natural Resources (WDNR) for the period from September 1994 through December 2001.

2. PROJECT GOALS, OBJECTIVES, AND MANAGEMENT PLAN

a. General. As stated in the 1989 Definite Project Report (DPR), the Bertom and McCartney Lakes Project was initiated primarily because sedimentation was occurring in this backwater complex due to normal fluvial processes of the river and erosion from adjacent upland drainage systems. Sedimentation had decreased the extent and diversity of aquatic habitat in the project area. Turbidity associated with shoaling and substrate burial, combined with temperature elevations were resulting in less than optimal conditions for aquatic life.

b. Goals and Objectives. Goals and objectives were formulated during the project design phase and are summarized in Table A-1 in Appendix A.

c. Management Plan. A formalized management plan has not been developed for this project. The Bertom and McCartney Lakes Project is operated as generally outlined in the Operation and Maintenance (O&M) manual dated March 1996.

3. PROJECT DESCRIPTION

a. Project Features. The project consists of: a submerged rock partial closing structure, a deep aquatic habitat, a confined dredged material placement site, and a fish and mussel rock habitat channel. The project features are illustrated on Figure 3-1 below and Plates 1 and 2 see Appendix G).

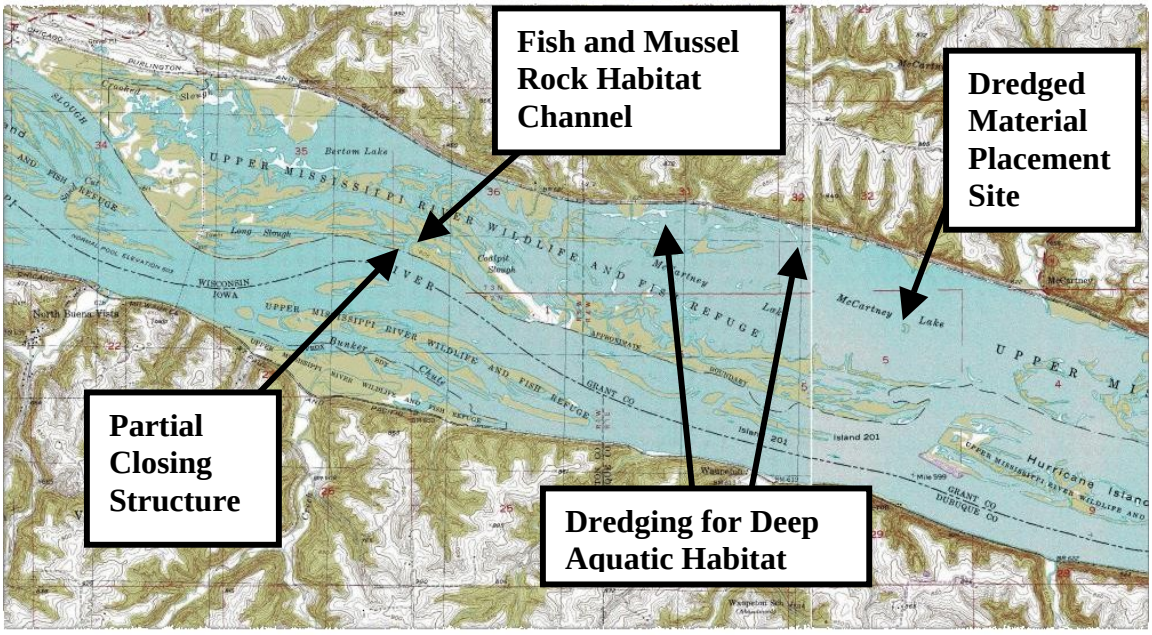


Figure 3 - 1. Project Features.

(1) Submerged Rock Partial Closing Structure. The partial closing structure reduces the movement of Mississippi River bedload sediment directly into the Bertom and McCartney Lakes complex.

(2) Deep Aquatic Habitat. Hydraulic dredging of approximately 400,000 cubic yards of fine-grained material from McCartney Lake side channels and sloughs was done to ensure a minimum water depth of 6 feet throughout the project life. The dredging was designed to increase the amount of deep-water habitat and encourage the flow of oxygen-rich main channel water into Bertom and McCartney Lakes.

(3) Dredged Material Placement Site. The dredged material was placed in an in-water confined dredged material placement site. A dredged material containment dike surrounds the placement site.

(4) Fish and Mussel Rock Habitat Channel. A fish and mussel rock habitat channel was constructed to improve aquatic habitat in the inlet channel to Bertom Lake by providing a rock substrate channel bottom and installing fish structures.

b. Construction and Operation. Dredging and confined placement of the dredged material in McCartney Lake began during the late summer of 1990 and was essentially completed in the fall of 1991. The rock substrate and partial closing structure construction also began in the late summer of 1990 and were completed in the fall of 1991. Final Inspection of the project was performed after the vegetation at the dredged material placement site was given a growing season to establish itself. This time was given to address concerns that seeding or earthwork would be needed in sandy areas to allow sufficient vegetative growth. Adequate vegetation established itself and this additional work was not needed. A Final Inspection of the project construction was made in the summer of 1992, indicating overall project completion. The project requires no operational activities.

4. PROJECT PERFORMANCE MONITORING AND PERFORMANCE EVALUATION

a. General. The relative success of the project as related to original project objectives will be measured using this data along with other project data, field observations and project inspections performed by the U.S. Fish and Wildlife Service (USFWS) and the Wisconsin Department of Natural Resources (WDNR). The U.S. Army Corps of Engineers, Rock Island District (Corps) has overall responsibility to measure and document project performance.

Appendix A presents the Post-Construction Evaluation Plan. This plan was developed during the design phase and serves as a guide to measure and document project performance. Appendix B contains the Monitoring and Performance Evaluation Matrix and Resource Monitoring and Data Collection Summary. This schedule presents the types and frequency of data that have been collected to meet the requirements of the Post-Construction Performance Evaluation Plan.

b. Corps of Engineers. The physical locations of the sampling stations referenced in the Post-Construction Evaluation Plan and the Resource Monitoring and Data Collection Schedule are presented on Plates 1 and 2. The Corps monitors sediment at 14 transects. Two transects were added for Bertom Lake in 1998. Sediment transect data collection was scheduled during ice-over in the winter of 1997-1998. Due to insufficient ice cover, sediment transect surveys were re-scheduled for the winter of 1998-1999 and since completed. Each transect has an established control point for ease of recovery for continued post-construction monitoring. The Corps has completed two surveys to investigate the enlarged channel below the Bertom Lakes Boat Ramp and the potential new project features for riprap and notched closing structure (see section 5.b. for details). These surveys were completed in September 2000 and August 2001, but have not been added to the monitoring plan for continuous evaluation for the project at this time. The Corps continually collected water quality data as summarized in Appendix B. A wind station has been installed on the confined dredged material placement site. Wind speed and wind direction data has been collected for the summer growing season (May – September). The water quality and wind station data collected by the Corps is presented in Appendix D. The Mussel and vegetation surveys have not been completed to date; but periodic field observations have been completed.

c. U.S. Fish and Wildlife Service. The USFWS is responsible for maintaining the Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project (HREP). The USFWS does not have project specific monitoring responsibilities. This is a Corps responsibility as identified in the 5th Annual Addendum for the UMRS-EMP. The USFWS McGregor District Manager is required to conduct annual inspections of the project and participate in periodic joint inspections of the project with the Corps. On site qualitative observations are a valuable component of assessing the performance of the project.

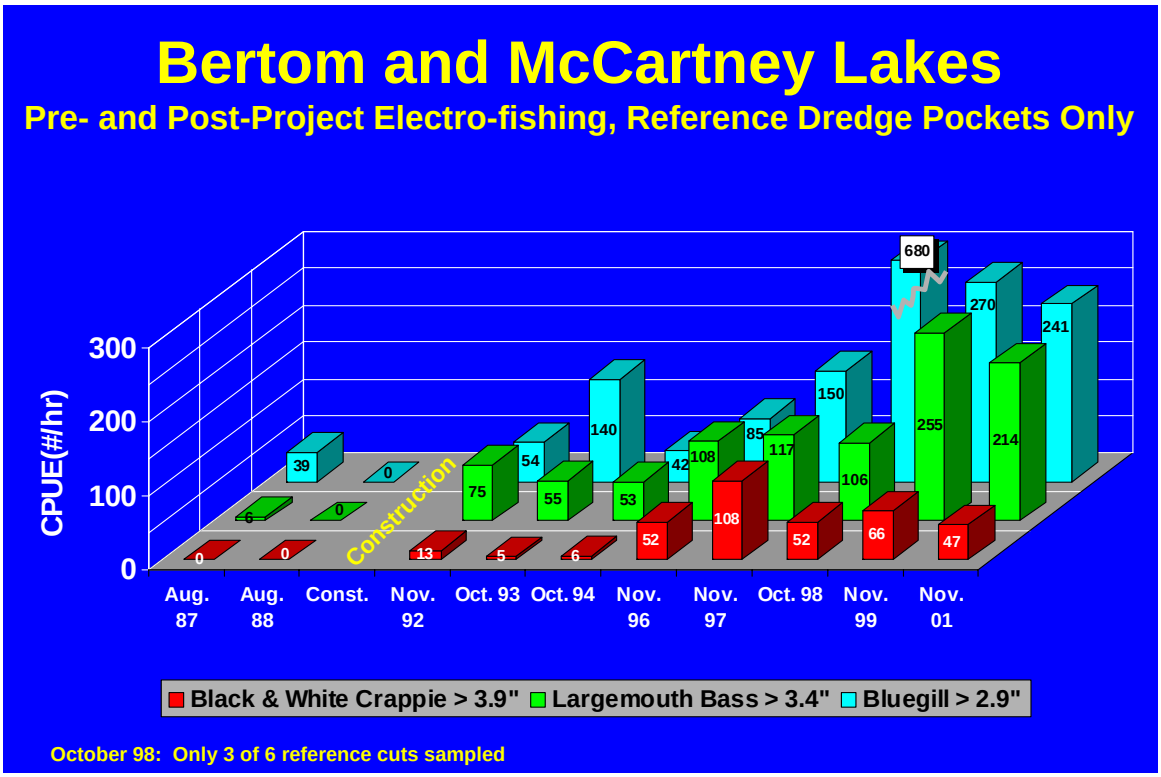
d. Wisconsin Department of Natural Resources. The WDNR has collected data at water quality and fish stations located in the project area. All available WDNR monitoring data is included in Appendix D.

5. EVALUATION OF AQUATIC HABITAT OBJECTIVES

a. Restore Deep Aquatic Habitat.

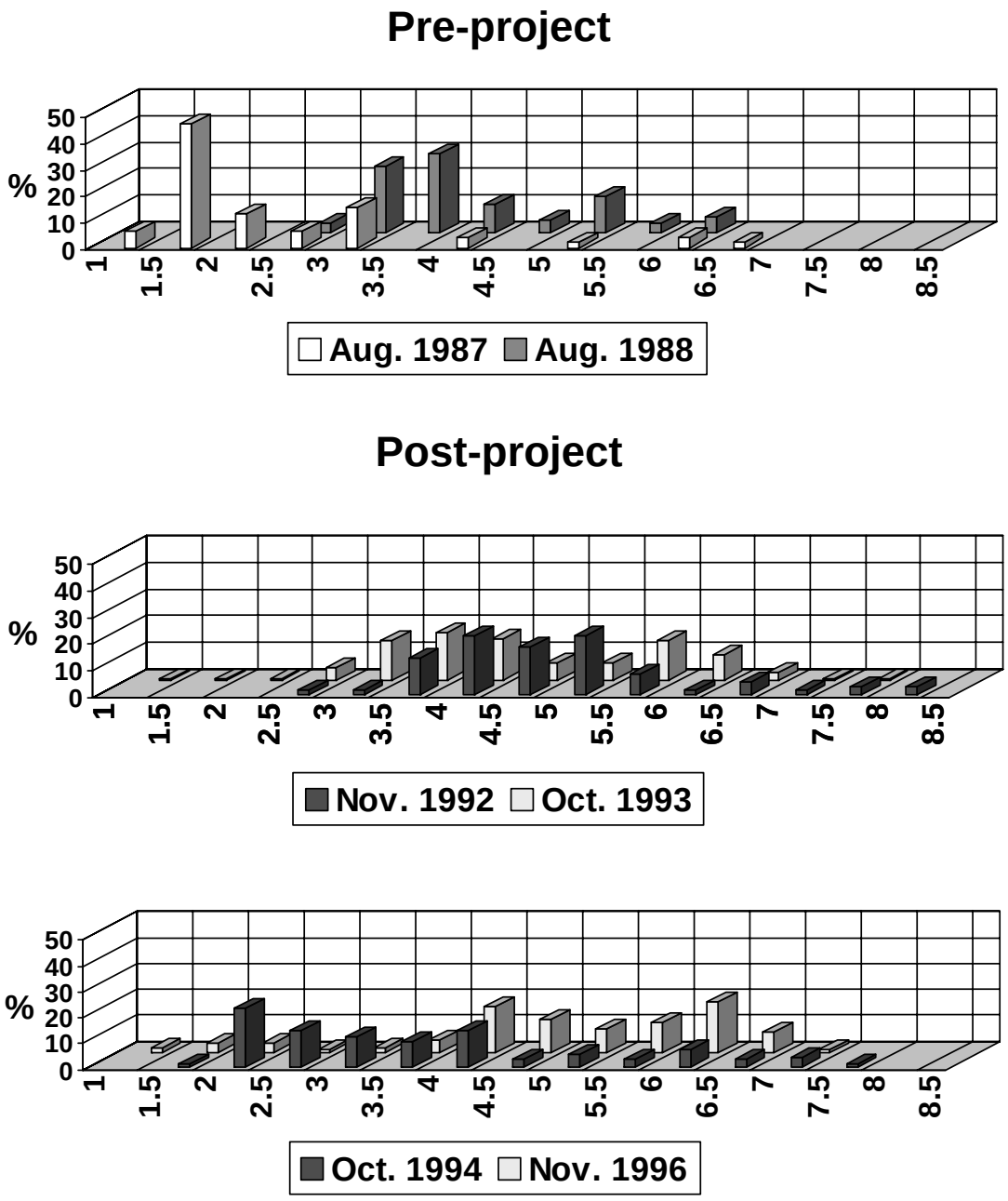
(1) Monitoring Results. As stated in the May 1995 Post-Construction PER, fish habitat is being monitored by electrofishing, observing changes in sedimentation transects over time, and by monitoring water quality. The water quality results are further discussed in section 5.f and Appendix D.

a) Electrofishing monitoring efforts are summarized in graphs shown below.



Source: Wisconsin Department of Natural Resources.

Figure 5 - 1. Bertom And Mccartney Lakes EMP Pre- and Post-Project Electro-Fishing Catch Per Unit Effort (CPUE) of Target Species of Fish in Reference Dredge Pockets Only



Source: Wisconsin Department of Natural Resources.

Figure 5 - 2. August 1988 length-frequency based on bluegills sampled using Fyke nets, all other years based on bluegills sampled using electro-shocking.

The fish sampling graph Figure 5-1 depict the Pre – and Post – Project electrofishing Catch Per Unit Effort (CPUE) of Black & White Crappie, Largemouth Bass, and Bluegill target fish species from the reference dredge pockets only. The graphic

covers electrofish monitoring from August 1987 to November of 2001, however only 3 of the 6 reference dredge pockets were sampled in 1998. Figure 5-2 shows the Length-Frequency of Bluegill target fish species sampled. Post-construction increases in catch per unit effort (CPUE) of targeted centrarchid species compared with pre-construction sampling efforts indicate an increase in fish use of the project area. The Wisconsin DNR provided the following information on Figures 5-1 and 5-2:

"Figures 5-1 and 5-2 show that pre-project sampling were done in the August timeframe. After the construction of the project, the sampling dates were changed after it was learned that the best time to be assessing the performance of an over-wintering location was to do the sampling late in the year (Oct-Nov). The August sampling does not affect the interpretation of the data however. Pre-project catch per unit of age 1+ fish would have been low even if the sampling had been conducted in November. The size distribution of fish in the project area has greatly changed showing no obvious signs of limiting factors. The pre-project size distribution showed many young fish, indicating that very few fish survived more than a year or two in the area due to habit limitations primarily associated with DO and depth. The project eliminated these limiting factors and we now see a "healthy" size distribution made up of numerous year classes. It would have been nice to do the pre-project sampling in the fall, but only the august data was available. Overwintering projects constructed after 1992 will all have fall sample dates."

(b) Dredged channels were constructed in McCartney Lake to create deep aquatic habitat. Sedimentation transects have been established in the McCartney Lake dredged channels to monitor depth changes. Depth changes are measured by performing hydrographic soundings at the selected locations. Seven transects encompassing 12 dredged channels have been established. The location of these sedimentation transects are shown in Appendix G on Plates 1 and 2.

The feature measurement for this objective is acre-feet of deep ($\geq$ 6 feet) aquatic habitat volume. Depth is measured from flat pool (elevation 603.0). The construction was completed in the fall of 1991 and the project inspected for project completion in the summer of 1992. The deep aquatic volume created was 290 acre-feet.

The results of the hydrographic soundings of the established transects are shown in Appendix G on Plates 3 and 4. The November 1998 data is plotted and compared to the sounding transects as they were constructed. The fall 1998 data shows 263 acre-feet of deep aquatic habitat volume.

The original plan called for creation of 250 ac-ft of this habitat. It was predicted that, due to sediment accumulation, this would be reduced to 200 ac-ft by the end of the project life, or 50 years. This is an average loss of 1 ac-ft per year. The actual constructed volume was 290 ac-ft, and by year 7 (1998) the volume had been reduced to 263 ac-ft, or a loss of 3.9 ac-ft per year. At the current rate, deep aquatic habitat volume would be reduced to 200 ac-ft by the year 2014. A graph of past and predicted dredged channel deep aquatic habitat volume is shown below. It is noted that this assumes that the rate of sediment accumulation will be constant. From experience on other EMP projects, it appears that the rate of sediment accumulation in dredged channels is faster initially after construction and

slows gradually. With the assumption of a slowing rate of sediment accumulation, a better prediction of aquatic habit volume would be a reduction to 225 ac-ft by the year 2014.

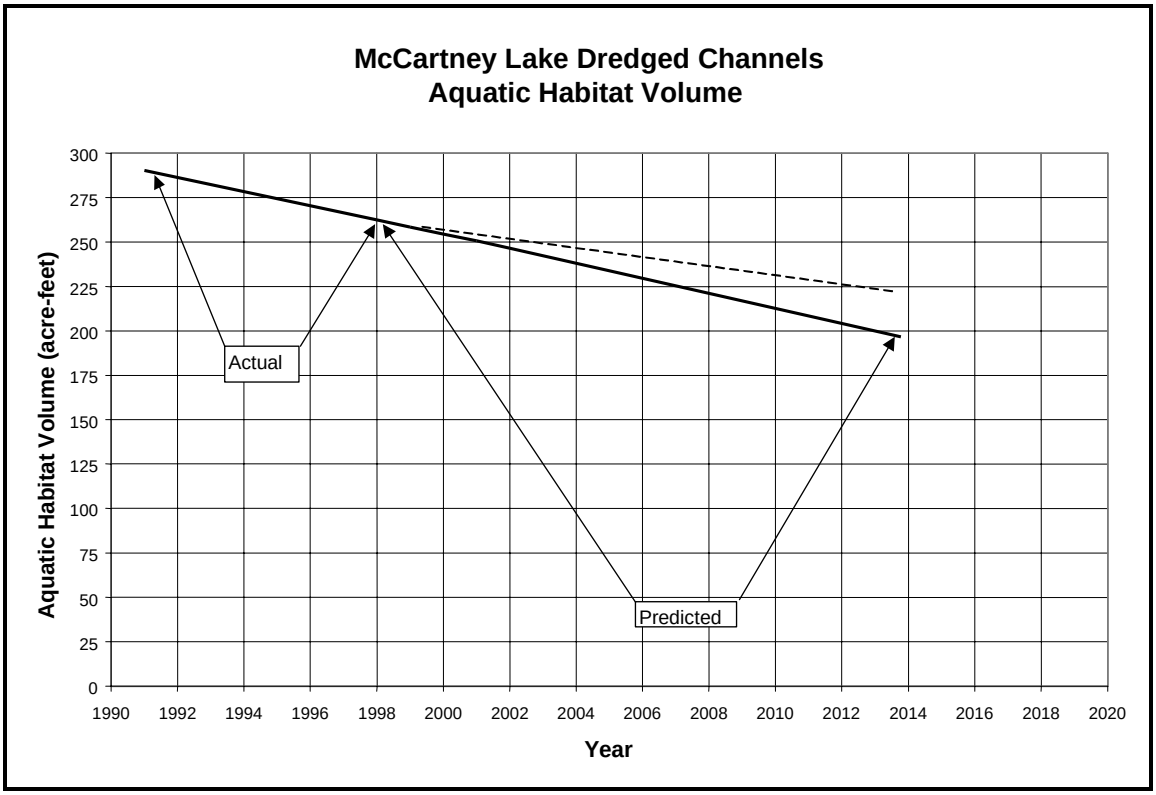


Figure 5 - 3. **McCartney Lake Dredged Channels Aquatic Habitat Volume, 1991-2014.**

Another useful parameter is depth of sediment accumulation. The Definite Project Report for the Bertom and McCartney Lakes EMP (1989) calculated a historic sedimentation rate for the overall project area of 0.39 inches/year. This represents a time period from 1938 to 1988.

Sedimentation transects were taken in late 1993 and early 1994 as part of the Flood of 93 Damage Assessment. The transects showed a sediment deposition depth varying from 0.0 to 1.1 feet. These surveys cannot be compared directly to the 1998 sections. The 1998 sections have established control points and the locations can be reproduced for future surveys. This was not the case for the 1993-1994 surveys.

The sedimentation rate in the dredged channels for the time period from construction (1991) to the latest survey (1998) has been 1.7 inches per year. It should be noted that this rate is for the dredged channels only and is not representative of the whole Bertom-McCartney Lake area. It has been the experience at other EMP projects that feature dredged channels as a component that the channels experience sediment deposition at a faster rate than do the surrounding area.

There is a good probability that this higher-than-normal sedimentation rate in the initial phases of this project could be attributed to sloughing of banks due to the side slopes of the dredged channel being unstable. After the next channel survey is performed the data will be examined from project initiation through project history. An attempt will be made at that time to quantify the amount of sediment deposition possibly attributable to channel side slope sloughing.

(c) Water quality monitoring data by the WDNR and the Corps is summarized in Appendix D.

(2) Conclusions. The goal of this project feature is to restore deep aquatic habitat ($\geq$ 6') that will be beneficial during low pool levels and winter months. Target fish sampling efforts indicate an increase in fish use in the project area.

The habitat loss per year due to sediment accumulation was predicted to be 1 ac-ft per year. The original created habitat volume, 290 ac-ft, was larger than designed, 250 ac-ft. The rate of volume loss has been greater than predicted, being 3.9 ac-ft/yr vs. 1 ac-ft/yr. As was mentioned previously, experience at other EMP-sponsored dredged channels shows that sediment accumulation in the channels is often at a higher rate compared to the surrounding area, at least in the time period immediately after construction. It is anticipated that this rate will decrease.

The original estimate of deep aquatic habitat volume present at the end of the project life (50 years) was 200 ac-ft. At the present rate of 3.9 ac-ft/yr, deep aquatic habitat volumes would be reduced to 200 ac-ft by the year 2014. Based on experience with other EMP projects, the deep aquatic habitat volume would be reduced to 225 ac-ft by the year 2014.

The project is meeting its goal of providing deep aquatic habitat volume. The rate of loss of aquatic habitat volume due to sediment deposition appears to be larger than anticipated based on the sediment transects collected in 1993 and 1998. The higher than expected sedimentation rate is a concern that requires further analysis. To determine if the rate of loss is consistent, another set of sediment transects will be collected in 2002 and further evaluation of the deep aquatic habitat volumes will be provided in the next performance evaluation report. The Wisconsin DNR has also suggested the investigation use spatial surveys to more accurately represent the bathymetry changes in the project area and looking at some preliminary comparisons of sedimentation in the dredge cuts with channel width changes that they have done to assist in the next evaluation of this project goal. After the next channel survey is performed the data will be examined from project initiation through project history. An attempt will be made at that time to quantify the amount of sediment deposition possibly attributable to channel side slope sloughing.

b. Restore Lentic Lotic Habitat Access Cross-Sectional Area.

(1) Monitoring Results. The measurement for analyzing this feature is hydrographic soundings, dissolved oxygen monitoring concentrations and site

investigations. No hydrographic soundings have been performed at the access areas where the dredged channels merge with the deeper, main open water channel. However, field observations by the USFWS (Mr. Clyde Male) noted that there has been no littoral zone development for the project area since construction ended in 1992. Also a channel leading to Area A has enlarged during post-construction, probably due to high flows in 1993 and 1997. The photos below show these observations.

Figure 5 - 4. Enlarged Channel at RM 601.5, taken April 2000.

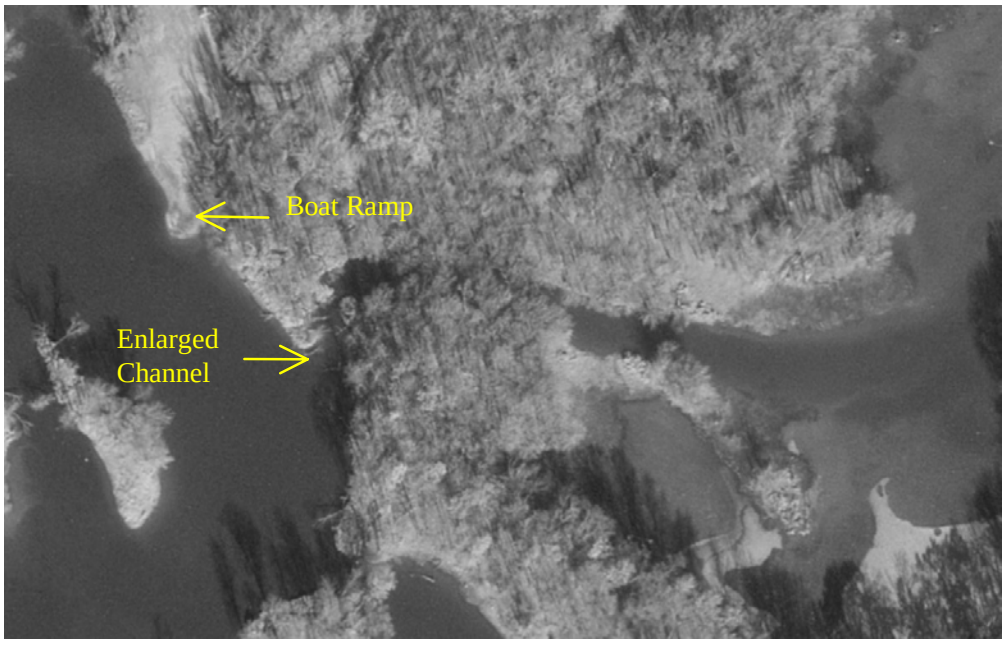


Figure 5 - 5. Aerial View of enlarged channel at RM 601.5, mouth of channel is just below Bertom Boat Ramp (formerly the Farnuf Boat Landing).

