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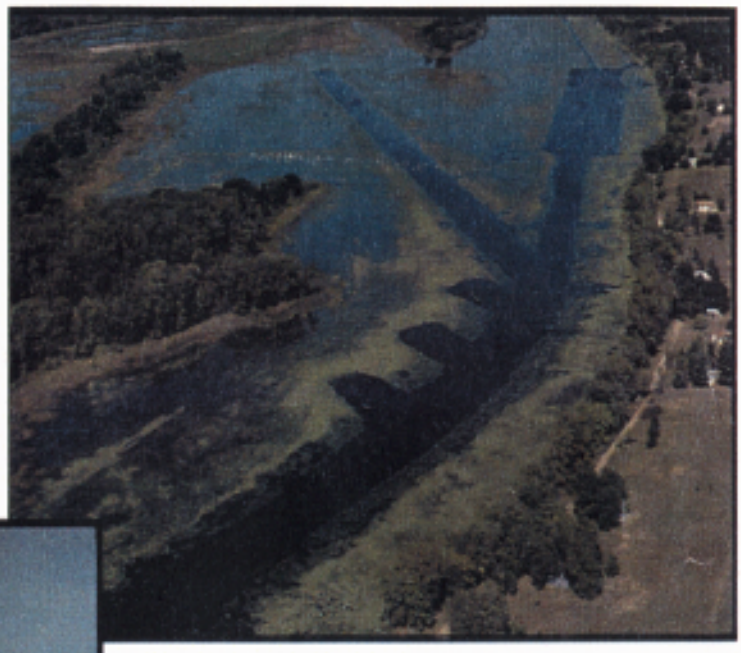
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POST-CONSTRUCTION INITIAL PERFORMANCE
EVALUATION REPORT (IPER9F)

POTTERS MARSH REHABILITATION AND ENHANCEMENT



NOVEMBER 1998

US Army Corps
of Engineers
Rock Island District

POOL 13
MISSISSIPPI RIVER MILES 522.5-526.0
CARROLL AND WHITESIDE COUNTIES, ILLINOIS

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Dist File (PM) (2 cys)
PM-M (Foley)
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ED-G
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ED-DG (Dziuk)
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OD-MN (Swenson)
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IM-CL (2 cys)

MFR: Distribution of final Initial Performance Evaluation Report (IPER 9F) for the Potters Marsh, IL, HREP to agencies and interested parties.

SKALAK/dmd/5605

December 11, 1998

Planning, Programs, and
Project Management Division

SEE REPORT DISTRIBUTION LIST (APPENDIX H)

The Rock Island District of the U.S. Army Corps of Engineers has enclosed for your information the Initial Performance Evaluation Report (IPER 9F [final]) for the Potters Marsh, Illinois, Habitat Rehabilitation and Enhancement Project (HREP), dated November 1998. Performance Evaluation Reports, initial and supplemental, are this District's primary mechanism for documenting and communicating the effectiveness of the Upper Mississippi River System – Environmental Management Program (UMRS-EMP) HREPs.

The following is a list of the report development team members from Rock Island District's *Planning, Programs, and Project Management Division (PM), Engineering Division (ED), and* Operations Division (OD). The telephone number is 309/794-XXXX (number as shown in list):

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To highlight the partnership that implementation of the UMRS-EMP represents, this report includes a multi-agency "signature" page (see acknowledgment page of the enclosed report).

Should you have any questions regarding this distribution, please contact Mr. Jerry Skalak of our Project Management Branch. You may reach Mr. Skalak by telephoning 309/794-5605, or by electronic mail at **jerry.a.skalak@usace.army.mil**.

Sincerely,

ORIGINAL SIGNED BY

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Enclosure

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

CEMVR-PM-M

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POST-CONSTRUCTION INITIAL PERFORMANCE EVALUATION REPORT (IPER9F)

POTTERS MARSH REHABILITATION AND ENHANCEMENT

POOL 13, MISSISSIPPI RIVER MILES 522.5-526.0 CARROLL AND WHITESIDE COUNTIES, *ILLINOIS*

NOVEMBER 1998

ACKNOWLEDGMENT

Identified below are the primary staff members of the Rock Island District of the U.S. Army Corps of Engineers; the U.S. Fish and Wildlife Service; the U.S. Geological Survey; and the Illinois Department of Natural Resources who contributed to the development of this Post-Construction Initial Performance Evaluation Report for the Potters Marsh Habitat Rehabilitation and Enhancement Project:

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POOL 13, MISSISSIPPI RIVER MILES 522.5-526.0
CARROLL AND WHITESIDE COUNTIES, ILLINOIS

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POTTERS MARSH REHABILITATION AND ENHANCEMENT

POOL 13, MISSISSIPPI RIVER MILES 522.5-526.0 CARROLL AND WHITESIDE COUNTIES, ILLINOIS

1. INTRODUCTION

The Potters Marsh Habitat Rehabilitation and Enhancement Project (HREP), hereafter referred to as "the Potters Marsh project," is a part of the Upper Mississippi River System (UMRS) Environmental Management Program (EMP). The Potters Marsh project is located in Pool 13 on the Illinois side of the Upper Mississippi River navigation channel between river miles 522.5 and 526 (see plate 1).

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

(1) Summarize the performance of the Potters Marsh project relative to the project goals and objectives;

(2) Review the monitoring plan for possible modification;

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

(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 Illinois Department of Natural Resources (ILDNR) for the period from May 1992 through July 1998.

2. PROJECT GOALS, OBJECTIVES, AND MANAGEMENT PLAN

a. General. As stated in the Definite Project Report (DPR), the Potters Marsh project was initiated in response to the quantitative and qualitative losses of off-channel aquatic and wetland habitat due to sedimentation.

b. Goals and Objectives. Goals and objectives, formulated during the project design phase, are summarized in Table 2-1.

TABLE 2-1

Project Goals and Objectives

Goals	Objectives	Project Features [1/]
Rehabilitate and Enhance Aquatic Habitat	Restore and create fisheries habitat	Hydraulically dredge channel segments 2 and 3
		Improve water quality
	Reduce sediment input	Hydraulically dredge channel segment 1 and mechanically excavate hole below causeway
Enhance Habitat for Migratory Birds Through Wetland Rehabilitation	Increase migratory bird feeding and resting area	Managed marshland unit
		Grass and forb plantings
	Increase waterfowl brood habitat and fall feeding sites	Pothole creation

[1/] See plate 2.

c. Management Plan. A formal Annual Management Plan has been developed for the Potters Marsh project. The Management Plan, developed by the Corps in coordination with the USFWS, is summarized in Table 2-2. The Potters Marsh project is managed by the USFWS under authority of Cooperative Agreements with the Corps. Potters Marsh is operated as generally outlined in the O&M manual (Reference 3, Appendix G).

TABLE 2-2

Annual Management Plan for Potters Marsh

Month	Management Action	Purpose
September-October	Fill 32.5 acre-managed marshland with 1.5± foot of water in approximate 20-day period with 500 gpm submersible pump in well. Maintain 1.0 foot of water depth throughout the fall season.	Inundate quality emergent vegetation, providing feeding and/or resting area for migratory birds.
April-May	Dewater 32.5 acre-managed marshland in 5- to 10-day period by operating stop log structure with 3-foot-wide hydraulic opening.	Prevent undesired growth during spring/summer and establish moist soil vegetation.
Every 3-5 years	Fill 32.5 acre-managed marshland with 3.0± feet of water in approximate 50-day period with 500 gpm submersible pump in well.	Terminate any undesired vegetation and promote new growth of quality emergent vegetation.

3. PROJECT DESCRIPTION

a. Project Features. The project consists of aquatic habitat channels in Potters Slough and on the upstream side of the Thomson Causeway; a mechanically excavated sediment trap on the downstream side of the Thomson Causeway; a 32.5-acre managed marshland and 7-acre grassland created by construction of the confined placement site; and 18 potholes. The project features are illustrated below in Figure 3-1 and on plate 2.

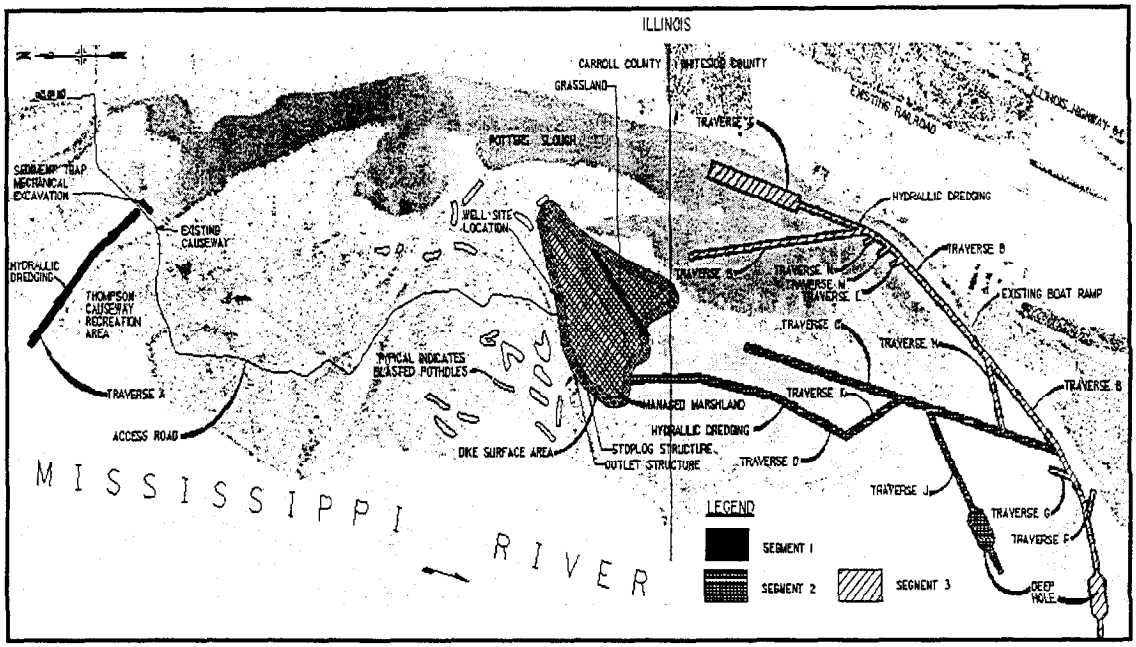


Figure 3-1. Project Features.

(1) Aquatic Habitat Channels. Segments 2 and 3 were hydraulically dredged[1] to restore overwintering and summer thermal refuge for fish. The bottom width of the dredged channels was 50 feet with a depth of 8 feet below flat pool. A deep hole was dredged in each of these segments. Each deep hole was 500 feet long by 200 feet wide and 12 feet deep. Side slopes in segments 2 and 3 were 2 horizontal on 1 vertical. The total channel length was 24,379 feet.

(2) Sediment Trap. A mechanically excavated sediment trap was created immediately below the existing causeway. The sediment trap dimensions were 200 feet wide by 60 feet long by 10 feet deep.

Segment 1 hydraulic dredging in upper Potters Slough is also considered part of the sediment trap feature. Segment 1 was approximately 2,100 feet long with a 50-foot bottom width and 10-foot depth and 2 horizontal on 1 vertical side slopes.

[1] The contractor worked with a dredge manufacturer to make modifications, one of which was to use vegetable oil in place of hydraulic oil, to a portable articulated dredge.

(3) Managed Marshland and Grassland.

(a) Confined Placement Site. The 32.5-acre managed marshland unit and 7-acre grassland were created by construction of the Confined Placement Site (CPS) for the dredged channel material. Beneficial use of the CPS was realized by establishing an area that could be managed under controlled conditions to meet the project goal of enhancing habitat for migratory birds by providing maximum control over water levels and vegetation production within the CPS. The grassland will provide habitat for dabbling ducks as well as nongame species like the dickcissel and the indigo bunting.

(b) Water Supply Well. The well was sized to fill the marshland to a depth of 1.5 feet in 20 days. The well is provided with a 500 gpm submersible pump, which is housed in a vandal-resistant protective casing. The outlet splash pad was modified with additional erosion protection (slush concrete) following pump testing. Underground electrical power is provided to the site, and all necessary electrical equipment is located on a power pole in the vicinity of the pump station.

(c) Water Control Structure. Operation of the managed marsh requires the use of one concrete stoplog water control structure. The water control structure has one 3-foot stoplog bay. The water control structure has a steel grate deck to allow easy access for cleanout.

(d) Access Road. The approximately 5,100-foot-long access road to the managed marshland unit follows a previously existing access road alignment from the refuge parking lot at the project site to the former agricultural lease field. The remainder of the road is new construction.

Access to the managed marshland unit is controlled by the USFWS with a locked gate to prevent public vehicular access to the refuge area and to minimize consequent disturbance.

(4) Potholes. Both mechanical excavation and explosives were used in the creation of open water depressions within the developing mudflats and higher terrestrial habitat. These holes have filled with water and will provide secluded open water for ducks and geese. Several naturally formed potholes existed at this site prior to project implementation.

b. Construction and Operation. The project construction contract was awarded to J. F. Brennan of La Crosse, Wisconsin, on September 11, 1993. Construction was essentially complete in December of 1995. The access road was constructed to provide vehicular access to the CPS. As the access road was completed, construction of the CPS commenced. The contractor mechanically excavated a hole in the interior of the CPS and hydraulically dredged the interior to build the containment dike. More coarse material was dredged than initially anticipated, resulting in a greater accumulation of material in the planned grassland area and a topsoil shortage. To compensate for the rapid accumulation of coarse materials, the dredge line was continually monitored and moved when materials reached elevation 590. To compensate for the topsoil shortage, the remainder of traverse D

(would have connected traverse D with the deep hole of alignment J) and all of traverse E (a stub traverse to the north of the traverse B deep hole, same length as traverses F and G) were eliminated and replaced with traverse S, which was known to have a greater quantity of fines and organic material. Following completion of the CPS, a water control structure and a well with a 500 gpm submersible pump were installed to provide the means to fill and drain the managed marshland.

The Potters Marsh project utilized both blasting and mechanical excavation for pothole construction. Lessons learned from blasting potholes for the Big Timber project were utilized in configuring the Potters blasted potholes—larger and shallower. The average blasted pothole area was about 1/3 acre. The mechanically excavated potholes are also shallow with gradual slopes. The excavated material was placed on the sides, and the ends were left open to allow for a natural variation in water depth with the seasonal fluctuation of the river. Mechanically excavated potholes range in size from 0.17 acre to 1.52 acre.

Project operation and maintenance generally consists of: (1) operating and maintaining the well and water control structure; (2) clearing the potholes of debris; (3) routinely burning the CPS dike and grassland; and (4) maintaining the access road.

4. PROJECT MONITORING

a. General. The Corps has overall responsibility to document project performance. The success of the project relative to original project objectives will be measured using data collected by the Corps and others (USGS, USFWS, ILDNR, etc.), field observations, and project inspections performed by the USFWS and the Corps. Appendix A presents the Post-Construction Performance 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 Performance Evaluation Plan.

b. Corps of Engineers. The physical locations of the sampling stations referenced in the Performance Evaluation Plan and the Resource Monitoring and Data Collection Summary are presented in Figure 4-1 and on plate 3. The Corps collects bathymetric data in the form of channel profiles and sediment transects that traverse the various dredged channels of the Potters Marsh complex. Plates 4 through 16 show the Corps' sediment transect, channel profile data, and sedimentation cross sections. The channel profiles and sediment transects are surveyed at various[2] times during the year. Plates 17 through 27 show the pothole plans and transects. The Corps also monitors water quality at three stations.

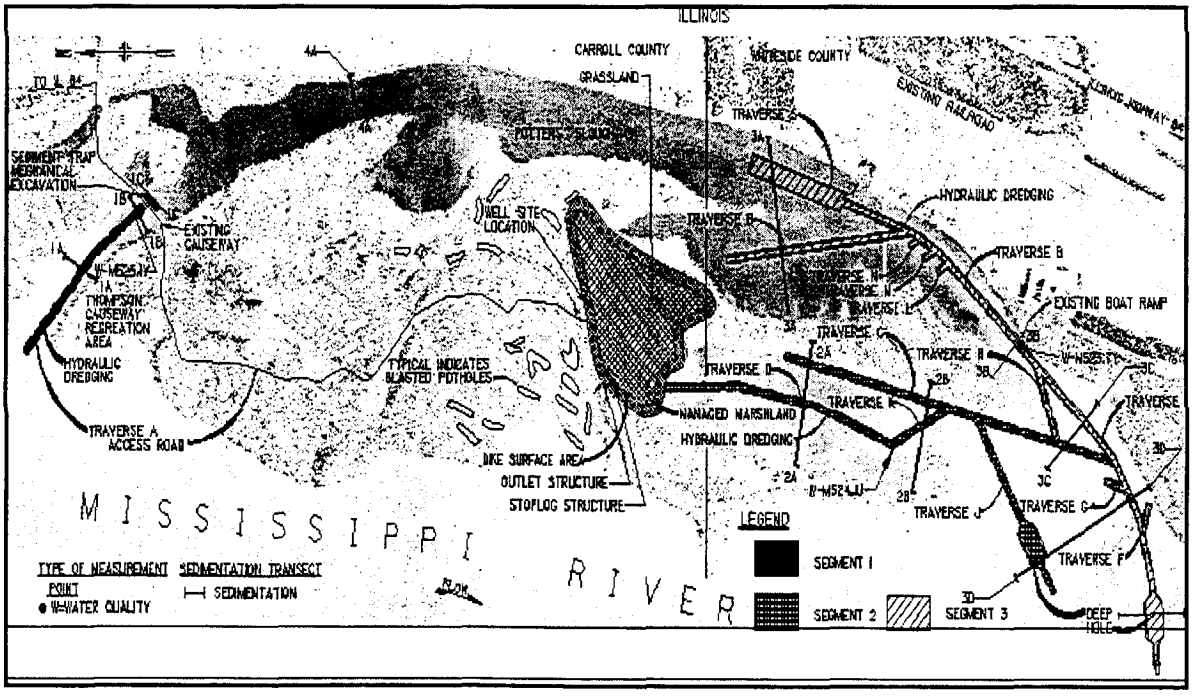


FIGURE 4-1. Potters Marsh Monitoring Plan.

[2] Surveying efforts are dependent upon water levels, ice conditions, and site accessibility.

c. U.S. Fish and Wildlife Service. The USFWS is responsible for operating and maintaining the Potters Marsh project. The USFWS does not have project-specific monitoring responsibilities. This is a Corps responsibility as identified in the 6th Annual Addendum for the UMRS-EMP. The USFWS Savanna District Manager of the Upper Mississippi River National Wildlife and Fish Refuge (USFWS Site Manager) is required to conduct annual inspections of the project and to participate in periodic joint inspections of the project with the Corps.

d. U.S. Geological Survey/Iowa Department of Natural Resources. The USGS, in cooperation with the IADNR at the Bellevue Field Station, conducts standardized monitoring of water quality, fish, macroinvertebrates, and vegetation in Pool 13 as part of the Long Term Resource Monitoring Program (LTRMP). Although neither the USGS nor the IADNR has project-specific monitoring responsibilities, staff of the Bellevue Field Station, under contract with the Corps, conducted an initial study of waterfowl and wading bird use of the pothole features during the spring of 1996. The results of this study are summarized within the context of this report.

e. Illinois Department of Natural Resources. The ILDNR has monitored post-construction fish numbers/use of the dredged channels and has indicated their intention to continue periodic monitoring of fisheries in the project area over the next several years. Additionally, the Illinois Natural History Survey's Center for Aquatic Ecology, under contract with the Corps, conducted an initial ice creel survey (see Appendix C) during the winter of 1996-1997 to obtain information on overwintering fish use of the project area.

5. EVALUATION OF AQUATIC HABITAT OBJECTIVES

a. Restore and Create Fisheries Habitat.

(1) Monitoring Results. Dredged channel plans, profiles, and composite sedimentation cross sections for segments 2 and 3 are shown on plates 6 through 16. As shown in Appendix A, Table A-1, the Potters Marsh project was designed to provide 220 acre-feet of fisheries habitat at year 50, and was based on a maintained water depth of 6 feet over the project life (ref. DPR pages 24 and 25). Changes in project scope between the DPR and construction eliminated portions of segment 2 and added to segment 3. As built, about 290 acre-feet of fisheries habitat was created (see Table 5-1 and Appendix E, Table E-1). Taking into account changes in project scope and assuming a 6-foot depth over the project life, Appendix A, Table A-1 fisheries habitat at year 50 has been adjusted to 190 acre-feet.

TABLE 5-1

Potters Marsh Fisheries Habitat, Segments 2 and 3

Dredged Channels	Depth, Ft [1]				Fisheries Habitat, Acre-Ft
		Year 2			
	Year 0	Maximum	Minimum	Average	
Segment 2 (S2)	8				109
Profile		8	3	6	77
Average Cross Sections		7.8	6.0	6.9	91
Segment 3 (S3) [2]	8				119
Profile		7	2	6	84
Average Cross Sections [3]		7.5	4.4	5.9	83
Deep Holes	12				62
Profile		11	7	9	45
Cross Sections					
Average Cross Sections		10.4	8.7	9.6	48
		As Built (Year 0) [4]			290
		Total at Year 2 (Profile) [4]			206
		Total at Year 2 (Cross Sections) [4]			222

[1] Profile depths were obtained July 1997. Cross-section data were obtained March 1998.
[2] Segment 3 includes additional shallow dredging (4' deep, 2,180' long) to compensate for a topsoil shortage.
[3] Does not include the shallow dredging.
[4] Difference in acre-feet is due to rounding.

As shown in Table 5-1, segments 2 and 3 channel profiles indicate that depths range from 2 feet to 8 feet below flat pool (elevation 583 NGVD 1912), with an average depth of 6 feet. The deep hole profiles range from 7 feet to 11 feet below flat pool. In comparison, the sedimentation cross section depths range from 7.8 to 4.4 feet below flat pool with an average depth of 6.4 feet. Cross sections at the deep holes range from 8.7 to 10.4 feet below flat pool. Assuming a 50-foot bottom width, 2H:1V side slopes and cross section average depths, year 2 fisheries habitat is approximately 220 acre-feet.

On May 13, 1992, an ILDNR fisheries team arrived at Potters Marsh to conduct pre-construction fish sampling at the lower end of the side channel. Maximum side channel depth was 16 inches, and heavy growths of filamentous algae and submergent vascular plants were observed in the area. Dead and dying fish were observed, and water quality measurements taken during the sampling effort indicated that low dissolved oxygen levels were a probable cause of the fish kill. Further sampling efforts were discontinued.

ILDNR fisheries staff returned to Potters Marsh on August 5, 1996, to conduct an initial post-construction fish population sample. During a total of 60 minutes of electrofishing, 318 fish representing 18 species were collected. Largemouth bass comprised 61 of the specimens collected; 10 of these were over 2 pounds each in weight, with the largest being just under 4 pounds. Other sport fish species collected included bluegill, walleye, yellow perch, and black crappie. Channel catfish and flathead catfish were expected to be present in the area as well, but were not collected, possibly because the deeper water of the dredged channels allowed them to elude sampling efforts.

A second electrofishing sampling effort conducted on July 31, 1997, yielded 19 species of fish. Large numbers of age 0 fish were present, indicating considerable use of the area as nursery habitat. Secchi disk transparencies of 6.0 feet were recorded during sampling efforts.