The channel size increase is suspected of increasing flow and affecting overwintering habitat, thus impacting Areas A and C. The Corps completed two surveys of the enlarged channel to investigate potential for riprap and a notched closing structure that would be used to stabilize the bankline along the enlarged channel entrance and to slow down the flow velocities through the channel. The one survey was completed before and the second was completed after the 2001 flood. Drawings C15-C18 of Appendix G shows the results of these surveys.

The WDNR have provided the following comments from their monitoring efforts:

"Most of the dredged pockets are functioning fine from the standpoint of DO, temperature and velocity. However, Area I, where the pocket extends to the Wisconsin shoreline has an eddy that contributes to less than desirable velocity and temperature conditions. In hindsight this makes sense since this is the end of the dredging and is a natural location for an eddy to form. Another change which is occurring and potentially impacting the habitat quality of Areas J and I is the erosion of the peninsulas of land that separated the "bays" from the channel. Placing the dredge cuts too close to them, wind erosion, or perhaps other forces may have caused the erosion of these peninsulas. Our observations are that the first significant loss of these peninsulas began around 1993 and may have some relationship to the prolonged flooding and summer wind events. The quality of the habitat in Area J bay appears good based on the presence of fish and monitoring of water quality. The quality of Area I bay is questionable from the standpoint of winter centrarchid use, however summer centrarchid use has not been evaluated. During one summer sampling event, we did shock a paddlefish at the entrance to Area I bay, but were unable to net it. Therefore, Area I bay may be useful for other fish and should be assessed further.

The additional flow entering into Area A, due to enlargement of the upstream channel, is still a concern of the WDNR. This is due to the potential of increasing winter water velocities above DPR goals and potential reduction in winter water temperatures for Area A and a portion of Area B. Prior to enlargement of the channel, both of these areas were within DO, temperature and velocity conditions desirable for quality over-wintering habitat."

Overall, according to the post construction monitoring, the dissolved oxygen concentrations appear to be acceptable most of the time. Currently, the WDNR, USFWS, and the Corps plan to keep monitoring the flow velocity and winter water temperatures for Area A and a portion of Area B based on the concerns caused by the enlarged channel, and before pursuing the proposed riprap bank stabilization work or the notched closing structure.

(2) Conclusions. The project has been successful based on the fish and water quality monitoring and the comments from local anglers. The enlarged channel leading to

Area A and subsequent impact to the habitats designed for the project will continue to be monitored by the WDNR, the Corps and the USFWS.

c. Increase Rock Substrate Aquatic Habitat.

(1) Monitoring Results. The Flood of 1993 washed away approximately 300 feet of the riprap protection wing that tied the closing structure into the bank on the upstream end of the partial closing structure. Scour of the rock-lined channel was also noted as damage from the flood. The repair of the damage to the partial closing structure was completed in 1995. This repair included replacing the riprap on the upstream riprap protection wings to the bottom toe elevation of 602.0 or to a maximum of 25 feet from the top of the bank. The location and photos of the damage and repair for partial rock structure are given below in Figures 5-6 and 5-7, Plates 1 and 2 of the Site Investigation Report; Bertom & McCartney Lakes Partial Closing Structure dated February 1, 1995.

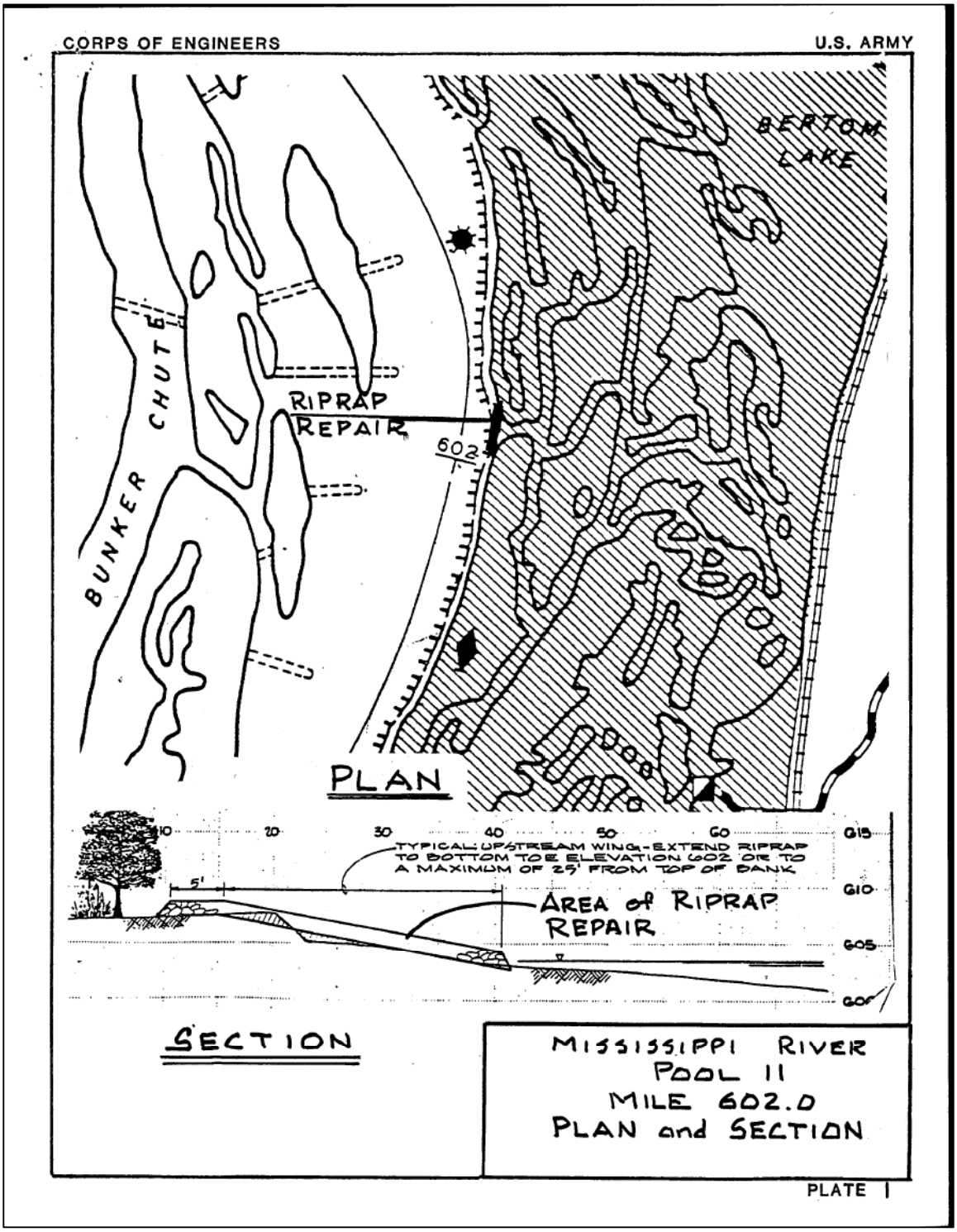


Figure 5 - 6. Plate 1, Site Investigation Report for Mississippi River - River Mile 602.0, Pool 11, Bertom & McCartney Lakes/Partial Closing Structure, dated February 1, 1995.

MISSISSIPPI RIVER
POOL 11
MILE 602.0
PHOTOGRAPHS

PLATE 2

Figure 5 - 7. Plate 2, Site Investigation Report for Mississippi River - River Mile 602.0, Pool 11, Bertom & McCartney Lakes/Partial Closing Structure, dated February 1, 1995.

The 400-pound stone riprap protection was placed approximately 300 feet in length with a thickness of two feet. The 1993 and 1998 cross-section transects for the rock habitat channel and the submerged partial closing structure show evidence of scour in the rock lined channel as seen in Appendix G on plates 3 & 4. This scour may be the carry over from the Flood of 1993, and any subsequent repair of this damage is still under review.

After a more recent event, the flood of 2001, the USFWS Site Manger and representatives from the Corps inspected the project area to identify locations of physical damage that may have been the result of this flood. Excessive sedimentation, bank erosion, and scour were noted at several locations during the inspection and are shown in the photos below. Figure 5-13 identifies the locations the primary damage was found. General conditions for the channel, lunkers, and logjam were checked and preliminary discussions were made with the USFWS Site Manager and WDNR to determine the scope for further investigation and potential repair of damaged areas. The need to further evaluate the cost and feasibility of repair of the identified areas requires a follow-up discussion between the project sponsors, so these details will be covered in the next post-construction performance evaluation report.

Figure 5 - 8. Bank scour behind left bank of riprap of rock habitat channel, dated 14 August 2001.

Figure 5 - 9. Sedimentation and scour of rock lined channel, dated 14 August 2001.

Figure 5 - 10. Bank scour behind downstream riprap protection wing of partial rock closure structure, dated 14 August 2001.

Figure 5 - 11. Bank scour behind upstream riprap protection wing of partial rock closure structure, dated 14 August 2001.

(2) Conclusions. The primary damage caused by the Flood of 1993 to the riprap protection wing for the partial closure structure was repaired in 1995. The USFWS Site Manager and representatives from the Corps visually checked the evidence of scour damage in the rock channel and new damage to the partial closing structure during a joint site inspection after the Flood of 2001. The requirements for repair are currently being developed. Factors such as feasible equipment access and availability of funds are instrumental to whether the repair work can be done. Cross-sections and surveys of the damaged areas are planned for the 2002 evaluation year to help detail the proposed repair. Further feature assessment requires a follow-up meeting and discussion with the project sponsors that will be scheduled during the next year once the survey of the damaged areas are complete. The results of this discussion will be provided in the next post-construction performance evaluation report. Damage from high flows/flood events will continue to be a challenge for the success of these features.

d. Establish Mussel Bed.

(1) Monitoring Results. A rock substrate dive was conducted by the WDNR on August 31, 2000, to evaluate the establishment of a mussel community. A new settlement of zebra mussels for the year 2000 was observed, and the zebra mussels were not attached to any of the other mussels found. The objective of the Rock Habitat feature was to provide habitat diversity for aquatic invertebrates, including mussels. The rock substrate gradations A, B, C, and D appeared to be too large for mussel colonization. However, native mussels were observed in depositional areas where these gradations were used. Gradations E1 and E2 appeared to offer better substrate conditions. Future mussel projects

should consider using a similar gradation, but use "river washed" stones instead of crushed rock. While no mussels were found in the Gradation F section, this gradation should be sampled again in the future.

(2) Conclusions. The WDNR report that the fact that mussels were present is encouraging given the probability of a mussel infecting a fish, being transported to this location as a glochidia attached to the gill of a suitable host, being at a level of development to drop from the host into the habitat channel and surviving for up to 10 years for us to find it. However, although mussels have been reported in the rock substrate, it appears too soon to classify the habitat as a success, primarily due to the rock substrate gradations' inability to have a strong settlement of the desired native species of mussels. Future site observations will help determine the success of the rock substrate. Also, a study involving the WDNR is being done in conjunction with the St. Paul District to determine the best substrate for mussel habitats.

e. Reduce Movement of Bedload Sediment into Bertom Lake.

(1) Monitoring Results.

(a) Transects. A rock partial closing structure was constructed at the start of the entrance channel into Bertom Lake. The purpose of this structure was to reduce the amount of bedload sediment moving into Bertom Lake. The closing structure was damaged as a result of the 1993 as noted in section 5.b above and repairs were completed in 1995.

As noted in section 5.c., after the flood of 2001, the USFWS Site Manger and representatives from the Corps inspected the project area to identify locations of physical damage that may have been the result of the 2001 flood. Excessive sedimentation was noted at several locations during the inspection and is shown in the photos below (See Figure 5-13 to identify the locations the primary damage was found).

Figure 5 - 12. Sedimentation and loss of riprap to rock habitat embankment, dated 14 August 2001.

Figure 5 - 13. Excessive sedimentation behind upstream protection wing of partial rock closure structure, dated 14 August 2001.

Figure 5 - 14. Excessive sedimentation in northern back channel leading to Bertom Lake from closure structure dated 14 August 2001.

Figure 5 - 15. 2001 Flood Inspection, Areas of Noted Damage noted on 14 August 2001.

1) Excessive sedimentation at the entrance of a channel that has previously been a concern due to its enlarging and is located just downstream of the Farnuf boat ramp (Drawings C15-C18, App. G, show survey results of this area),

2) Excessive sedimentation in a re-opened channel into McCartney Lake from the main channel of the Mississippi River and also just downstream of the Farnuf Boat Ramp,

3) Excessive sedimentation at the upstream protection wing / bank of the partial closure and the adjacent northern back channel leading to Bertom Lake,

4) Excessive scour at the entrance of rock habitat channel,

5) Bank erosion along left descending bank of the Mississippi River main channel below the partial closing structure,

6) Bank erosion and breach of the dike surrounding the perched wetland.

The Bertom Lake Monitoring Plan, as shown in Appendix G on Plate 1, calls for surveys of three sedimentation transects in Bertom Lake: one transect along the crest of the partial closing structure, one transect across the rock habitat channel, and one transect in the channel extending to the left from the submerged partial closing structure into Bertom Lake. The plan specifies that these sections be surveyed at five-year intervals.

Transects S-M602.2J (Transect E) and S-M602.0B (Sta. 29+95) have never been surveyed to date. Current plans are to survey these transects in FY03. This will allow an evaluation regarding the enlarging of the northern (left branching) channel above the partial closure structure at Station –10+01 and sedimentation bedload into Bertom Lake as noted in the conversation records dated July 6, 2000, and October 11, 2000.

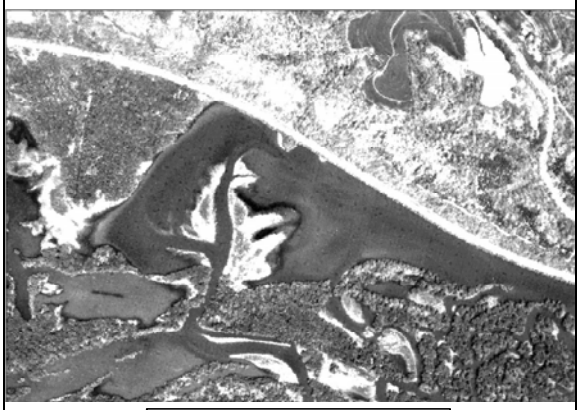
The transect along the crest of the submerged partial closing structure (S-M602.1J, or Transect Station –10+01), and the transect across the rock habitat channel (S-M602.1G, or Transect Station –10+00) were surveyed in 1993 and 1998, and are provided in Appendix G on Plate 3. These transects show some damage after the 1993 Flood. The 1998 transects for the submerged rock partial closure structure shows some change that may be from sediment accumulation. Further monitoring and investigation are still underway, so any action or conclusions will be provided in a subsequent performance evaluation report.

Two of the three Bertom Lake sections (Sta. 5+99 and Sta. 6+00, or Monitoring Site S-M602.2B and S-M602.3B) were surveyed in 1998. These surveys are plotted and compared to the 1988 survey on pages G-2 thru G-4. The comparison of the 1988 vs. 1998 sections yields an average sedimentation rate of 0.46 inches per year for these sections.

The pre-project average sedimentation rate for Bertom Lake was 0.70 inches/year. This value was based on comparing 1938 through 1988 sedimentation surveys. The project goal had a target of reducing this rate to 0.55 inch/year.

(b) Aerial Photography. A qualitative method of analyzing the amount of sedimentation occurring in Bertom Lake is to compare aerial photographs. The following aerial photographs, see Figures 5-14 thru 5-16 below, show the change in the size of the landmass in Bertom Lake over a period of time. The first three photos shown in Figure 5-14 were rectified using the REGISTER command in ArcView. The gage used for the photos was Gage #27 Cassville, WI, located at river mile 606.3.

October 1970 Stage = 6.8



May 1989 Stage = 8.8

November 1995 Stage = 9.67

Figure 5 - 16. Aerial Photos of Bertom Lake at Three Time Periods, Gage #27, Cassville, WI, River Mile 606.3.

Figure 5 - 17. Close-up Aerial View of Bertom Lake, Bertom & McCartney Lakes HREP, dated 9 August 2000.

Figure 5 - 18. Aerial View, Bertom & McCartney Lakes HREP, dated 9 August 2000.

The individual images were then created by displaying each photo in ArcView using the same projection, and scale.

In order to validate an assessment of sedimentation via aerial photographs, the stage, location of gage referenced and discharge must be known. One of the most important is the stage.

The Wisconsin DNR noted from the information provided that "the stage for the November 1995 photo is a foot higher than the photo from 1989, yet the area of the delta appears to be the same. However, if the stages were equivalent we speculate that much more deposition would be observed in the 1995 photo. Another way of looking at this is that over 1 foot of deposition could have occurred in the peninsula area and be covered by the higher water levels in the 1995 photo. The Wisconsin DNR's field observations indicate that delta formation has been greater than indicated by these photos."

Clearly, in order to give a valid interpretation of sedimentation changes occurring in the project area from the aerial imagery, further analysis is required and will be provided in the next performance evaluation report.

(2) Conclusions. Several flood events have left considerable sedimentation within project features that requires further follow-up with the project sponsors. The historical sedimentation rate in past years for Bertom Lake has been 0.70 in/yr. The project goal was to decrease this rate to 0.55 in/yr. Since project completion the sedimentation rate had shown a decrease to 0.46 in/yr, and was meeting and exceeding its project goal. Field observations tend to indicate delta formation greater than shown by the aerial photography. In summary, further assessment is required to determine the success of reducing the amount of bedload sediment entering Bertom Lake.

f. Improve Dissolved Oxygen Concentration During Critical Seasonal Stress Periods.

(1) Monitoring Results. The Rock Island District is monitoring water quality parameters at five sites as shown in Appendix G on Plates 1 and 2 and on Table B-2. Comparison of pre-project and post-construction water quality data shows that several positive trends in water quality have emerged immediately after post-construction.

WDNR performed continuous water quality monitoring during the period July 24 - 31, 1996 and also performed a winter survey on February 13, 1997. The results of this water quality monitoring can be found in Appendix D.

The WDNR also has noted that the channel entering the dredge cuts in McCartney Lake appears to be enlarging (see Figures 5-1 and 5-2). Visual observations indicate that the channel is wider and deeper than pre-project conditions. Flow measurements by the WDNR show that flow into the dredge cuts is increasing as well. The location of the channel can be seen in Appendix G on Plate 1.

The WDNR has also performed electro-fishing monitoring throughout the pre- and post-construction phases of the project. This information is summarized in graphic form in Table 5-1 and 5-2.

(2) Conclusions. Dissolved oxygen concentrations appear to have improved during both summer and winter at all monitoring locations since project construction. While post-construction concentrations below 5.0 mg/l are occasionally observed during the summer, this occurs at a reduced frequency compared to the pre-project period. During the winter months dissolved oxygen concentrations are consistently observed to exceed 5.0 mg/l at all sampling locations. Post-construction increases in catch per unit effort (CPUE) of targeted centrarchid species compared with pre-construction sampling efforts also indicate an increase in fish use of the project area.

g. Other Monitoring Results for the Evaluation of Aquatic Habitat Objectives.

(1) Monitoring Results. In a memorandum dated January 27, 1998, Mr. Clyde Male, Refuge Manger, reported that the expected erosion on the northwest edge of the island created for the dredged material containment facility has reached equilibrium. It was also noted that another area of concern due to erosion on the island along its eastern edge still remains and has the potential of breaching the berm and jeopardizing the integrity of the perched wetland basin (See Figures 5-23 and 5-24). At the time of the observation, this particular area was approximately 535 feet long. It had a small cliff edge averaging 37 inches high. The top 12 inches of the cliff was soil and the remaining 25 inches was packed sand. No additional problems were observed during 1996 and 1997.

As noted in section 5.c., after the flood of 2001, the USFWS Site Manger and representatives from the Corps inspected the project area to identify locations of physical damage that may have been the result of the 2001 flood. It was observed that a channel connecting the Mississippi River to the McCartney Lake had re-opened and deposited a substantial amount of sediment into McCartney Lake habitat area (See Figures 5-19, 5-20, and 5-21).

Additionally, the channel below the Bertom Lake Boat Ramp that had previously been noted for enlarging also was subjected to excessive sedimentation (See Figure 5-22). The channel was resurveyed on 14 August 2001 and the results were plotted against the previous survey completed on 26 September 2000 and 18 November 2000 (See Appendix G, Plates 10 and 11). The typical sections of the left descending bankline below the Bertom Lake Boat Ramp and the mouth of the enlarged channel showed changes due to the sedimentation, but the bankline's profile showed very little change. The thalweg survey of the enlarged channel also did not show very much change in elevation with the predominant sedimentation noted only at the channel's entrance.

Figure 5 - 19. Re-opened channel from Mississippi River to McCartney Lake habitat area, dated 14 August 2001.

Figure 5 - 20. Edge of sediment deposits left in McCartney Lake habitat areas by the re-opened channel from Mississippi River, dated 14 August 2001.

Figure 5 - 21. Line of sediment deposits left in McCartney Lake habitat area by the re-opened channel to the Mississippi River, dated 14 August 2001.

Figure 5 - 22. Excessive sedimentation at the entrance of a channel that has been a concern due to its enlarging and is located immediately downstream of the Farnuf boat ramp, dated 14 August 2001.

Figure 5 - 23. Bank erosion of berm surrounding perched wetland, dated 14 August 2001.

Figure 5 - 24. Bank erosion of berm surrounding perched wetland, dated 14 August 2001.

(2) Conclusions. As stated in previous sections, details of proposed actions in light of the joint inspection results require further feature assessment and a follow-up discussion with the project sponsors. The results of this discussion will be provided in the next post-construction performance evaluation report.

6. EVALUATION OF MIGRATING WATERFOWL HABITAT ENHANCEMENT OBJECTIVES

a. Enhance Aquatic Habitat.

(1) Monitoring Results. The report memorandum dated 27 January 1998, from the Upper Mississippi River National Wildlife and Fish Refuge, McGregor District (see Appendix C), identified several observations of nesting birds and waterfowl. Approximately 80 Bank Swallows had established a colony on the northwest edge of the Bertom and McCartney Lake Island in May 1995 that was the first and only nesting area on Pool 11. The waterfowl observations during 1995-1997, noted that during periods of low water levels due to a lack of precipitation, the representative count of waterfowl compared to normal water level observations was lower. The island provided little cover for deer and little habitat for raccoons and created, at least for a short period, a predator free environment. Of particular note, certain wildlife such as nesting turtles and loafing shorebirds have benefited from the predator-free microhabitat. Waterfowl broods are observed as "common on the island wetland during the spring and are assumed to have been hatched there."

The establishment of a vegetative bed within the perched wetland is considered voluntary. "The vegetation on the berm was seeded but the remaining area has come back naturally. The aquatic vegetation within the perched wetland is some of the best on the Refuge and is attributed to the initial rich seed bank and stable clear water (see Figure 6-1).

Figure 6 - 1. Abundant aquatic vegetation within the perched wetland, dated 14 August 2001.

During this report period, vegetation on the lee-side littoral zone had not developed. It is noted that the lush aquatic vegetation in conjunction with the invertebrate population support waterfowl use in the wetland, especially when unfavorable conditions in the surrounding bay forces the birds into the area." Fall peak aerial waterfowl counts for the Bertom – McCartney area during the 1996-1999 period are presented in Table 6-1 below.

Table 6-1. Aerial Waterfowl Counts, 1996-1999.

Bertom-McCartney Waterfowl Survey Data

Fall Peak Aerial Waterfowl Counts 1996-1999

Species	***1996***	***1997***	***1998***	***1999***
Mallard	625	330	900	625
Black Duck	0	5	0	0
Pintail	0	0	0	0
Gadwall	0	30	0	0
Widgeon	0	0	0	0
Shoveler	0	0	0	0
BW Teal	0	25	20	0
GW Teal	0	20	30	0
Wood Duck	10	10	20	0
Canvasback	0	50	15	100
Ringneck	0	0	0	0
Scaup	0	25	0	0
Goldeneye	0	5	0	0
Bufflehead	0	0	0	0
Merganser	0	0	0	0
Canada Geese	65	20	175	155
Other Geese	0	0	0	0
Swans	60	0	5	0
Puddle Ducks	635	420	970	625
Diving Ducks	0	80	15	100
S/G/D Total	635	520	1165	880
No. of Species	4	9	8	3

(2) Conclusions. While no clear trends in waterfowl use are apparent in the results of the 1996-1999 peak waterfowl aerial counts, this data and the observations by site managers indicates the island is providing seasonal habitat for a variety of waterfowl and other migratory birds. Pre-project migratory waterfowl use of the project area was identified primarily in Bertom Lake and the adjacent Hay Meadow Lake area. Since pre-project conditions did not support adequate aquatic vegetation, the unit of measure to evaluate the success of this goal was established as acres of established aquatic vegetation

bed and not waterfowl counts. However, the establishment of the perched wetland has created a waterfowl food source that was not anticipated during the pre-project phase and field observations of waterfowl use and development of aquatic vegetation has been the primary source of evaluating this goal. Monitoring by field observations will continue to evaluate the success of this goal.

b. Other There are no other migratory waterfowl habitat objectives.

7. OPERATION AND MAINTENANCE SUMMARY

a. Operation. The project requires no operational activities.

b. Maintenance.

(1) Inspections. Inspections of the Bertom and McCartney Lakes project are to be made by the U.S. Fish and Wildlife Service Refuge Manager (Site Manager) at least annually and will follow inspection guidance presented in the March 1996 O&M manual. Other project inspections should occur as necessary after high water events or as scheduled by the Site Manager. These inspections are necessary to determine maintenance needs.

(2) Maintenance Based on Inspections. Joint inspections of the Bertom and McCartney Lakes project are to be conducted periodically by the U.S. Fish and Wildlife Service and the Corps. The results of these joint inspections will be summarized in future Post-Construction Performance Evaluation Reports.

8. CONCLUSIONS AND RECOMMENDATIONS

a. Project Goals, Objectives, and Management Plan. Based on field data and observations collected since project completion in 1992, it appears that many stated goals and objectives are generally being met; however, physical changes and flood events in the project areas have generated concern that has in turn prompted closer scrutiny and assessment of those impacted project areas. Further evaluation of the unexpected benefits of the confined placement site will help determine if a management plan is needed there. Further data collection will better define the degree of reduced movement of bedload sediment into Bertom Lake, improved dissolved oxygen concentration during critical seasonal stress periods, and increased migratory waterfowl habitat. The vegetation and fish/mussel surveys still need to be done. The next survey of sediment transects should be completed in FY02 for the assessment of bed load movement in the project area.

b. Post-Construction Evaluation and Monitoring Schedules. In general, most project monitoring efforts have been performed according to the Post-Construction Performance Evaluation Plan in Appendix A and the Resource Monitoring and Data Collection Summary in Appendix B except where flood conditions or other obstacles have prevented monitoring tasks. A Post-Construction Performance Evaluation Supplement will be prepared annually. The next Post-Construction Performance Evaluation will be completed for 2002, 11-years after construction, for distribution in March 2003.

c. Project Operation and Maintenance. Project operation and maintenance has been conducted in accordance with the O&M manual. Annual site inspections by the Site Manager will and have resulted in proper corrective maintenance actions since project completion. Noted areas of concern attributed to flood impacts are still being assessed for level of repair or continued monitoring.

d. Project Design Enhancement. Discussions with USFWS, WDNR and Corps personnel involved with operation, maintenance, and monitoring activities at the Bertom and McCartney Lakes project have resulted in the following general conclusions regarding project features which may affect future project design:

(1) Littoral zone development has not been observable on the lee-side of the island in McCartney Lake. It is a function of water depth and the turbidity of the river. Future performance evaluations will continue to evaluate the Littoral zone development and establishment of an aquatic vegetation bed.

(2) Further evaluation of the McCartney Lake and the associated wetland community that is developing on the dredged material containment facility is still required. The current habitat success of the island is likely attributable to the good water clarity in the lake. The wetland catches runoff from the island and the stable water levels in the lake allow it to function essentially independent of river levels. The perched wetland has low to non-existent water levels during dry periods, allowing the wetland area to fully dry out. Essentially, the wetland is functioning well with the development of excellent aquatic

vegetation. Additionally, many willow and cottonwood trees have established themselves along the eastern shore of the island that provide habitat to wildlife as well.

(3) The channel immediately below the Bertom Lake Boat Ramp, at approximately RM 601.5, has enlarged during post-construction. It is suspected that this is causing an increase in flow and affecting overwintering water quality of the dredged aquatic habitat areas A & C. Additional monitoring will be done to verify the effects to water quality in the dredged aquatic habitat areas. A notched partial closing structure has been proposed to reduce flows and prevent any further widening of the channel; and riprap along the banks of the slough has also been proposed to prevent further erosion in the event these habitat areas are degraded because of this channel.

(4) After several flooding events, a lot of erosion and sediment deposition was noted along several areas of the project area. The Site Manager questions the function of the partial closing structure off the main channel since field observation identified excessive sediment deposition into Coal Pit Slough from the main channel. The transect analysis from the 1993 surveys did show damage to the partial closing structure that had been repaired in 1995, but the 1998 surveys also show damage that has not been repaired. The requirements for repair are currently being developed. Factors such as feasible equipment access and availability of funds are instrumental to whether the repair work can be done. Also, even though physical damage or changes to the channels are noted, it is not clear if the aquatic habitats are adversely affected. Therefore, an assessment of whether the aquatic habitats are not meeting project objectives due to the flood damage and changes noted in the channels is scheduled for FY02. The sediment transport up Coal Pit Slough will continue to be monitored.

APPENDIX A

POST-CONSTRUCTION EVALUATION PLAN

Table A-1. Project Goals and Objectives

Enhancement Potential

Goal	Objective	Alternative	Enhancement Feature	Unit	Year 0 (1991) without Alternative	Year 0 with Alternative (As-Built)	Year 7 with Alternative	Year 50 Target with Alternative	Feature Measurement	Annual Field Observations by Site Manager
Enhance Aquatic Habitat	Restore deep (≥6') aquatic habitat volume	McCartney Lake dredging	Hydraulic dredging	Acre-feet	0	290	263	200	Perform hydrographic soundings	Observe sedimentation effects by pole soundings or depth gauging
	Restore lentic-lotic habitat access cross-sectional area	McCartney Lake dredging	Hydraulic dredging	SF	300			1,800	Perform hydrographic soundings	Observe sedimentation erosion changes
	Increase rock substrate aquatic habitat	Fish and mussel rock habitat	Rock habitat channel	SY	0			10,000	Perform profile of rock substrate transect	Observe changes in rock substrate (i.e., movement, sedimentation, organic growth)
	Establish mussel bed	Fish and mussel rock habitat	Rock habitat channel	#/SY	0			10	Perform area mussel survey	Observe mussel changes
	Reduce movement of bedload sediment into the Bertom Lake	Partial closing structure	Rock partial closing structure	In/Yr	0.7		0.46	0.55	Perform hydrographic soundings of transect	Observe condition of dam and localized effects
	Improve dissolved oxygen concentration during critical seasonal stress periods	McCartney Lake dredging	Hydraulic dredging	Mg/l	<5.0	>5.0		>5.0	Perform water quality tests at Stations W-M600.3C, W-M598.9E, W-M599.8B	Observe aquatic life changes (i.e., fish kills, sport fishing)
Enhance Migratory Waterfowl Habitat	Establish aquatic vegetation bed	In-water confined dredged material placement site	Aquatic Bed Perched Wetland (new)	Acre	0	0	Unknown	10	Perform Aerial Surveys	Observe vegetation development

1/ The Habitat Unit is a methodology used to quantitatively measure wildlife habitat characteristics. Missouri Department of Conservation (MDOC) and the Soil Conservation Service (SCS) developed the methodology. The methodology is called the Wildlife Habitat Appraisal Guide (WHAG).

Table A-2. Data Collection Transects & Surveys for Project Objectives Evaluation				
Engineering Data				
Type of Transect	Project Feature	Monitoring Site Title	Transect Title & Station	Objectives Evaluated
Transects 2/ Hydrographic Soundings	Lake Dredging	S-M601.2B S-M600.8B S-M600.2B S-M599.6B	STA. 68+90 (D) (Extra for Flood of 1993) STA. 71+92 (E) STA. 75+74 (F) (Extra for Flood of 1993) STA. 89+90 (G) STA. 107+87 (H) STA. 125+85 (I) (Extra for Flood of 1993) STA. 131+84 (J)	Enhance Aquatic Habitat
Transect 3/ Profile	Substrate Channel	S-M602.1G S-M602.1D	STA. –10+00 rock habitat channel (Transect H)	Enhance Aquatic
Transects 4/ Hydrographic Soundings	Bertom Lake	S-M602.1J S-M602.2J S-M602.3B S-M602.2B S-M602.0B	STA. –10+01 submerged partial closure structure (Transect G) Transect E STA. –6+00 STA. 5+99 STA. 29+95	Enhance Aquatic Habitat
Surveys (Transects 5)/Vegetation Survey	Aquatic Bed Perched Wetland (new)	V-M599.5B V-M599.2B V-M599.4B	Aerial Photo Interpretation/Vegetation Mapping Aerial Photo Interpretation/Vegetation Mapping Wildlife Observations by Site Manager	Enhance Migratory Waterfowl Habitat

APPENDIX B

MONITORING AND PERFORMANCE EVALUATION MATRIX
AND
RESOURCE MONITORING AND DATA COLLECTION SUMMARY

Table B- 1. Project 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. Evaluates planning assumptions.	WDNR	USGS (UMESC) 3/	LTRM 1/	--
	Pre-Project Monitoring	Identifies and defines problems at HREP site. Establishes need of proposed project features.	WDNR	USFWS	USFWS	--
	Baseline Monitoring	Establish baseline for performance evaluation.	Corps	Field station or sponsor through Cooperative Agreements or Corps.	HREP	See Table B-2.
Design	Data Collection	Includes quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP 2/	See Table B-2.
Construction	Construction Monitoring	Assess construction impacts; assures permit requirements are met.	Corps	Corps	HREP	See State Section 401 Stipulations.
Post-Construction	Performance Evaluation Monitoring	Continue monitoring and assess physical, chemical, and vegetation performance of project relative to design goal and objectives.	Corps (Quantitative) Sponsor (Field observations)	Sponsor thru Corps. USGS (UMESC)	HREP	See Table A-1
	Analysis of Biological Responses to Projects	Evaluates predictions and assumptions of habitat unit analysis. Studies beyond scope of performance evaluation, or if projects do not have desired biological results.	Corps		HREP	--

1/ Long-Term Resource Monitoring of the Environmental Management Program (P.L.99-662)
2/ Habitat Rehabilitation and Enhancement Project of the Environmental Management Program (P.L. 99-662)
3/ Upper Midwest Environmental Sciences Center

Table B- 2. Resource Monitoring and Data Collection Summary for Transect and Area Measurements

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
Transect Measurements														
Transect 2/ Hydrographic Soundings									5Y				Corps	
Transect 3/ Profile									5Y				Corps	
Transect 4/ Hydrograpic Soundings									5Y				Corps	
Transect 5/ Vegetation Survey												5Y	Corps	
Area Measurements														
Fish and Mussel Habitat Area														
Mussel M-M602.1G Survey												5Y	Corps	
Bertom/McCartney Lake														
Vertical Stereo Aerial Photography (1:50,000)											1	5Y	Corps	

Legend

5Y - Once every 5 years

M - Monthly

C - Continuous Monitoring using a YSI 6000 or 6600 multi parameter water quality probe. Monitoring using this equipment did not start until Summer of 1996. Monitors were deployed for the duration of sampling period, 2W, M, etc. However, they were not deployed for every sampling event.

1 - (n)=number of times sampled

Table B- 3. Resource Monitoring and Data Collection Summary for Station W-M601.0C

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M601.0C													Corps	
Years Sampling Occurred						2000								
Turbidity						M								
Secchi Disk Transparency						M								
Dissolved Oxygen						M								
Specific Conductance						M								
Water Temperature						M								
Velocity						M								
Water Depth						M								
Continuous Sampling Depth														
Ice Depth						M								
Snow Depth						M								
Total Alkalinity						M								
pH						M								
Chlorophyll						M								
Suspended Solids						M								
Wind Direction						M								
Wind Velocity						M								
Wave Height						M								
Cloud Cover						M								

Table B- 4. Resource Monitoring and Data Collection Summary for Station W-M600.8B

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M600.8B													Corps	
Years Sampling Occurred						Winter of 1996-1997								
Turbidity						M, C								
Secchi Disk Transparency						M, C								
Dissolved Oxygen						M, C								
Specific Conductance						M, C								
Water Temperature						M, C								
Velocity						M								
Water Depth						M								
Continuous Sampling Depth						C								
Ice Depth						M								
Snow Depth						M								
Total Alkalinity						M, C								
pH						M, C								
Chlorophyll						M								
Suspended Solids						M								
Wind Direction						M								
Wind Velocity						M								
Wave Height						M								
Cloud Cover						M								

Table B- 5. Resource Monitoring and Data Collection Summary for Station W-M600.3C

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M600.3C													Corps	
Years Sampling Occurred		Jan 1990	1991, 1992	1991	1992-2000	1992-2000								
Turbidity		1	2W	2W	2W, C	M, C								
Secchi Disk Transparency			2W	2W	2W	M, C								
Dissolved Oxygen		1	2W	2W	2W, C	M, C								
Specific Conductance			2W	2W	2W, C	M, C								
Water Temperature		1	2W	2W	2W, C	M, C								
Velocity		1	2W	2W	2W	M								
Water Depth		1	2W	2W	2W	M								
Continuous Sampling Depth					C	C								
Ice Depth		1				M								
Snow Depth		1				M								
Total Alkalinity			2W	2W	2W, C	M, C								
pH		1	2W	2W	2W, C	M, C								
Chlorophyll			2W	2W	2W	M								
Suspended Solids			2W	2W	2W	M								
Wind Direction			2W	2W	2W	M								
Wind Velocity			2W	2W	2W	M								
Wave Height					2W	M								
Cloud Cover			2W	2W	2W	M								

Table B- 6. Resource Monitoring and Data Collection Summary for Station W-M599.8B

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M599.8B													Corps	
Years Sampling Occurred			1991, 1992	1991	1992-2000	1992-2000								
Turbidity			2W	2W	2W, C	M, C								
Secchi Disk Transparency			2W	2W	2W	M, C								
Dissolved Oxygen			2W	2W	2W, C	M, C								
Specific Conductance			2W	2W	2W, C	M, C								
Water Temperature			2W	2W	2W, C	M, C								
Velocity			2W	2W	2W	M								
Water Depth			2W	2W	2W	M								
Continuous Sampling Depth					C	C								
Ice Depth						M								
Snow Depth						M								
Total Alkalinity			2W	2W	2W, C	M, C								
pH			2W	2W	2W, C	M, C								
Chlorophyll			2W	2W	2W	M								
Suspended Solids			2W	2W	2W	M								
Wind Direction			2W	2W	2W	M								
Wind Velocity			2W	2W	2W	M								
Wave Height					2W	M								
Cloud Cover			2W	2W	2W	M								

Table B- 7. Resource Monitoring and Data Collection Summary for Station W-M599.5D

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M599.5D													Corps	
Years Sampling Occurred			1991, 1992	1991	1992-2000	1992-1995								
Turbidity			2W	2W	2W	M								
Secchi Disk Transparency			2W	2W	2W	M								
Dissolved Oxygen			2W	2W	2W	M								
Specific Conductance			2W	2W	2W	M								
Water Temperature			2W	2W	2W	M								
Velocity			2W	2W	2W	M								
Water Depth			2W	2W	2W	M								
Continuous Sampling Depth														
Ice Depth						M								
Snow Depth						M								
Total Alkalinity			2W	2W	2W	M								
pH			2W	2W	2W	M								
Chlorophyll			2W	2W	2W	M								
Suspended Solids			2W	2W	2W	M								
Wind Direction			2W	2W	2W	M								
Wind Velocity			2W	2W	2W	M								
Wave Height					2W	M								
Cloud Cover			2W	2W	2W	M								

Table B- 8. Resource Monitoring and Data Collection Summary for Station W-M599.2C

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M599.2C													Corps	
Years Sampling Occurred			1991, 1992	1991	1992-2000	1992-1995								
Turbidity			2W	2W	2W	M								
Secchi Disk Transparency			2W	2W	2W	M								
Dissolved Oxygen			2W	2W	2W	M								
Specific Conductance			2W	2W	2W	M								
Water Temperature			2W	2W	2W	M								
Velocity			2W	2W	2W	M								
Water Depth			2W	2W	2W	M								
Continuous Sampling Depth														
Ice Depth						M								
Snow Depth						M								
Total Alkalinity			2W	2W	2W	M								
pH			2W	2W	2W	M								
Chlorophyll			2W	2W	2W	M								
Suspended Solids			2W	2W	2W	M								
Wind Direction			2W	2W	2W	M								
Wind Velocity			2W	2W	2W	M								
Wave Height					2W	M								
Cloud Cover			2W	2W	2W	M								

Table B- 9. Resource Monitoring and Data Collection Summary for Station W-M598.9E

	Water Quality Data						Engineering Data			Natural Resource Data				
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
Type Measurements	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar	Apr-Sept	Oct-Mar							Sampling Agency	Remarks
POINT MEASUREMENTS														
STATION W-M598.9E													Corps	
Years Sampling Occurred			1991, 1992	1991	1992-2000	1992-1995								
Turbidity			2W	2W	2W	M								
Secchi Disk Transparency			2W	2W	2W	M								
Dissolved Oxygen			2W	2W	2W	M								
Specific Conductance			2W	2W	2W	M								
Water Temperature			2W	2W	2W	M								
Velocity			2W	2W	2W	M								
Water Depth			2W	2W	2W	M								
Continuous Sampling Depth														
Ice Depth						M								
Snow Depth						M								
Total Alkalinity			2W	2W	2W	M								
pH			2W	2W	2W	M								
Chlorophyll			2W	2W	2W	M								
Suspended Solids			2W	2W	2W	M								
Wind Direction			2W	2W	2W	M								
Wind Velocity			2W	2W	2W	M								
Wave Height					2W	M								
Cloud Cover			2W	2W	2W	M								

Legend for all Resource Monitoring and Data Collection Tables

2W Biweekly

M Monthly

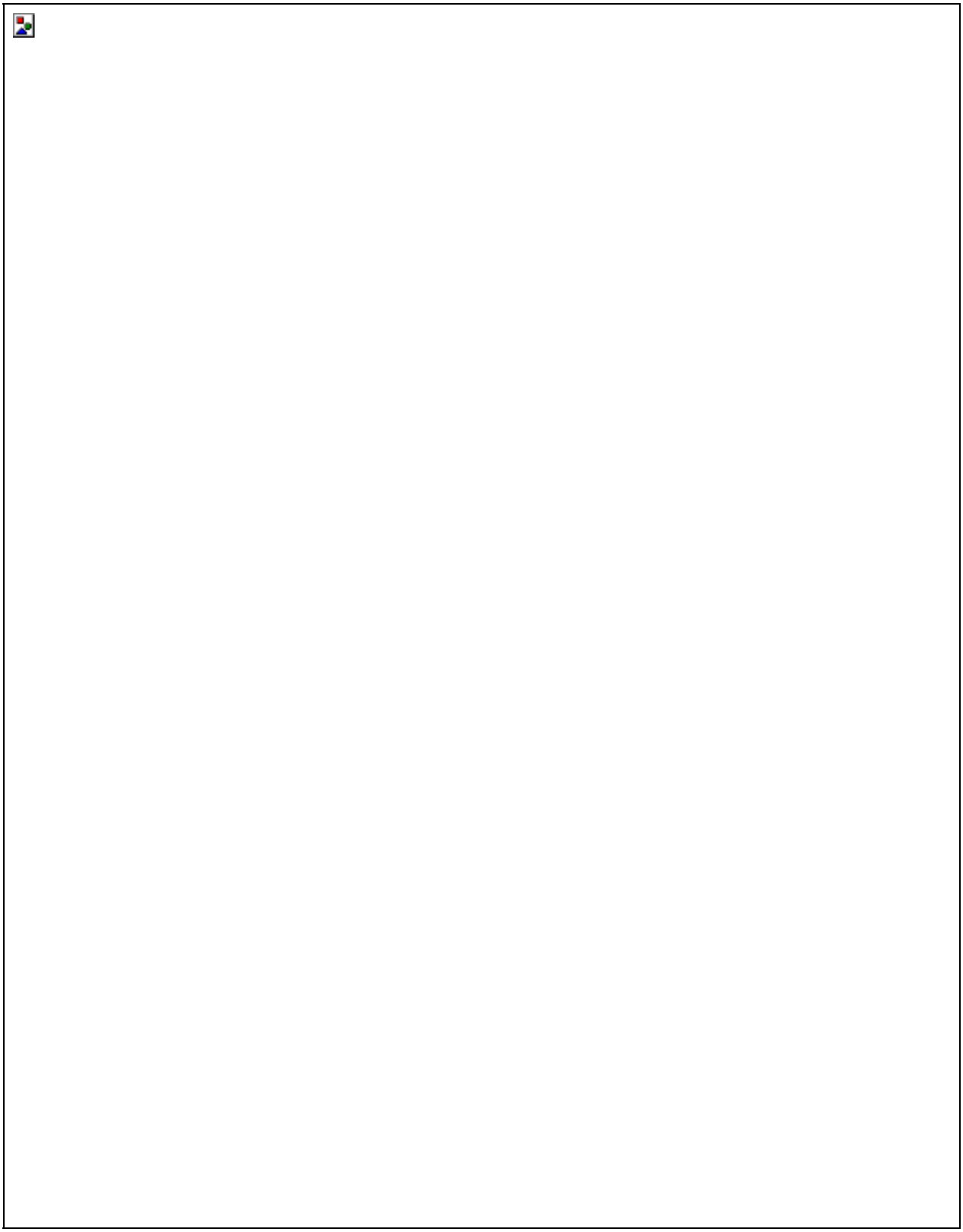
5Y Every 5 years

C Continuous Monitoring using a YSI 6000 or 6600 multi-parameter water quality probe. Monitoring using this equipment did not start until Summer of 1996. Monitors were deployed for the duration of the sampling period, 2W, M, etc. However, they were not deployed for every sampling event.

1 (n)=number of times sampled

A P P E N D I X C

COOPERATING AGENCY CORRESPONDENCE



MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES FISH AND WILDLIFE SERVICE
AND
THE DEPARTMENT OF THE ARMY
FOR
ENHANCING FISH AND WILDLIFE RESOURCES
OF THE
UPPER MISSISSIPPI RIVER SYSTEM
AT BERTOM AND McCARTNEY LAKES, WISCONSIN

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (FWS) and the Department of the Army (DA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Bertom and McCartney Lakes, WI, separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP). All project lands are owned by the United States and are managed by the FWS as part of the Upper Mississippi River National Fish and Wildlife Refuge.

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features on Bertom and McCartney Lakes are 100 percent Federal, and all operation, maintenance, repair, and rehabilitation costs are to be cost shared, 75 percent Federal and 25 percent non-Federal.

III. GENERAL SCOPE

The project to be accomplished pursuant to this MOA shall consist of creating 250 acre-feet of deep aquatic habitat, creating 6 acres of rock substrate aquatic habitat, and providing a wind sheltered area for aquatic bed establishment at Bertom and McCartney Lakes.

IV. RESPONSIBILITIES

A. DA is responsible for:

1. Construction: Construction of the project which consists of creating 250 acre-feet of deep aquatic habitat, creating 6 acres of rock substrate aquatic habitat, and providing a wind sheltered area for aquatic bed establishment at Bertom and McCartney Lakes.

2. Major Rehabilitation: Any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. Construction Management: Subject to and using funds appropriated by the Congress of the United States, DA will construct the Bertom and McCartney Lakes Fish and Wildlife Enhancement Project as described in the Definite Project Report, "Bertom and McCartney Lakes Rehabilitation and Enhancement," dated June 1989, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The FWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. If DA encounters potential delays related to construction of the project, DA will promptly notify FWS of such delays.

4. Maintenance of Records: DA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. DA shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the FWS.

B. FWS is responsible for:

1. Operation, Maintenance, and Repair: Upon completion of construction as determined by the District Engineer, Rock Island, the FWS shall accept the project and shall operate, maintain, and repair the project as defined in the Definite Project Report entitled "Bertom and McCartney Lakes Rehabilitation and Enhancement," dated June 1989, in accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662.

2. Non-Federal Responsibilities: In accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662, the FWS shall obtain 25 percent of all costs associated with the operation and maintenance of the project from the Wisconsin Department of Natural Resources.

V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the project.

VI. REPRESENTATIVES

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties:

FWS: Regional Director
U.S. Fish and Wildlife Services
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

DA: District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY

BY: _____
COLONEL JOHN R. BROWN
District Engineer
U.S. Army Engineer District,
Rock Island
Corps of Engineers

DATE: 11 DECEMBER 1989

THE U.S. FISH AND WILDLIFE SERVICE

BY: _____
JAMES C. GRITMAN
Regional Director
U.S. Fish and Wildlife
Service

DATE: NOV 2 1 1989

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
McGregor District
Post Office Box 460
McGregor, Iowa 52157

IN REPLY REFER TO:

January 27, 1998

Memorandum

To: Celia Kool, CEMVR-ED-DN

From: Acting District Manager, Upper Mississippi River NW&FR, McGregor, IA

Subject: Bertom-McCartney Performance Evaluation Report

Enclosed please find the Site Manager's Project Inspection and Monitoring Results for the Bertom and McCartney project. As we have already discussed over the phone, our information is generally related to the spoil's placement site, and observations there. In researching the files, it looks like an update since the September 28, 1994, evaluation is needed.

May 1995 - Observations from Clyde Male reported to EMP Coordinator Beseke in memorandum dated May 24, 1995. The erosion on the NW edge of the Bertom McCartney spoils island was expected and Beseke indicated it would reach equilibrium, and it has. The other area of concern was the east edge of the island, specifically the potential for erosion breaching the berm and jeopardizing the integrity of the perched wetland basin. The problem still remains today, however, it has not progressed to a critical point. The area in question is approximately 535 feet long, and located along the east edge of the island. At that time it formed a small cliff edge averaging 37 inches high. Only the top 12 inches is soil. The remaining 25 inches is packed sand. During 1996 and 1997 this area was monitored for continued problems. No additional problems were noted.

May 1995 Monthly Activities - Bank swallows have moved into the NW edge of the Bertom/McCartney island and established a colony of approximately 80 birds. While these birds are not rare on the District, it is the first and only nesting site on Pool 11.

Annual Narrative 1995 - Water levels in the McCartney Bay perched wetland basin remained stable all spring and summer until August when water levels decreased approximately 50 percent due to the lack of precipitation. Waterfowl observations indicated a total of 4,588 duck-use days from eight different species during March. Fall use was down considerably due to reduced water levels.

A total of 2,604 duck-use days was recorded in October with similar waterfowl use in November. The Bertom McCartney EMP Island open-area was maintained mechanically and with the aid of Rodeo during May. This isolated habitat remains undiscovered by the general public. Wildlife use, especially nesting turtles, loafing shorebirds, and waterfowl, have benefited from the predator free microhabitat.

March 1996 Monthly Activities - Water levels within the elevated perched wetland Bertom/McCartney EMP Island continue to remain low. Approximately 60 percent of the previous basin is filled with water. The lack of precipitation in the area is responsible. Waterfowl use is normally heavy at this location, but this spring less than 40 birds have been observed.

April 1996 Monthly Activities - The perched elevated wetland within the McCartney Bay EMP Island has filled with water to nearly 90 percent of its original basin capacity. A total of 2,670 duck-use days was recorded by seven different species. Shorebird use was also significant because of the shallow stable water levels within the unit despite the flooding on the surrounding floodplain.

1997 - Due to the lose of personnel in Pool 11, no regular observations were made on wildlife use on the island. During the year, water levels within the perched wetland fluctuated between 50 and 90 percent of basin capacity.

The spoils island itself was not developed for wildlife benefits, but for an economical choice to place spoils.

I will try to answer some of your specific questions about the Island and provide some general comments.

All vegetation found within the perched wetland is voluntary. The remainder of the island has vegetation that was seeded on the perimeter berm and the remaining area allowed to come back naturally. The aquatic vegetation within the perched wetland is some of the best we have on the Refuge. I am sure this is a function of the initial rich seed bank, and stable clear water. Vegetation within the island shadow or lee-side littoral zone has not developed.

The wetland does not support any real fish populations. After the flood of 1993, there were several species of fish that temporarily resided within the basin. They soon perished as water temperatures became critical during the summer months. This is a real plus not to have carp to disrupt the substrate.

The Island provides little cover for deer at this time. One of the pluses early in its creation was that it also provided little habitat for raccoons, and at least for a while was predator free.

Waterfowl broods are common on the island wetland during the spring and are assumed to have been hatched there.

Waterfowl use within this small wetland at times can be impressive. It is usually a function of unfavorable conditions in the surrounding bay that forces birds into the wetland. The invertebrate populations, in conjunction with lush aquatic vegetation, also attract birds to this location.

I hope some of this will prove beneficial, if not, I am out of ideas, and it is Keith Beseke's turn. If you need further information or clarification, give me a call at (319) 873-3423.