During the winter of 1997, an ice fishing creel survey was conducted to obtain information on winter fisheries use of the Potters Marsh HREP following project construction. Creel survey data were collected and analyzed for the Corps by the Illinois Natural History Survey, Center for Aquatic Ecology. Results of the survey (Appendix C) showed that ice anglers fishing on Potters Marsh encountered six species of fish: black crappie, bluegill, largemouth bass, redear sunfish, smallmouth bass, and yellow perch. Conversations with staff of the Bellevue LTRM field station, ILDNR Streams Program, and Illinois Natural History Survey indicate that many specimens identified in the survey as redear sunfish may in fact have been pumpkinseed, a species similar in appearance to redear sunfish and much more common in Pool 13.

(2) Conclusions. Although the profile data indicate up to 5 feet accumulation of sediment, these results may be due to the nonrepeatablity of the vessel's position during the surveys. In other words, depth of the thalweg, or channel bottom, is being compared to the depth on the channel's slope. At the time of the channel profile surveys, the aquatic vegetation had not matured to the point where the dredged channels were clearly defined, complicating the surveyors' ability to confine the profile data to the thalweg. Transect cross-sectional data collected in March of 1998 indicate that dredged channel depths are generally greater than those indicated by the channel profiles. Side slopes have softened in some areas, and sloughing is evident at others. This is consistent with several years of bathymetric data collected at the Brown's Lake, Monkey Chute, and Big Timber HREPs, and suggests that sediment deposition in dredged channels may be high initially and decrease as the channel cross section reaches equilibrium. Continued monitoring will better define project sedimentation rates and patterns.

Monitoring and observations of biological response by the Corps, USFWS, USGS and ILDNR indicate that the project is meeting the objective of restoration and creation of fisheries habitat. Data collected during two consecutive years of post-construction electrofishing and an initial winter creel survey indicate that the project area is providing year-round fisheries benefits, including nursery and overwintering habitat.

During the summer of 1998, an experimental drawdown of Pool 13 to 1.0 foot below normal operating level was conducted by the Corps at the request of the Fish and Wildlife Interagency Committee (FWIC). Additional details of the results of this action and its relationship to the Potters Marsh HREP are included in Appendix C, Cooperating Agency Correspondence.

b. Reduce Sediment Input.

(1) Monitoring Results. The dredged channel profile for segment 1 is shown on plate 4. Sedimentation cross sections are shown on plate 5. As shown in Appendix A, Table A-1, the 50-year target for this objective is 24 acre-feet of deep water, and was based on a maintained water depth of 6 feet over the project life (reference DPR page 30). As shown in Table 5-2 and Appendix E, Table E-1, 37 acre-feet of deep water habitat was created. Both the profile data and sedimentation cross-section data indicate that segment 1 channel depths range from 7 feet to 10 feet below flat pool and average about 9 feet. Sediment trap cross-section data depths range from 8 to 9 feet below flat pool and average about 8 feet. Assuming as-constructed bottom widths, side slopes and average depths, there is approximately 32 acre-feet of deep water at year 2.

TABLE 5-2

Potters Marsh Reduced Sediment Input, Segment 1

Dredged Channels	Depth, Ft [1]				Deep Water, Acre-Ft
	Year 0	Year 2			
		Maximum	Minimum	Average	
Segment 1 (S1) [2]	10				34
Profile		10	7	9	30
Cross Sections					
1A		10.0	9.0	9.5	
1B		10.8	7.1	9.0	
Average Cross Sections		10.4	8.0	9.2	30
Sediment Trap [3]	10				3
Profile		NA	NA	NA	
Cross Section 1C		8.2	6.0	7.1	2
			As Built (Year 0)		37
			Total at Year 2		32

[1] Profile depths were obtained July 1997. Cross-section data were obtained March 1998.

(a) Aquatic Resource Objectives. The primary aquatic resource problem in the study area identified in the DPR was sedimentation of the backwater areas leading to loss of habitat suitable for fisheries. Specifically, sedimentation was shown to have caused filling of the deeper channels of the slough, resulting in shallow water that would freeze from top to bottom during the winter. Also, the sediments present were shown to contain a high percentage of organic material (peat), placing a high sediment oxygen demand on the water column and causing poor water quality during critical summer and winter periods. Goals of the project, related to water quality, included reducing sediment input to the slough by creating sediment traps, improving dissolved oxygen levels during critical periods, and improving overall water quality.

(b) Monitoring Methods. Four monitoring locations were established within the project boundaries—Sites 523.6W, 523.7Y, 524.1U and 252.1Y (see Figure 3-1). All four sites were shallow prior to construction but are now within the deep channels dredged as part of the project. Baseline water quality monitoring was conducted from May 1991 through March 1994 at Sites 523.7Y, 524.1U, and 525.1Y. Post-project monitoring began in June 1996 and is still ongoing. Sampling at Site 523.6W was initiated in February 1998 and is ongoing. Parameters monitored include measures of dissolved oxygen, temperature, depth, water clarity, and several meteorological and hydrologic variables.

Throughout the pre- and post-project period, instantaneous monitoring has been performed biweekly during the summer months and monthly during the winter. This has consisted of taking grab samples from just beneath the water surface. Field analyses have been performed for ephemeral parameters and preserved subsamples are shipped to a commercial laboratory for further analysis. Prior to the project, 37 instantaneous monitoring events were performed. Since project completion, 27 instantaneous monitoring events have been performed.

In addition, periodic, in-situ continuous monitoring (YSI model 6000UPG) has been performed since project completion during both the summer and winter. Monitoring equipment is calibrated in the laboratory prior to placing in the field. A single monitoring event lasts for a period of two weeks during the summer and four weeks during the winter. Monitors were suspended approximately 3 feet beneath the water surface or 3 feet above the bottom as indicated on the data plots. Upon retrieval, the equipment was recalibrated in the laboratory and adjustments were made to the data where necessary. Since project completion, continuous monitoring events have been performed at all four sampling locations.

(c) Monitoring Results. All instantaneous monitoring results are shown in Appendix D, Tables D-1 though D-4 (pages D-3 through D-18). Graphical representation of the continuous monitoring data is shown in pages D-19 through D-28.

Prior to the project, water depth at all three locations was less than 3 feet, while depths between 6 and 8 feet have been consistently observed since project completion (page D-1). This has resulted in lower maximum water temperatures being observed during the summer months. Also, during the winter, slight temperature stratification is observed in

the deepened channels (page D-2). This results in a warmer layer of water near the bottom, thereby affording fish the opportunity to avoid the very coldest water temperatures.

Results of instantaneous surface dissolved oxygen monitoring show that most low dissolved oxygen concentrations occur during the summer months (June-September). Rarely are low surface dissolved oxygen concentrations seen during the winter (December-February). This was true both prior to and following project construction. Dissolved oxygen concentrations exceeded the minimally acceptable level of 5 mg/l at Sites 523.7Y, 524.1U, and 525.1Y with approximately the same frequency following project construction as occurred prior to project construction. Results from the continuous monitors reveal substantial diurnal variation that cannot be seen from the instantaneous data. It is also obvious that even greater changes in concentrations occur over periods of several days. At Site 524.1U, for instance, dissolved oxygen levels were well above 5 mg/l for most of the monitoring period of July 26, 1996, through August 8, 1996, except for a few measurements early in August and near the end of the monitoring period. From these data it can be seen that the continuous monitors provide a much more complete picture of water quality at a given site.

Quantitative comparison of pre- and post-project water clarity is not possible because, on several occasions, the secchi disk depth was equal to or greater than the water depth prior to project construction. Thus, an accurate measure of secchi disk depth was not possible on those occasions. Post-project secchi disk depths are very good, averaging near or over 2 feet. Water clarity at Site 524.1U is particularly good, with secchi disk depths in excess of 4 feet being measured on several occasions. Comparing pre- and post-project turbidity values does not reveal a remarkable difference at any of the sites. Suspended solids concentrations, on the other hand, were substantially higher pre-project at Sites 523.7Y and 525.1Y. There does not appear to be any difference at Site 524.1U. Determining whether these post-project reductions in suspended solids concentrations at Sites 523.7Y and 525.1Y are related to project features may require collection of additional data. It is noteworthy that there was no evidence of excessive algal growth based on measurements of chlorophyll concentrations.

(2) Conclusions. In general, water quality following restoration of the deep channels is improved over that observed prior to project construction. The results of instantaneous dissolved oxygen monitoring show that the severity of summer dissolved oxygen problems seems to have lessened and that no dissolved oxygen problems have been observed during the winter months following project completion.

Results from continuous monitoring show that low dissolved oxygen concentrations rarely exist for extended periods of time. More often they are observed for relatively short periods during the evening and early morning hours. While low dissolved oxygen concentrations are more common near the river bottom, the severity and frequency of occurrence seems to be less both near the surface and near the bottom as compared to pre-construction conditions. Further continuous monitoring will serve to better define these trends.

6. EVALUATION OF WETLAND REHABILITATION OBJECTIVES

a. Increase Migratory Bird Feeding or Resting Area.

(1) Monitoring Results. By providing maximum control over water levels and vegetation production within the confined placement site (CPS), beneficial use of it was realized. This met the project goal of enhancing habitat for migratory birds. After settlement of the dredged material, higher elevations of the CPS were converted to warm season grassland to provide a feeding and/or resting area for resident and migrating species. The managed marshland is approximately 32.5 acres and the grassland is approximately 7 acres.

Corps and USFWS staff visited the CPS on September 4, 1996, to view the water control structures and observe vegetative response to the project (see Appendix F). The berm and grassland areas of the CPS were dominated by the cover crop species of annual and perennial rye. None of the warm season grass species included in the seed mixture specifications was observed at the time of the site visit. A variety of emergent, rooted floating, and moist-soil vegetation was present in and around the CPS. In this first year after construction, remnant specimens of arrowhead were observed growing on the crown of the CPS berm. Some invasion of the interior and berm areas of the CPS by cottonwood seedlings was noted by Corps and USFWS staff.

A second site visit to inspect vegetation on the CPS was made by Corps staff on July 17, 1997 (Appendix F). The grassland area, crown, and outer slopes of the CPS berm were still dominated by annual and perennial rye. The lower inside slope of the berm was dominated by white sweet clover. Several scattered clumps of little bluestem, possibly

Little Bluestem

Black-Eyed Susan

remnants of last year's growth, were noted in the grassland area. A few specimens of purple prairie clover and black-eyed susan were observed in flower on the area. These species were not included in the seed mixture listed in construction specifications. The berm and grassland areas were initially seeded in the spring of 1996 following construction. The USFWS Refuge staff originally planned to conduct a maintenance burn

in the year following the initial seeding; however, on-site conditions in the spring of 1997 did not permit the burn to take place. Cottonwood seedlings were still evident in July 1997 in the interior of the CPS but appeared to be less abundant on the berm than on the 1996 site visit. A small amount of purple loosestrife was observed adjacent to and outside of the southwest portion of the CPS.

The Refuge Manager reported that during the spring of 1997 several pairs of Canada geese had nested in the interior of the CPS and mallards had nested on the associated berm and grassland areas. Small numbers of sandhill cranes visit the Savanna District each year. During 1995, a sandhill crane nest located near the containment site successfully hatched two young. This was the first documented sandhill crane nest in northwestern Illinois since 1872. Refuge staff observed nesting activity by sandhill cranes on or around the CPS grassland and berm in the spring of 1997, although actual nests or hatching success were not confirmed.

A third site visit to the CPS by Corps staff on October 2, 1997, showed cover crop rye grasses were still dominant on the berm and grassland (see Appendix F). This third inspection revealed an increased presence of warm season grasses and forbs. Several species encountered, such as little bluestem, sideoats grama, and blue grama, were included in the seed mixture specified for the CPS. Other species, such as New England aster, Indian grass, and big bluestem, were not included in seeding specifications, but could either be natural components of the seed bank in the area or incidental inclusions in the seed mixtures applied after construction of the CPS.

During the October 2, 1997, site visit, Corps staff encountered a plant specimen tentatively identified in the field as the federally listed threatened species decurrent false aster (*Boltonia decurrens*). This identification was confirmed the following day by the endangered species coordinator at the Rock Island Field Office of the USFWS. The known range for this species in Illinois is limited to floodplains of the Illinois River and of the Upper Mississippi River downstream of the confluence with the Illinois. This species is not recorded as occurring in Carroll or Whiteside Counties, and the reason for its presence on the CPS feature at Potters Marsh is not known. There is a possibility that seeds of this species may have been accidentally transported to the site in seeding mixtures or through some other construction-related activity.

(2) Conclusions. The initial vegetation response and observed waterfowl use of the area since construction indicates a positive response to the HREP and suggests that the project is providing benefits to migratory bird species. Establishment of a plant community dominated by warm season native grasses and forbs typically requires at least 3 to 4 years to fully develop, with periodic maintenance activity such as controlled burning to control less desirable vegetation (e.g., cottonwood seedlings). Continued monitoring of vegetation changes and migratory bird use within and around the CPS will help to determine the long-term performance of this feature.

On April 1, 1998, USFWS refuge staff conducted a maintenance burn of the berm and grassland areas of the CPS. Site visits conducted by Corps staff on May 22 and July 15, 1998, revealed an increased dominance of warm season grasses and forbs, as well as an

increase in the number of species present. These initial observations suggest that the grassland community responded well to the initial maintenance burn.

b. Increase Waterfowl Brood Habitat and Fall Feeding Sites.

(1) Monitoring Results. To increase waterfowl brood habitat and fall feeding sites, potholes were created by both mechanical excavation and blasting. A total of 18 potholes was created as part of the Potters Marsh project. At year 2, the potholes provide approximately 8 acres of surface (open) water area habitat and feeding sites. Plate 17 shows the location of the blasted and mechanically excavated potholes. Plate 18 shows the plan view and sediment transects of potholes 1-8. Plate 22 shows the plan view and sediment transects of potholes 9-19. The mechanically excavated pothole cross sections are shown on plates 19-21 and 23-25. The blasted pothole cross sections are shown on plates 26 and 27.

During the spring of 1996, the Bellevue LTRM Field Station initiated a study of the potholes in Potters Marsh for the Corps. The purpose of this study was to quantify and compare waterfowl usage, nesting, and brooding activity on several of the constructed potholes in the project area (Appendix A). Six mechanically excavated potholes and five blasted potholes were selected for study. Weekly or semiweekly surveys of waterfowl use and nesting activity were conducted (when water levels permitted access) from March to July 1996. Waterfowl using the potholes were counted and when possible identified as to species. Waterfowl nesting and brooding activity also was observed and recorded. Terrestrial vegetation surrounding the potholes, submergent aquatic vegetation, and plankton populations within 10 of the potholes were qualitatively surveyed on July 5, 1996, to determine species present and approximate area coverage. Plankton populations were sampled in conjunction with the vegetation sampling.

A total of 571 adult waterfowl and 49 wading birds representing 9 species were observed on the study potholes during counts made on 20 surveys between March 20 and July 20, 1996. All bird groups showed a slight preference (57%) for the blasted potholes compared to the mechanically excavated potholes. Members of the local chapter of Waterfowl USA installed artificial nest structures (mallard nesting tubes) on each of the excavated potholes. In addition, a 5-foot-diameter hay bale was placed in the middle of each of two excavated potholes to simulate a nesting island and promote zooplankton production. Water levels nearly 2 feet above normal at Lock and Dam 13 during the peak nesting period flooded all of the potholes, making the area inaccessible, destroying the hay bales and any existing shoreline nests, and discouraging any nesting attempts. Consequently, no waterfowl nests were found in proximity to potholes, and only minimal evidence of nesting activity associated with the potholes was observed later in the season by researchers. Checks of the mallard nest tubes in November 1996 revealed no use by waterfowl during 1996.

Total volume of zooplankton sampled in each pothole was highly variable. As a group, the mechanically excavated potholes had a greater abundance of zooplankton and also had a greater diversity of organisms represented. Submergent aquatic vegetation was present in 3 of the 10 potholes sampled (all excavated potholes). Floating macrophytes (duckweed) were observed in only one (excavated) pothole. Although no submergent aquatic

vegetation was present in any of the blasted potholes, substantial amounts of filamentous algae were present on all blasted potholes sampled. Terrestrial vegetation surrounding the potholes was unique to pothole type and was determined by the habitat type surrounding each group of potholes. The mechanically excavated potholes were constructed at the edge of oak-savanna habitat and are surrounded by reed canary grass, rice cutgrass, mixed forbs and sporadic trees. The blasted potholes were constructed in marsh habitat and are surrounded by dense stands of river bulrush with adjacent trees at three of the potholes.

(2) Conclusions. The pothole cross sections will be used to monitor sediment deposition and will be useful in determining if depth or configuration is related to waterfowl/wading bird use.

Both types of potholes constructed in the Potters Marsh HREP were effective in providing usable habitat for waterfowl and wading birds on Pool 13. Throughout the study, waterfowl were observed using at least one of the potholes included in the study during each visit to the project area. Even though waterfowl use patterns were highly variable among potholes, this variability was evident both within and between pothole types and was not dependent on construction method. Although use was highest in blasted potholes, pothole type was not significant in determining bird use. The primary factor affecting bird use appeared to be location. Potholes with the heaviest waterfowl use were located in protected locations, usually with trees or other cover in close proximity. High water levels that flooded all potholes in April 1996 severely restricted the potential for nesting use and likely resulted in lower levels of brooding activity. While none of the mallard nesting tubes showed evidence of being inundated by high water, during the flood these structures were completely surrounded by an expanse of open water and may have appeared undesirable to nesting pairs.

The mechanically excavated potholes had significantly higher zooplankton populations and were the only potholes containing aquatic macrophytes. Several of the species of zooplankton and aquatic plants encountered in the survey are reported to be excellent food sources for a variety of duck species. Shallow water and diminished surface area in the blasted potholes during the latter part of the survey period may account for the low zooplankton populations and dense mats of filamentous algae, which provide low benefits for waterfowl.

Although designed as nesting and brooding habitat for waterfowl, the potholes were used extensively as resting areas during the spring migration and as loafing areas by a variety of waterfowl and wading birds throughout the early summer. This habitat was particularly attractive to migrating ducks during windy spring days when adjacent open water areas on lower Pool 13 were windswept and rough. The potholes offered protection from the strong winds, providing calm water and isolation. In summary, the potholes appear to be a beneficial feature of the Potters Marsh HREP. A follow-up to this initial pothole survey is planned for the spring of 1999 to continue monitoring the performance of this feature.

7. OPERATION AND MAINTENANCE SUMMARY

a. Operation. Project operations are detailed in the O&M manual and generally consist of: (1) inspecting the containment dike; (2) placing the stoplogs in the stoplog structure when the managed marshland is in use; (3) manually activating and deactivating the pump for the managed marshland when the marshland is to be inundated; (4) inspecting the potholes following high water events; (5) inspecting the grassland and recording herbicide applications, burns, and other corrective actions; and (6) periodically inspecting the access road after high water events to assure there have been no slides, sloughing, or washed-out sections.

The project has been operated successfully in this manner since its completion in July 1996. As described in the Annual Management Plan (Table 2-2), the managed marsh is dewatered in April or May to prevent undesired growth during spring and summer and establish moist soil vegetation. The managed marsh unit water levels are gradually raised from September to October to inundate quality emergent vegetation and provide feeding and/or resting areas for migratory birds.

b. Maintenance.

(1) Inspections. Inspections of the Potters Marsh project follow inspection guidance presented in the O&M manual. They are to be made by the USFWS (site manager) at least annually. Other project inspections should occur as necessary after high water events or as scheduled by the site manager. Joint inspections of the Potters Marsh project are to be conducted periodically by the ILDNR, USFWS, and the Corps. These inspections are necessary to determine maintenance needs. The site manager's project inspection and monitoring results for 1997 can be found in Appendix C.

(2) Maintenance Based on Inspections. In 1997, the USFWS repaired eroded areas of the access road and cleaned sediment from the outlet structure. The CPS dike and associated grassland areas were burned in the spring of 1998.

8. CONCLUSIONS AND RECOMMENDATIONS

a. Project Goals, Objectives, and Management Plan. Based on data and observations collected since project completion, the project goals and objectives are being met (see Table 8-1). Continued data collection will better define the levels to which these goals and objectives are being met.

TABLE 8-1

Project Goals and Objectives

Goals	Objectives	Project Features	Status
Rehabilitate and Enhance Aquatic Habitat	Restore and create fisheries habitat	Hydraulically dredged channel segments 1 and 2	Met
	Reduce sediment input	Improve water quality	Met
		Hydraulically dredged channel segment 1 and mechanically excavated hole below causeway	
Enhance Habitat for Migratory Birds Through Wetland Rehabilitation	Increase migratory bird feeding and resting area	Managed marshland unit	Met
		Grass and forb plantings	Met
	Increase waterfowl brood habitat and fall feeding sites	Pothole creation	Met

b. Post-Construction Evaluation and Monitoring Schedules. In general, project monitoring efforts have been performed according to the Post-Construction Performance Evaluation Plan (Appendix A) and the Monitoring and Performance Evaluation Matrix and Resource Monitoring and Data Collection Summary (Appendix B). The next comprehensive Post-Construction Performance Evaluation will be completed following collection of data for the first 5-year interval.

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 have resulted in appropriate maintenance actions.

d. Project Design Enhancement. Discussions with personnel involved with operation, maintenance, and monitoring activities at the Potters Marsh project have resulted in the following general conclusions regarding project features that may affect future project design:

(1) Well Outlet Splash Pad Modifications. The well outlet was provided with a splash pad; however, following testing of the well, it was evident that additional erosion protection would be necessary. To remedy the erosion, a mixture of slush concrete and riprap was placed around the splash pad.

(2) Managed Marshland Construction. The contractor worked with a dredge manufacturer to make modifications, one of which was the use of vegetable oil in place of hydraulic oil, to a portable articulated dredge.

In order to construct the CPS, the contractor built an approximately 2-foot-high water deflection berm of native material (primarily silt). To construct the levee for the CPS, the contractor dredged material from the interior of the CPS (primarily sand). As the contractor formed the CPS levee (approximately 15 feet high), the water deflection berm directed runoff from the dredging operation to the interior of the CPS. Due to the nature of the native material used to construct the water deflection berm, it was more susceptible to failure than sand and non-stop monitoring was required. When the levee was approximately 1,000 feet long (total length is approximately 6,000 feet), the water deflection berm failed, releasing a large quantity of sand into the bay closest to Traverse D. The water deflection berm was not being monitored when it failed. It was subsequently determined that to remove all of the sand from the bay would have caused additional damage to the aquatic vegetation. To mitigate the USFWS for the consequent loss of depth in the bay, the contractor expanded his dredging exit channel from 40 feet to 60 feet wide to connect Traverse D to the CPS, retained the on-off construction ramp connecting the dredging exit channel to the CPS (1V:10H side slopes vs. 1V:3H side slopes), and placed stumps in the dredging access channel to deter waterfowl hunters from entering the CPS.

After construction of the CPS, the contractor commenced dredging at a pace that resulted in a 13-foot head, in contrast to the specified 2-foot head. The increased head forced the dike to unravel at the toe. The contractor was told to drain the CPS and keep the head at 2 feet.