Clyde B. Male

OPERATION AND MAINTENANCE MANUAL
BERTOM AND McCARTNEY LAKES REHABILITATION AND ENHANCEMENT

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILES 595 THROUGH 603
GRANT COUNTY, WISCONSIN

SITE MANAGER'S PROJECT INSPECTION AND MONITORING RESULTS

Inspected by Clyde Male Date 01/16/98

Type of Inspection: (X) semi-annual ( ) emergency-disaster) other

1. PROJECT INSPECTION.

Item	Comment
a. Partial Closing Structure	
(X) Wavewash, scouring	Rock work completed - 1995
(X) Overtopping erosion	Bank line stabilization project
(X) Displaced/missing riprap	1993 damage
( ) Burrowing animals	
( ) Encroachments	
b. Fish and Mussel Rock Habitat	
( ) Displaced/missing riprap	
( ) Blockage of inlet and outlet channels	
( ) Erosion adjacent to rock substrate	
( ) Concrete pipe condition	
( ) Lunker fish structures condition	
c. McCartney Lake Dredging	
( ) Sedimentation/erosion changes	
d. Confined Dredged Material Placement Site	
( ) Waste materials/unauthorized structures	
( ) Bank erosion	

2. PROJECT MONITORING.

a. Partial Closing Structure

( ) Sediment changes in Bertom Lake _____

b. Fish and Mussel Rock Habitat

( ) Sedimentation/erosion changes _____
( ) Changes in rock substrate _____
( ) Presence of mussels _____
( ) Fishery usage of fish structures _____

c. McCartney Lake Dredging

( ) Fish population/species changes _____

d. Dredged Material Placement Site

( ) Specie usage see attached memo

Site Manager

CONVERSATION RECORD	TIME	DATE
	2:20 p.m.	July 6, 2000

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE (☒ INCOMING ☐ OUTGOING)

Location of Visit/Conference:

ROUTINE — NAME/SYMBO | INI

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO:
Clyde Male	U.S. FWS	(319) 873-3423

SUBJECT: Bertom and McCartney Performance Evaluation Report (PER)

SUMMARY

Mr. Male called regarding the e-mail I sent him to get information for the project design enhancement section of the report. I sent him the section from the 1995 PER, adding a new sub-section, and asked for the changes that he has observed since then.

For (1): He said there has been no littoral zone development. He said that it is a function of water depth and the turbidity of the river.

For (2): He said that the first sentence is still true. The perched wetland that is independent of the river has low to non-existent water levels during dry periods, allowing the area to dry out. According to Mr. Male, the wetland is functioning well and the vegetation is superb, a function of water clarity. Lots of willows and cottonwood.

For (3): Keep the same.

Mr. Male mentioned another concern he had. It concerned the partial closure structure off the main channel. The water enters Coal Pit Slough and it travels to either the Fish and Mussel Rock Habitat or to the channel to the north. Erosion and sediment transport along the northern channel has been observed.

Mr. Male also said that the ice fishermen have utilizing the area since the construction and have found plentiful amounts of fish.

ACTION REQUIRED

None.

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
Nichole E. Engel		7/6/00

ACTION TAKEN

SIGNATURE	TITLE	DATE

CONVERSATION RECORD — OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

CONVERSATION RECORD

TIME	DATE
1:10 p.m.	October 11, 2000

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE — ☒ INCOMING ☐ OUTGOING

Location of Visit/Conference:

ROUTINE: NAME/SYMBO | INI

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO:
Jeff Janvrin	WI DNR	(608) 785-9005

SUBJECT: Bertom and McCartney Performance Evaluation Report (PER)—Mussel Survey

SUMMARY

Mr. Janvrin returned my telephone call in reference to a mussel survey in the rock habitat channel created for the Bertom and McCartney Lakes EMP project.

He did conduct a dive on 31 Aug 00. Clearly, the rock substrate gradation is too large to establish mussels in the habitat, however, there were more different species of mussels in the area then ever seen before. He observed some silt on the rocks and a new "this years" settlement of zebra mussels, but the zebra mussels were not attached to any of the other mussels found. It is too soon to classify the habitat as a success primarily due to the existing rock substrate and inability for the desired species of mussels to establish a strong settlement in the habitat. Jeff also stated that there is a study being done in conjunction with the St. Paul District to determine the best substrate for mussel habitats, and he will provide that information as soon as it becomes available.

He also noted that there seems to head cutting and excessive bank erosion in the channel that branches to the left from the rock habitat channel. He mentioned this should be assessed for repair due to its negative impact on the EMP project features if it is allowed to continue to degrade. I told Jeff that this might be the same channel identified by Mr. Clyde Male of the USFWS regarding channel erosion. I will follow up on this with Mr. Male and Mr. Janvrin to determine if these observations are about the same channel.

Comment from Clyde Male telephone conservation, Jul 00:
"Mr. Male mentioned another concern he had. It concerned the partial closure structure off the main channel. The water enters Coal Pit Slough and it travels to the Fish, Mussel Rock Habitat or to the channel to the north. Erosion and sediment transport along the northern channel has been observed."

Jeff commented that the fish response appears successful.

I explained the status of the project to stabilize the banks of the channel immediately downstream of the Farnuff Boat Landing for Bertom Lake. Jeff stated that the bank erosion on the island used as a dredged material containment facility may require stabilization as well and asked that we investigate.

ACTION REQUIRED

Conduct an investigation into the problems identified in the telephone conversation.

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
Alaena A. Ensey		10/11/00

ACTION TAKEN

SIGNATURE	TITLE	DATE

CONVERSATION RECORD — OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

A P P E N D I X D

WATER QUALITY REPORT

BERTOM AND McCARTNEY LAKE WATER QUALITY SUMMARY

1. INTRODUCTION

Examination of available data shows that several positive trends in water quality that emerged immediately post construction have continued. These include improved flow through the project area as a result of the dredged channels, improved dissolved oxygen concentrations at specific locations which previously experienced periods of low concentrations and the establishment of aquatic vegetation in the vicinity of the island created from dredged material. A reduction of sediment resuspension during the growing season attributable to this island has not been seen. This is apparently due to the fact that island orientation and configuration do not shelter the target area from wind-induced wave action. In general, it appears that many of the original water quality objectives have been met.

2. PROJECT OBJECTIVES

As part of the general goal of enhancing the aquatic habitat within the backwater complex, specific water quality objectives were established. These included increasing water exchange between lotic and lentic areas and reducing resuspension of fine-grained bottom sediments. Because of sediment deposition, some areas within the project site had become isolated from oxygenated, flowing water sources. Groundwater interactions further reduced dissolved oxygen concentrations during critical periods such as under snow and ice cover. By selectively dredging access channels to these isolated areas it was anticipated that the occurrence of low dissolved oxygen concentrations could be avoided.

Much of the sediment deposited to the backwater complex is very fine-grained and easily resuspended by wind-induced wave action. This resuspension greatly reduces water clarity and makes for an unsuitable substrate in which aquatic plants can become established. It was anticipated that constructing and strategically orienting an island would realize some wind-sheltering effect. This would potentially reduce sediment resuspension, improve light penetration and promote aquatic plant growth. Once aquatic plants become established, the bottom would be stabilized and thus be less subject to resuspension.

3. MONITORING METHODS

a. Grab Samples. Prior to project construction and throughout the post-project period, instantaneous monitoring has been performed. During the summer months samples were collected approximately bi-weekly; during the winter samples were collected approximately monthly. Sampling consisted of taking grab samples from approximately 1 meter beneath the water surface at the 5 locations (W-M600.3C, W-M599.8B, W-M599.5D, W-M598.9E and W-M600.8B) shown on the McCartney Lake Monitoring Plan, Plate 2, Appendix G. In addition, field determinations of dissolved oxygen were routinely made at the approximate mid-depth of the water column and near the bottom. Field analyses were performed for ephemeral parameters. Parameters measured in this fashion

included dissolved oxygen, pH, water temperature, water depth, specific conductance, secchi disk depth, wave height, water velocity, water temperature, percent cloud cover, wind speed and direction, total alkalinity, suspended solids, and chlorophyll. All dissolved oxygen measurements were made in the field using an oxygen sensitive membrane electrode and appropriate meter. Preserved sub-samples were shipped to a commercial laboratory for further analysis

Prior to the project 37 instantaneous monitoring events were performed. Since project completion 60 instantaneous monitoring events have been performed. Monitoring was suspended during construction.

b. Continuous Monitoring.

In-Situ Continuous Monitoring. In-situ continuous monitoring has been performed for short periods during both the summer and winter since project completion. Monitoring equipment consisted of Yellow Springs Instrument model 6000UPG data sondes. Calibration was performed in the laboratory prior to field deployment. A single monitoring event lasted for a period of two weeks during summer months and four weeks during winter months. Data sondes were suspended approximately 3 feet beneath the water surface or 3 feet above the bottom. On occasion sondes were placed at both depths at a single site. Upon retrieval, the sondes were recalibrated in the laboratory and adjustments for instrument drift were made to the data where necessary.

Sampling Locations. Since project completion continuous monitoring events have been performed at three sampling locations (W-M600.3C, W-M599.8B and W-M600.8B) shown in Plate 2, Appendix G. Parameters measured with data sondes include dissolved oxygen, pH, water temperature, depth, specific conductance and turbidity.

Wind Speed and Direction. Continuous monitoring of wind speed and direction was also conducted in the project area. A meteorological station was placed on the dredged island during the growing season for the years 1995, 1997 and 1998. Measurements were recorded each hour throughout the monitoring period.

Prior to project construction it was anticipated that the shallow water area near the concave side of the island might be suitable for the establishment of aquatic vegetation because of a "shadow effect" created by the island. This would tend to protected this area from wind-driven waves minimize sediment resuspension. By knowing wind speed and direction in the immediate vicinity of the island, it is possible to determine how frequently this phenomenon was observed.

4. RESULTS AND DISCUSSION

a. Grab Samples.

Velocity. Surface measurements at sites W-M600.3C (in the dredged channel near Area G) and site W-M599.8B (Area A) indicate that velocity in the channel is consistently

higher. This is clearly shown on Bertom Lake Monitoring Plan, Plate 1, Appendix G. During the winter months of December – March (and fish are dependent upon areas with minimal velocity) water temperature at both sites averaged 1.5 degrees Celsius, and velocity within the channel averaged 4.0 cm/sec compared to 0.84 cm/sec at site W-M599.8B. Thus in terms of water velocity, site W-M599.8B demonstrated a good over-wintering location for fish.

Dissolved Oxygen. Surface dissolved oxygen concentrations from six locations are summarized in Table D1. Prior to project construction surface dissolved oxygen concentrations were observed to fall below 5.0 mg/l at site W-M600.3C frequently, both during the summer and winter months. Dissolved oxygen concentrations as low as 1.0 mg/l were observed at the surface. Based on samples taken since project completion, surface dissolved oxygen concentrations below 5.0 mg/l have been observed only two times and never below 3.7 mg/l. At site W-M599.8B similar findings were observed. Post-construction monitoring at sites not sampled prior to construction reveal surface dissolved oxygen concentrations to be acceptable most of the time.

Table D- 1. Surface Dissolved Oxygen Summary.

Statistic	W-M600.3C	W-M599.8B	W-M598.9E	W-M599.5D	W-M599.2C	W-M600.8B
Total samples collected	105	83	56	55	55	6
			N/A	N/A	N/A	N/A
Pre-project samples collected	34	12	N/A	N/A	N/A	N/A
Range (mg/l)	1.0 - 15.8	1.1 - 16.0	N/A	N/A	N/A	N/A
Mean (mg/l)	7.9	10.7	N/A	N/A	N/A	N/A
Percent of samples < 5.0 mg/l (%)	21	8	N/A	N/A	N/A	N/A
Post project samples collected	71	71	56	55	55	6
Range (mg/l)	3.7 – 18.9	3.7 – 19.0	5.1 – 18.3	4.2 14.3	4.2 – 15.9	10.1 – 12.34
Mean (mg/l)	9.96	10.1	9.3	8.8	8.8	11.6
Percent of samples < 5.0 mg/l (%)	3	4	0	4	4	0

In addition, dissolved oxygen profiles were determined at all sampling sites at various times between 1992 and present. These data are presented in Appendix D2. Dissolved oxygen concentrations below 5.0 mg/l were observed on several occasions during the summer months at sites W-M600.3C and W-M599.8B. This occurred more frequently at site W-M599.8B, and there is evidence of these conditions persisting at this site. From the data shown, it is apparent that dissolved oxygen concentrations are closely correlated with phytoplankton activity. It appears that instances of low dissolved oxygen concentrations are related to algal population dynamics.

Water Clarity. Turbidity samples were taken at five locations following project construction. All samples were collected in plastic bottles, labeled and returned to the laboratory where they were analyzed immediately. A summary of these data is presented in Table D2.

Table D- 2. Summary of Turbidity Results.

Turbidity (NTU)	W-M600.3C	W-M599.8B	W-M598.9E	W-M599.5D	W-M599.2C
Number of Samples	74	74	60	57	57
Mean	15	18	16	18	20
Maximum	35	31	40	45	51
Minimum	3	4	3	3	3

No obvious differences in turbidity values exist between sites monitored since project construction. Earlier it was reported that turbidity measurements at site W-M599.8B appeared to be consistently less than the other sites monitored. That trend appears to have been caused by the relatively short period of record at that time as opposed to physical causes. At sites W-M599.5D and W-M599.2C measurements were taken in an attempt to identify any "shadow effect" and subsequent reduction in resuspension of bottom sediments that might be attributable to the presence of the newly constructed island. In order for the island to have any beneficial impacts in this regard, the predominate wind direction must be from a westerly direction. Also, in order for aquatic plants to benefit from improved water clarity, data gathered only during warm weather months were analyzed. No difference was observed in data from two these sites.

Field secchi disc depth measurements were made at 5 sites following project construction during the growing season. Results of these measurements are presented in Table D3. Secchi disc depth does appear to be noticeably better at sites W-M600.3C and W-M599.8B compared to the other sites. On page D-18, the graph, Secchi Disc Depths, compares secchi disc depth measurements from sites on either side of the island and the site near Hurricane Chute. There does not appear to be any difference between these three sites.

Table D- 3. Summary of Secchi Disc Measurements.					
Secchi Disc Depth (Feet)	**W-M600.3C**	**W-M599.8B**	**W-M598.9E**	**W-M599.5D**	**W-M599.2C**
Number of measurements	57	56	54	53	53
Mean	1.43	1.49	0.7	0.65	0.55
Maximum	3.3	2.75	2.45	2.65	2.40
Minimum	0.7	0.65	0.7	0.65	0..55

Wave Height. Wave height determinations were routinely made at two locations, one on either side of the dredged island. As was the case with turbidity and secchi disc depth, wind-sheltering effects were anticipated as a result of the presence of the dredged island. Estimates of wave height were based on visual observations by comparing to objects of known height. Results of the wave height data are summarized in Table D4.

Table D- 4. Summary of Wave Height Results.		
Wave Height (feet)	**W-M599.2C**	**W-M599.5C**
Number of measurements	52	52
Mean	0.13	0.22
Maximum	0.5	1.1
Minimum	0	0

There appears to be a slight sheltering effect from the island that results in lower maximum wave height and average wave height on the leeward side of the island.

b. Continuous Monitoring. Prior to project construction continuous monitoring of dissolved oxygen was conducted on numerous occasions during the summer by WDNR. At an isolated location called “the Rock”, which is near site W-M600.3C, WDNR personnel consistently observed low dissolved oxygen concentrations during July and August. In August 1994, following project construction, WDNR again sampled at this location for a period of eight days. At no time did the dissolved oxygen concentration drop below 5 mg/l.

Beginning in 1996 continuous monitoring was conducted at 3 locations for periods ranging from 14 to 30 days. Results are depicted in Figures D1-1 – D1-3. Obvious trends in the data are apparent for several parameters. Diurnal variations in water temperature, pH, and dissolved oxygen can be seen during most monitoring events. Site 600.3C seems to experience greater diurnal water temperature fluctuations during the winter compared to the other sites monitored, although the absolute range of change is only about 0.5 – 2.0 C. Site 599.8B is slightly warmer during the winter compared to site 600.3C while site

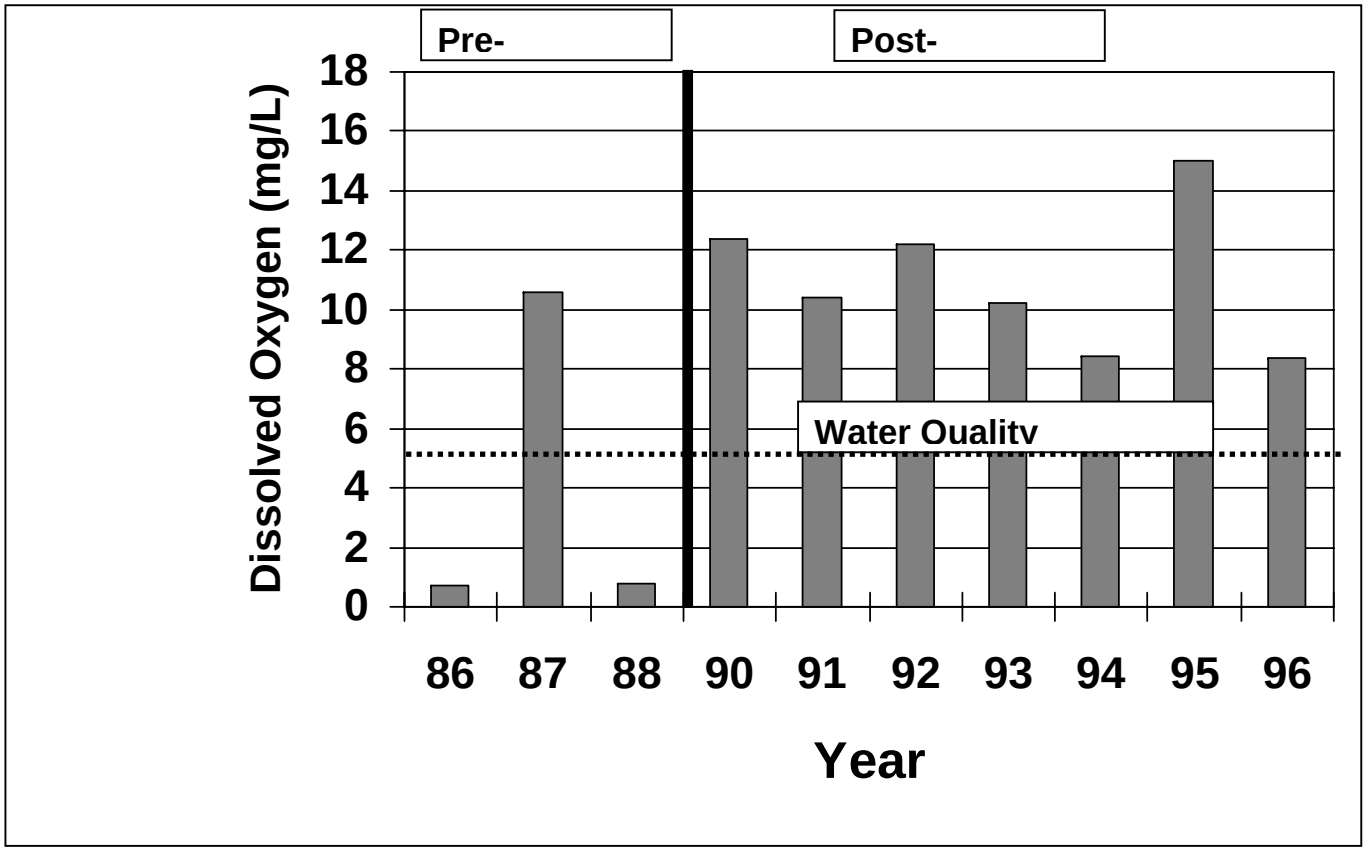
600.8B tends to be intermediate. At site 599.8B the bottom temperature during the winter is approximately 0.3 C warmer than the surface water temperature.

Dissolved oxygen data collected during the winter indicate that all 3 sites routinely experience adequate concentrations. This is an improvement over pre-project conditions. During the summer, site 600.3C experiences periods when concentrations fall below 5.0 mg/l near the bottom. At site 599.8B few instances of low dissolved oxygen concentrations near the bottom were observed.

c. Wind Speed and Direction. The island which was constructed from dredged material was shaped and oriented to afford protection to an area located immediately to the east and slightly north. This was based on the assumption that the prevailing winds would be westerly. This was reasonable since the nearby bluffs and river orientation generally run west to east. Based on the results of continuous wind speed and direction measurements made on the island during the growing season however, it appears that the area on the leeward side of the island benefits from the shadow effect of the island approximately 30-60 percent of the time. Figures D1-4 thru D1-8 depict this graphically. It does appear that the island is more effective when wind speed is higher, however, 1998 was an exception to this generality. This helps explain the rather slow development of aquatic vegetation on the leeward side of the island.

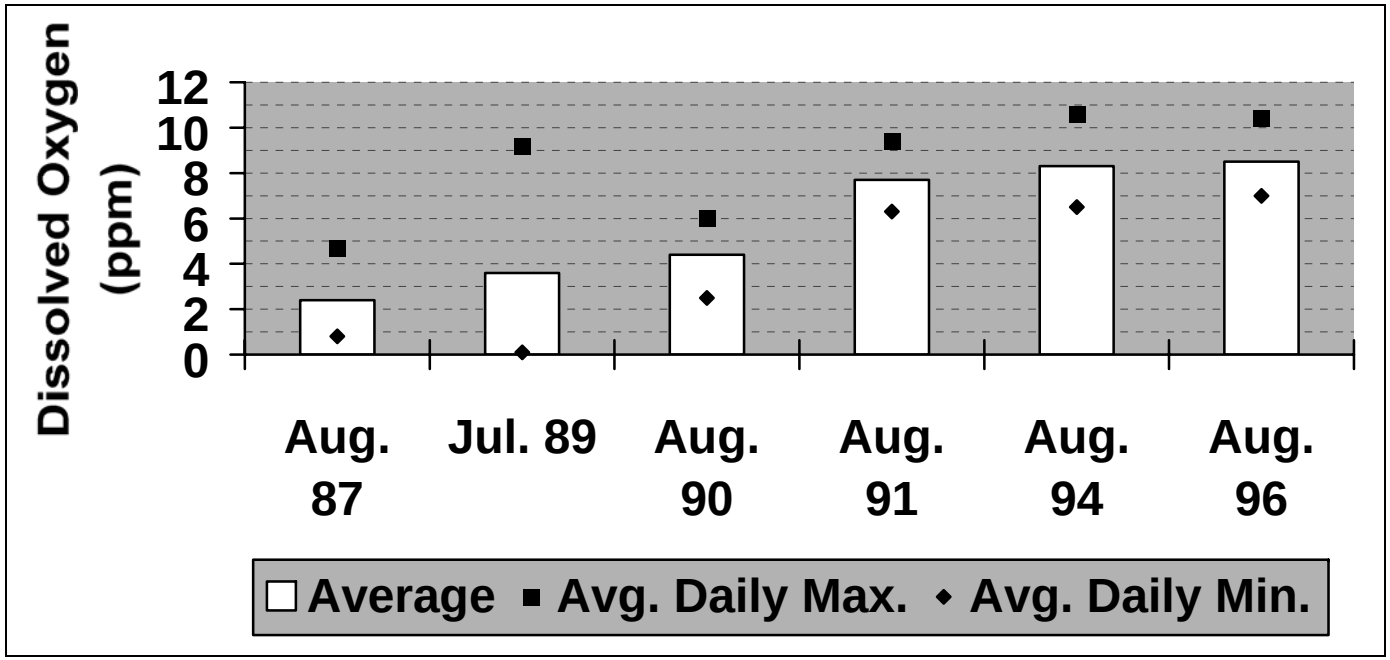
5. CONCLUSIONS.

Over all it is clear that many of the original water quality objectives of this project have been achieved. The dredging of channels has improved the circulation of water within the backwater complex and in particular to previously isolated areas. Adequate oxygenated water is now available to areas that previous experienced less than desirable concentrations at different times throughout the year. Water depth has been improved at both flowing water and slack-water locations. While the water quality impacts of the newly constructed island are subtle, some evidence exists for improvement in conditions conducive to aquatic plant growth on the leeward side of the island. Finally, no negative water quality impacts resulting from any project feature have been observed.



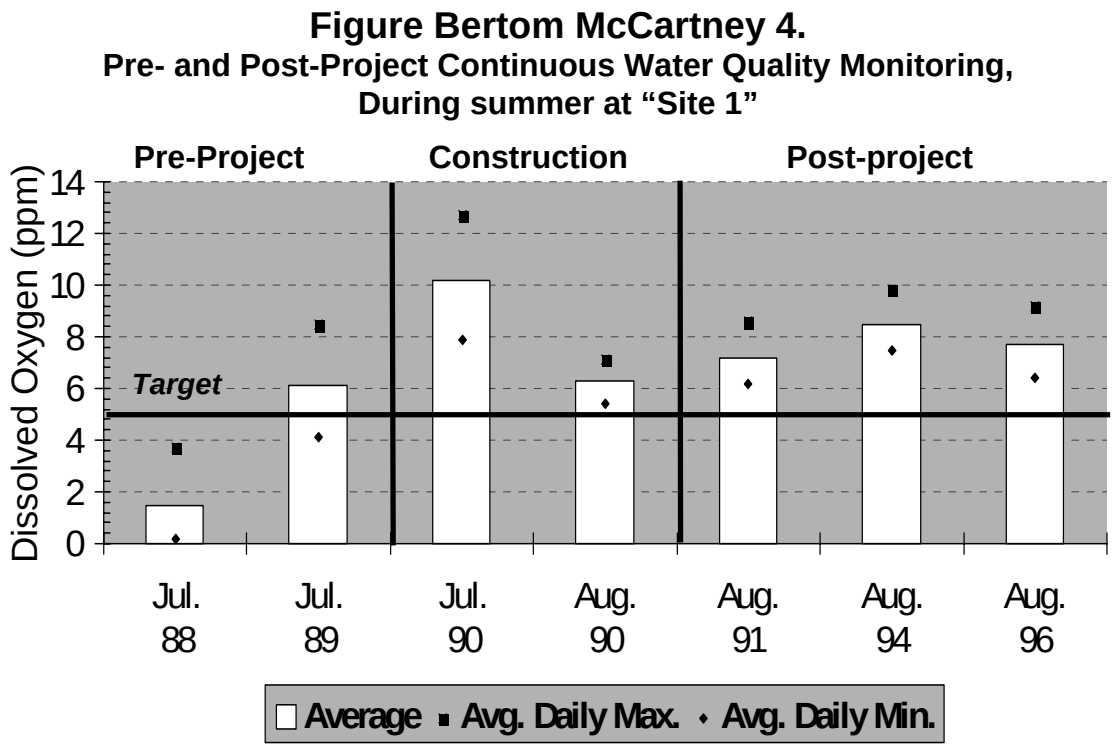
Source: Wisconsin Department of Natural Resources

Figure D1-1. Onalaska - Average surface dissolved oxygen for sites 4 & 5 combined, during late January and February



Source: Wisconsin Department of Natural Resources

Figure D1-2. Pre- and Post-Project Continuous Water Quality Monitoring, During summer at "The Rock"



Source: Wisconsin Department of Natural Resources

Figure D1-3. Pre- and Post-Project Continuous Water Quality Monitoring, During summer at "The Rock"

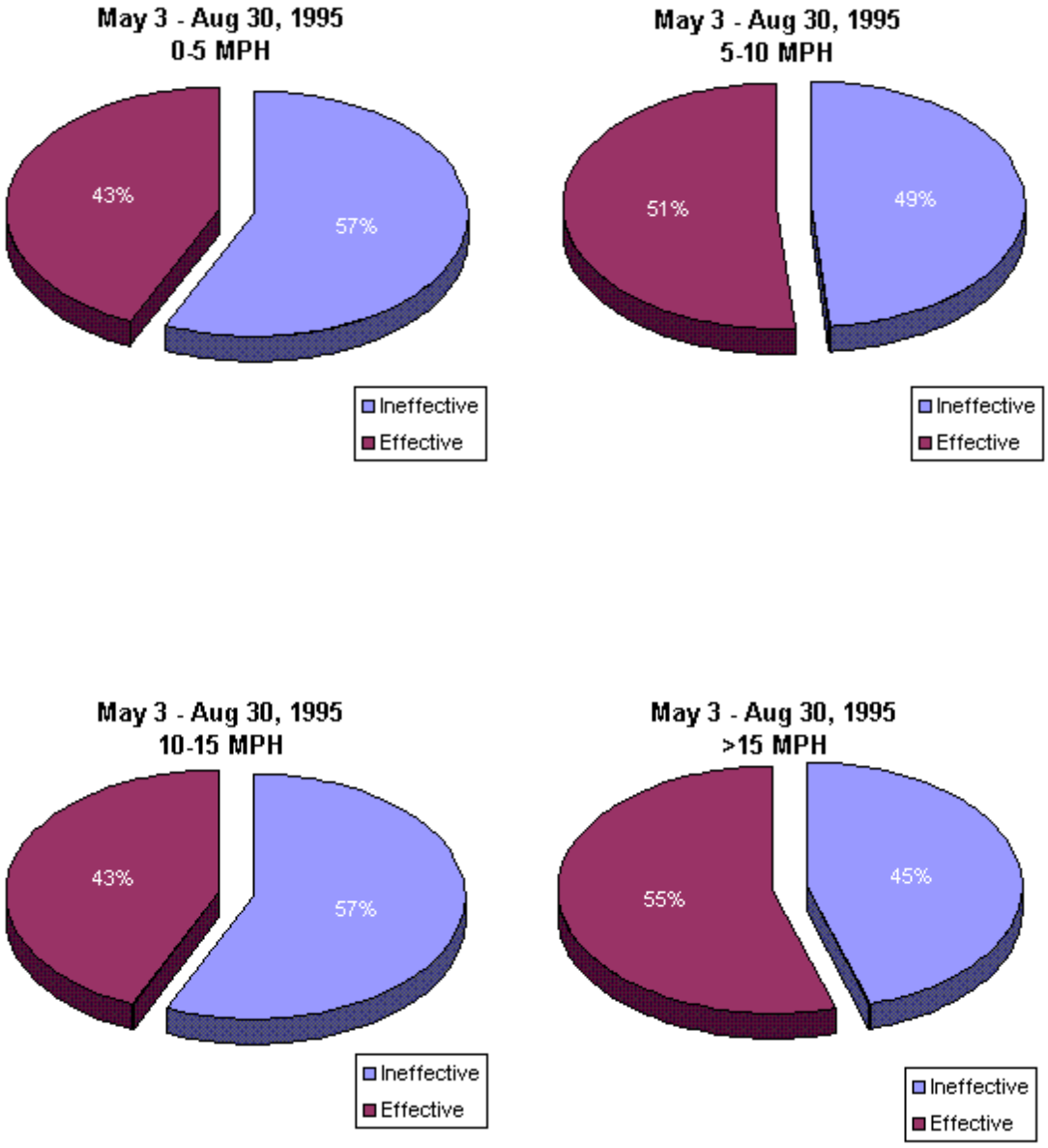


Figure D1-4. Bertom and McCartney Lakes EMP Island (Site M599.4B) Effective Wind Direction (NW, W, SW) vs. Ineffective Wind Direction (N, NE, E, SE, S) During 1995 at Wind Speeds of 0-5, 5-10, 10-15, and >15MPH.

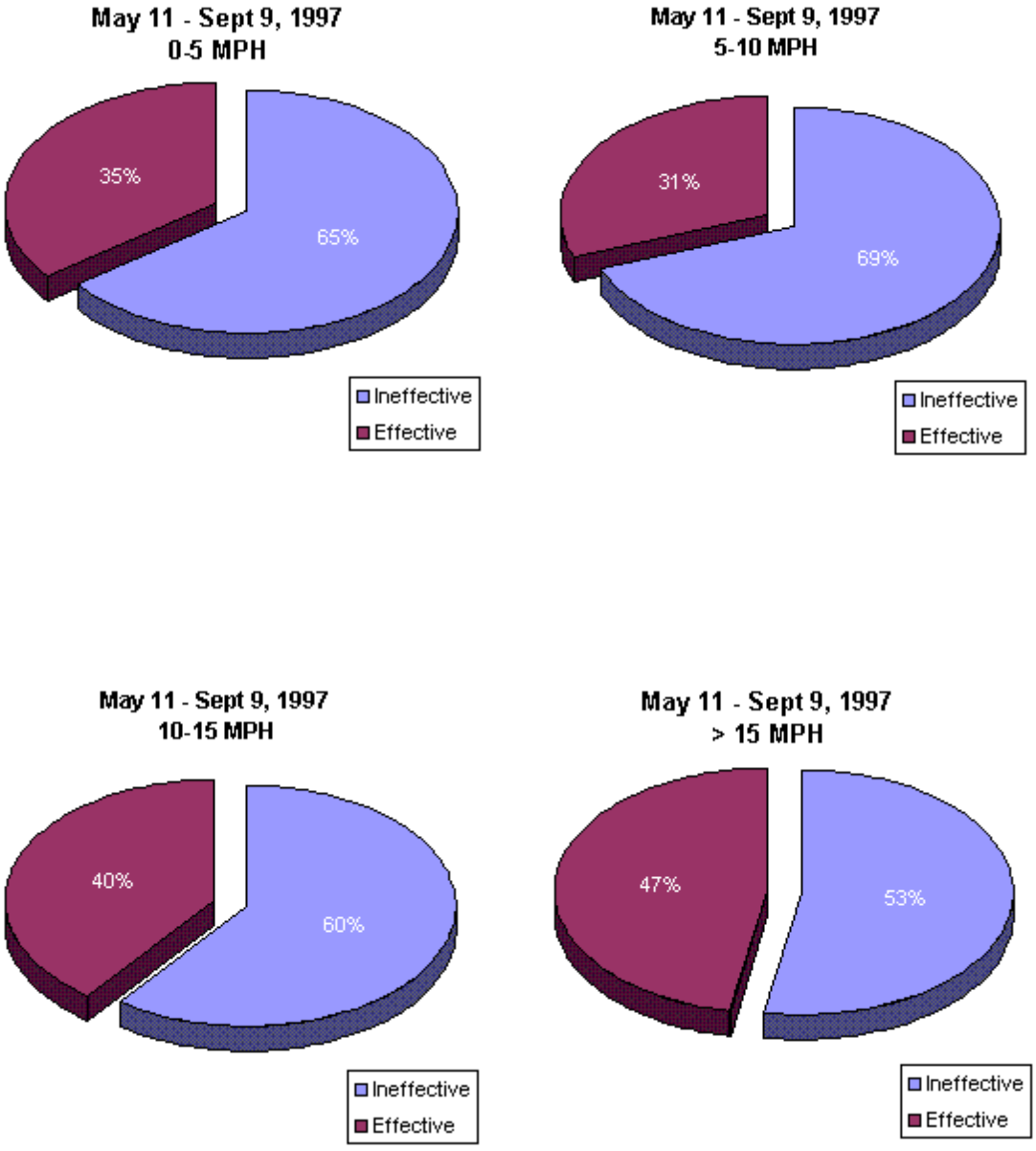


Figure D1-5. Bertom and McCartney Lakes EMP Island (Site M599.4B) Effective Wind Direction (NW, W, SW) vs. Ineffective Wind Direction (N, NE, E, SE, S) During 1997 at Wind Speeds of 0-5, 5-10, 10-15, and >15MPH.

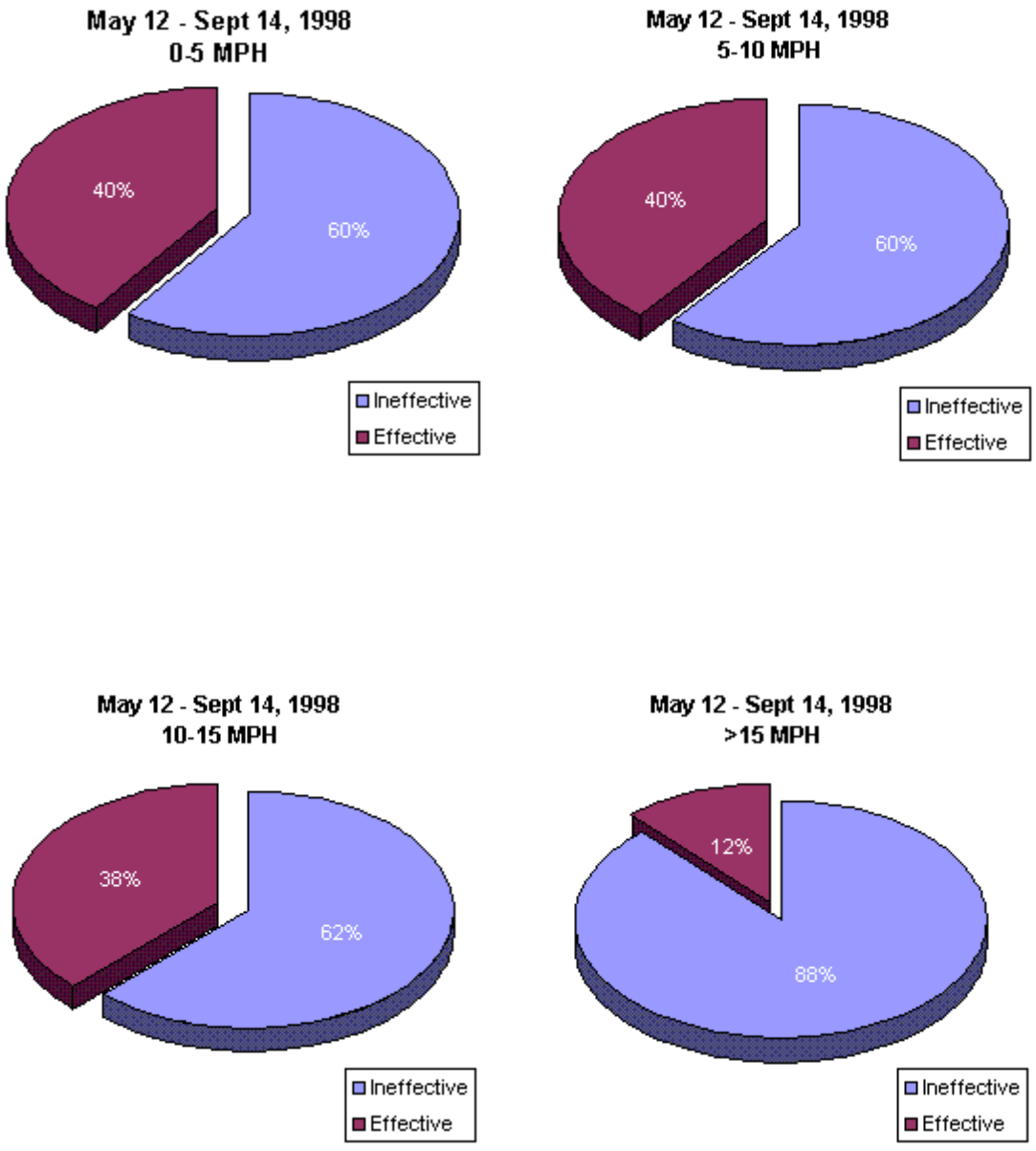


Figure D1-6. Bertom and McCartney Lakes EMP Island (Site M599.4B) Effective Wind Direction (NW, W, SW) vs. Ineffective Wind Direction (N, NE, E, SE, S) During 1998 at Wind Speeds of 0-5, 5-10, 10-15, and >15MPH.

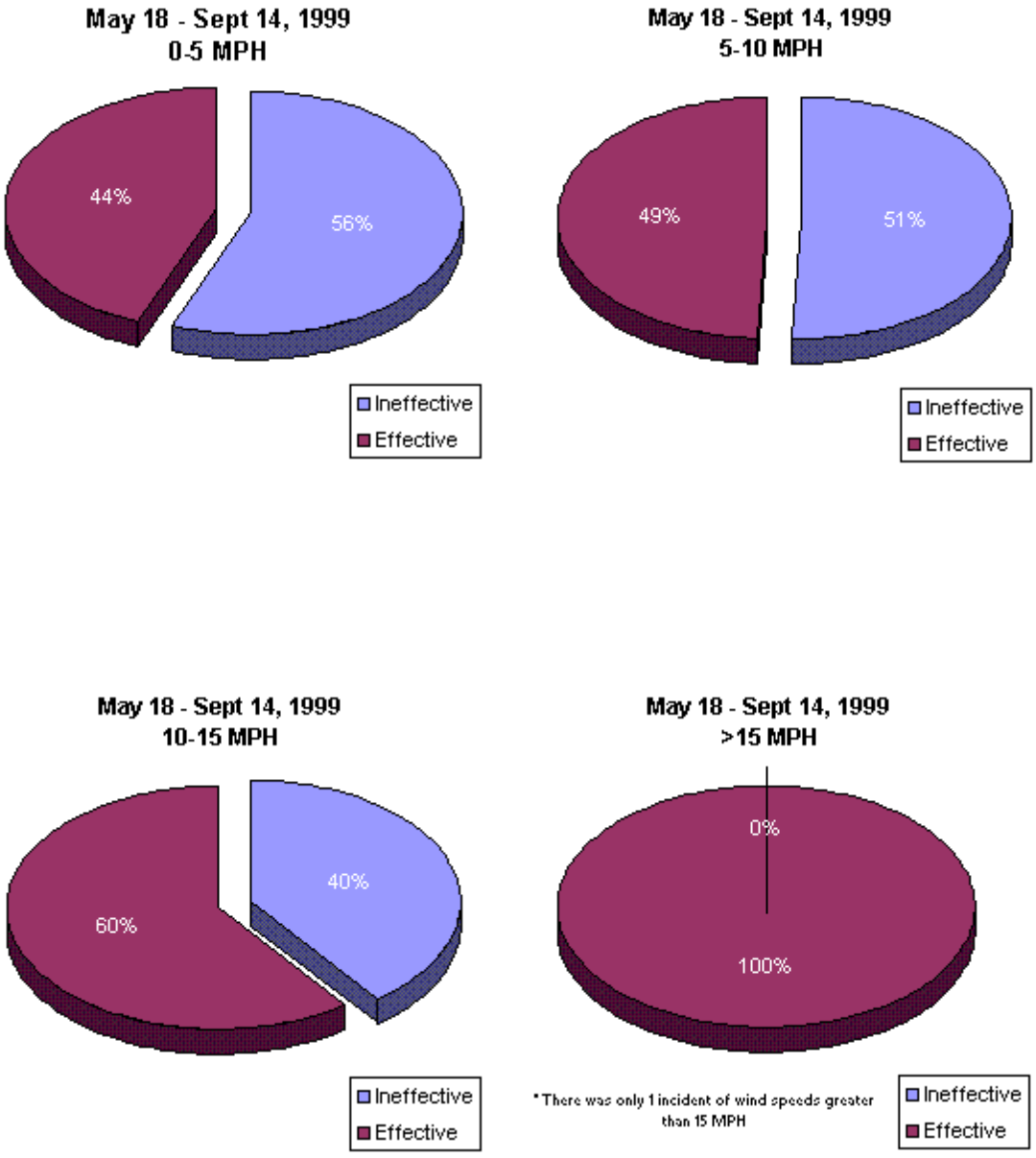


Figure D1-7. Bertom and McCartney Lakes EMP Island (Site M599.4B) Effective Wind Direction (NW, W, SW) vs. Ineffective Wind Direction (N, NE, E, SE, S) During 1999 at Wind Speeds of 0-5, 5-10, 10-15, and >15MPH.

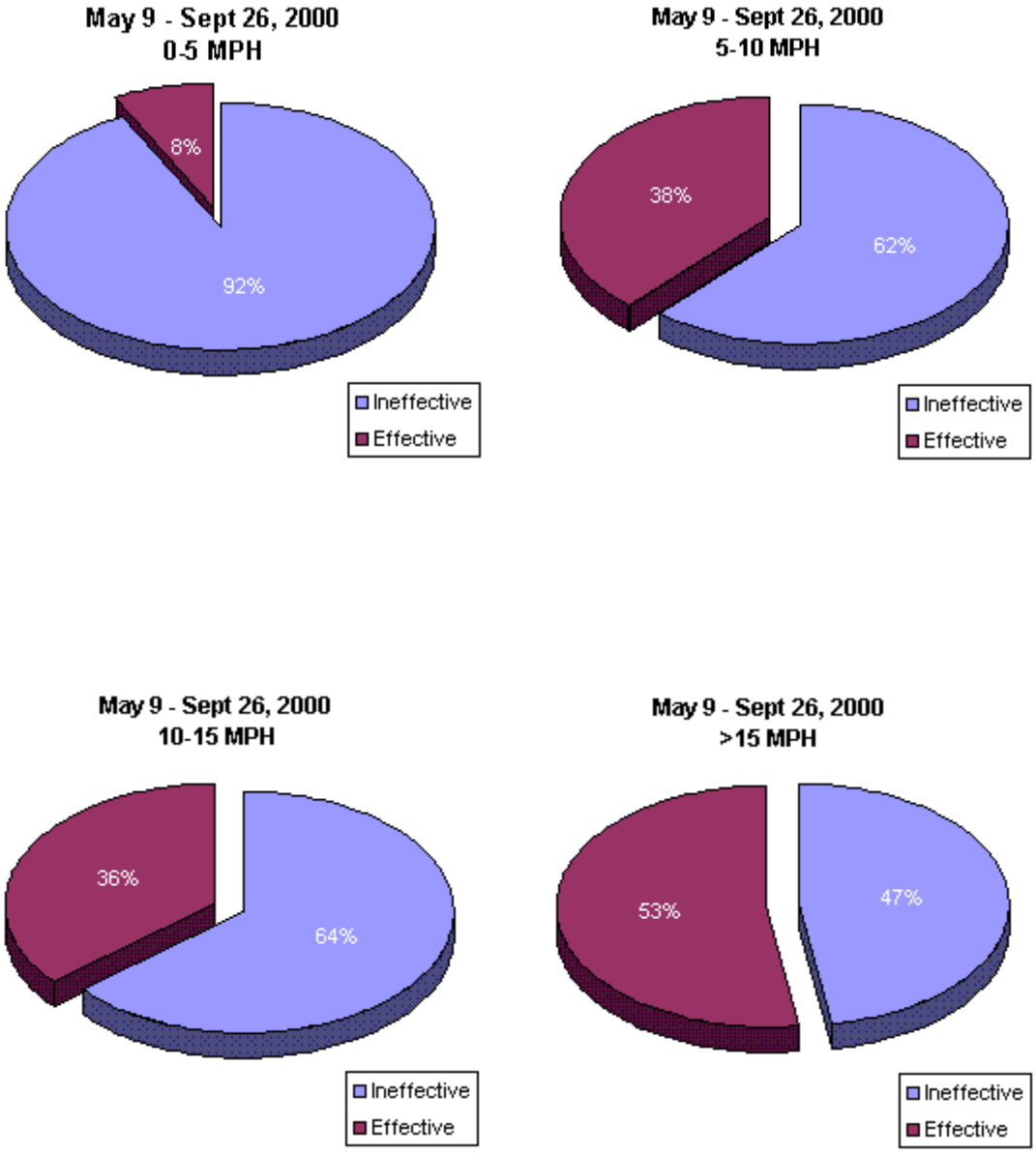


Figure D1-8. Bertom and McCartney Lakes EMP Island (Site M599.4B) Effective Wind Direction (NW, W, SW) vs. Ineffective Wind Direction (N, NE, E, SE, S) During 2000 at Wind Speeds of 0-5, 5-10, 10-15, and >15MPH.