(3) Topsoil Shortage. Due to a higher percentage of sand in the dredged material than had been originally anticipated, two dredge sites were eliminated and replaced with another known to have a higher percentage of fines and organic material.

(4) Public Access. Access to the managed marshland unit is controlled by the USFWS with a locked gate to prevent public vehicular access to the refuge area and to minimize consequent disturbance.

APPENDIX A

POST-CONSTRUCTION PERFORMANCE EVALUATION PLAN

TABLE A-1

Potters Marsh Rehabilitation and Enhancement Project
Post-Construction Performance Evaluation Plan [1/]

Enhancement Potential

Goal	Objective	Alternative	Enhancement Feature	Unit	Year 0 (1995) Without Alternative	Year 0 (1995) With Alternative (As-Built)	Year 2 With Alternative	Year 50 Target With Alternative [2/]	Feature Measurement	Annual Field Observations by Site Manager
Rehabilitate & Enhance Aquatic Habitat	Restore & create fisheries habitat	Create deep water in lower channel & embayment areas	Hydraulically dredge channel seg. 2 & 3	Acre-feet of deep water	0	290	220	~~220~~ 190	Soundings	Describe presence of snags, debris, channel sedimentation or vegetation
			Improved water quality	Mg/l DO	Approx. 1-4			~~Projected 4-8~~ ≥ 5	Perform water quality tests	Describe presence of fish stress or kills
	Reduce sediment input	Create deep water above and below causeway	Hydraulically dredge seg. 1 & mech. excav. hole below causeway	Acre-feet of deep water	0	37	32	24	Soundings	Describe presence of snags, debris, channel *sedimentation or* vegetation
Enhance Habitat for Migratory Birds Through Wetland Rehabilitation	Increase migratory bird feeding or resting area	Best use of CPS surface	Managed marshland	Acres of managed water level	0	32.5	32.5	32.5	Informal vegetation surveys	Presence of waterfowl
			Grassland area	Acres of grassland	*	7	7	7	Informal vegetation surveys	Survival of plantings
	Increase waterfowl brood habitat & fall feeding sites	Pothole creation	Improve and increase existing potholes	Acres of potholes	Approx. 2.0		9.45	6.8	Sediment transects/aerial photography	Presence of vegetation and presence of waterfowl

TABLE A-1 (Cont'd)

Potters Marsh Rehabilitation and Enhancement Project

[1/] See plate 3 of this report for monitoring plan.

[2/] Year 50 Target With Alternatives are shown as underlined for revised targets and strike outs if revised or deleted from the monitoring program.

TABLE A-2

Potters Marsh Rehabilitation and Enhancement Project
Sedimentation Transect Project Objectives Evaluation

Transect	Project Objectives to Be Evaluated			
	Restore & Create Fisheries Habitat	Reduce Sediment Input	Increase Migratory Bird Feeding or Resting Area	Increase Waterfowl Brood Habitat & Fall Feeding Sites
1A		X		
1B		X		
1C		X		
2A East	X			
2A West	X			
2B East	X			
2B West	X			
3A East				
3A West	X			
3B	X			
3C East	X			
3C West	X			
3D East	X			
3D West	X			
3E (new)	X			
4A		X		
POTHOLES				
1-20				X

APPENDIX B

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

TABLE B-1

Potters Marsh Rehabilitation and Enhancement 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.	USGS	USGS	LTRMP 1/	--
	Pre-Project Monitoring	Identifies and defines problems at HREP site. Establishes need of proposed project features.	USFWS	USFWS	USFWS	--
	Baseline Monitoring	Establishes baselines for performance evaluation.	Corps	Corps	HREP	See Table A-2
Design	Data Collection for Design	Includes quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP 2/	See Table A-2
Construction	Construction Monitoring	Assesses construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations
Post-Construction	Performance Evaluation Monitoring	Determines success of project as related to objectives.	Corps (quantitative) Sponsor (field observation)	Corps USFWS	HREP	See Table A-2
	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	Corps	HREP	--

1/ Long-Term Resource Monitoring Program is a component of the UMRS-EMP.
2/ Habitat Rehabilitation and Enhancement Projects

TABLE B-2

Potters Marsh Rehabilitation & Enhancement Project
Resource Monitoring and Data Collection Summary [1/]

Type Measurement	Water Quality Data					Engineering Data			Natural Resource Data			Sampling Agency	Remarks
	Pre-Project Phase	Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
		Apr-Sep	Oct-Mar	Jun-Sep	Dec-Mar								
POINT MEASUREMENTS													
Water Quality Stations												Corps	
Turbidity				2M	M								
Secchi Disk Transparency	2W			2M	M								
Suspended Solids	2W			2M	M								
Dissolved Oxygen	2W			2M	M								
Specific Conductance	2W			2M	M								
Water Temperature	2W			2M	M								
pH	2W			2M	M								
Total Alkalinity				2M	M								
Chlorophyll	2W			2M	M								
Velocity				2M	M								
Water Depth	2W			2M	M								
Ice Thickness					M								
Snow Depth					M								
Wind Direction				2M	M								
Wind Velocity				2M	M								
Wave Height				2M	M								
Air Temperature				2M	M								
Percent Cloud Cover				2M	M								

TABLE B-2 (Cont'd)

Type Measurement	Water Quality Data						Engineering Data			Natural Resource Data			Sampling Agency	Remarks
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar								
POINT MEASUREMENTS (Cont'd)														
Sediment Test Stations														
Bulk Sediment			1										Corps	
Elutriate			1										Corps	
Grain Size			1										Corps	
Boring Stations														
Geotechnical Borings - See Construction Drawings Column Settling Analysis								1					Corps	
Waterfowl Surveys														
Aerial Survey												Y	ILDNR	
Fish Stations														
Electrofish/Netting												1M	ILDNR	
TRANSECT MEASUREMENTS														
Sedimentation Transects														
Hydrographic Soundings							1		5Y				Corps	
Informal Vegetation Surveys														
Moist-Soil Plant Survey												5Y	Corps	

TABLE B-2 (Cont'd)

Type Measurement	Water Quality Data						Engineering Data			Natural Resource Data			Sampling Agency	Remarks
	Pre-Project Phase		Design Phase		Post-Const. Phase		Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	Design Phase	Post-Const. Phase		
	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar	Apr-Sep	Oct-Mar								
AREA MEASUREMENTS														
Mapping [2/]														
Aerial Photography										1		5Y	Corps	

Legend

M = Monthly
Y = Yearly
nM = n-Month interval
nY = n-Year Interval
1,2,3,.... = Number of times data were collected within designated project phase

TABLE B-2 (Cont'd)

Potters Marsh Rehabilitation and Enhancement Project

[1/] See plate 3 of this report for locations of post-construction phase sampling points (stations), transects, and area measurements. See DPR for locations of design phase sampling locations.

[2/] *Mapping (Post-Construction Phase)*

July 12, 1993, Color Aerial Photography (Scale = 1000 ft/in)
April 17, 1994, Color Aerial Photography (Scale = 1000 ft/in)
1994 Color Infrared
November 21, 1995, Black and White Aerial Photography (low flight - Scale = 1400 ft/in)
November 24, 1995, Black and White (high flight - Scale = 2800 ft/in)

APPENDIX C

COOPERATING AGENCY CORRESPONDENCE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Upper Mississippi River National Wildlife and Fish Refuge
Savanna District
Post Office Building
Savanna, Illinois 61074

IN REPLY REFER TO:

June 15, 1994

Bob Hoffman, Project Engineer
U.S. Army Engineer, Rock Island District
Clock Tower Building
Rock Island, Illinois 61204

Dear Mr. Hoffman:

Keith Beseke, Project Engineer, U.S. Fish and Wildlife Service and I met on-site at Potter's Marsh EMP project with Victor Buhr, J.F. Brennan Co., Inc. and Dick Bielenberg and Lee Schweigan, Corps of Engineer, Rock Island on June 14, 1994 to determine clean-up required because of a toe dike break on April 27-28, 1994.

The conclusions of this meeting are as follows:

1. To compensate for dredged material lost into Mallard Bay, the contractor would expand his dredging exit channel from 40 feet to 60 feet wide. This would be completed from the containment dike to the west Mallard Bay channel.

2. As agreed by the contractor, stumps will still have to be placed in this exit channel.

3. Also, as agreed to in the contractor's plan of operation, the sand plug at the toe of the containment dike will still be required.

4. Finally, on-off construction ACCESS ramp connecting exit channel to the containment dike can remain at the conclusion of the project. It should be contoured into the final dike slope, top soiled, and seeded the same as the dike.

If you have any further questions, please feel free to contact either Keith Beseke (507) 452-4232 or myself (815) 273-2732.

Sincerely,

Larry A. Wargowsky
District Manager

A FAX MESSAGE FROM THE
U.S. FISH AND WILDLIFE SERVICE, REGION 3
Upper Mississippi River National Wildlife and Fish Refuge
Savanna District
P.O. BOX 336
Savanna, Illinois 61074
(815) 273-2732
FAX (815) 273-2960

FAXFORM

U.S. FISH AND WILDLIFE SERVICE - REGION 3 **PAGE 1 OF 3 PAGES**

DATE: 11-~~21~~ 25-97

TO: Charlene Carmack **PHONE:**

FROM: Ed **PHONE:**

SUBJECT: Potter's Inspection Report Form

COMMENTS: 5 pairs of Canada geese raised young @ Potter's M.
1 pair of Sandhill cranes were thought to nest, but no nest found;
they did use the area until mid-October.
In spring, hundreds of waterfowl used the impoundment areas
Very little waterfowl use in fall/winter due to intense
hunting pressure.

Regards
Ed

Happy Thanksgiving

OPERATION AND MAINTENANCE MANUAL
POTTERS MARSH REHABILITATION AND ENHANCEMENT

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILES 522.5 THROUGH 526
CARROLL AND WHITESIDE COUNTIES, ILLINOIS

SITE MANAGER'S PROJECT INSPECTION AND MONITORING RESULTS

Inspected By Bill Davison Date 10-17-97

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

1. PROJECT INSPECTION.

Item	Condition
a. Containment Dike	
(✓) Settlement, sloughs or loss of section	ok
(✓) Wavewash, scouring	very little
(✓) Overtopping erosion	none
(✓) Vegetative cover (mowing)	Not mowed - May be burned in spring
(✓) Burrowing animals	None noted
(✓) Unauthorized grazing or traffic	None
(✓) Encroachments	None
(✓) Unfavorable tree/shrub growth	Cottonwoods & willows have come up along shoreline zone approx 3 ft up the slope - Also woody veg on islands.
(✓) Other	
b. Stoplog Structure	
(✓) Stoplogs, stoplog keepers, stoplog slots	ok
(✓) Concrete	ok
(✓) Steel rails, rail posts, grating, fasteners	ok
(✓) Displaced/missing riprap	ok
(✓) Erosion adjacent to structure	none noted
(✓) Sedimentation (culverts/approaches)	have been cleaned out several times
( ) Other	

Item	Condition
c. Well	
(✓) Protective casing	good
(✓) Bollards	good
(✓) Outlet pad	OK
(✓) Displaced/missing riprap	none
(✓) Electrical controls	ok
(✓) Pump	OK
( ) Other	
d. Potholes	
(✓) Debris	None
(✓) Woody vegetation encroachment on banks	[redacted] some regrowth
( ) Other	some refilling of sediment
e. Vegetation - Grassland Planting	
(✓) Grassland and forb species	ok
(✓) Woody vegetation encroachment	Very little - will hopefully be included in mow-
(✓) Other	* Federally ~~Endangered~~ Threatened species found. see below
f. Access	
(✓) Road - granular surfacing, etc.	OK - some washing did occur after flood but it was minimal + easily repaired.
(✓) Drainage - CMP	OK

2. COMMENTS.

Dc current False Aster observed in summer of 1997 in upland grass area

Ed Britton
Site Manager

EFFORT TABLE FOR THE FULL DAY *** DAY ***

REGION :=1 LAKE :=POTTERS MARSH
DISTRICT :=01 YEAR :=97
ACREAGE :982 SAMPLING RATIO :=135/354 = 38.1%
NUMBER OF INTERVIEWS:287

YEAR PERIOD 01/01 TO 02/15 OF SECTION 1 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 1 COALESCED WITH
YEAR PERIOD 01/01 TO 02/15 OF SECTION 2 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 2

	ANGL HRS	95% CONF INTVL		HRS/ ACRE	95% CONF INTVL		% EFF INTVD
BOAT FISHING:							
WEEKDAY	2047	1433-2661	(30%)	2	1-3	(30%)	22.39
WKND/HOL	2447	1796-3098	(27%)	2	2-3	(27%)	28.21
STR TOTAL	4494	3613-5375	(20%)	5	4-5	(20%)	25.56
SHORE FISHING:							
WEEKDAY	0		(0%)	0		(0%)	
WKND/HOL	0		(0%)	0		(0%)	
STR TOTAL	0		(0%)	0		(0%)	0
BOAT/SHORE COALESCED:							
WEEKDAY	2047	1433-2661	(30%)	2	1-3	(30%)	22.39
WKND/HOL	2447	1796-3098	(27%)	2	2-3	(27%)	28.21
STR TOTAL	4494	3613-5375	(20%)	5	4-5	(20%)	25.56
BOAT/SHORE STRATIFIED:							
WEEKDAY	2047	1433-2661	(30%)	2	1-3	(30%)	22.39
WKND/HOL	2447	1796-3098	(27%)	2	2-3	(27%)	28.21
STR TOTAL	4494	3613-5375	(20%)	5	4-5	(20%)	25.56

HARVESTED AND CPUE TABLE BY SUBSTRATUM ACROSS STRATA *** DAY ***
REGION :=1 LAKE :=POTTERS MARSH
DISTRICT :=01 YEAR :=97
ACREAGE :982 SAMPLING RATIO :=135/354 = 38.1%
RATIO OF EFFORT HOURS INTERVIEWED := 1148.4/4496.6 = 25.53%
NUMBER OF INTERVIEWS: 287

COMBINED ACROSS STRATA:

YEAR PERIOD 01/01 TO 02/15 OF SECTION 1 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 1 COALESCED WITH
YEAR PERIOD 01/01 TO 02/15 OF SECTION 2 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 2

MSC SPECIES CAUGHT:

SUBSTRATUM:
DAY PERIODS STRATIFIED
WEEKDAY/WEEKEND: WEEKDAY/WEEKEND STRATIFIED
FISHING TYPE: BOAT/SHORE COALESCED
FISH: HARVESTED

SPEC	#/HR	95% CI		# HARVST	95% CI		#/HA	#/ACRE
BLC	.012	.003-.021	(75 %)	84	31-137	(63 %)	.21	.09
BLG	.110	.062-.158	(44 %)	1112	551-1673	(50 %)	2.80	1.13
LMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
RSF	.134	.062-.207	(54 %)	1009	483-1535	(52 %)	2.54	1.03
SMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
YEP	.061	.025-.097	(60 %)	360	173-547	(52 %)	.91	.37
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.317	.212-.423	(33 %)	2565	1469-3662	(43 %)	6.45	2.61

SPEC	KG/HR	95% CI		KG HARVST	95% CI		KG/HA	AVG WT(G)
BLC	.002	.000-.003	(73 %)	13	4-21	(66 %)	.032	153.5
BLG	.011	.006-.016	(46 %)	106	54-158	(49 %)	.267	95.2
LMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
RSF	.014	.006-.021	(55 %)	95	46-143	(51 %)	.239	94.0
SMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
YEP	.007	.002-.012	(66 %)	38	18-58	(52 %)	.097	106.5
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.034	.022-.045	(34 %)	252	150-354	(40 %)	.634	98.2

SPEC	LB/HR	95% CI		LB HARVST	95% CI		LB/ACRE	AVG WT(LB)
BLC	.004	.001-.007	(73 %)	28	10-47	(66 %)	.029	.3384
BLG	.025	.013-.036	(46 %)	234	120-347	(49 %)	.238	.2099
LMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
RSF	.030	.014-.047	(55 %)	209	102-316	(51 %)	.213	.2071
SMB		*** NOT RECORDED ***			*** NOT RECORDED ***			
YEP	.016	.005-.026	(66 %)	85	40-129	(52 %)	.086	.2348
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.075	.049-.100	(34 %)	555	332-779	(40 %)	.566	.2165

CAUGHT AND CPUE TABLE BY SUBSTRATUM ACROSS STRATA *** DAY ***
REGION :=1 LAKE :=POTTERS MARSH
DISTRICT :=01 YEAR :=97
ACREAGE :982 SAMPLING RATIO :=135/354 = 38.1%
RATIO OF EFFORT HOURS INTERVIEWED := 1148.4/4496.6 = 25.53%
NUMBER OF INTERVIEWS: 287

COMBINED ACROSS STRATA:

YEAR PERIOD 01/01 TO 02/15 OF SECTION 1 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 1 COALESCED WITH
YEAR PERIOD 01/01 TO 02/15 OF SECTION 2 COALESCED WITH
YEAR PERIOD 02/16 TO 02/28 OF SECTION 2

MSC SPECIES CAUGHT:

SUBSTRATUM:
DAY PERIODS STRATIFIED
WEEKDAY/WEEKEND: WEEKDAY/WEEKEND STRATIFIED
FISHING TYPE: BOAT/SHORE COALESCED
FISH: CAUGHT

SPEC	#/HR	95% CI		# CAUGHT	95% CI		#/HA	#/ACRE
BLC	.014	.004-.024	(69 %)	106	42-169	(60 %)	.27	.11
BLG	.223	.110-.335	(50 %)	2336	1191-3482	(49 %)	5.88	2.38
LMB	.018	+-.047	(157 %)	150	+-346	(131 %)	.38	.15
RSF	.296	.166-.426	(44 %)	2750	1452-4047	(47 %)	6.92	2.80
SMB	.000	+-.001	(202 %)	6	+-18	(202 %)	.01	.00
YEP	.090	.046-.134	(49 %)	611	248-973	(59 %)	1.54	.62
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.641	.429-.853	(33 %)	5958	3603-8313	(40 %)	14.99	6.07

SPEC	KG/HR	95% CI		KG CAUGHT	95% CI		KG/HA	AVG WT(G)
BLC	.002	.000-.003	(71 %)	14	5-22	(64 %)	.034	128.5
BLG	.015	.008-.022	(48 %)	146	76-216	(48 %)	.367	62.5
LMB	.002	+-.006	(146 %)	21	+-46	(120 %)	.053	139.2
RSF	.018	.010-.027	(48 %)	144	77-212	(47 %)	.363	52.5
SMB	.000	+-.000	(202 %)		+-.46364	(202 %)	.000	26.5
YEP	.008	.003-.013	(60 %)	44	23-66	(49 %)	.111	72.5
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.046	.030-.061	(34 %)	369	227-511	(39 %)	.929	62.0

SPEC	LB/HR	95% CI		LB CAUGHT	95% CI		LB/ACRE	AVG WT(LB)
BLC	.004	.001-.007	(71 %)	30	11-49	(64 %)	.030	.2833
BLG	.033	.017-.049	(48 %)	322	167-476	(48 %)	.328	.1377
LMB	.005	+-.013	(146 %)	46	+-101	(120 %)	.047	.3068
RSF	.040	.021-.060	(48 %)	318	170-466	(47 %)	.324	.1158
SMB	.000	+-.000	(202 %)		+-1	(202 %)	.000	.0583
YEP	.018	.007-.028	(60 %)	98	50-145	(49 %)	.099	.1598
MSC		*** NOT RECORDED ***			*** NOT RECORDED ***			
TOT	.101	.067-.135	(34 %)	814	500-1128	(39 %)	.829	.1366

TABLE POTTERS MARSH 1997 DAY CREEL FINAL REPORT
DAYTIME DATA FOR LAKE=POTTERS MARSH CREEL BEGUN IN YEAR=97

SECTION 1 FROM 01/01 TO 02/15
SECTION 1 FROM 02/16 TO 02/28
SECTION 2 FROM 01/01 TO 02/15
SECTION 2 FROM 02/16 TO 02/28

HOURS PER COMPLETED TRIP:

	MEAN	95% CONF.INTVL. OF MEAN		MIN.	MAX.	#SAMPLES
BOAT	2.9	2.6 - 3.2	(10%)	.4	9	131
SHORE	***	NO DATA ***				
BOAT & SHORE	2.9	2.6 - 3.2	(10%)	.4	9	131

23 SAMPLES WERE FROM SPLIT INTERVIEWS OF COMPLETED TRIPS
49.2% OF ALL 266 INTERVIEWS WERE COMPLETED TRIPS

SUPPLEMENTARY DATA:

QUESTION	MEAN	95% CONF.INTVL. OF MEAN		MIN.	MAX.	#SAMPLES
DISTANCE TRAVELLED IN MILES	29.7	25.8 - 33.6	(13%)	1	275	254
SUCCESS RATING 1-10?	2.3	2.1 - 2.6	(12%)	1	10	254

IS CATCH ILLEGAL?
CLERK NOTED 0 OUT OF 266 INTERVIEWS HAD ILLEGAL CATCHES

INTERVIEWS (AND %) PER SPECIES SOUGHT

ANY	243 (91.4%)	BLG	20 (7.5%)
YEP	3 (1.1%)		

PARTY SIZE VS. # INTERVIEWS

	BOAT	SHORE
1	109	1
2	117	2
3	31	3
4	6	4
5	2	5
6	1	6
7		7
8		8
9		9
10+		10+

TABLE POTTERS MARSH 1997 DAY CREEL FINAL REPORT CONTINUED
DAYTIME DATA FOR LAKE=POTTERS MARSH CREEL BEGUN IN YEAR=97

FISH HARVESTED/RELEASED BY # ANGLER-COMPLETED TRIPS FOR DIFFERENT TAXA

HARVESTED FISH:

ALL SIZES		ALL SIZES		ALL SIZES		ALL SIZES		ALL SIZES	
#BLC	#ANGLERS	#BLG	#ANGLERS	#BLG	#ANGLERS	#RSF	#ANGLERS	#RSF	#ANGLERS
0	219	0	156	16		0	167	16	
1	14	1	35	17		1	27	17	
2	1	2	15	18		2	24	18	
3		3	18	19		3	11	19	
4		4	8	20		4	2	20	
5		5	2	21		5	1	21	
6		6		22		6	1	22	
7		7		23		7		23	
8		8		24		8	1	24	
9		9		25		9		25	
10		10		26		10		26	
11		11		27		11		27	
12		12		28		12		28	
13		13		29		13		29	
14		14		30		14		30	
15+		15		31+		15		31+	

RELEASED FISH:

ALL SIZES		ALL SIZES		ALL SIZES		ALL SIZES		ALL SIZES	
#BLC	#ANGLERS	#BLG	#ANGLERS	#BLG	#ANGLERS	#RSF	#ANGLERS	#RSF	#ANGLERS
0	230	0	209	16		0	220	16	
1	3	1	16	17		1	8	17	
2	1	2	5	18		2	4	18	
3		3	2	19		3		19	
4		4		20		4	1	20	
5		5	1	21		5	1	21	
6		6		22		6		22	
7		7	1	23		7		23	
8		8		24		8		24	
9		9		25		9		25	
10		10		26		10		26	
11		11		27		11		27	
12		12		28		12		28	
13		13		29		13		29	
14		14		30		14		30	
15+		15		31+		15		31+	

(TAXA FOR L.FREQS.= BLC BLG RSF)