Appendix D2 Water Quality Monitoring Data

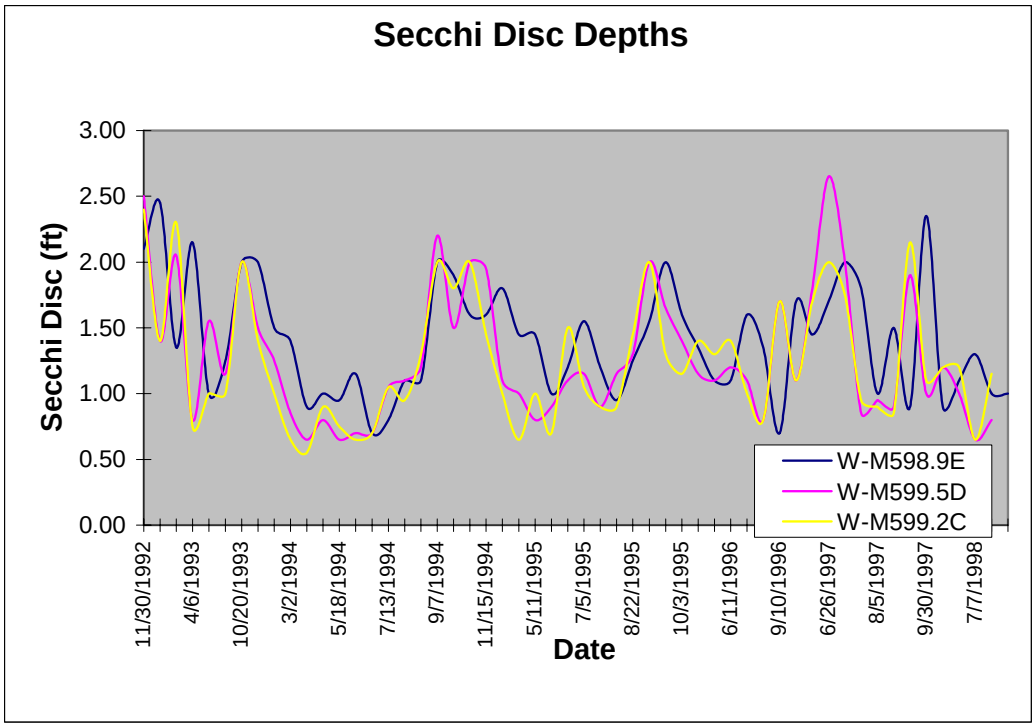


Figure D2- 1. Secchi Disc Depths, W-M598.9E, W-M599.5D, W-M599.2C

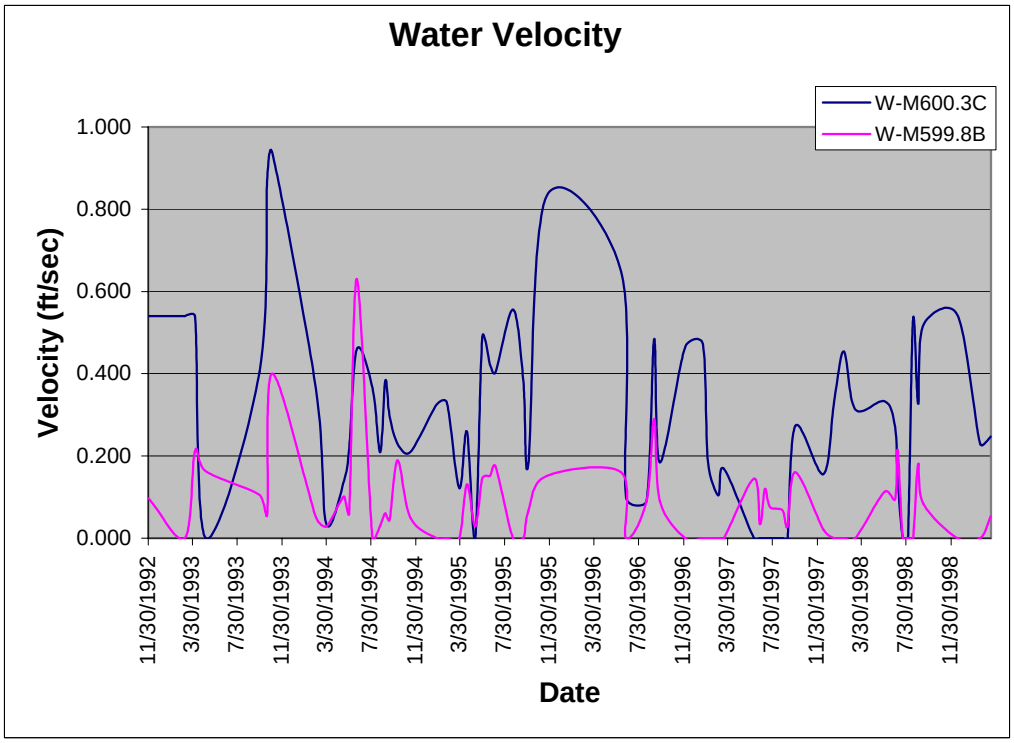


Figure D2- 2. Water Velocity, W-M600.3C, W-M599.8B

Station 599.8B

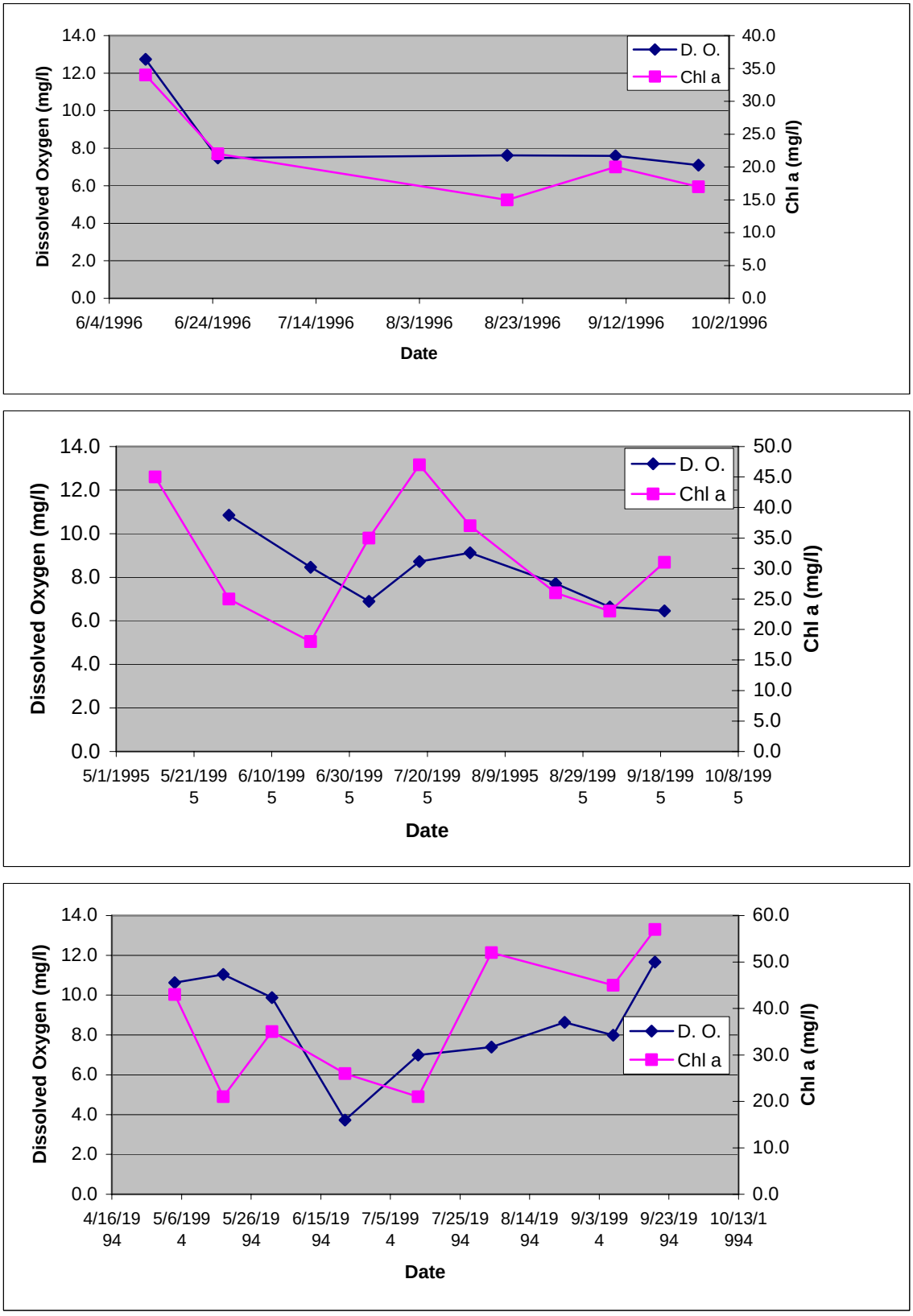


Figure D2- 3. Dissolved Oxygen (mg/l) Station 599.8B

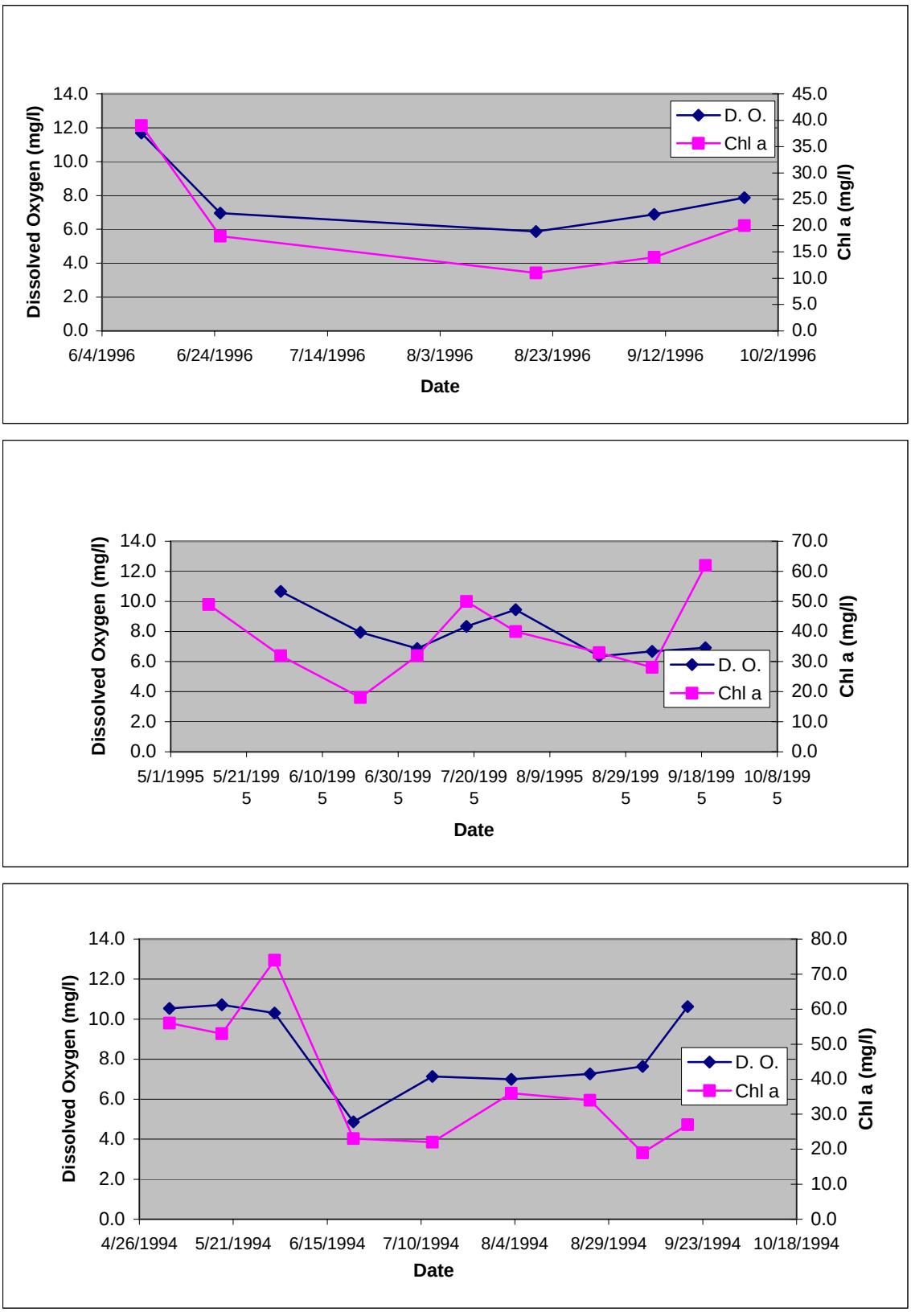
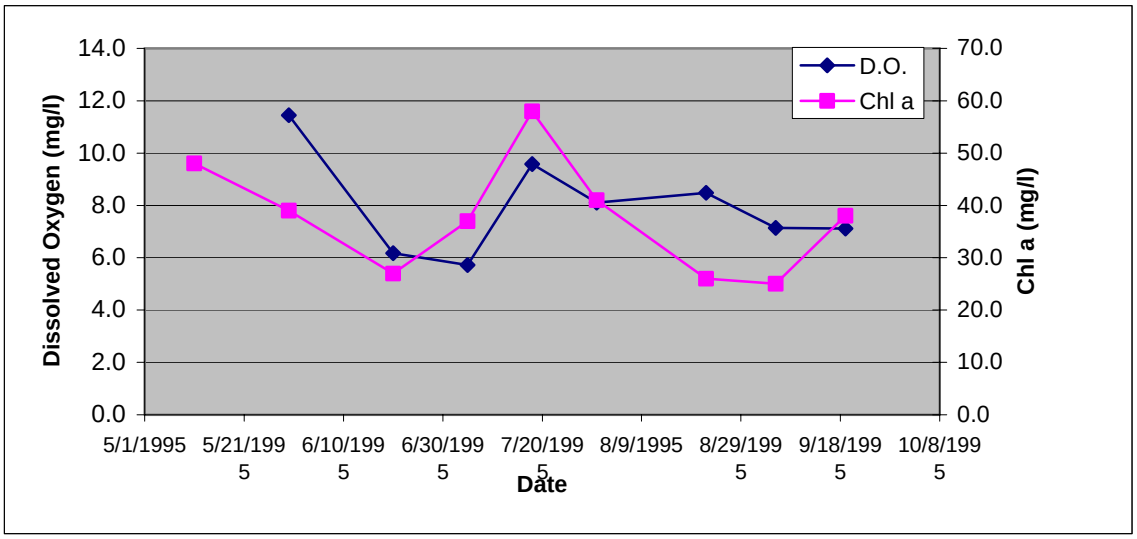
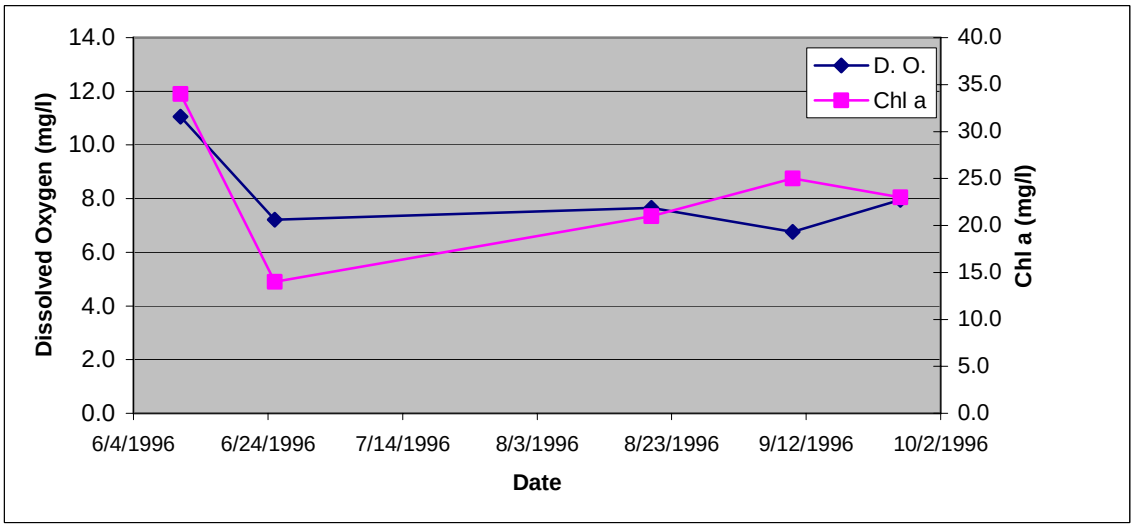


Figure D2- 4. Dissolved Oxygen (mg/l) Station 600.3C

Station 599.2C





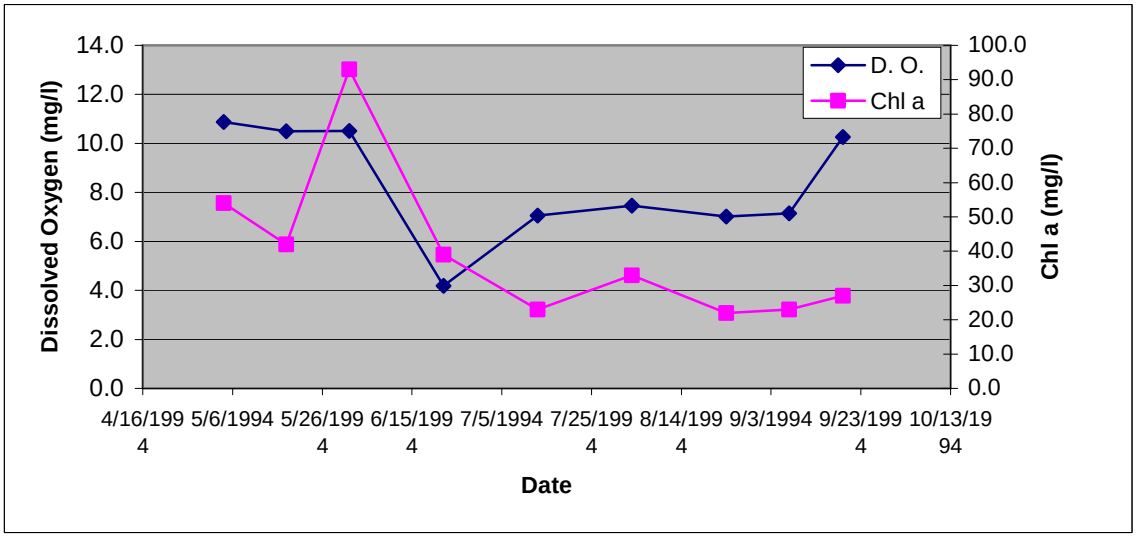
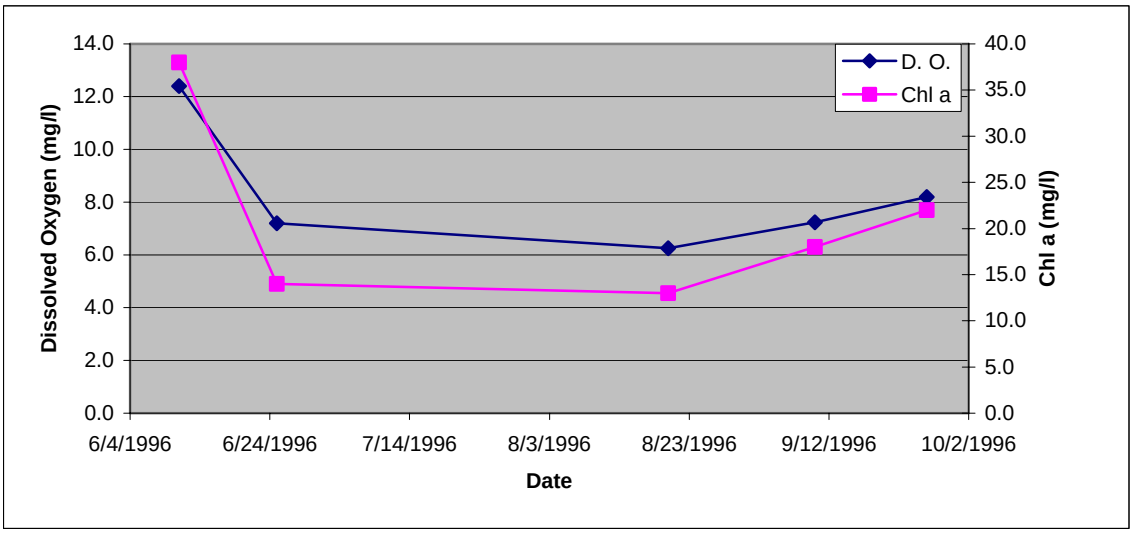
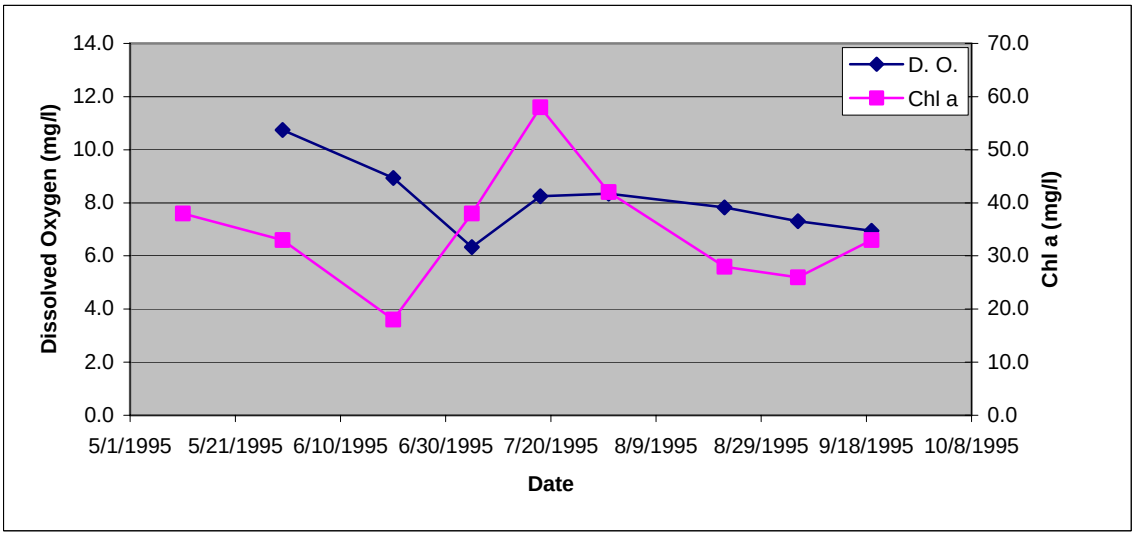


Figure D2- 5. Dissolved Oxygen (mg/l) Station 599.2C

Station 599.5D





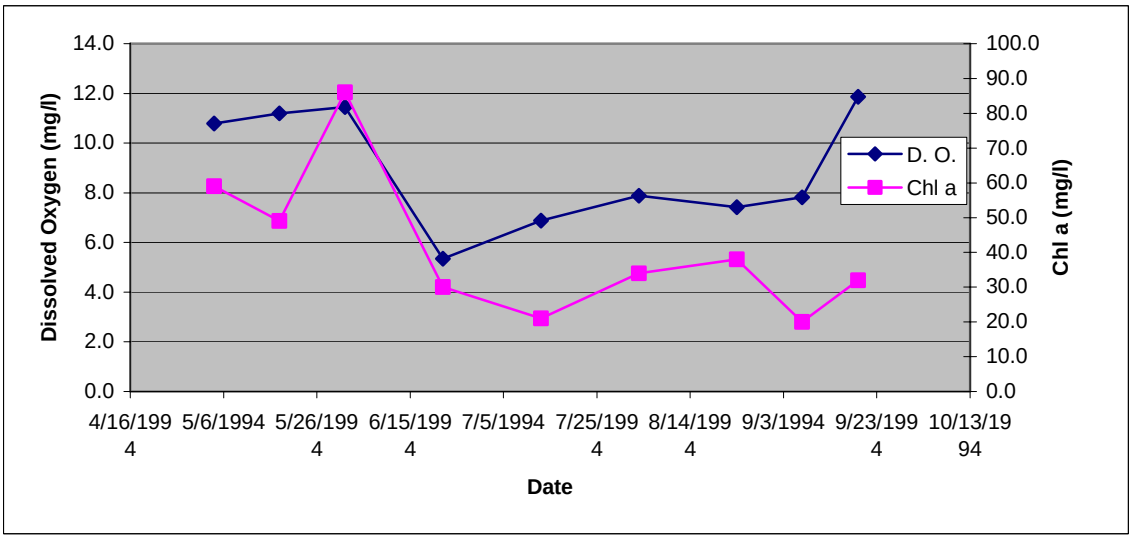


Figure D2- 6. Dissolved Oxygen (mg/l) 599.5D

Station 598.9E

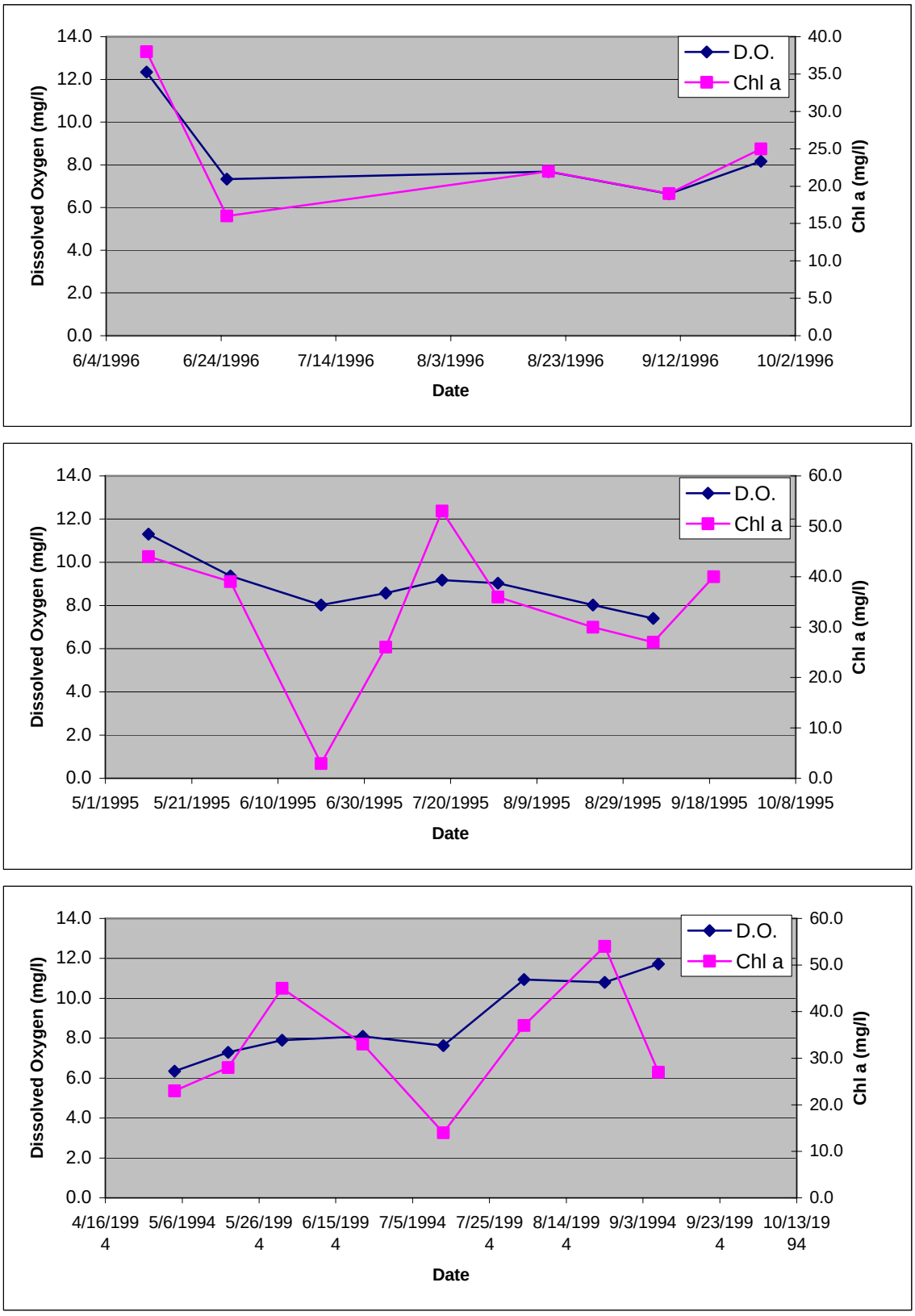


Figure D2- 7. Dissolved Oxygen (mg/l) Station 598.9E

A P P E N D I X E

REFERENCES

Published reports related to the Bertom and McCartney Lakes project that supplement the June 2000 Post-Construction Evaluation Report or which were used as references in the production of this document are presented below.

(1) *Definite Project Report with Integrated Environmental Assessment, Bertom and McCartney Lakes Rehabilitation and Enhancement,* June, 1989 (DPR). This presents a detailed proposal for extensive dredging of McCartney Lake's adjacent side channels and sloughs, in-water confined placement of dredged material, construction of an underwater rock partial closing structure, and placement of rock substrate and protective cover structures in a Bertom Lake side channel. 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) *Plans and Specifications, Upper Mississippi River System, Environmental Management Program, Pool 11, River Miles 599-603, Bertom and McCartney Lakes***,** October, 1989 (P&S)**.** This document was prepared to provide sufficient detail of project features to allow construction of the dredged sloughs and side channels adjacent to McCartney Lake, utilization of the dredged material to construct a barrier island in McCartney Lake, construction of an underwater rock partial closing structure, lining a side channel with several different sizes, gradations, and types of rock, and installation of protective fish cover structures in the rock-lined side channel by a contractor.

(3) *Operation and Maintenance Manual, Bertom and McCartney Lakes Rehabilitation and Enhancement,* March 1996 (O&M Manual). This manual has been prepared to serve as a guide for the operation and maintenance of Bertom and McCartney Lakes Rehabilitation and Enhancement. Operation and maintenance instructions for major features of the project are presented. These instructions are consistent with the general procedures presented in the Definite Project Report. This manual has been written for project and management personnel familiar with the project and does not contain detailed information which is common to site personnel or which is presented in other existing manuals or regulations.

(4) *Bertom and McCartney Lakes Habitat Rehabilitation and Enhancement Project Great Flood of 93 Damage Assessment*, February 1994 (93 DA). This document was prepared to provide a summary describing the Flood of 1993 damage, proposed corrective action, and estimated cost for repairs.

(5) *Post Construction Performance Evaluation Report (PER3F), Bertom and McCartney Lakes Rehabilitation and Enhancement, Pool 11, Upper Mississippi River Mile Miles 599-603, Grant County, Wisconsin,* May 1995 (95PER). This document was prepared to summarize all available monitoring data, project inspections, and project observations by the Corps, the USFWS, and the WDNR since project completion in the fall of 1991 through August 1994.