TABLE POTTERS MARSH 1997 DAY CREEL FINAL REPORT CONTINUED
DAYTIME DATA FOR LAKE=POTTERS MARSH CREEL BEGUN IN YEAR=97

FISH HARVESTED/RELEASED BY # ANGLER-COMPLETED TRIPS FOR DIFFERENT TAXA

HARVESTED FISH:

ALL SIZES #YEP	#ANGLERS	ALL SIZES #LMB	#ANGLERS	ALL SIZES #LMB	#ANGLERS	ALL SIZES #SMB	#ANGLERS	ALL SIZES #SMB	#ANGLERS
0	193	0	234	16		0	234	16	
1	27	1		17		1		17	
2	10	2		18		2		18	
3	4	3		19		3		19	
4		4		20		4		20	
5		5		21		5		21	
6		6		22		6		22	
7		7		23		7		23	
8		8		24		8		24	
9		9		25		9		25	
10		10		26		10		26	
11		11		27		11		27	
12		12		28		12		28	
13		13		29		13		29	
14		14		30		14		30	
15+		15		31+		15		31+	

RELEASED FISH:

ALL SIZES #YEP	#ANGLERS	ALL SIZES #LMB	#ANGLERS	ALL SIZES #LMB	#ANGLERS	ALL SIZES #SMB	#ANGLERS	ALL SIZES #SMB	#ANGLERS
0	228	0	229	16		0	233	16	
1	5	1	3	17		1	1	17	
2	1	2	1	18		2		18	
3		3	1	19		3		19	
4		4		20		4		20	
5		5		21		5		21	
6		6		22		6		22	
7		7		23		7		23	
8		8		24		8		24	
9		9		25		9		25	
10		10		26		10		26	
11		11		27		11		27	
12		12		28		12		28	
13		13		29		13		29	
14		14		30		14		30	
15+		15		31+		15		31+	

(TAXA FOR L.FREQS.= YEP LMB SMB)

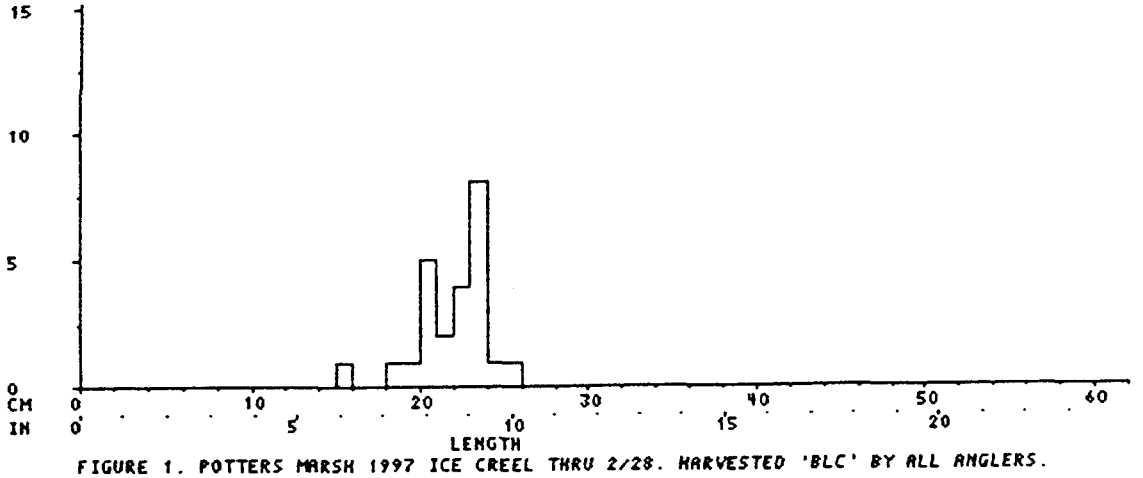


FIGURE 1. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'BLC' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 24 INDIVIDUALS

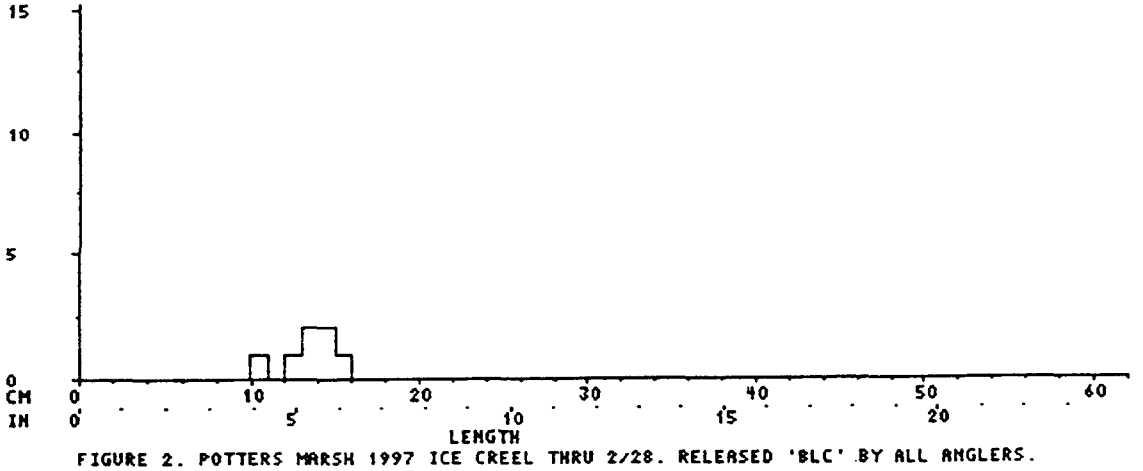


FIGURE 2. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'BLC' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 7 INDIVIDUALS

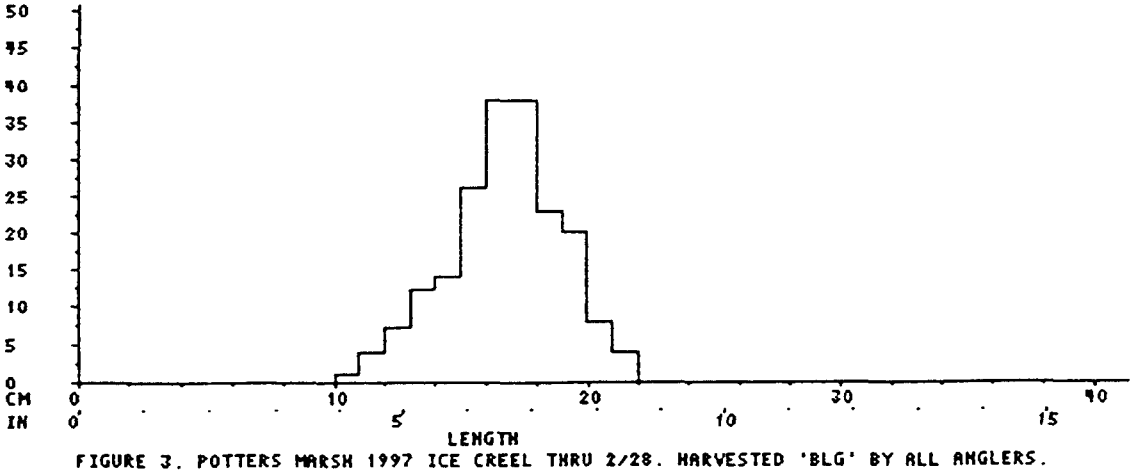


FIGURE 3. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'BLG' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 195 INDIVIDUALS

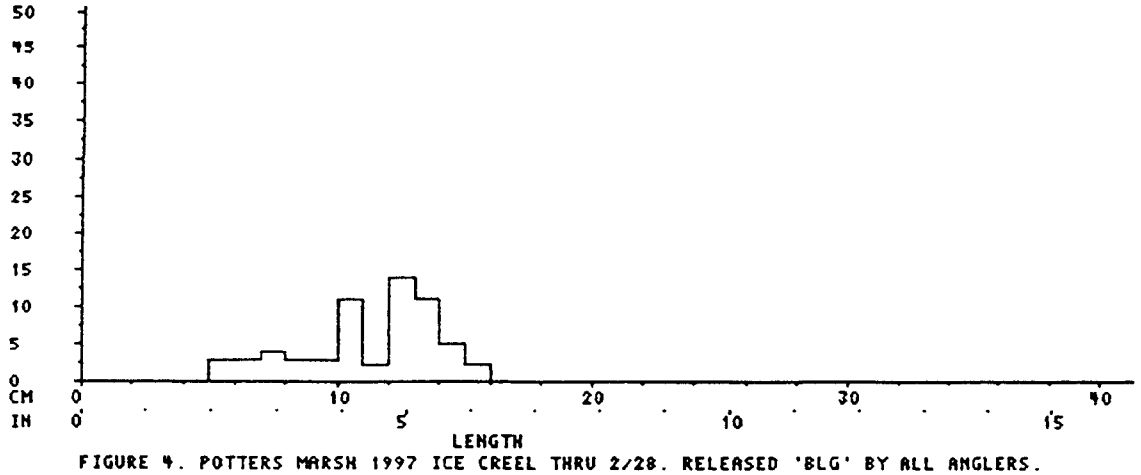


FIGURE 4. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'BLG' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 61 INDIVIDUALS

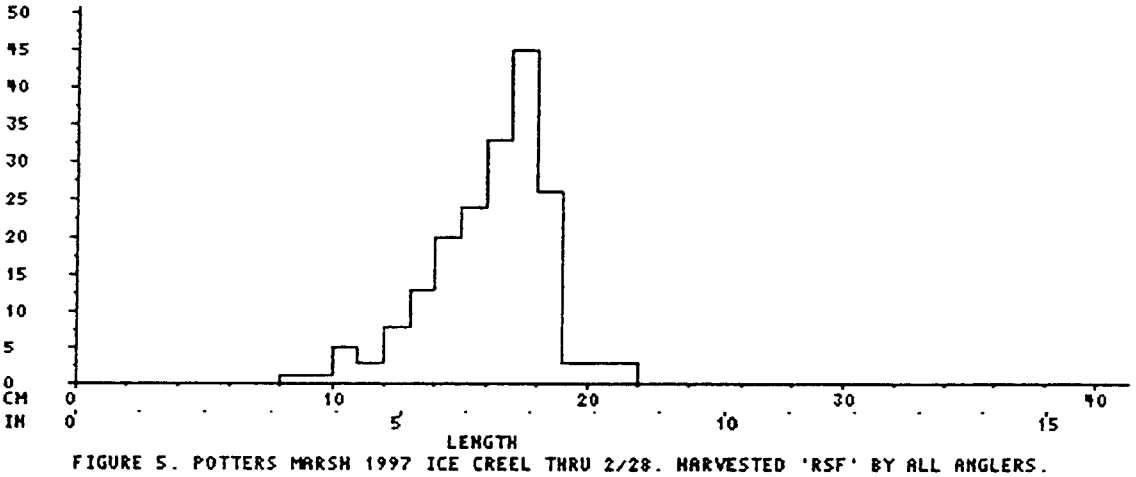


FIGURE 5. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'RSF' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 188 INDIVIDUALS

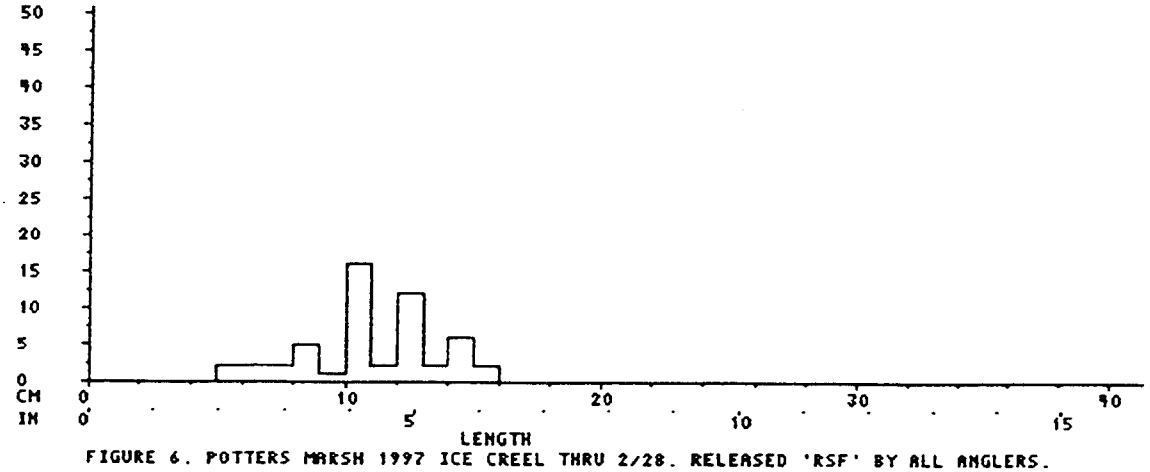


FIGURE 6. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'RSF' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 52 INDIVIDUALS

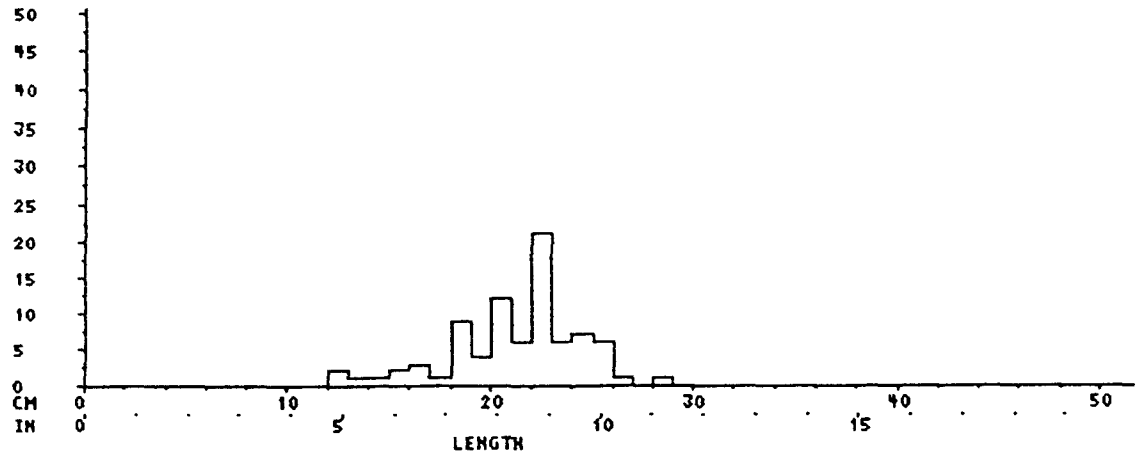


FIGURE 7. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'YEP' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 83 INDIVIDUALS

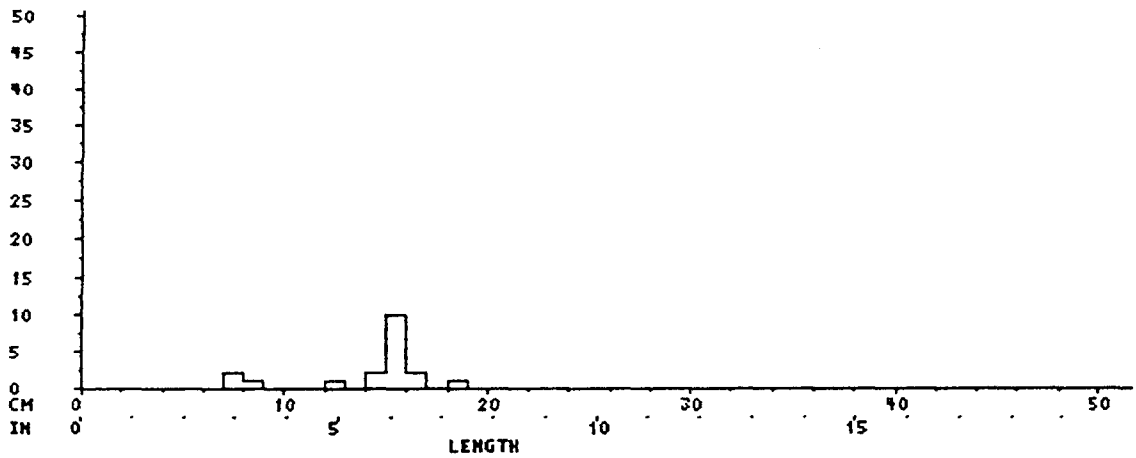


FIGURE 8. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'YEP' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 19 INDIVIDUALS

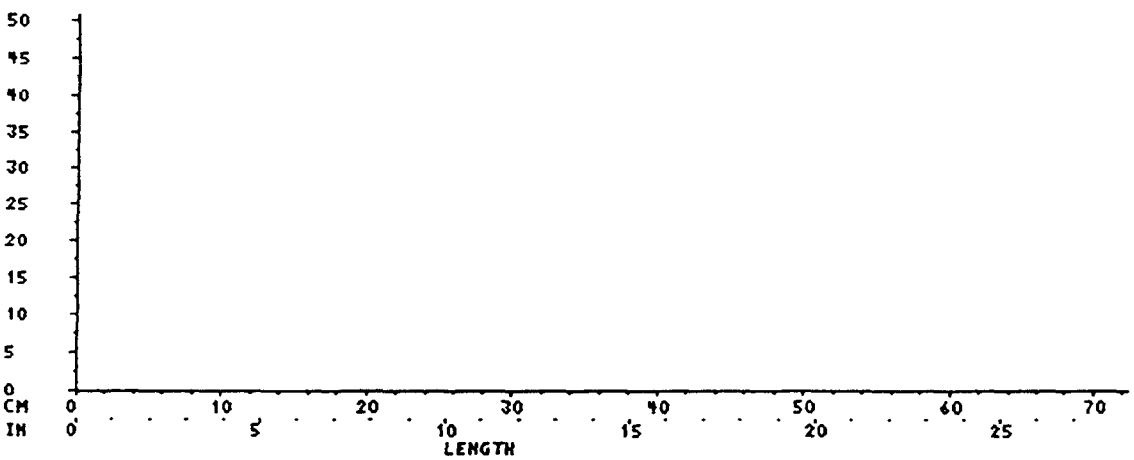


FIGURE 9. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'LMB' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 0 INDIVIDUALS

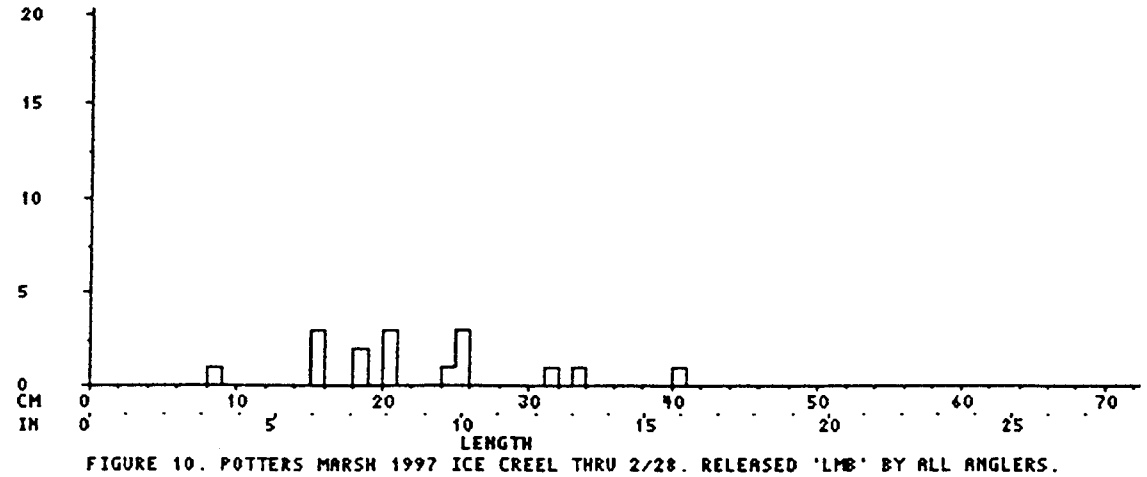


FIGURE 10. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'LMB' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 16 INDIVIDUALS

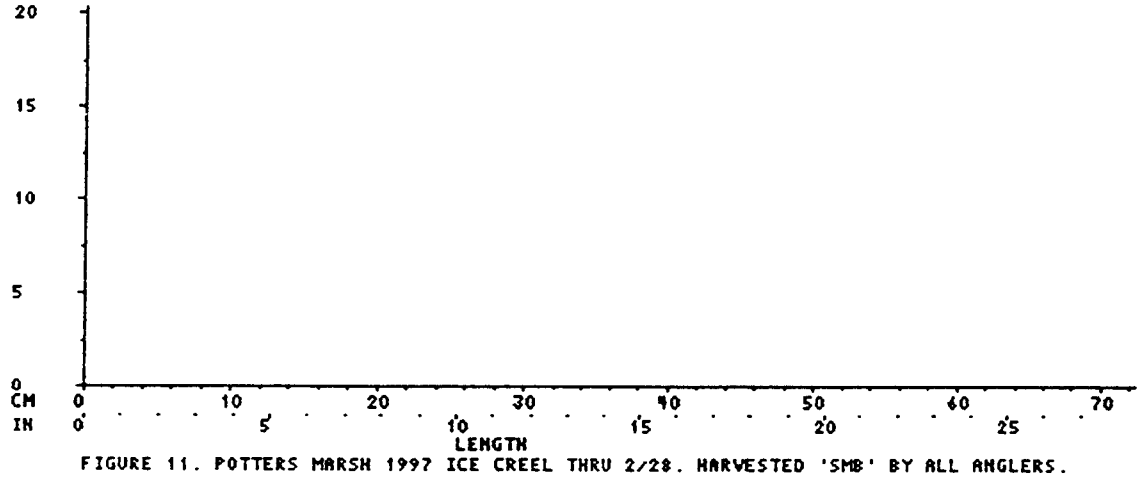


FIGURE 11. POTTERS MARSH 1997 ICE CREEL THRU 2/28. HARVESTED 'SMB' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 0 INDIVIDUALS

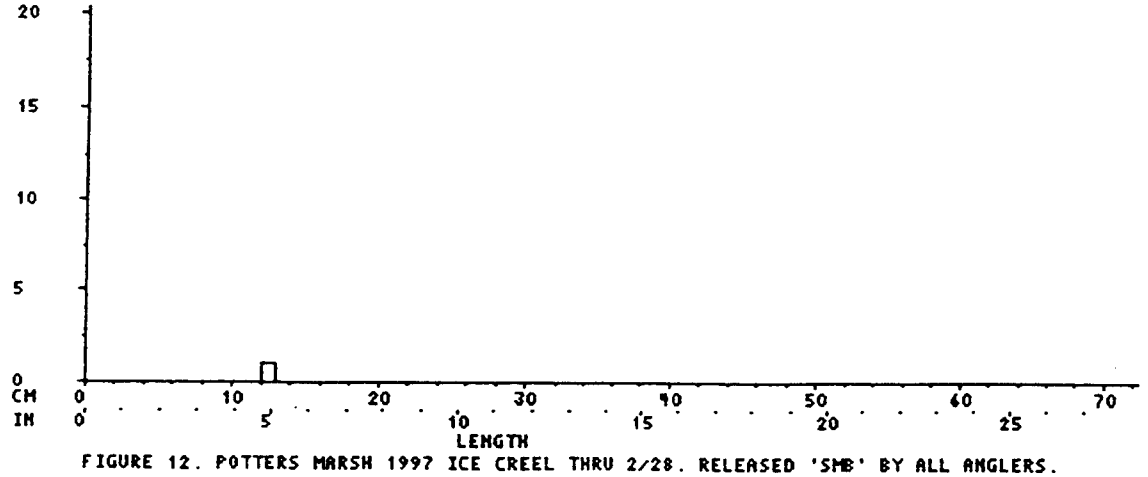


FIGURE 12. POTTERS MARSH 1997 ICE CREEL THRU 2/28. RELEASED 'SMB' BY ALL ANGLERS.
FREQUENCY VS. FISH LENGTH 1 INDIVIDUALS

CEMVR-PM-R 7 October 1998

MEMORANDUM FOR RECORD

SUBJECT: Effects of Pool 13 Experimental Drawdown on Potters Marsh

1. During the summer of 1998, an experimental lowering of water levels at Lock and Dam 13 was conducted by the Corps at the request of the Fish and Wildlife Interagency Committee (FWIC). The FWIC is a group of State and Federal resource agency biologists and other professionals assigned to aquatic and terrestrial projects on the Upper Mississippi River. The purpose of this "drawdown" experiment was to investigate the potential for modifying dam operations to partially restore historic summer river profiles for the benefit of fish and wildlife. The primary objective of the drawdown experiment was to maintain water levels at Dam 13 at 1.0 foot below the authorized pool elevation for 30 consecutive days to allow germination of moist-soil vegetation.