A P P E N D I X F

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Mounds View, MN 55112

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CEMVR-OD-MN
CEMVR-OD-MN (Swenson)
CEMVR-IM-CL (Romic)

A P P E N D I X G

SURVEY PLOTS AND P L A T E S

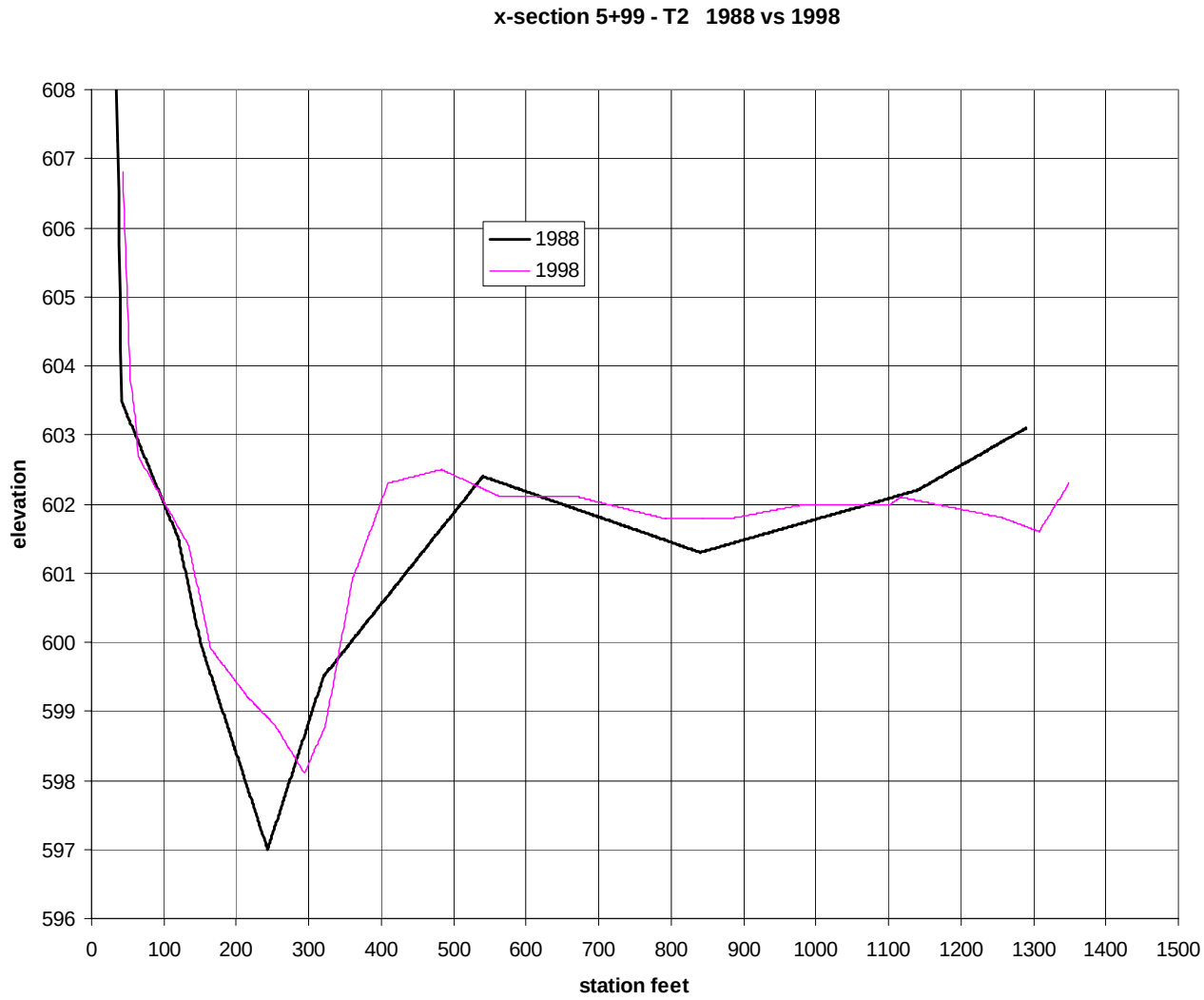


Figure G- 1 Survey Transect 1988 vs. 1998, Station 5+99

Figure G- 2. Survey Transect 1988 vs. 1998, Station -6+00

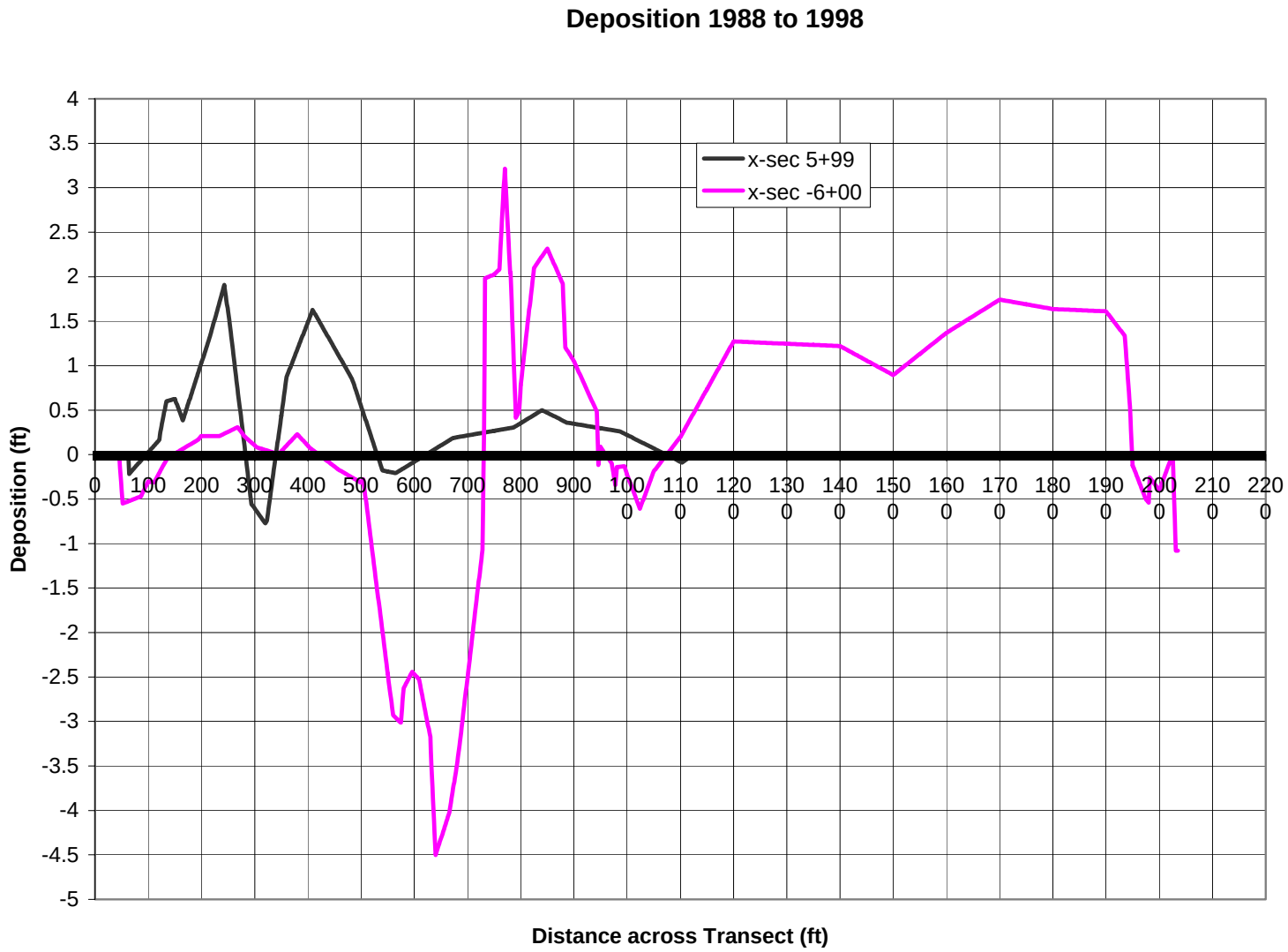
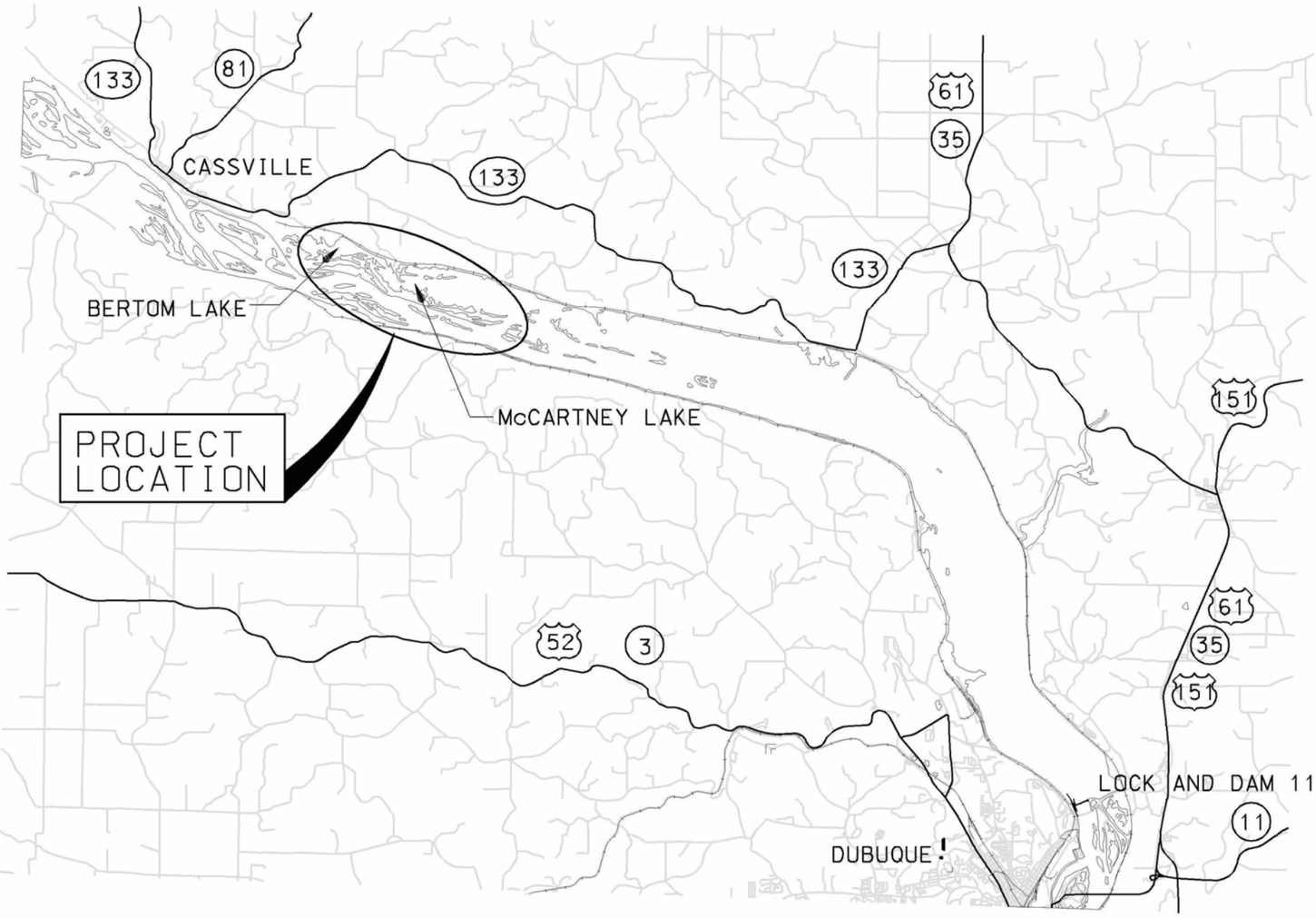


Figure G- 3. Deposition 1988 to 1998, Stations 5+99 and Stations -6+00



LOCATION PLAN

6000 0 6000 12000 18000
SCALE IN FEET

VICINITY MAP

25 0 25 50 75
SCALE IN MILES

US Army Corps of Engineers
Rock Island District

Symbol	Description Revisions	Date	Approved

Dated	XXXXXXX
Scale	AS SHOWN
Project code	EP59
Solicitation Number	DACW25-XX-B-XXXX
Designed By	AAE
Drawn By	SDB/JDM
Checked By	DJJ
Approved By	DJH

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

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11 RIVER MILE 583.0-603
BERTOM AND McCARTNEY LAKES
PERFORMANCE EVALUATION

LOCATION PLAN AND VICINITY MAP

PLATE 1

10-FEB-2003 14:54
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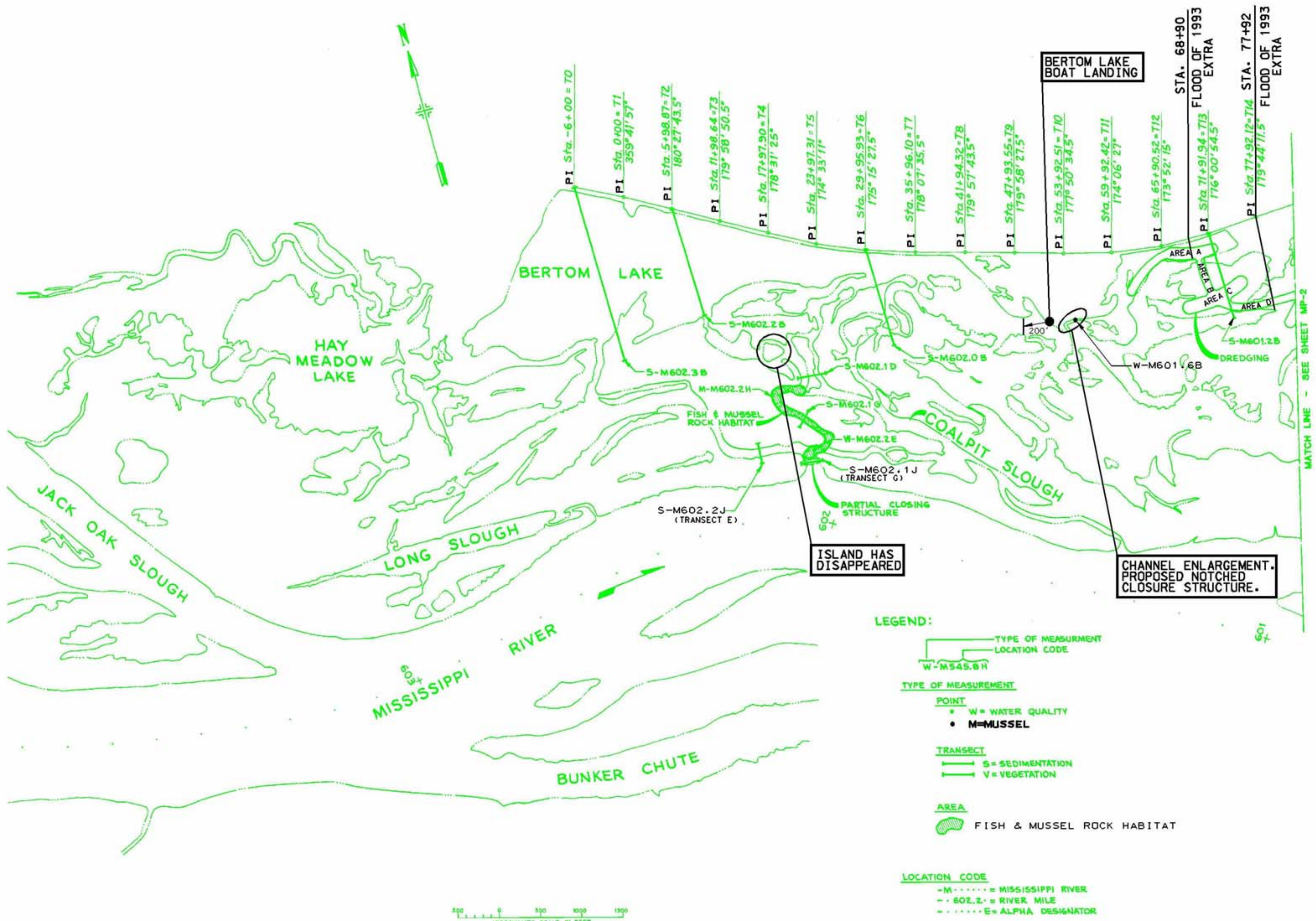

US Army Corps of Engineers
Rock Island District

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

Designed By: AAE	Date: XXXXXXX
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Checked By: DJJ	Project Code: EP59
Reviewed By: DJH	Solicitation Number: DACW25-XX-B-XXXX

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

BERTOM LAKE MONITORING PLAN

PLATE 2

10-FEB-2003 14:04
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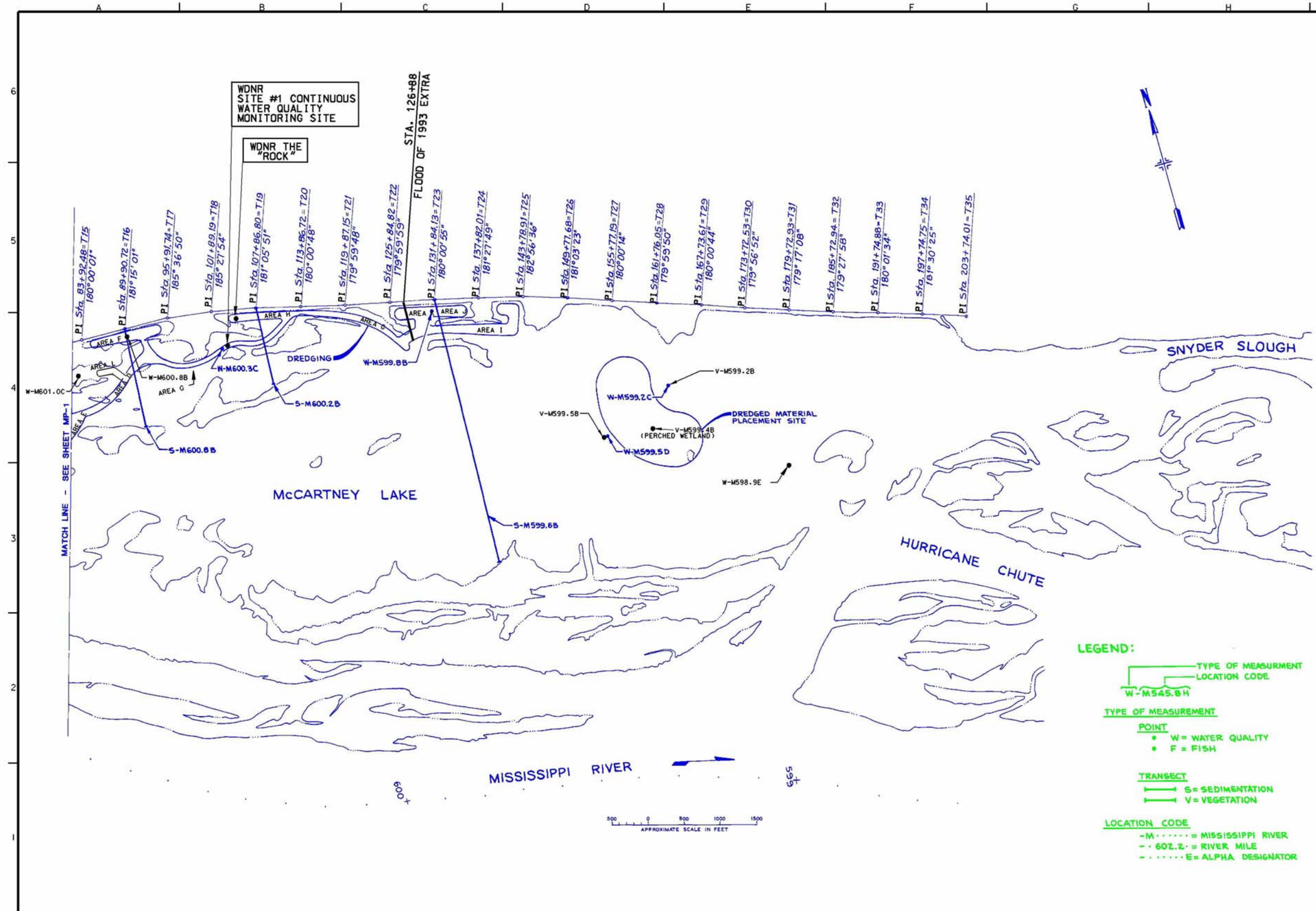

US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

Designed By: AAE	Dates: XXXXXXX	
Drawn By: SOB/JDM	Scales: AS SHOWN	
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Reviewed By: DJH	Solicitation/ERP Numbers: DACW25-XX-B-XXXX	

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

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

McCARTNEY LAKE MONITORING PLAN

PLATE 3

10-FEB-2003 14:04
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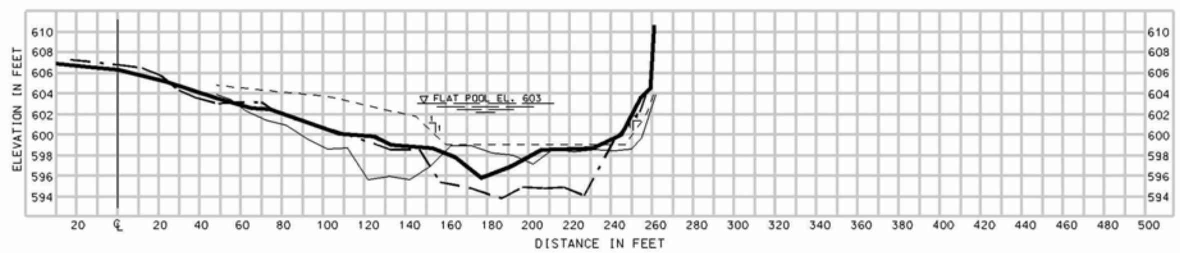
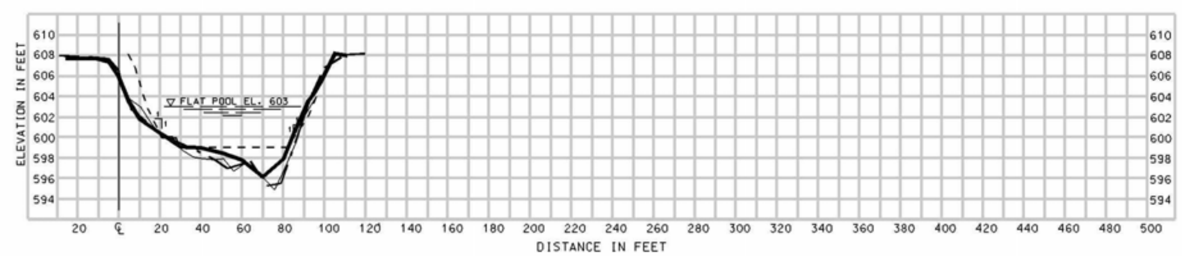
US Army Corps of Engineers
Rock Island District



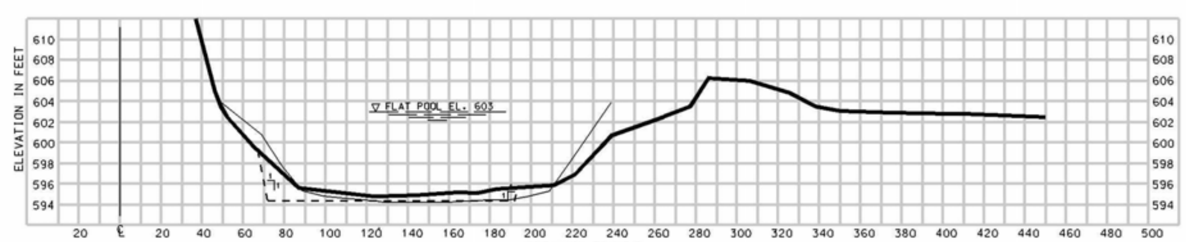
STATION -10+01

SUBMERGED ROCK PARTIAL CLOSURE STRUCTURE
RANGE ACROSS MOUTH, S-M602.1J, TRANSECT G



STATION -10+00

RANGE ACROSS ROCK HABITAT CHANNEL, S-M602.1G, TRANSECT H



STATION 68+90

DREDGE AREA A - TRANSECT ADDED AFTER FLOOD OF 1993

DATA SOURCES:
1993 Field book SWEATTII-01 pages 6/17 & dredging plans
1998 Field book FC-98-10 pages 2/25
2002 Field Book FC-02-2

NOTE:
FLAT POOL ELEVATION 603.0.

LEGEND:

- — · — RANGES 2002
- ——— RANGES 1993
- ▬▬▬ RANGES 1998
- - - - - STRUCTURE AS-BUILT 1991

Revisions

Symbol	Description	Date	Approved

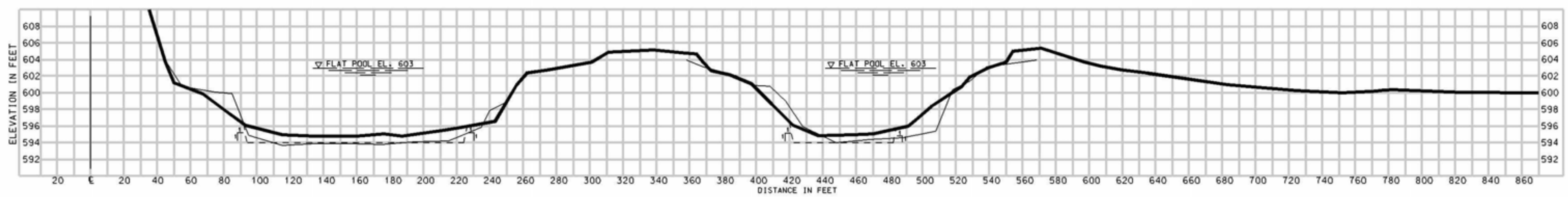
Designed By: AAE	Date: XXXXXXX	
Drawn By: SDB/JDM	Scale: AS SHOWN	
Checked By: DJJ	Project Code: EP59	
Reviewed By: DJH	Solicitation Number: DACW25-XX-B-XXXX	

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

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

SEDIMENTATION TRANSECTS I

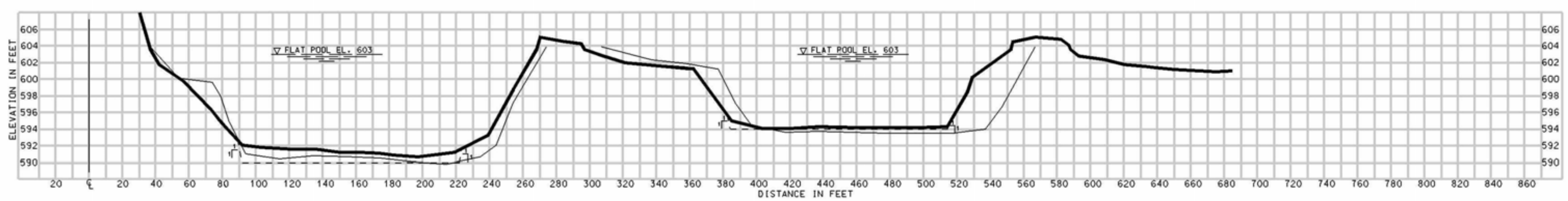
PLATE 4



DREDGE AREA H – TRANSECT S-M600.2B

DREDGE AREA G – TRANSECT S-M600.2B

STATION 107+87



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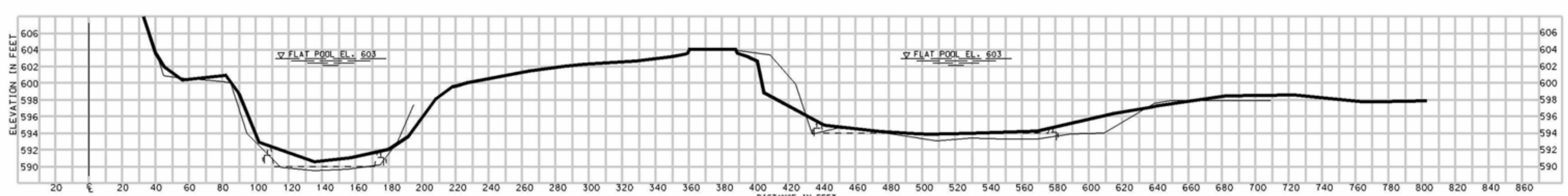
DREDGE AREA I – TRANSECT S-M599.6B

STATION 131+84



DREDGE AREA K – TRANSECT ADDED AFTER FLOOD OF 1993

DREDGE AREA I – TRANSECT ADDED AFTER FLOOD OF 1993

STATION 126+88

NOTE:
FLAT POOL ELEVATION 603.0.