2. The Environmental Assessment prepared for the drawdown predicted that a 1-foot lowering of water levels at the dam would reduce water depths in Potters Marsh by 0.8 to 0.9 foot. This reduction of depth in the aquatic vegetation beds adjacent to the dredged channels of the HREP had the potential to adversely affect spawning and nursery habitat for centrarchids and other fish species, by stranding and dessicating nests and young fish or by forcing young fish into the deep channels where high densities of predators occur.

3. Operational objectives were to gradually lower water levels at the dam over approximately 3-5 days, maintain the water level at 1.0 foot below authorized flat pool elevation for 30 days, and then gradually return to normal operating levels over a period of about 7 to 10 days. This was to occur within the June 15-August 15 timeframe. Successful implementation of these objectives required that river discharges remain between 50,000 and 110,000 cfs throughout the "drawdown" period. This year, discharges did not remain within this range. The initial drawdown attempt was maintained for 13 days, from June 21 to July 3. Between July 3 and July 10, discharges above 110,000 cfs took the dam out of operation and ended the initial drawdown attempt. The drawdown was re-initiated on July 11 as flows subsided and the dam went back into operation. This second attempt had to be discontinued on July 17 when discharges were forecast to fall below 50,000 cfs.

4. FWIC agencies are continuing to monitor the effects of the attempted drawdown. Iowa DNR and Illinois DNR biologists established seven photopoints in lower Pool 13 to monitor changes in water levels, vegetation, and other aquatic life during the drawdown. The Fish and Wildlife Service had planned to obtain aerial photography of the lower pool during the drawdown, but the interruption of the drawdown prevented scheduling of a flight when the pool was at the lower elevation. The Corps contracted with the Alton LTRMP Field Station to monitor larval fish in Potters Marsh and Brown's Lake (another Pool 13 HREP located upstream of the area influenced by the drawdown) to obtain information to evaluate whether the drawdown adversely affected larval fish production in the area of impact. Samples collected this summer are currently being analyzed and the results should be available early next year. A follow-up monitoring effort is anticipated to occur in 1999.

5. Site visits to the Potters Marsh HREP conducted during 1998 as part of ongoing post-construction performance monitoring also provided an opportunity to observe and document changes in water levels in the HREP project area. The attached photo page provides views of dredging Segment 2 near its termination point at the CPS (looking downstream), approximately 2 miles upstream of the dam. The 5/22/98 photo was taken prior to initiation of the drawdown and at the beginning of the growing season for aquatic vegetation. The middle number below the photo (14.2) represents the river stage at Lock and Dam 14 recorded for that date, and the number to the right (51000) is the approximate discharge in cubic feet per second. The photos taken on 6/22/98 and 7/15/98 show the area in drawdown condition, with aquatic vegetation near its peak growth and revealing a dewatered area adjacent to the left side of the dredge cut in the middle background. The photo taken on 9/25/98 shows the area in post-drawdown condition, with aquatic vegetation beginning to die back and normal water levels once again in evidence.

6. Kevin Landwehr of ED-H compiled a summary of the drawdown timeline and information on impacts reported to Corps staff, together with a graphic of water stage and discharge during June and July 1998. These are also attached to this memorandum.

Charlene Carmack

CHARLENE CARMACK
Environmental Analysis Branch

3 Attachments

Experimental Drawdown of Pool 13
Summer 1998

Drawdown Timeline:

- **April 30 - Open house meeting held in Clinton, IA**
- **May 18 – Signing of FONSI**
- **June 12 – Request for temporary deviation from regulation plan approved by MVD**
- **June 18 – Decision made to proceed with drawdown, navigation notice and press release issued**
- **June 21 – 1-Foot drawdown established**
- **July 3 – Dam taken out of operation due to high flows**
- **July 11 – Dam returned to operation, drawdown re-established**
- **July 17 – Decision made to discontinue drawdown due to declining flows**
- **July 21 – Normal Operation of Pool 13 resumes**

Reported Impacts:

- **Channel Conditions – Main channel depths of 10' and depths of 8' along the left descending bank were reported between UMR Miles 527.0 - 528.0. A navigation notice was issued warning vessels of the channel conditions (see *Navigation Notice 2* on attached page). This is in the location where depths were anticipated to be shallowest. The 10' measurements are approximately 4 inches less than the minimum depth predicted based upon the 1997 channel survey.**

- **Limited/Reduced Access At Boat Ramps – Boat Ramp at Bulger's Hollow initially closed then re-open two days later as "launch at own risk" due to complaints from commercial fishing boats. Limited access from LD 13 ramp, as a result no fees were charged for launching during drawdown. Ramps at Thomson and Mickelson's were unaffected.**

- **Fishing From Thomson Campground – Numerous complaints to Rangers at Thomson Ranger Station over inability to fish from the campground shoreline. Many of the fishermen are drawn from Rockford and Chicago and were caught unaware by the drawdown. Complaints were also received for several days following the drawdown due to the odor produced by the decaying vegetation in the dewatered areas.**

- **Impacts to Commercial Fishing – Commercial fisherman were prepared for initial drawdown, but were caught by surprise during the second drawdown period following the flood wave. Would like to have seen notification that we intended to re-establish the drawdown.**

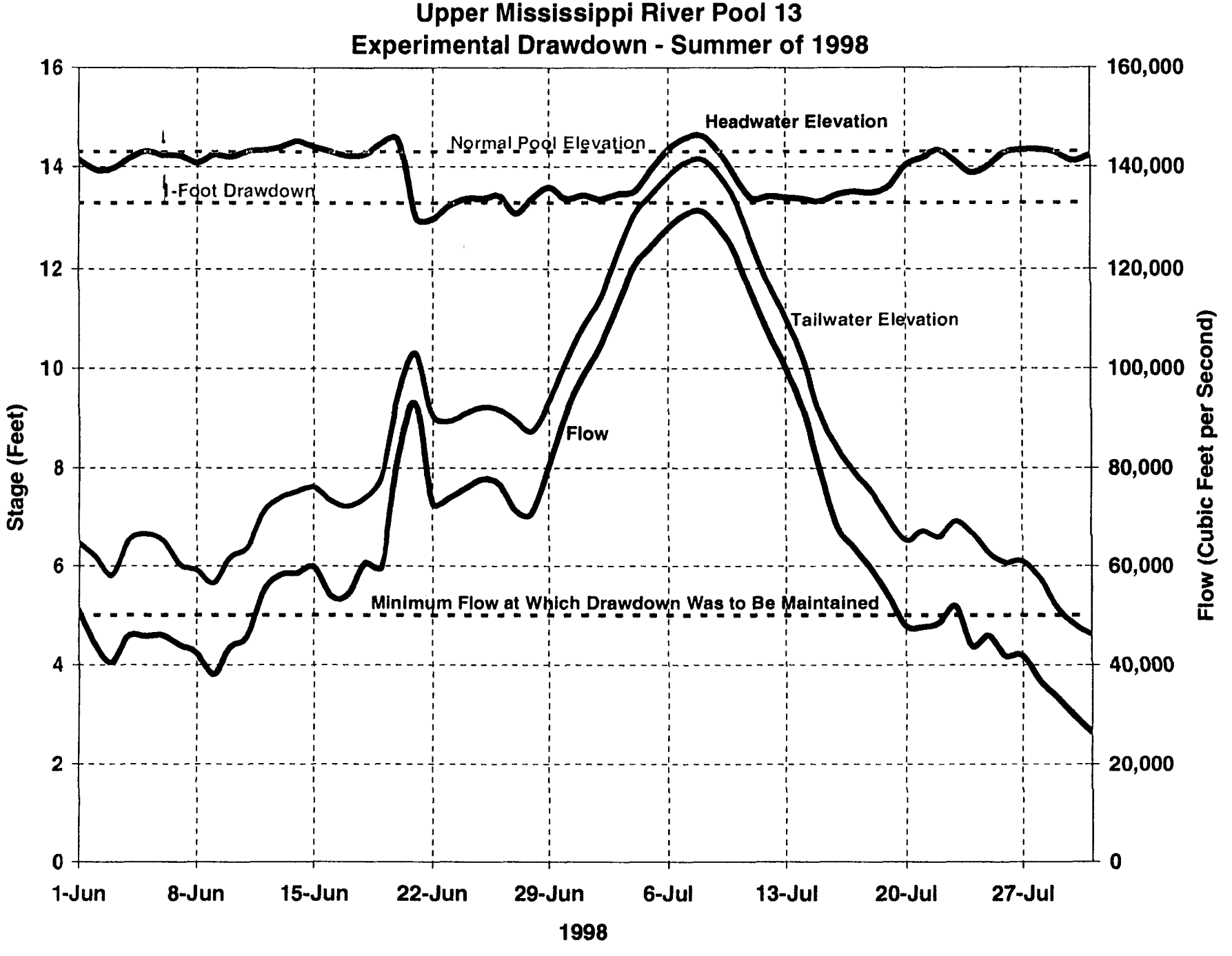
- **A fish kill was reported in a small slough adjacent to Thomson Causeway.**

- **Complaint received from a bait shop owner in Thomson over reduced revenue from previous seasons.**

- **Several local residents during phone conversations described the drawdown as an inconvenience to boat access in off channel areas and inquired as to when the drawdown would end.**

Miscellaneous:

- **For the season, visitation and revenue were reported to be up approximately 10% at the Thompson Recreation Area over the previous year.**


Upper Mississippi River Pool 13
Experimental Drawdown - Summer of 1998
Headwater Elevation
Normal Pool Elevation
1-Foot Drawdown
Tailwater Elevation
Flow
Minimum Flow at Which Drawdown Was to Be Maintained
Stage (Feet)
Flow (Cubic Feet per Second)
16
14
12
10
8
6
4
2
0
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1-Jun
8-Jun
15-Jun
22-Jun
29-Jun
6-Jul
13-Jul
20-Jul
27-Jul
1998

5/22 14.2 51000

6/22 13.0 73000

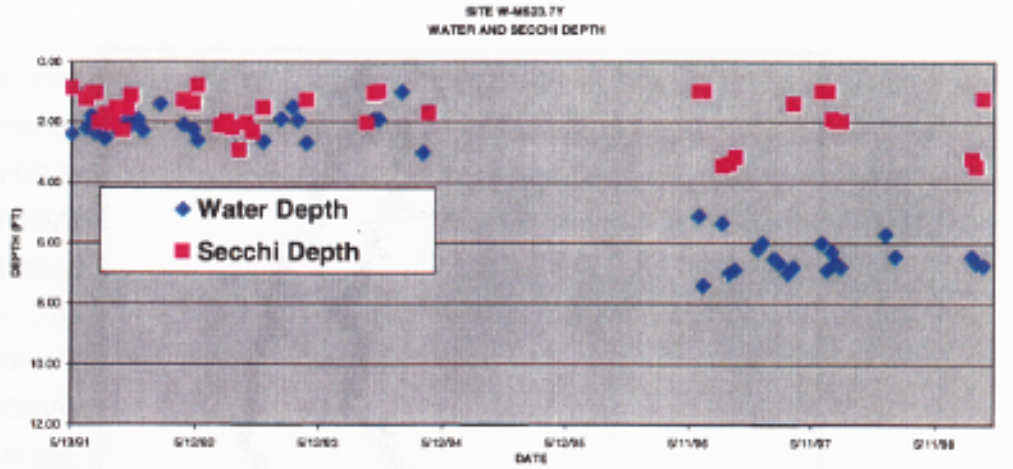
7/15 13.3 79000

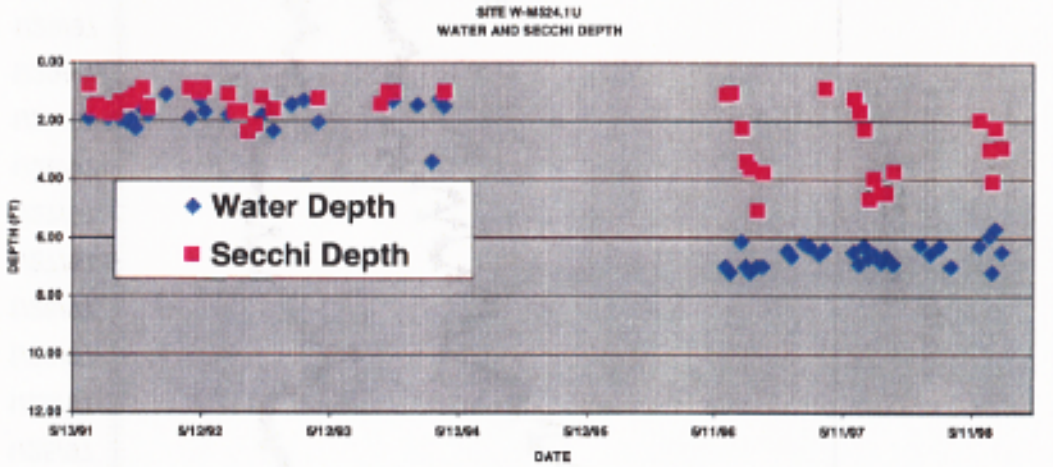
9/25 14.3 24000

APPENDIX D

WATER QUALITY DATA

WATER AND SECCHI DEPTH





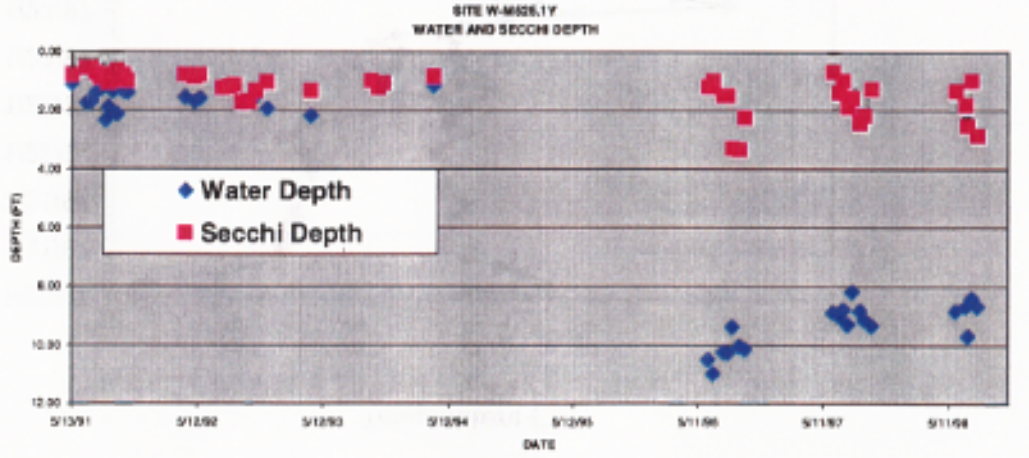


Table D-1. Water quality monitoring results from samples collected at site W-M523.7Y

STATION	DATE	WATER DEPTH (FT)	VELOCITY (FT/SEC)	WAVE HEIGHT (FT)	AIR TEMP. (°C)	CLOUD COVER (%)	WIND SPEED (MPH)
W-M523.7Y	5/13/91	2.40	0.153	0.4	22	100	13
W-M523.7Y	6/25/91	2.20	0.115	0.0	21	10	2
W-M523.7Y	7/10/91	1.80	0.056	0.1	24	20	5
W-M523.7Y	7/22/91	2.35	0.162	0.1	29	40	10
W-M523.7Y	8/5/91	2.00	0.297	0.1	21	95	5
W-M523.7Y	8/19/91	2.54	0.460	0.1	20	90	9
W-M523.7Y	8/28/91	1.75	**	0.0	28	40	3
W-M523.7Y	9/9/91	2.05	**	0.0	24	60	12
W-M523.7Y	9/23/91	2.25	0.137	0.0	16	20	11
W-M523.7Y	10/11/91	2.30	0.419	0.1	11	5	5
W-M523.7Y	10/23/91	1.95	0.111	0.1	19	35	12
W-M523.7Y	11/6/91	2.10	0.067	0.0	-7	100	10
W-M523.7Y	11/25/91	1.90	0.039	**	-11	5	5
W-M523.7Y	12/10/91	2.30	0.031	**	9	5	5
W-M523.7Y	1/30/92	1.40	0.000	**	2	100	3
W-M523.7Y	4/6/92	2.10	**	0.4	14	70	13
W-M523.7Y	5/4/92	2.25	0.070	0.1	12	60	5
W-M523.7Y	5/18/92	2.60	0.147	0.3	15	5	8
W-M523.7Y	7/24/92	2.15	0.000	0.0	24	100	0
W-M523.7Y	8/12/92	2.00	0.322	0.0	17	100	5
W-M523.7Y	8/28/92	2.20	0.229	0.0	16	1	8
W-M523.7Y	9/18/92	2.95	0.230	0.0	21	10	15
W-M523.7Y	10/9/92	2.05	0.296	0.1	8	100	10
W-M523.7Y	10/28/92	2.35	0.106	0.0	10	85	7
W-M523.7Y	11/30/92	2.65	0.000	0.0	1	100	10
W-M523.7Y	12/18/92	BOAT WOULD NOT START					
W-M523.7Y	1/19/93	1.90	0.000	**	-11	0	0
W-M523.7Y	2/23/93	1.50	**	**	-18	0	5
W-M523.7Y	3/9/93	1.95	0.101	**	2	95	0
W-M523.7Y	4/6/93	2.70	0.054	0.0	3	98	3
W-M523.7Y	9/29/93	2.05	0.254	0.0	5	30	3
W-M523.7Y	10/20/93	1.90	0.063	0.1	11	100	3
W-M523.7Y	11/3/93	1.90	0.168	0.2	4	40	12
W-M523.7Y	1/11/94	1.00	**	**	-4	20	3
W-M523.7Y	2/22/94	TOO SHALLOW TO GET SAMPLE					
W-M523.7Y	3/14/94	3.00	0.093	**	3	95	7
W-M523.7Y	3/29/94	1.70	0.000	0.1	0	15	3

MIN	1.00	0.000	0.00	-18.00	0.0	0.0
MAX	3.00	0.460	0.40	29.40	100.0	15.0
AVG	2.12	0.139	0.09	10.34	52.8	6.6

W-M523.7Y	6/11/96	5.10	0.038	0.0	21	100	2
W-M523.7Y	6/25/96	7.40	0.045	0.0	22	10	3
W-M523.7Y	8/20/96	5.35	0.000	0.0	20	100	0
W-M523.7Y	9/10/96	7.00	0.037	0.0	16	95	0
W-M523.7Y	9/26/96	6.90	0.167	0.0	12	100	1
W-M523.7Y	12/4/96	6.20	0.000	**	-12	85	0
W-M523.7Y	12/17/96	6.00	0.000	**	-8	80	9
W-M523.7Y	1/20/97	6.50	0.000	**	3	15	2
W-M523.7Y	2/4/97	6.65	0.000	**	0	100	3
W-M523.7Y	3/4/97	7.00	0.000	**	1	75	17
W-M523.7Y	3/19/97	6.80	0.000	0.0	1	15	2
W-M523.7Y	6/10/97	6.00	0.029	0.0	20	0	2
W-M523.7Y	6/26/97	6.90	0.041	0.0	23	10	3
W-M523.7Y	7/9/97	6.30	0.044	0.2	16	95	8
W-M523.7Y	7/23/97	6.65	0.000	0.1	20	100	1
W-M523.7Y	8/5/97	6.80	0.115	0.2	16	5	5
W-M523.7Y	8/26/97	6.45	0.000	0.0	19	95	0
W-M523.7Y	9/9/97	6.65	0.038	0.0	17	98	2
W-M523.7Y	9/30/97	6.75	0.165	0.1	13	15	4
W-M523.7Y	12/16/97	5.70	0.000	**	3	30	7
W-M523.7Y	1/14/98	6.45	0.000	**	-7	100	1

MIN	5.10	0.000	0.00	-12.0	0.0	0.0
MAX	7.40	0.167	0.20	23.0	100.0	17.0
AVG.	6.45	0.034	0.04	10.3	63.0	3.4

Table D-1 Con't.

DATE	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	TOTAL ALKALINITY (MG/L as CaCO3)
5/13/91	N	22.9	8.06	7.87	**
6/25/91	SE	26.9	10.04	8.14	159
7/10/91	NE	26.1	6.73	7.01	158
7/22/91	SW	28.4	5.46	7.87	164
8/5/91	E	21.4	1.52	7.26	179
8/19/91	N	22.4	4.90	7.65	156
8/28/91	SE	27.8	3.72	7.41	179
9/9/91	SW	22.8	5.07	7.42	191
9/23/91	NW	14.4	8.75	7.53	138
10/11/91	NW	13.5	8.50	7.96	155
10/23/91	S	14.7	9.91	8.41	172
11/6/91	NW	0.3	11.67	8.41	162
11/25/91	W	0.6	13.22	**	134
12/10/91	S	1.4	13.60	7.66	155
1/30/92	SW	0.3	9.86	7.20	162
4/6/92	SW	9.5	13.76	8.98	122
5/4/92	NW	15.8	8.44	8.57	118
5/18/92	NE	19.2	11.17	8.72	123
7/24/92	-	20.2	5.60	7.20	163
8/12/92	N	20.2	1.28	7.20	167
8/28/92	NW	16.1	1.31	7.05	174
9/18/92	N	21.7	2.34	**	165
10/9/92	S	11.5	6.33	7.87	149
10/28/92	SW	10.8	7.75	7.93	165
11/30/92	SW	0.9	11.80	8.25	177
12/18/92	BOAT WOULD NOT START				
1/19/93	**	0.0	15.51	8.08	160
2/23/93	W	0.0	30.20	9.69	104
3/9/93	**	0.3	24.10	9.79	95
4/6/93	NW	4.2	11.02	7.45	122
9/29/93	N	8.8	5.05	7.83	****
10/20/93	N	13.2	4.72	7.71	133
11/3/93	SE	3.1	9.18	9.34	136
1/11/94	NE	0.7	0.25	7.88	369
2/22/94	TOO SHALLOW TO GET SAMPLE				
3/14/94	S	0.3	11.73	7.87	149
3/29/94	SW	2.9	8.86	7.77	132

MIN	-	0.00	0.25	7.01	95.0
MAX	-	28.40	30.20	9.79	369.0
AVG	-	12.09	8.90	7.97	157.2

6/11/96	N	18.9	13.08	8.69	120
6/25/96	NE	23.9	8.09	8.53	150
8/20/96	**	23.2	3.04	**	144
9/10/96	**	22.8	2.79	7.54	157
9/26/96	E	15.4	4.92	6.93	147
12/4/96	-	1.7	14.54	7.58	119
12/17/96	W	1.8	14.16	**	116
1/20/97	W	0.6	11.09	**	169
2/4/97	N	0.9	14.15	7.56	143
3/4/97	W	2.1	12.18	7.14	79
3/19/97	W	2.3	14.10	8.10	133
6/10/97	SW	21.7	8.45	8.41	125
6/26/97	N	26.6	4.19	7.42	128
7/9/97	NE	23.3	6.89	8.76	118
7/23/97	N	23.7	2.26	7.60	120
8/5/97	NE	24.5	4.13	7.72	132
8/26/97	**	21.4	4.89	7.61	126
9/9/97	N	21.3	4.73	7.68	137
9/30/97	SW	15.4	6.86	7.91	144
12/16/97	SW	1.3	17.48	*	151
1/14/98	NE	0.9	*	*	155

MIN	-	0.6	2.26	6.93	79.0
MAX	-	26.6	17.48	8.76	169.0
AVG.	-	14.0	8.60	7.82	134.0

Table D-1 Con't.

DATE	SPECIFIC CONDUCTANCE (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (FT)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
5/13/91	326	0.90	32	56.0
6/25/91	386	1.25	13	**
7/10/91	440	1.05	14	**
7/22/91	456	1.05	14	**
8/5/91	416	2.00	7	**
8/19/91	383	1.84	10	**
8/28/91	417	1.75	5	**
9/9/91	410	2.05	7	**
9/23/91	390	1.55	8	**
10/11/91	372	2.30	10	**
10/23/91	389	1.55	10	**
11/6/91	317	1.15	20	**
11/25/91	275	**	9	**
12/10/91	329	**	8	11.0
1/30/92	320	**	2	<6.0
4/6/92	299	1.30	12	27.0
5/4/92	284	1.40	12	28.0
5/18/92	311	0.80	17	33.0
7/24/92	321	2.15	8	<3.8
8/12/92	325	2.00	4	7.0
8/28/92	312	2.20	2	4.1
9/18/92	337	2.95	5	10.1
10/9/92	337	2.05	3	<5.0
10/28/92	339	2.35	6	13.0
11/30/92	356	1.55	15	25.6
12/18/92	BOAT WOULD NOT START			
1/19/93	264	**	7	<2.0
2/23/93	199	**	9	13.6
3/9/93	168	**	6	<3.3
4/6/93	282	1.30	16	22.6
9/29/93	243	2.05	5	<4.0
10/20/93	266	1.05	14	<2.5
11/3/93	290	1.00	14	47.7
1/11/94	582	**	19	**
2/22/94	TOO SHALLOW TO GET SAMPLE			
3/14/94	297	**	8	2.0
3/29/94	264	1.70	8	18.0

MIN	168.0	0.80	2.0	<2.0
MAX	582.0	2.95	32.0	56.0
AVG	334.3	1.64	10.3	21.2

6/11/96	299	1.00	18	30.0
6/25/96	401	1.00	19	31.0
8/20/96	339	3.45	11	6.0
9/10/96	318	3.40	9	4.0
9/26/96	310	3.15	9	6.0
12/4/96	276	**	10	5.0
12/17/96	256	**	3	3.0
1/20/97	348	**	3	1.0
2/4/97	308	**	6	9.0
3/4/97	149	**	13	6.0
3/19/97	246	1.40	18	20.0
6/10/97	341	1.00	23	34.0
6/26/97	342	1.00	23	17.0
7/9/97	305	1.90	23	17.0
7/23/97	300	2.00	10	9.0
8/5/97	317	2.00	10	18.0
8/26/97	322	3.25	5	4.0
9/9/97	334	3.50	5	4.0
9/30/97	373	1.25	15	4.0
12/16/97	310	**	3	2.0
1/14/98	322	**	3	3.0

MIN	149.0	1.00	2.7	1.0
MAX	401.0	3.50	23.1	34.0
AVG.	310.3	2.09	11.3	11.1

Table D-1 Con't.

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
5/13/91	**	**	**	**
6/25/91	**	**	**	**
7/10/91	**	**	**	**
7/22/91	**	**	**	**
8/5/91	**	**	**	**
8/19/91	**	**	**	**
8/28/91	**	**	**	**
9/9/91	**	**	**	**
9/23/91	**	**	**	**
10/11/91	**	**	**	**
10/23/91	**	**	**	**
11/6/91	**	**	**	**
11/25/91	**	**	**	**
12/10/95	5.5	<1.0	<1.0	<1.0
1/30/92	9.7	12.0	14.0	18.0
4/6/92	64.0	<1.8	6.0	36.0
5/4/92	45.0	12.0	13.0	<1.1
5/18/92	86.0	14.0	12.0	<1.9
7/24/92	<5.4	<6.9	<8.1	<9.9
8/12/92	,5.3	<6.7	<8.0	<9.7
8/28/92	5.7	<2.1	<2.4	52.5
9/18/92	<1.0	<1.3	<1.5	<1.8
10/9/92	15.8	6.0	12.9	9.5
10/28/92	47.5	30.1	42.4	60.2
11/30/92	8.4	8.4	<1.5	10.2
12/18/92	BOAT WOULD NOT START			
1/19/93	<1.2	10.4	<2.5	<4.5
2/23/93	57.1	61.7	77.9	161.0
3/9/93	13.8	20.7	28.7	25.8
4/6/93	23.0	12.4	16.0	14.5
9/29/93	2.9	3.7	4.3	<2.7
10/20/93	3.3	<1.4	<1.6	<2.7
11/3/93	85.2	41.0	<1.6	108.0
1/11/94	**	**	**	**
2/22/94	TOO SHALLOW TO GET SAMPLE			
3/14/94	2.6	<1	<1	<1
3/29/94	45.0	<1	4.2	<1

MIN	<1	<1	<1	<1
MAX	86.00	61.70	77.90	161.00
AVG	25.40	12.20	12.40	24.00

6/11/96	110.0	<1	<1	<1
6/25/96	45.0	<1	<1	8.3
8/20/96	15.0	<1	<1	<1
9/10/96	14.0	<1	<1	<1
9/26/96	8.9	<1	1.9	<1
12/4/96	<1	<1	<1	<1
12/17/96	2.3	<1	<1	<1
1/20/97	2.2	<1	<1	<1
2/4/97	<1	<1	<1	<1
3/4/97	4.5	<1	<1	<1
3/19/97	32.0	<1	1.4	6.5
6/10/97	63.0	<1	7.0	30.0
6/26/97	25.0	<1	<1	4.2
7/9/97	26.0	<1	<1	<1
7/23/97	7.1	<1	<1	5.9
8/5/97	12.0	<1	1.7	<1
8/26/97	5.0	<1	<1	4.0
9/9/97	9.0	4.0	2.0	<1
9/30/97	16.0	1.9	2.0	5.3
12/16/97	3.9	<1	<1	<1
1/14/98	8.4	<1	<1	1.2

MIN	2.2	1.9	1.4	1.2
MAX	110.0	4.0	7.0	30.0
AVG.	21.5	3.0	2.7	8.2

Table D-2. Water quality monitoring results from samples collected at site W-M524.1U

STATION	DATE	WATER DEPTH (FT)	VELOCITY (FT/SEC)	WAVE HEIGHT (FT)	AIR TEMP. (°C)	CLOUD COVER (%)	WIND SPEED (MPH)
W-M524.1U	6/25/91	1.90	0.087	0.0	21.1	10	5
W-M524.1U	7/10/91	1.70	0.610	0.0	24.4	20	3
W-M524.1U	7/22/91	1.70	0.043	0.0	29.4	40	15
W-M524.1U	8/5/91	1.70	0.081	0.0	21.1	95	2
W-M524.1U	8/19/91	1.90	0.225	0.1	20.0	100	9
W-M524.1U	8/28/91	1.76	**	0.1	28.0	70	4
W-M524.1U	9/9/91	1.70	**	0.0	24.4	50	5
W-M524.1U	9/23/91	1.95	0.137	0.0	17.0	20	11
W-M524.1U	10/11/91	2.05	0.109	0.1	11.0	5	15
W-M524.1U	10/23/91	1.95	0.331	0.1	19.0	35	12
W-M524.1U	11/6/91	2.25	0.073	0.0	-7.0	100	10
W-M524.1U	11/25/91	1.60	0.043	0.0	-10.0	5	5
W-M524.1U	12/10/91	1.80	0.148	0.1	9.0	5	15
W-M524.1U	1/30/92	1.10	0.000	**	2.0	100	3
W-M524.1U	4/6/92	1.90	**	0.3	14.0	70	15
W-M524.1U	5/4/92	1.25	0.071	0.1	12.0	70	5
W-M524.1U	5/18/92	1.70	0.112	0.3	15.0	5	8
W-M524.1U	7/24/92	1.80	0.064	0.0	24.0	100	3
W-M524.1U	8/12/92	1.70	0.090	0.0	18.0	100	0
W-M524.1U	8/28/92	1.70	0.083	0.0	16.0	2	3
W-M524.1U	9/18/92	2.40	0.062	0.0	21.0	15	15
W-M524.1U	10/9/92	2.15	0.109	0.1	8.0	100	12
W-M524.1U	10/28/92	1.80	0.152	0.0	10.0	80	5
W-M524.1U	11/30/92	2.35	0.000	0.0	1.0	100	10
W-M524.1U	12/18/92	BOAT WOULD NOT START					
W-M524.1U	1/19/93	1.45	0.000	**	-11.0	0	0
W-M524.1U	2/23/93	1.30	**	**	-18.0	0	5
W-M524.1U	3/9/93	****	0.000	**	2.0	95	0
W-M524.1U	4/6/93	2.05	0.040	0.0	3.0	95	5
W-M524.1U	9/29/93	1.45	0.000	0.0	5.0	35	5
W-M524.1U	10/20/93	1.00	0.000	0.0	11.0	100	3
W-M524.1U	11/3/93	1.30	0.000	0.1	4.0	30	13
W-M524.1U	1/11/94	1.45	0.028	**	-4.0	20	3
W-M524.1U	2/22/94	3.40	0.000	**	-3.0	100	13
W-M524.1U	3/14/94	1.25	**	**	3.0	100	12
W-M524.1U	3/29/94	1.50	0.031	0.1	0.0	20	5

MIN	1.00	0.00	0.00	-18.0	0.0	0.0
MAX	3.40	0.61	0.30	29.4	100.0	15.0
AVG	1.76	0.09	0.05	9.7	54.1	7.3

W-M524.1U	6/11/96	7.00	0.025	0.1	21.0	98	4
W-M524.1U	6/25/96	7.20	0.070	0.1	22.0	10	4
W-M524.1U	7/26/96	6.15	0.110	0.0	24.0	0	0
W-M524.1U	8/8/96	7.00	0.000	0.0	27.0	0	2
W-M524.1U	8/20/96	7.20	0.000	0.0	21.0	90	0
W-M524.1U	9/10/96	7.00	0.000	0.0	17.0	75	0
W-M524.1U	9/26/96	7.00	0.123	0.1	12.0	100	2
W-M524.1U	12/4/96	6.45	0.000	**	-12.0	85	2
W-M524.1U	12/17/96	6.65	0.000	**	-8.0	90	4
W-M524.1U	1/20/97	6.20	0.000	**	3.0	75	1
W-M524.1U	2/4/97	6.30	0.000	**	0.0	100	3
W-M524.1U	3/4/97	6.55	0.000	**	1.0	65	9
W-M524.1U	3/19/97	6.40	0.000	0.0	1.0	15	3
W-M524.1U	6/10/97	6.50	0.051	0.0	21.0	0	3
W-M524.1U	6/26/97	6.90	0.062	0.0	24.0	15	2
W-M524.1U	7/9/97	6.30	0.081	0.2	16.0	95	5
W-M524.1U	7/23/97	6.70	0.000	0.0	21.0	100	3
W-M524.1U	8/5/97	6.55	0.109	0.2	16.0	2	8
W-M524.1U	8/26/97	6.85	0.000	0.1	19.0	95	4
W-M524.1U	9/9/97	6.65	0.034	0.0	**	100	2
W-M524.1U	9/30/97	6.90	0.081	0.1	**	15	4
W-M524.1U	12/16/97	6.25	0.000	**	3	40	6
W-M524.1U	1/14/98	6.55	0.000	**	-7	100	3
W-M524.1U	2/10/98	6.30	0.000	**	2	100	2
W-M524.1U	3/13/98	7.00	0.000	**	1	95	15
W-M524.1U	6/1/98	6.30	0.075	0.1	16	15	4
W-M524.1U	6/30/98	5.95	0.084	0.1	21	2	3
W-M524.1U	7/7/98	7.20	0.054	0.1	27	80	6
W-M524.1U	7/17/98	5.70	0.000	0.0	23	55	3
W-M524.1U	8/4/98	6.50	0.000	0.1	21	90	7

MIN	5.70	0.000	0.00	-12.0	0.0	0.0
MAX	7.20	0.123	0.20	27.0	100.0	15.0
AVG.	6.61	0.032	0.06	12.6	60.1	3.8

Table D-2 Con't.

DATE	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	TOTAL ALKALINITY (MG/L as CaCO3)
6/25/91	SE	25.9	9.82	7.96	163
7/10/91	NE	26.9	5.02	7.05	175
7/22/91	SW	27.9	2.53	7.50	182
8/5/91	E	22.2	3.16	7.42	189
8/19/91	N	21.0	4.86	7.49	192
8/28/91	SE	26.8	3.55	7.30	197
9/9/91	SW	22.0	3.13	7.29	194
9/23/91	NW	14.2	4.88	7.51	150
10/11/91	NW	13.5	8.28	7.84	161
10/23/91	S	13.9	9.38	8.35	162
11/6/91	NW	0.3	12.40	8.36	166
11/25/91	W	0.2	13.19	**	147
12/10/91	S	1.7	12.79	7.50	144
1/30/92	SW	1.0	11.59	7.30	199
4/6/92	SW	10.8	12.71	8.87	107
5/4/92	NW	17.0	11.05	9.29	119
5/18/92	NE	19.8	8.43	7.89	146
7/24/92	SW	20.9	2.17	7.14	167
8/12/92	-	20.7	1.49	7.19	177
8/28/92	NW	17.3	2.75	7.12	178
9/18/92	N	21.7	4.69	**	155
10/9/92	S	10.4	6.53	7.95	149
10/28/92	SW	10.3	10.57	9.00	145
11/30/92	SW	1.3	11.40	8.10	177
12/18/92	BOAT WOULD NOT START				
1/19/93	-	0.2	22.50	8.67	201
2/23/93	W	0.1	18.78	7.61	139
3/9/93	-	1.0	10.42	8.03	94
4/6/93	NW	6.1	15.58	9.09	112
9/29/93	NW	10.0	9.62	9.43	**
10/20/93	N	12.9	7.52	9.14	132
11/3/93	SE	3.1	12.79	9.35	135
1/11/94	NE	0.2	0.25	7.51	213
2/22/94	NE	0.3	8.98	7.71	147
3/14/94	S	0.8	4.78	7.46	144
3/29/94	SW	3.2	13.24	9.26	137

MIN	-	0.10	0.25	7.05	94.0
MAX	-	27.90	22.50	9.43	213.0
AVG	-	11.59	8.60	8.02	158.7

6/11/96	N	19.2	8.87	8.17	124
6/25/96	NE	25.1	10.59	8.68	130
7/26/96	**	**	**	**	147
8/8/96	NW	**	**	**	144
8/20/96	**	23.2	3.87	**	142
9/10/96	**	22.6	2.28	7.55	161
9/26/96	NE	15.0	6.08	7.60	155
12/4/96	E	2.0	13.78	**	119
12/17/96	W	2.6	14.27	**	110
1/20/97	SW	1.1	11.10	**	173
2/4/97	N	1.0	19.03	8.11	143
3/4/97	W	2.3	13.20	7.09	67
3/19/97	W	2.0	13.05	**	137
6/10/97	NW	21.9	7.13	7.95	136
6/26/97	NW	26.5	4.74	7.48	128
7/9/97	NE	22.6	6.57	8.09	137
7/23/97	N	23.3	1.16	7.34	143
8/5/97	NE	24.0	3.73	7.39	142
8/26/97	SE	21.2	5.18	7.55	140
9/9/97	N	21.0	3.36	7.49	147
9/30/97	W	16.6	7.52	7.94	143
12/16/97	SW	2.7	17.40	*	163
1/14/98	SE	2.5	*	*	153
2/10/98	SE	1.4	27.50	*	135
3/13/98	SW	2.9	20.51	*	132
6/1/98	S	22.5	6.36	8.21	122
6/30/98	NW	25.5	1.79	7.24	152
7/7/98	NE	26.2	3.42	7.13	150
7/17/98	NW	26.3	4.70	7.46	165
8/4/98	SE	23.9	3.79	7.27	155

MIN	-	1.0	1.16	7.09	67.0
MAX	-	26.5	27.50	8.68	173.0
AVG.	-	15.3	8.93	7.75	139.8

Table D-2 Con't.

DATE	SPECIFIC CONDUCTANCE (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (FT)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
6/25/91	378	0.80	23	**
7/10/91	434	1.55	13	**
7/22/91	463	1.50	6	**
8/5/91	456	1.70	16	**
8/19/91	420	1.60	21	**
8/28/91	435	1.76	8	**
9/9/91	447	1.70	6	**
9/23/91	410	1.35	12	**
10/11/91	377	1.35	5	**
10/23/91	395	1.30	8	**
11/6/91	336	1.15	14	**
11/25/91	282	0.90	24	**
12/10/91	313	1.55	5	<6.0
1/30/92	384	**	8	21.0
4/6/92	291	0.90	21	43.0
5/4/92	290	1.00	14	40.0
5/18/92	360	0.90	18	34.0
7/24/92	364	1.10	22	17.0
8/12/92	362	1.70	10	7.6
8/28/92	365	1.70	9	16.9
9/18/92	407	2.40	5	8.4
10/9/92	341	2.15	7	10.7
10/28/92	303	1.20	18	45.5
11/30/92	360	1.60	11	13.4
12/18/92	BOAT WOULD NOT START			
1/19/93	390	**	11	12.0
2/23/93	255	**	8	12.7
3/9/93	201	**	18	8.3
4/6/93	242	1.25	14	27.1
9/29/93	252	1.45	14	8.7
10/20/93	292	1.00	7	<2.5
11/3/93	280	1.00	18	34.0
1/11/94	300	**	8	**
2/22/94	251	**	29	42.5
3/14/94	289	**	3	<1
3/29/94	273	1.00	21	94.0

MIN	201	0.80	3.0	<1
MAX	463	2.40	29.0	94.0
AVG	343	1.38	13.0	23.0

6/11/96	323	1.10	17	323.0
6/25/96	347	1.05	18	29.0
7/26/96	**	2.25	10	**
8/8/96	**	3.40	9	11.0
8/20/96	375	3.65	10	4.0
9/10/96	340	5.10	7	<1
9/26/96	345	3.80	7	4.0
12/4/96	274	**	12	2.0
12/17/96	357	**	5	4.0
1/20/97	361	**	4	1.0
2/4/97	300	**	12	14.0
3/4/97	139	**	13	15.0
3/19/97	254	0.90	33	34.0
6/10/97	392	1.25	18	20.0
6/26/97	361	1.70	13	8.0
7/9/97	355	2.30	10	12.0
7/23/97	354	4.70	4	1.0
8/5/97	361	4.00	5	8.0
8/26/97	343	4.50	3	2.0
9/9/97	354	4.50	4	2.0
9/30/97	360	3.75	3	4.0
12/16/97	332	**	4	4.0
1/14/98	328	**	6	4.0
2/10/98	282	**	9	6.0
3/13/98	291	**	18	21.0
6/1/98	386	2.00	9	6.0
6/30/98	375	3.00	7	6.0
7/7/98	381	4.10	4	3.0
7/17/98	391	2.25	8	
8/4/98	371	2.95	3	

MIN	139	0.90	3.0	1.0
MAX	392	5.10	33.4	323.0
AVG.	337	2.96	9.5	24.9

Table D-2 Con't.