LEGEND:

- RANGES 1993
- RANGES 1998
- STRUCTURE AS-BUILT 1991

DATA SOURCES:

1993	Field book SWEATT(I-01 pages 6/17 & dredging plans
1998	Field book FC-98-10 pages 2/25

US Army Corps of Engineers Rock Island District

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U.S. ARMY ENGINEER DISTRICT
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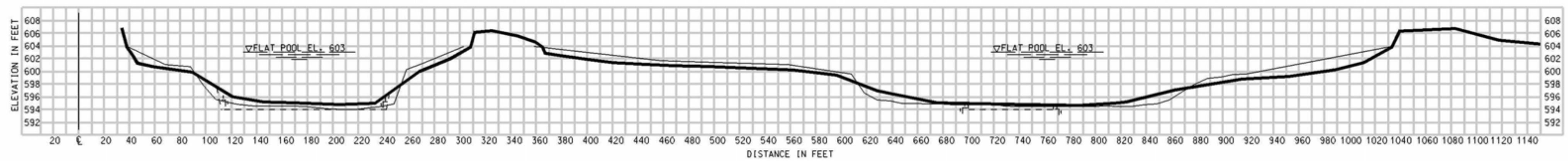
ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & MCCARTNEY LAKES
PERFORMANCE EVALUATION

SEDIMANTATION TRANSECTS II

PLATE 5

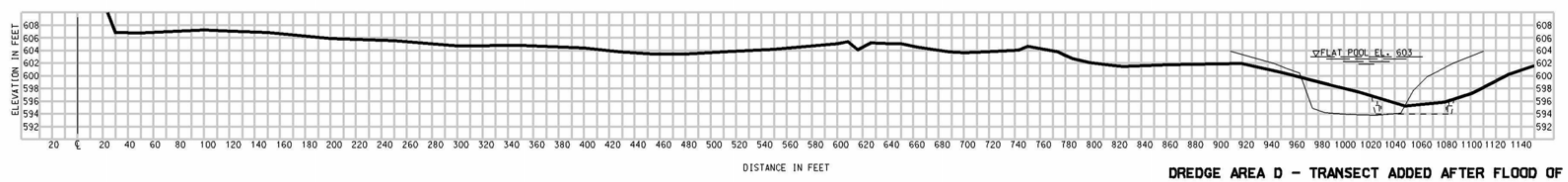
10-FEB-2003 14:55



DREDGE AREA A – TRANSECT S-M601.2B

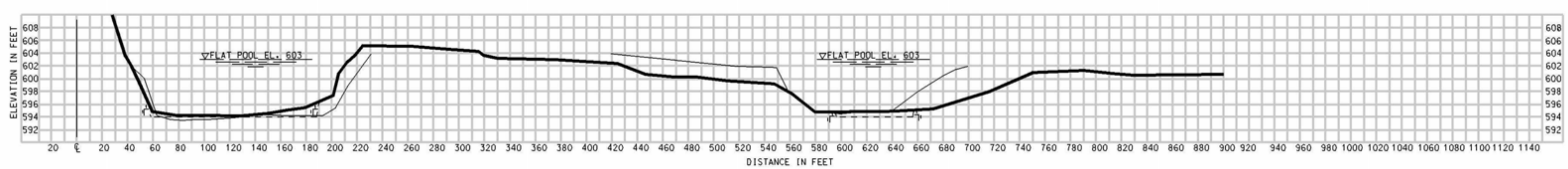
DREDGE AREA C & PARTIAL DREDGE D –TRANSECT S-M601.2B

STATION 71+92



DREDGE AREA D – TRANSECT ADDED AFTER FLOOD OF 1993

STATION 75+74



DREDGE AREA F – TRANSECT S-M600.8B

DREDGE AREA D – TRANSECT S-M600.8B

STATION 89+91

NOTE:
FLAT POOL ELEVATION 603.0.

LEGEND:

RANGES 1993
RANGES 1998
STRUCTURE AS-BUILT 1991

DATA SOURCES:

1993 Field book SWEATTII-01 pages 6/17 & dredging plans
1998 Field book FC-98-10 pages 2/25

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UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

SEDIMENTATION TRANSECTS III

PLATE 6

10-FEB-2003 14:56
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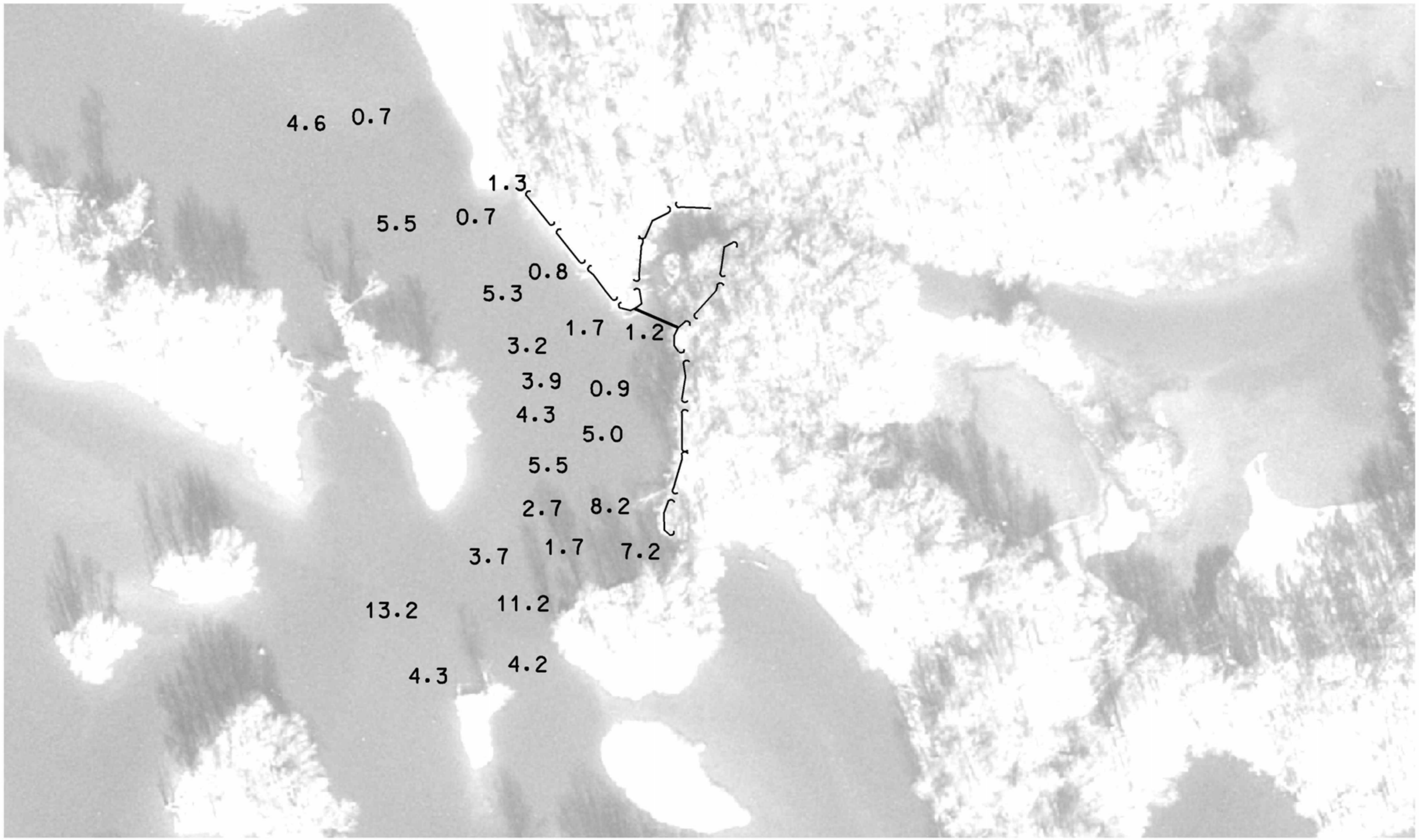

NOTE 1: SOUNDINGS TAKEN VICINITY OF BERTOM LAKE BOAT RAMP FOR PROPOSED RIPRAP AND CLOSING STRUCTURE ALTERNATIVE.
DATUM: IL WEST NAD 83
FLATPOOL: 603.0 FT. NGVD

NOTE 2: XXX SOUNDINGS ARE FROM JUNE 27, 2000

NOTE 3: GAGE ZERO 596.29 FT. NGVD
GAGE CASW3 - MISSISSIPPI RIVER
AT CASSVILLE, WI.

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U.S. ARMY ENGINEER DISTRICT
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ROCK ISLAND, ILLINOIS

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Solicitation Number: DACW25-XX-B-XXXX

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

SOUNDINGS FOR RIPRAP & CLOSING STRUCTURE ALTERNATIVES

PLATE 7

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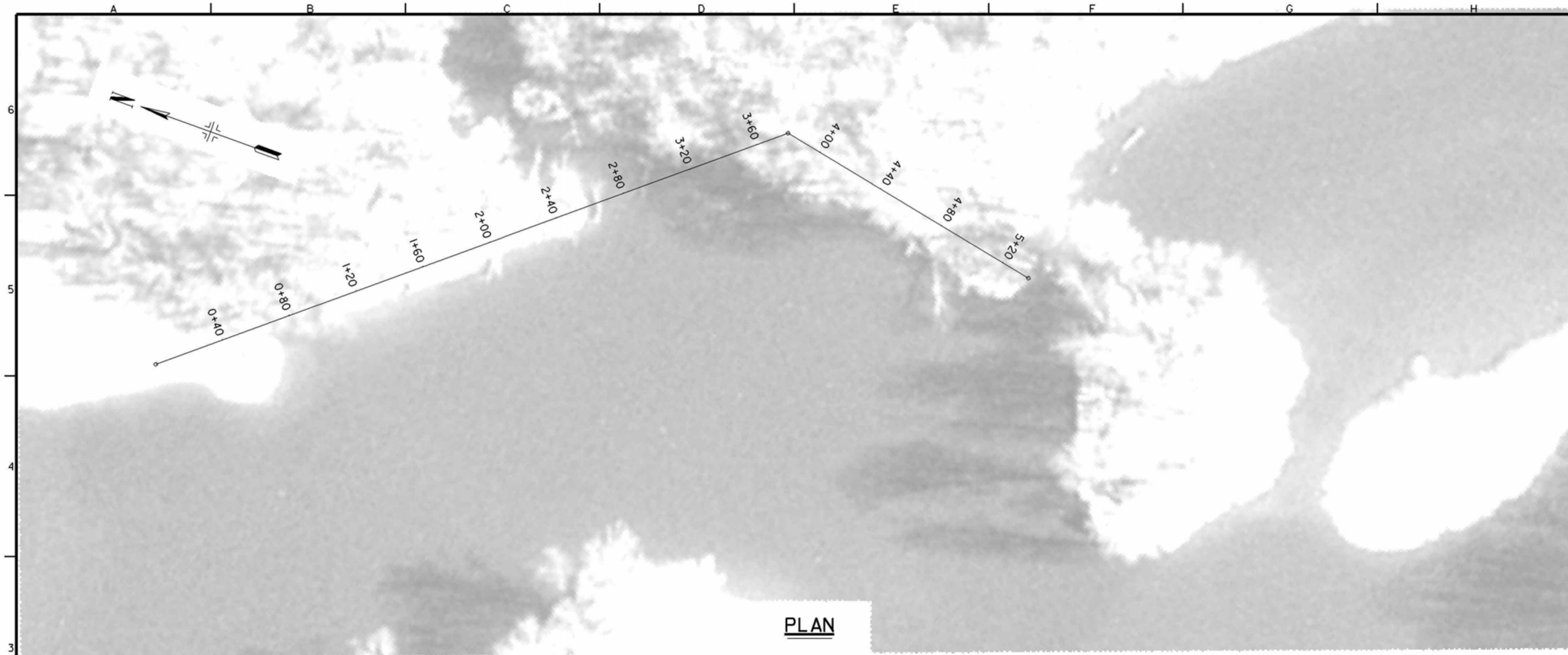
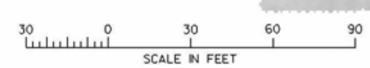
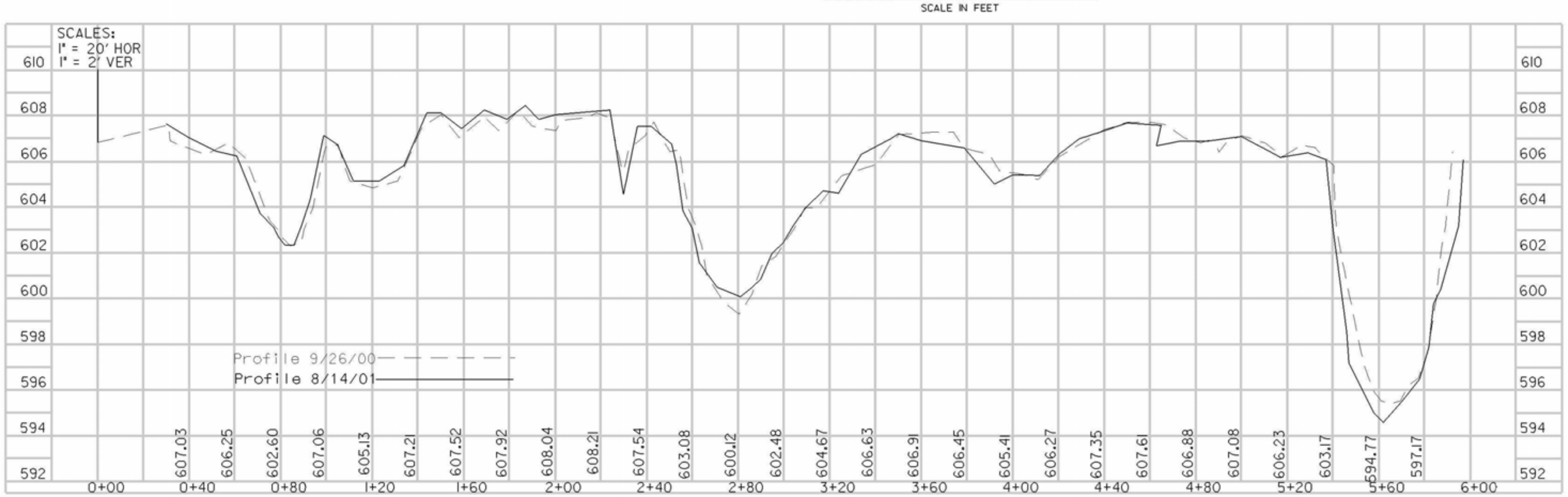


PLAN





PROFILE

NOTE:
DATUM IS IL WEST
NAD 83 SURVEY FIELDBOOK
FC-00-2-29/37
9/26/00
FC-00-2-61/68
8/14/01

US Army Corps of Engineers
Rock Island District

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

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UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

BANKLINE PROFILE

PLATE 8

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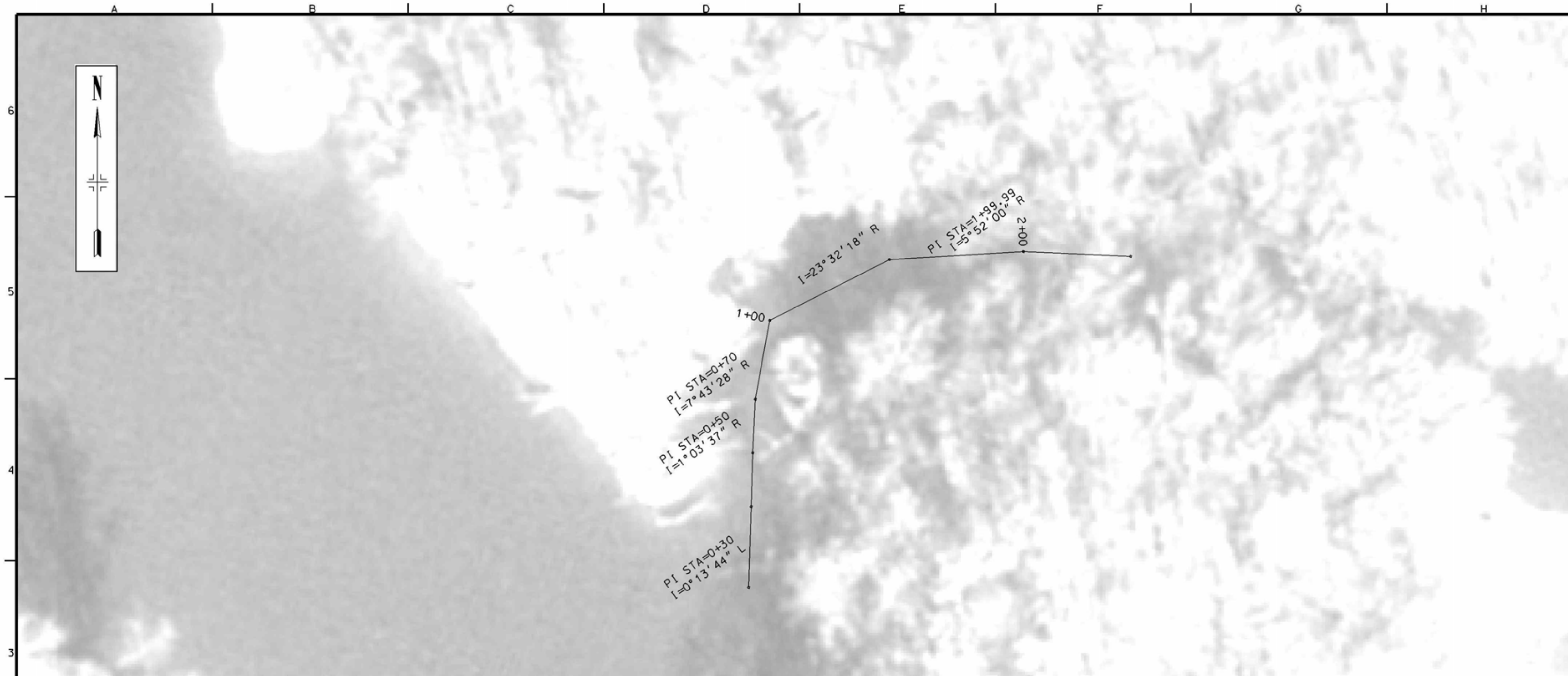
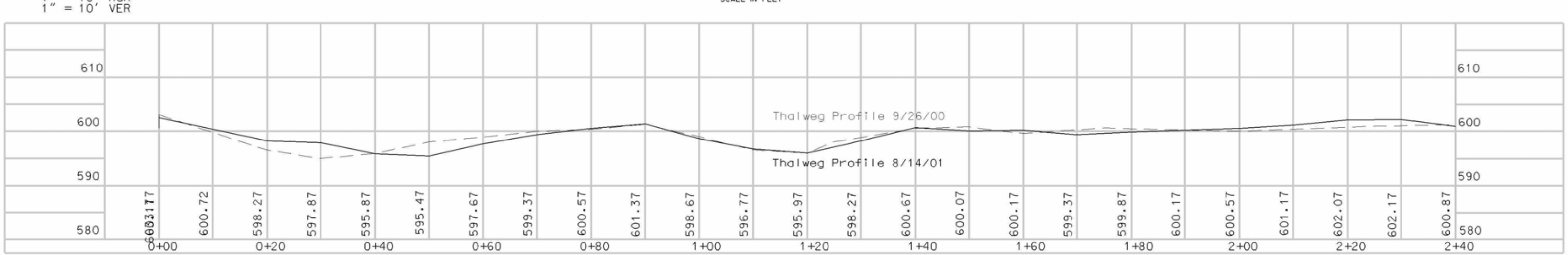


THALWEG-PLAN

NOTE:
DATUM IL WEST NAD 83
SURVEY FIELDBOOK:
FC-00-2-42/45
12/07/00

SCALES:
1" = 10' HOR
1" = 10' VER

20 0 20 40 60
SCALE IN FEET



PROFILE

US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved

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

Designed By: AAE	Date: XXXXXXX
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Reviewed By: DJH	Solicitation Number: DACW25-XX-B-XXXX

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION
THALWEG
PLAN AND PROFILE

PLATE 9

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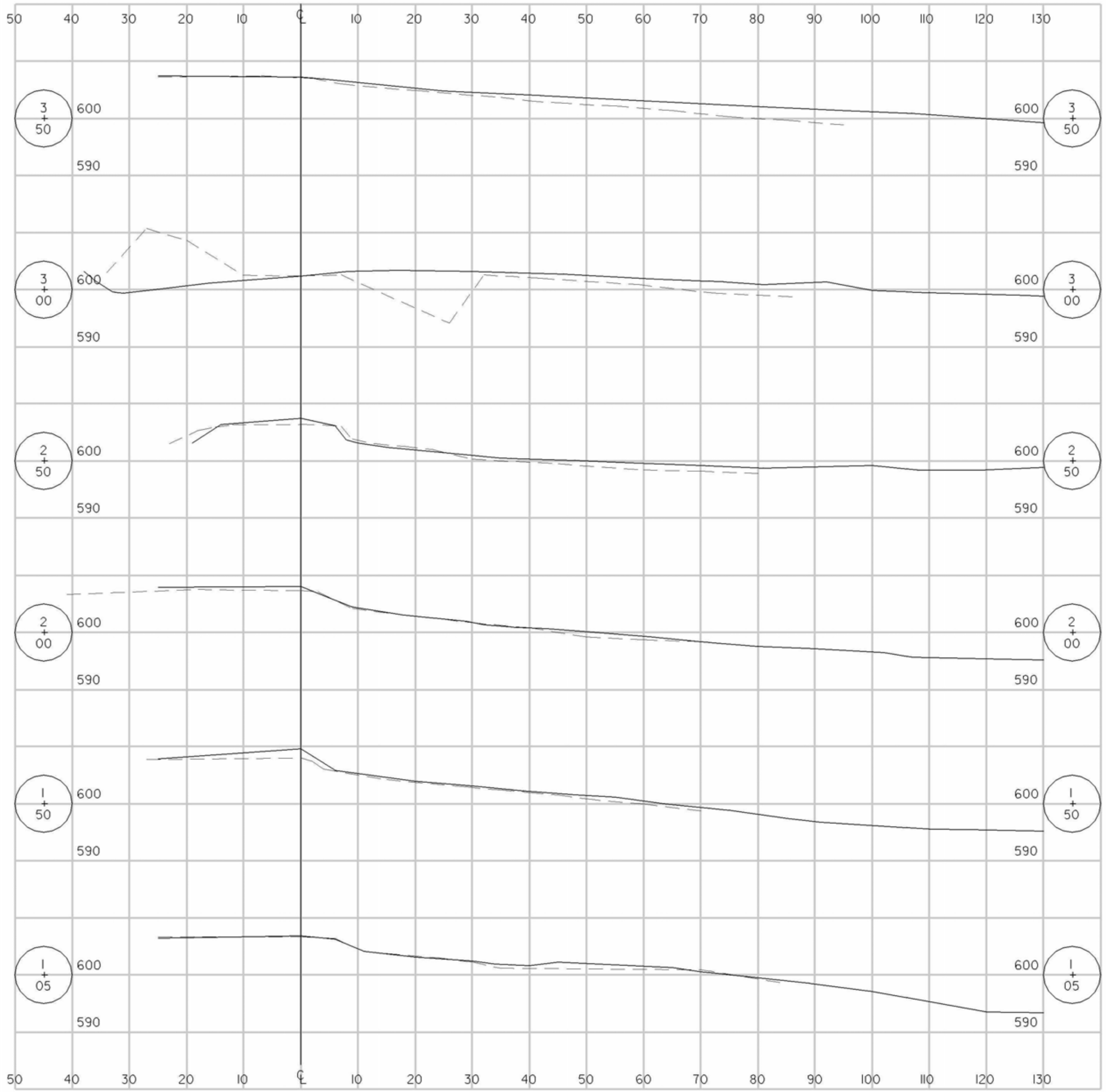

NOTE:
DATUM - IL WEST NAD 83
FIELD BOOK - FC-00-2-29/40
9/26/00
FC-00-2-61/68
8/14/01

LEGEND

11/18/00

8/13/01

US Army Corps of Engineers Rock Island District

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

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Reviewed By: DJH	Solicitation Number: DACW25-XX-B-XXXX

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

TYPICAL SECTION I

PLATE 10

10-FEB-2003 14:56
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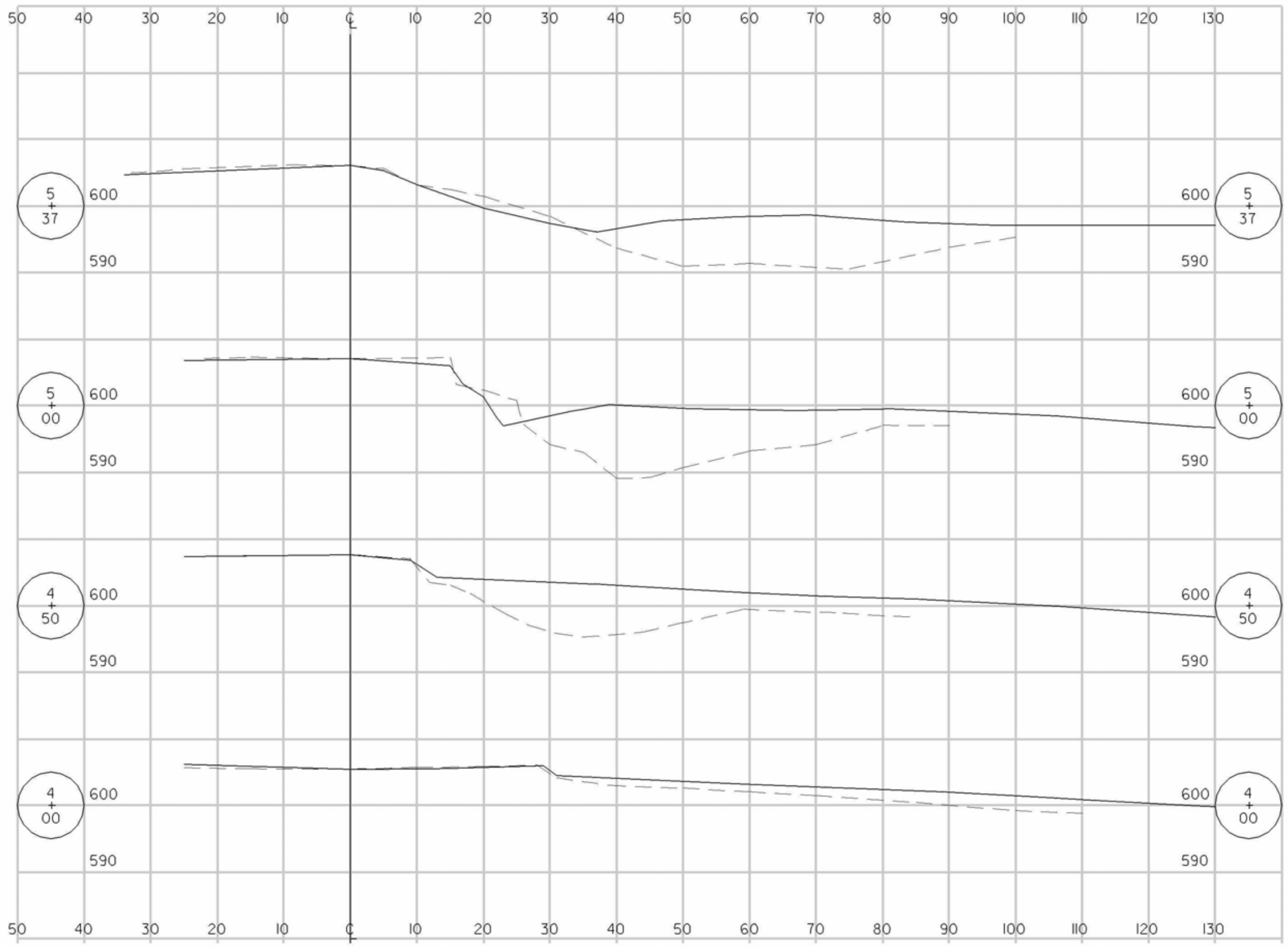

NOTE:
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FIELD BOOK - FC-00-2-29/40
9/26/00
FC-00-2-61/68
8/14/01

LEGEND

— — — — 11/18/00
———— 8/13/01

US Army Corps of Engineers
Rock Island District

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ROCK ISLAND, ILLINOIS

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UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 11, RIVER MILE 599-603
BERTOM & McCARTNEY LAKES
PERFORMANCE EVALUATION

TYPICAL SECTION II

PLATE 11