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
6/25/91	**	**	**	**
7/10/91	**	**	**	**
7/22/91	**	**	**	**
8/5/91	**	**	**	**
8/19/91	**	**	**	**
8/28/91	**	**	**	**
9/9/91	**	**	**	**
9/23/91	**	**	**	**
10/11/91	**	**	**	**
10/23/91	**	**	**	**
11/6/91	**	**	**	**
11/25/91	**	**	**	**
12/10/91	7.0	2.8	9.7	<1.0
1/30/92	20.0	5.6	23.0	<1.0
4/6/92	73.0	<1.9	5.6	61.0
5/4/92	62.0	22.0	27.0	20.0
5/18/92	54.0	10.0	13.0	24.0
7/24/92	16.0	<6.8	17.0	<9.8
8/12/92	11.5	<6.6	<7.8	<9.5
8/28/92	6.8	<2.1	<2.4	67.4
9/18/92	4.9	1.1	56.1	9.2
10/9/92	21.0	15.7	29.1	59.5
10/28/92	132.0	30.4	40.4	184.0
11/30/92	9.5	9.9	12.2	<1.9
12/18/92	BOAT WOULD NOT START			
1/19/93	22.0	4.8	38.1	14.7
2/23/93	39.5	50.4	99.8	17.1
3/9/93	14.4	21.2	31.6	14.7
4/6/93	58.5	15.2	16.6	27.0
9/29/93	12.3	6.2	6.9	<2.7
10/20/93	4.2	<1.4	<1.6	<2.7
11/3/93	103.0	13.9	14.4	<2.7
1/11/94	**	**	**	**
2/22/94	4.7	5.5	11.5	<2.7
3/14/94	<1	<1	<1	<1
3/29/94	170.0	2.2	18.0	<1

MIN	<1	1.1	5.6	9.2
MAX	170.0	50.4	99.8	184.0
AVG	38.5	11.6	21.9	24.3

6/11/96	67.0	<1	<1	14.0
6/25/96	75.0	<1	3.3	13.0
7/26/96	**	**	**	**
8/8/96	32.0	14.0	15.0	<1
8/20/96	28.0	<1	2.5	<1
9/10/96	9.9	<1	<1	<1
9/26/96	12.0	<1	<1	<1
12/4/96	4.2	<1	<1	<1
12/17/96	3.8	1.8	2.3	<1
1/20/97	8.4	<1	<1	<1
2/4/97	4.7	<1	<1	<1
3/4/97	15.0	<1	<1	<1
3/19/97	42.0	<1	3.5	12.0
6/10/97	66.0	<1	8.7	13.0
6/26/97	32.0	<1	<1	2.4
7/9/97	19.0	<1	<1	3.6
7/23/97	6.1	<1	<1	1.1
8/5/97	19.0	<1	<1	1.0
8/26/97	6.0	<1	<1	<1
9/9/97	5.0	<1	<1	<1
9/30/97	4.8	<1	<1	<1
12/16/97	6.6	<1	<1	1.4
1/14/98	14.0	<1	1.4	8.6
2/10/98	4.3	<1	<1	<1
3/13/98	54.0	<1	5.0	11.0
6/1/98	15.0	<1	<1	2.1
6/30/98	13.0	3.3	3.3	5.3
7/7/98	5.8	<1	<1	1.8
7/17/98		<1	<1	<1
8/4/98		<1	<1	<1

MIN	3.8	<1	<1	<1
MAX	75.0	14.0	15.0	14.0
AVG.	21.2	1.8	2.5	3.6

Table D-3. Water quality monitoring results from samples collected at site W-M525.1Y

STATION	DATE	WATER DEPTH (FT)	VELOCITY (FT/SEC)	WAVE HEIGHT (FT)	AIR TEMP. (°C)	CLOUD COVER (%)	WIND SPEED (MPH)
W-M525.1Y	5/13/91	1.10	0.053	0.1	22.1	70	3
W-M525.1Y	6/25/91	1.75	0.099	0.0	21.1	10	5
W-M525.1Y	7/10/91	1.70	0.110	0.0	23.9	20	0
W-M525.1Y	7/22/91	1.40	0.071	0.0	28.9	40	5
W-M525.1Y	8/5/91	1.30	0.175	0.0	21.1	98	5
W-M525.1Y	8/19/91	2.35	0.216	0.2	20.0	75	11
W-M525.1Y	8/28/91	1.90	**	0.0	27.0	20	1
W-M525.1Y	9/9/91	1.35	**	0.0	23.9	60	3
W-M525.1Y	9/23/91	2.15	0.049	0.0	16.0	20	5
W-M525.1Y	10/11/91	1.35	0.075	0.1	10.0	5	15
W-M525.1Y	10/23/91	1.40	0.085	0.0	18.0	35	10
W-M525.1Y	11/6/91	2.30	0.052	0.0	-7.0	100	20
W-M525.1Y	11/25/91	1.90	0.058	**	-11.0	5	3
W-M525.1Y	12/10/91	1.50	0.000	**	8.0	5	5
W-M525.1Y	1/30/92	0.70	0.000	**	2.0	100	3
W-M525.1Y	4/6/92	1.55	0.000	0.2	13.0	60	13
W-M525.1Y	5/4/92	1.70	0.085	0.0	12.0	20	2
W-M525.1Y	5/18/92	1.60	0.099	0.1	14.0	0	5
W-M525.1Y	7/24/92	1.25	0.000	0.0	24.0	95	2
W-M525.1Y	8/12/92	1.20	0.035	0.0	17.0	100	7
W-M525.1Y	8/28/92	1.15	0.000	0.0	16.0	0	6
W-M525.1Y	9/18/92	1.75	0.071	0.0	20.0	20	20
W-M525.1Y	10/9/92	1.70	0.112	0.0	8.0	95	5
W-M525.1Y	10/28/92	1.55	0.071	0.0	10.0	60	0
W-M525.1Y	11/30/92	1.95	0.000	0.0	1.0	100	5
W-M525.1Y	12/18/92	1.40	**	**	-2.0	100	12
W-M525.1Y	1/11/93	0.60	0.000	**	-7.0	100	7
W-M525.1Y	2/23/93	0.75	**	**	-18.0	10	5
W-M525.1Y	3/9/93	1.30	0.000	**	2.0	95	0
W-M525.1Y	4/6/93	2.20	0.093	0.0	3.0	98	3
W-M525.1Y	9/29/93	1.00	0.000	0.0	4.0	5	10
W-M525.1Y	10/20/93	1.25	0.000	0.0	11.0	100	0
W-M525.1Y	11/3/93	1.10	0.000	0.0	4.0	45	7
W-M525.1Y	1/11/94	0.90	**	**	-3.0	25	8
W-M525.1Y	2/22/94	**	**	**	**	**	**
W-M525.1Y	3/14/94	1.95	0.000	**	3.0	100	5
W-M525.1Y	3/29/94	1.15	0.000	0.1	0.0	25	3

MIN	0.60	0.000	0.00	-18.0	0	0
MAX	2.35	0.216	0.20	28.9	100	20
AVG	1.48	0.052	0.03	9.9	53	6

W-M525.1Y	6/11/96	10.50	0.117	0.1	21.0	100	3
W-M525.1Y	6/25/96	11.00	0.000	0.1	22.0	10	1
W-M525.1Y	7/26/96	10.75	0.000	0.0	26.0	0	0
W-M525.1Y	8/8/96	10.30	0.000	0.0	27.0	0	2
W-M525.1Y	8/20/96	9.40	0.045	0.0	20.0	100	5
W-M525.1Y	9/10/96	10.05	0.034	0.0	16.0	100	0
W-M525.1Y	9/26/96	10.15	0.000	0.1	12.0	100	6
W-M525.1Y	12/4/96	10.20	0.000	**	-12.0	90	0
W-M525.1Y	12/17/96	10.30	0.000	**	-8.0	65	3
W-M525.1Y	1/20/97	9.35	0.000	**	3.0	15	5
W-M525.1Y	2/4/97	9.22	0.000	**	0.0	100	2
W-M525.1Y	3/4/97	9.80	0.000	**	2.0	95	3
W-M525.1Y	3/19/97	8.40	0.000	**	1.0	20	1
W-M524.1U	6/10/97	8.90	0.022	0.0	19.0	0	3
W-M525.1Y	6/26/97	9.00	0.115	0.1	22.0	10	5
W-M525.1Y	7/9/97	8.80	0.025	0.1	16.0	95	5
W-M525.1Y	7/23/97	9.30	0.104	0.1	20.0	100	5
W-M525.1Y	8/5/97	8.20	0.000	0.1	15.0	0	4
W-M525.1Y	8/26/97	8.85	0.000	0.0	18.0	100	1
W-M525.1Y	9/9/97	9.15	0.000	0.0	17.0	98	1
W-M525.1Y	9/30/97	9.35	***	0.3	13.0	5	5
W-M525.1Y	12/16/97	8.85	0.000	**	3.0	20	1
W-M525.1Y	1/14/98	8.70	0.000	**	-7.0	100	4
W-M525.1Y	2/10/98	8.80	0.000	**	1.0	100	2
W-M525.1Y	3/13/98	9.20	0.000	**	1.0	90	3
W-M525.1Y	6/1/98	8.85	0.039	0.1	16.0	5	2
W-M525.1Y	6/30/98	8.70	0.077	0.2	22.0	5	8
W-M525.1Y	7/7/98	9.70	0.000	0.0	27.0	70	2
W-M525.1Y	7/17/98	8.40	0.000	0.1	23.0	55	5
W-M525.1Y	8/4/98	8.70	0.000	0.0	20.0	100	1

MIN	8.20	0.00	0.00	-12.00	0.00	0.00
MAX	11.00	0.12	0.30	27.00	100.00	8.00
AVG.	9.36	0.02	0.07	12.53	58.27	2.93

Table D-3 Con't.

DATE	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	TOTAL ALKALINITY (MG/L as CaCO3)
5/13/91	N	23.9	5.12	7.78	**
6/25/91	SE	24.9	4.24	7.60	141
7/10/91	**	26.9	6.20	7.39	154
7/22/91	SW	28.2	2.05	7.38	176
8/5/91	SE	22.2	1.92	7.42	178
8/19/91	N	21.0	7.92	8.35	160
8/28/91	SE	35.2	11.50	8.48	173
9/9/91	SW	23.0	5.28	7.67	173
9/23/91	NW	14.4	7.62	7.95	142
10/11/91	NW	13.2	9.06	8.06	157
10/23/91	S	13.8	9.43	8.37	165
11/6/91	NW	2.1	12.15	8.21	167
11/25/91	W	0.6	12.12	**	143
12/10/91	S	2.3	10.65	7.20	121
1/30/92	NW	0.7	9.55	7.22	142
4/6/92	SW	8.8	12.89	8.81	137
5/4/92	NW	14.9	12.13	8.60	124
5/18/92	NE	19.8	10.25	8.74	152
7/24/92	NE	20.6	3.95	7.43	132
8/12/92	N	20.2	0.85	7.19	193
8/28/92	NW	22.4	1.44	7.28	151
9/18/92	N	20.2	1.64	**	155
10/9/92	S	11.3	5.11	7.63	152
10/28/92	**	10.5	11.17	8.87	144
11/30/92	NW	1.8	10.50	7.67	164
12/18/92	SW	1.0	10.63	7.89	**
1/11/93	NE	0.3	5.50	7.04	127
2/23/93	W	0.5	**	8.96	137
3/9/93	**	0.7	9.60	7.90	101
4/6/93	NW	5.6	12.32	7.32	133
9/29/93	N	9.6	5.25	7.60	**
10/20/93	**	12.6	5.60	8.01	152
11/3/93	SE	3.8	16.07	9.42	155
1/11/94	NE	**	**	**	**
2/22/94	**	**	**	**	**
3/14/94	S	1.8	9.24	7.78	142
3/29/94	NW	2.9	15.73	9.21	160
MIN	-	0.3	0.9	7.04	101.0
MAX	-	35.2	16.1	9.42	193.0
AVG	-	12.62	8.1	7.95	150.1
6/11/96	NW	18.8	9.55	8.78	147
6/25/96	SE	24.1	5.96	8.08	147
7/26/96	**	**	**	**	169
8/8/96	NW	**	**	**	157
8/20/96	NW	23.2	3.79	**	143
9/10/96	**	23.5	1.70	7.33	197
9/26/96	SE	15.2	3.92	**	158
12/4/96	**	0.6	14.14	**	120
12/17/96	NW	0.6	14.18	**	140
1/20/97	SE	0.8	11.07	**	156
2/4/97	N	0.8	14.72	7.28	135
3/4/97	W	1.2	10.88	7.14	78
3/19/97	W	2.3	17.00	**	131
6/10/97	SE	20.9	4.44	7.64	135
6/26/97	NW	26.7	3.74	7.25	144
7/9/97	NE	24.0	5.54	7.82	146
7/23/97	NW	24.2	1.60	7.42	147
8/5/97	N	25.4	3.39	7.49	162
8/26/97	SE	21.6	2.96	7.47	165
9/9/97	N	21.8	3.15	7.48	156
9/30/97	NW	16.9	4.56	7.41	162
12/16/97	SE	1.7	19.00	7.71	148
1/14/98	SE	1.4	*	*	166
2/10/98	SE	0.3	23.46	8.88	125
3/13/98	S	1.9	17.22	*	92
6/1/98	SE	21.5	5.11	7.62	135
6/30/98	NW	26.3	3.98	7.43	159
7/7/98	NE	26.3	5.16	7.38	147
7/17/98	NW	27.4	3.93	7.56	149
8/4/98	NW	24.4	3.01	7.29	164
MIN	-	0.3	1.6	7.1	78.0
MAX	-	27.4	23.5	8.9	197.0
AVG.	-	15.1	8.0	7.6	146.0

Table D-3 Con't.

DATE	SPECIFIC CONDUCTANCE (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (FT)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
5/13/91	364	0.80	46	122.0
6/25/91	385	0.60	39	**
7/10/91	418	0.60	29	**
7/22/91	468	0.75	19	**
8/5/91	428	0.90	19	**
8/19/91	409	0.80	15	**
8/28/91	371	1.07	13	**
9/9/91	433	1.00	17	**
9/23/91	324	0.65	30	**
10/11/91	376	0.80	19	**
10/23/91	387	1.00	20	**
11/6/91	344	**	17	**
11/25/91	290	**	26	**
12/10/91	319	**	3	<10
1/30/92	324	**	4	<4.8
4/6/92	353	0.80	25	62.0
5/4/92	291	0.90	20	39.0
5/18/92	385	0.80	25	42.0
7/24/92	336	1.25	11	64.1
8/12/92	332	1.20	8	11.9
8/28/92	317	1.15	9	33.8
9/18/92	358	1.75	7	108.0
10/9/92	337	1.70	5	8.9
10/28/92	328	1.35	12	32.6
11/30/92	352	1.05	22	31.3
12/18/92	307	**	**	**
1/11/93	262	**	16	17.7
2/23/93	290	**	10	10.4
3/9/93	279	**	10	13.8
4/6/93	283	1.35	14	20.8
9/29/93	321	1.00	8	33.3
10/20/93	350	1.25	7	<4.0
11/3/93	302	1.10	18	4.0
1/11/94	**	**	**	**
2/22/94	**	**	**	**
3/14/94	280	**	8	1.0
3/29/94	322	0.85	26	78.0

MIN	262.0	0.60	3.0	1.0
MAX	468.0	1.75	46.0	108.0
AVG	343.6	1.02	17.0	38.7

6/11/96	378	1.20	19	29.0
6/25/96	418	1.00	18	26.0
7/26/96	**	1.50	17	**
8/8/96	**	1.50	15	14.0
8/20/96	375	3.30	11	6.0
9/10/96	360	3.35	10	7.0
9/26/96	372	2.25	12	17.0
12/4/96	263	**	5	<1
12/17/96	282	**	8	6.0
1/20/97	336	**	3	<1
2/4/97	296	**	7	9.0
3/4/97	182	**	19	9.0
3/19/97	256	**	10	7.0
6/10/97	399	0.70	42	45.0
6/26/97	387	1.40	18	13.0
7/9/97	384	1.00	30	48.0
7/23/97	404	1.90	11	9.0
8/5/97	408	1.60	13	12.0
8/26/97	422	2.45	7	6.0
9/9/97	407	2.20	11	8.0
9/30/97	402	1.30	17	19.0
12/16/97	309	**	3	2.0
1/14/98	349	**	6	5.0
2/10/98	263	**	4	2.0
3/13/98	285	**	17	18.0
6/1/98	429	1.35	19	17.0
6/30/98	397	1.85	16	14.0
7/7/98	385	2.55	8	8.0
7/17/98	380	1.00	26	
8/4/98	411	2.90	5	

MIN	182.0	0.70	3.0	2.0
MAX	429.0	3.35	42.0	48.0
AVG.	355.0	1.82	13.6	14.2

Table D-3 Con't.

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
5/13/91	**	**	**	**
6/25/91	**	**	**	**
7/10/91	**	**	**	**
7/22/91	**	**	**	**
8/5/91	**	**	**	**
8/19/91	**	**	**	**
8/28/91	**	**	**	**
9/9/91	**	**	**	**
9/23/91	**	**	**	**
10/11/91	**	**	**	**
10/23/91	**	**	**	**
11/6/91	**	**	**	**
11/25/91	**	**	**	**
12/10/91	3.1	2.0	2.8	<1.0
1/30/92	15.0	18.0	22.0	27.0
4/6/92	65.0	<2.1	7.7	45.0
5/4/92	98.0	13.0	29.0	17.0
5/18/92	64.0	15.0	7.4	<1.9
7/24/92	65.0	14.0	19.0	63.0
8/12/92	<5.3	<6.7	<7.9	<9.6
8/28/92	46.9	22.9	9.8	230.0
9/18/92	<1.0	<1.3	<1.5	<1.8
10/9/92	15.2	20.5	10.5	140.0
10/28/92	160.0	<1.3	19.8	116.0
11/30/92	10.3	<1.3	19.0	12.3
12/18/92	**	**	**	**
1/11/93	**	**	**	**
2/23/93	18.8	41.6	71.9	75.0
3/9/93	11.8	14.7	19.8	9.5
4/6/93	42.7	31.8	42.6	25.3
9/29/93	32.8	13.9	3.3	<2.7
10/20/93	32.9	2.1	<1.6	36.0
11/3/93	158.0	11.8	11.6	<2.7
1/11/94	**	**	**	**
2/22/94	**	**	**	**
3/14/94	7.5	<1	<1	<1
3/29/94	150.0	<1	14.0	1.3

MIN	<1	<1	<1.5	<1.0
MAX	160.0	41.6	71.9	230.0
AVG	55.7	17.8	20.0	62.3

6/11/96	31.0	<1	1.2	<1
6/25/96	31.0	<1	<1	4.5
7/26/96	**	**	**	**
8/8/96	34.0	9.5	3.1	5.7
8/20/96	6.9	<1	<1	6.3
9/10/96	11.0	<1	<1	3.4
9/26/96	4.2	<1	<1	7.0
12/4/96	3.1	<1	<1	<1
12/17/96	<1	<1	<1	1.8
1/20/97	<1	<1	<1	<1
2/4/97	<1	<1	<1	<1
3/4/97	<1	<1	<1	<1
3/19/97	11.0	<1	<1	1.7
6/10/97	27.0	<1	<1	5.9
6/26/97	23.0	<1	<1	6.7
7/9/97	8.8	<1	<1	<1
7/23/97	2.2	<1	<1	<1
8/5/97	10.0	<1	<1	4.3
8/26/97	3.0	<1	<1	<1
9/9/97	4.0	<1	>1	2.0
9/30/97	8.7	<1	<1	2.6
12/16/97	5.4	<1	<1	<1
1/14/98	24.0	<1	2.0	6.1
2/10/98	1.1	<1	<1	<1
3/13/98	7.5	<1	<1	<1
6/1/98	9.8	<1	<1	4.3
6/30/98	13.0	<1	<1	14.0
7/7/98	7.1	<1	<1	3.1
7/17/98	18.0	5.2	5.2	6.9
8/4/98	3.0	<1	<1	<1

MIN	<1	<1	<1	<1
MAX	34.0	5.2	2.0	1.7
AVG.	10.7	5.2	2.0	1.7

Table D-4. Water quality monitoring results from samples collected at site W-M523.6W

STATION	DATE	WATER DEPTH (FT)	VELOCITY (FT/SEC)	WAVE HEIGHT (FT)	AIR TEMP. (°C)	CLOUD COVER (%)	WIND SPEED (MPH)
W-M523.6W	2/10/98	11.00	0.000	**	1	100	3
W-M523.6W	3/13/98	11.00	***	0.8	1	75	15
W-M523.6W	6/1/98	10.55	0.209	0.2	16	10	8
W-M523.6W	6/30/98	9.15	0.063	0.2	21	2	10
W-M523.6W	7/7/98	11.20	0.184	0.3	27	85	7
W-M523.6W	7/17/98	10.00	0.000	0.2	23	50	7
W-M523.6W	7/24/98	10.70	-	0.0	23	5	2
W-M523.6W	8/4/98	9.80	0.000	0.2	20	95	6
MIN		9.15	0.000	0.0	1	2	2
MAX		11.20	0.209	0.8	27	100	15
AVG.		10.43	0.076	0.3	17	53	7

Table D-4 Con't.

DATE	WIND DIRECTION	WATER TEMP. (°C)	DISSOLVED OXYGEN (MG/L)	pH (SU)	TOTAL ALKALINITY (MG/L as CaCO3)
2/10/98	SE	0.2	16.08	8.26	160
3/13/98	W	1.0	15.49	*	132
6/1/98	S	21.2	6.15	8.18	127
6/30/98	NW	25.0	4.29	7.71	146
7/7/98	NE	26.4	4.13	7.27	145
7/17/98	NW	26.9	4.95	8.14	151
7/24/98	N	25.6	5.69	7.87	-
8/4/98	SE	24.2	3.17	7.30	146

MIN	-	0.2	3.17	7.27	127
MAX	-	26.9	16.08	8.26	160
AVG.	-	18.8	7.49	-	144

Table D-4 Con't.

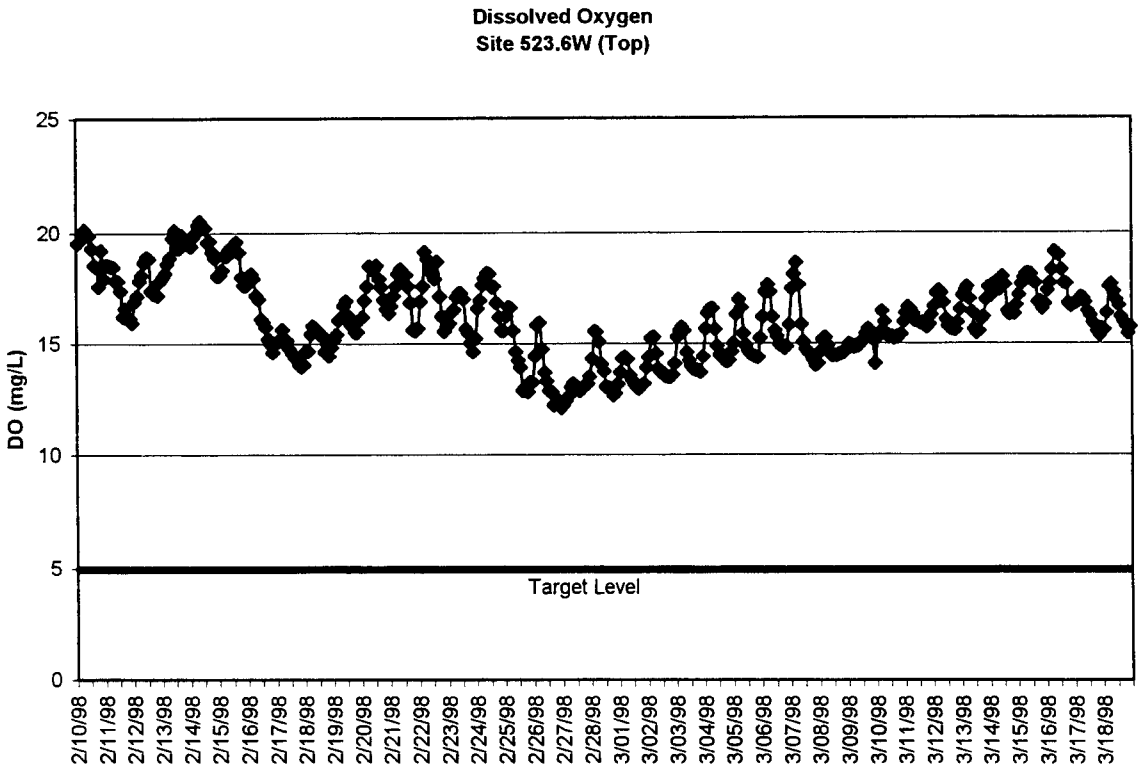
DATE	SPECIFIC CONDUCTANCE (µMHOS/CM @ 25°C)	SECCHI DISK DEPTH (FT)	TURBIDITY (NTU)	SUSPENDED SOLIDS (MG/L)
2/10/98	324	**	276	1.0
3/13/98	293	**	20	25.0
6/1/98	409	1.00	33	31.0
6/30/98	372	1.75	17	120.0
7/7/98	380	2.45	10	10.0
7/17/98	362	2.30	9	362.0
7/24/98	355	-	-	-
8/4/98	361	2.90	5	6.0

MIN	293	1.00	5	1.0
MAX	409	2.90	276	362.0
AVG.	357	2.08	53	79.3

Table D-4 Con't.

DATE	CHLOROPHYLL a (MG/M3)	CHLOROPHYLL b (MG/M3)	CHLOROPHYLL c (MG/M3)	PHEOPHYTIN a (MG/M3)
2/10/98	3.1	<1	<1	<1
3/13/98	22.0	<1	<1	9.2
6/1/98	16.0	<1	<1	15.0
6/30/98	5.1	1.4	<1	2.6
7/7/98	5.8	1.5	2.2	2.9
7/17/98	13.0	<1	<1	<1
7/24/98	-	-	-	-
8/4/98	6.3	<1	<1	<1

MIN	3.1	1.4	2.2	2.6
MAX	22.0	1.5	2.2	15.0
AVG.	10.2	1.5	2.2	7.4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Site 523.6W (Top)
DO (mg/L)
25
20
15
10
5
0
Target Level
2/10/98
2/11/98
2/12/98
2/13/98
2/14/98
2/15/98
2/16/98
2/17/98
2/18/98
2/19/98
2/20/98
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3/15/98
3/16/98
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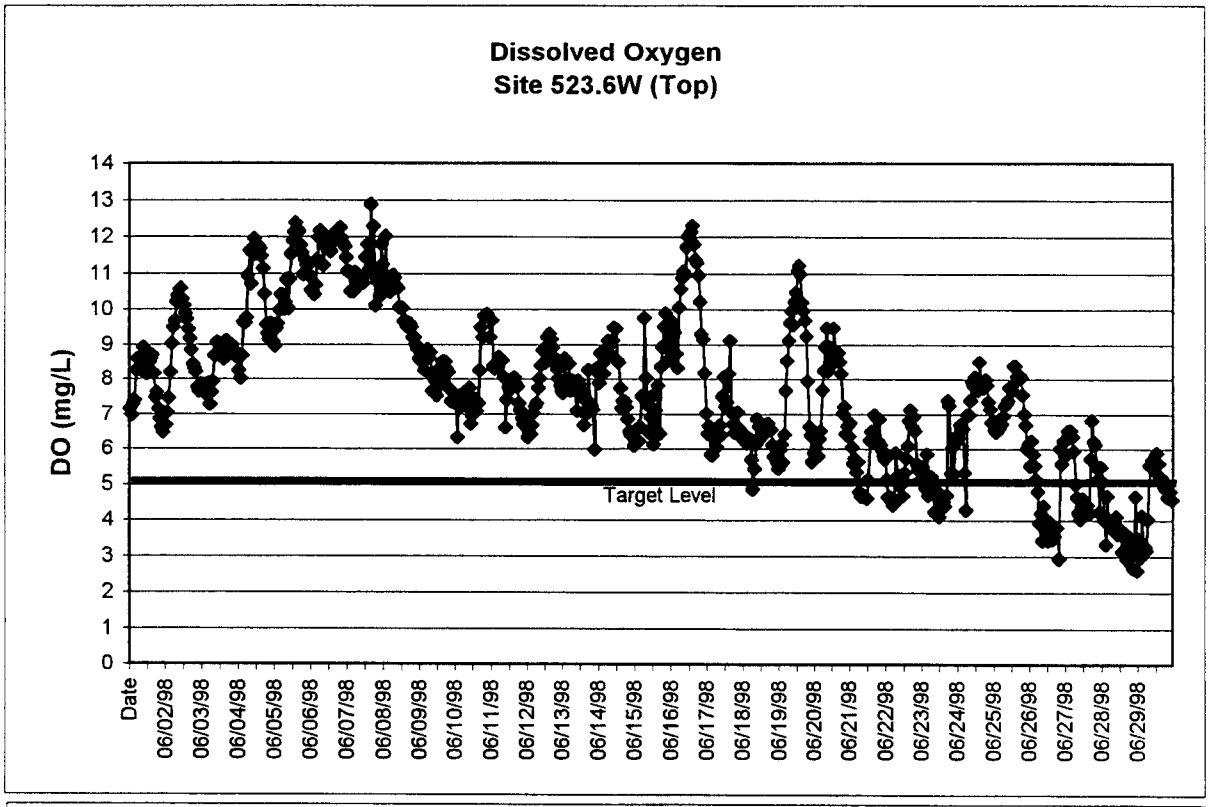
3/18/98


Dissolved Oxygen
Site 523.6W (Top)
DO (mg/L)
Target Level
Date
06/02/98
06/03/98
06/04/98
06/05/98
06/06/98
06/07/98
06/08/98
06/09/98
06/10/98
06/11/98
06/12/98
06/13/98
06/14/98
06/15/98
06/16/98
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06/18/98
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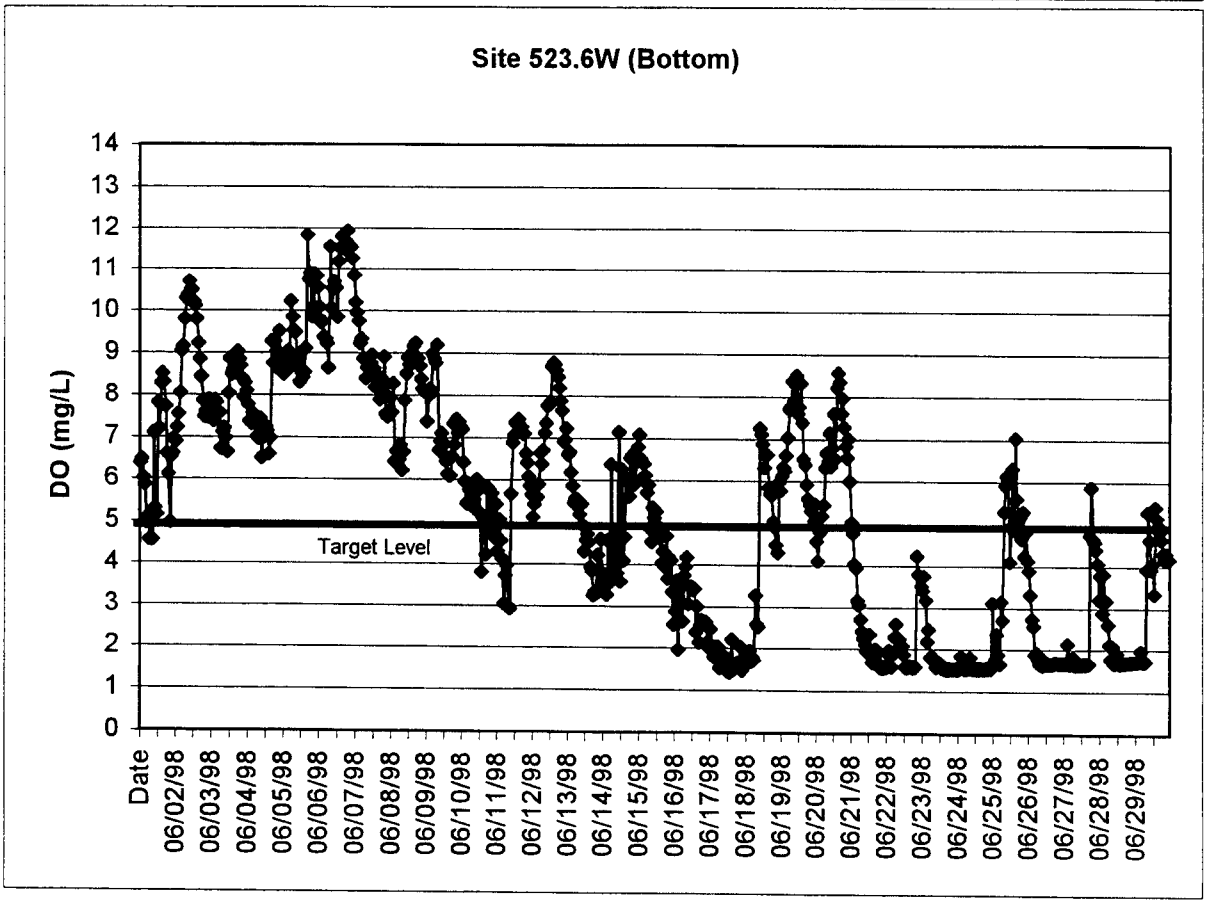
06/29/98


Site 523.6W (Bottom)
DO (mg/L)
Target Level
Date
06/02/98
06/03/98
06/04/98
06/05/98
06/06/98
06/07/98
06/08/98
06/09/98
06/10/98
06/11/98
06/12/98
06/13/98
06/14/98
06/15/98
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06/26/98
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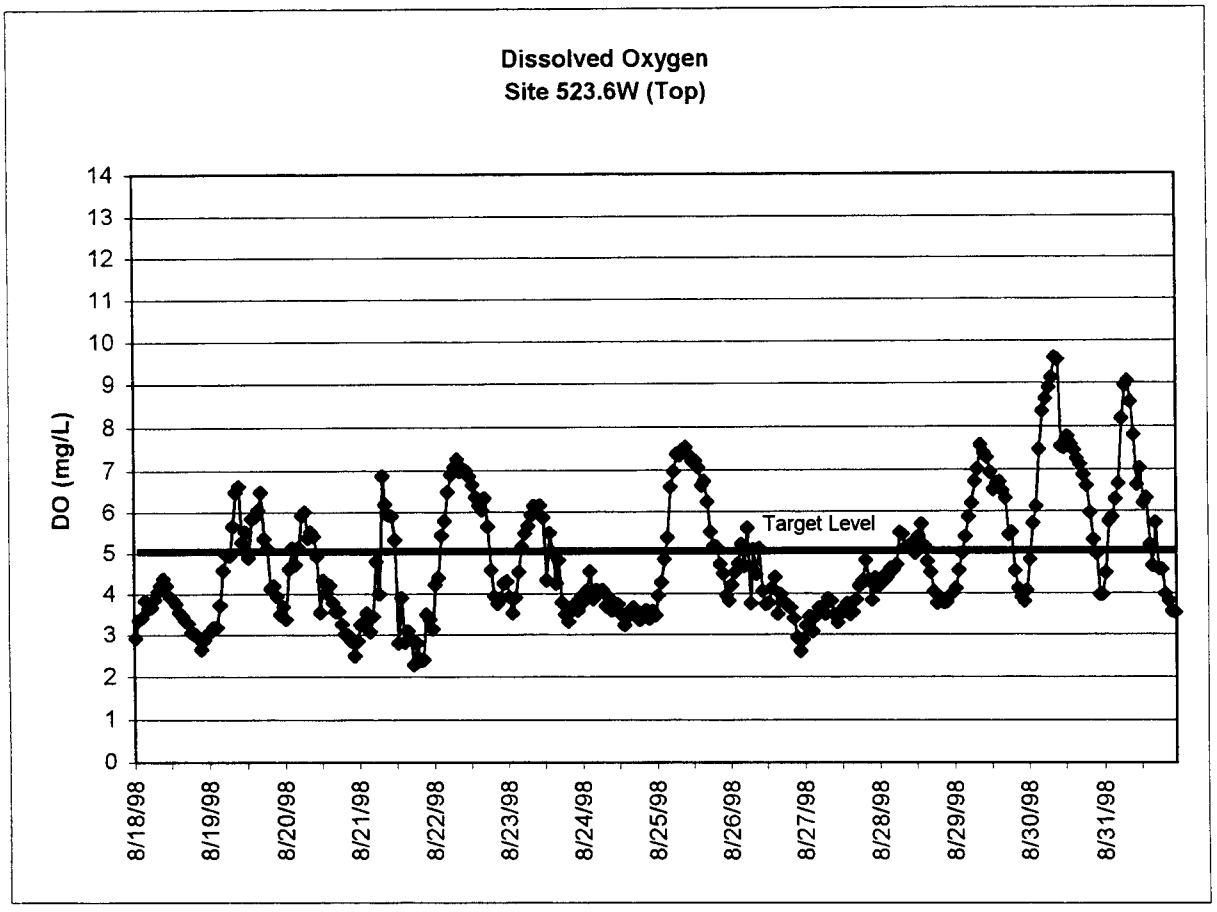
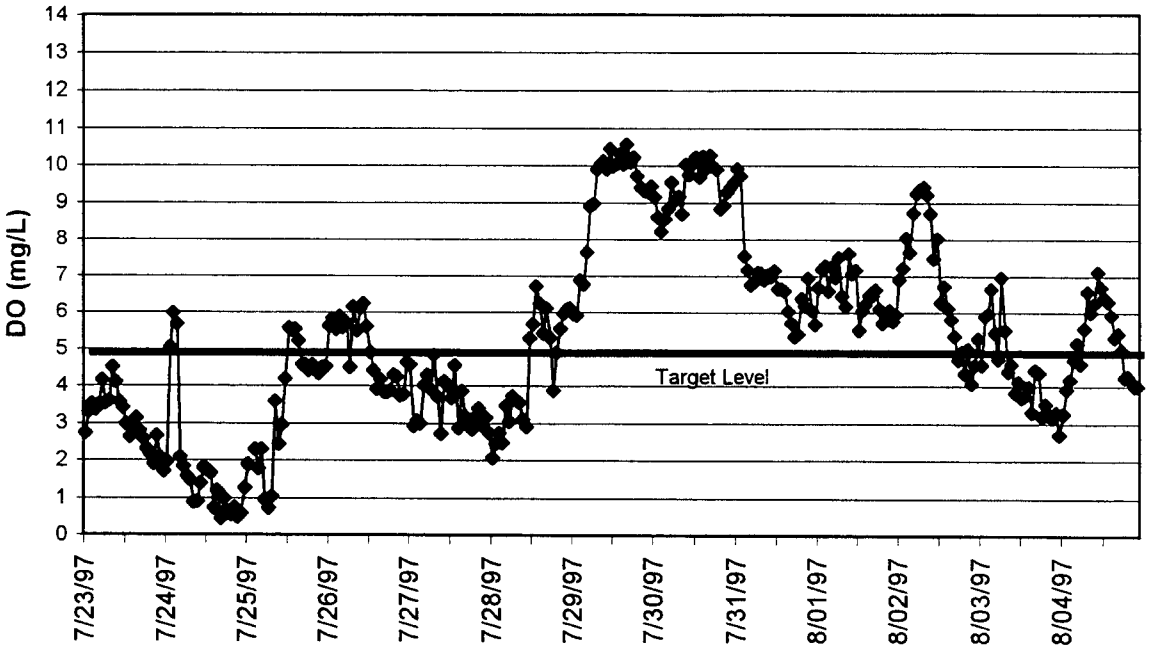
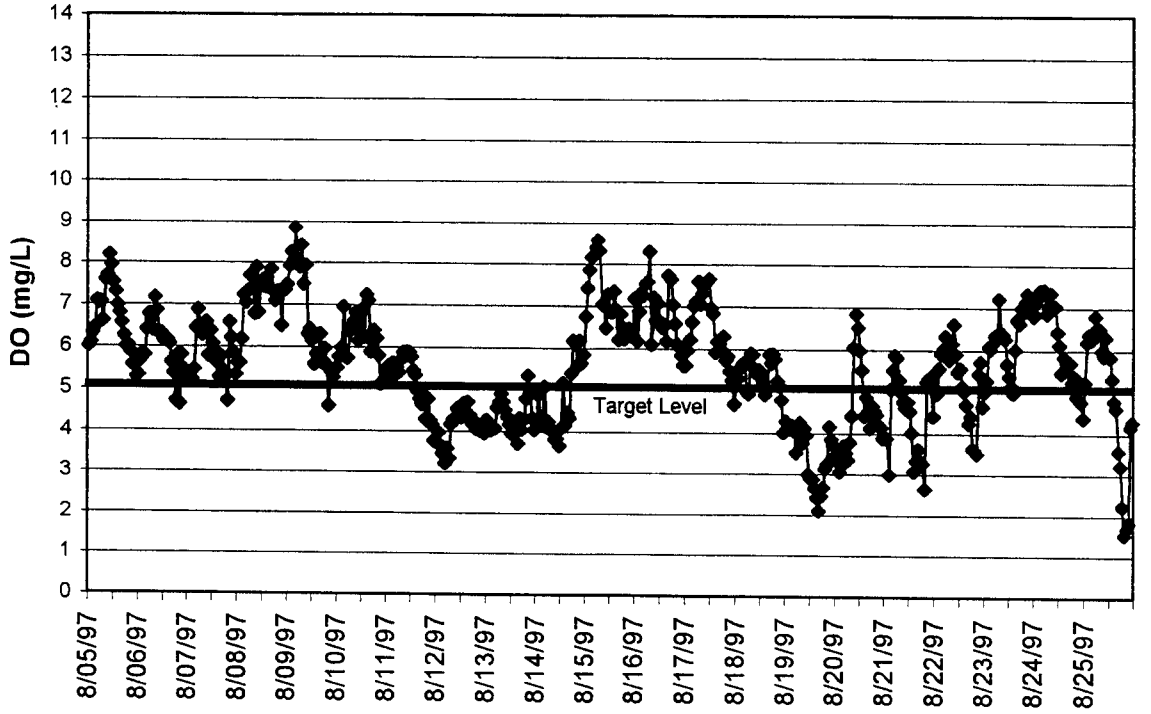
06/28/98
06/29/98

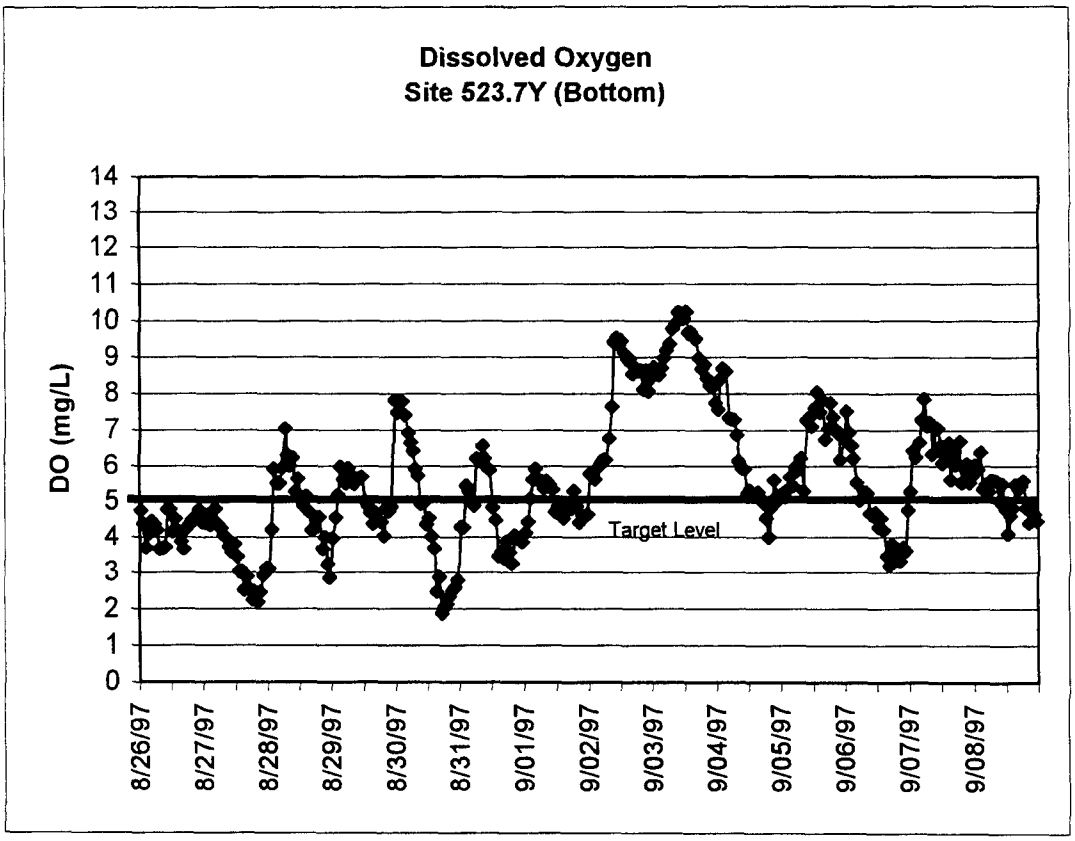

Dissolved Oxygen
Site 523.6W (Top)
DO (mg/L)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Target Level
8/18/98
8/19/98
8/20/98
8/21/98
8/22/98
8/23/98
8/24/98
8/25/98
8/26/98
8/27/98
8/28/98
8/29/98
8/30/98
8/31/98

Dissolved Oxygen
Site 523.7Y (Bottom)



Site 523.7Y (Bottom)

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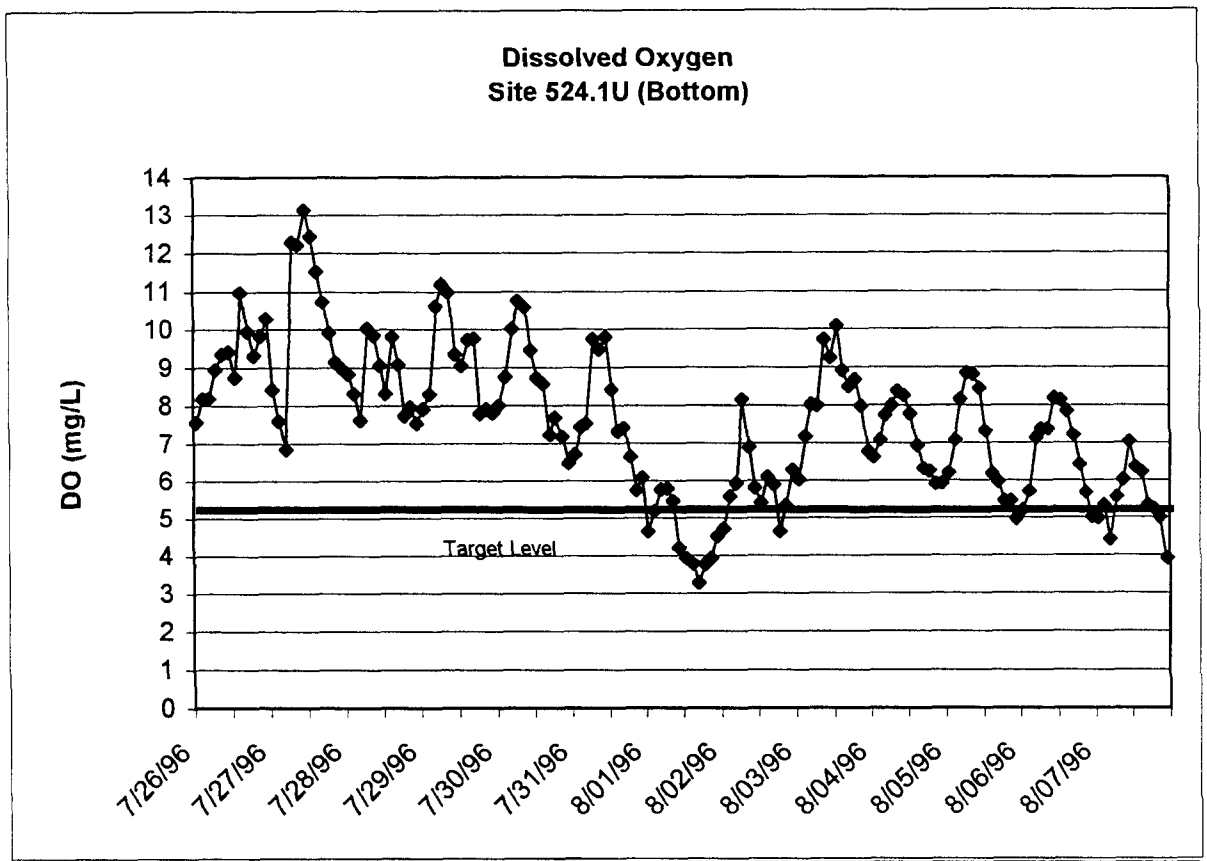
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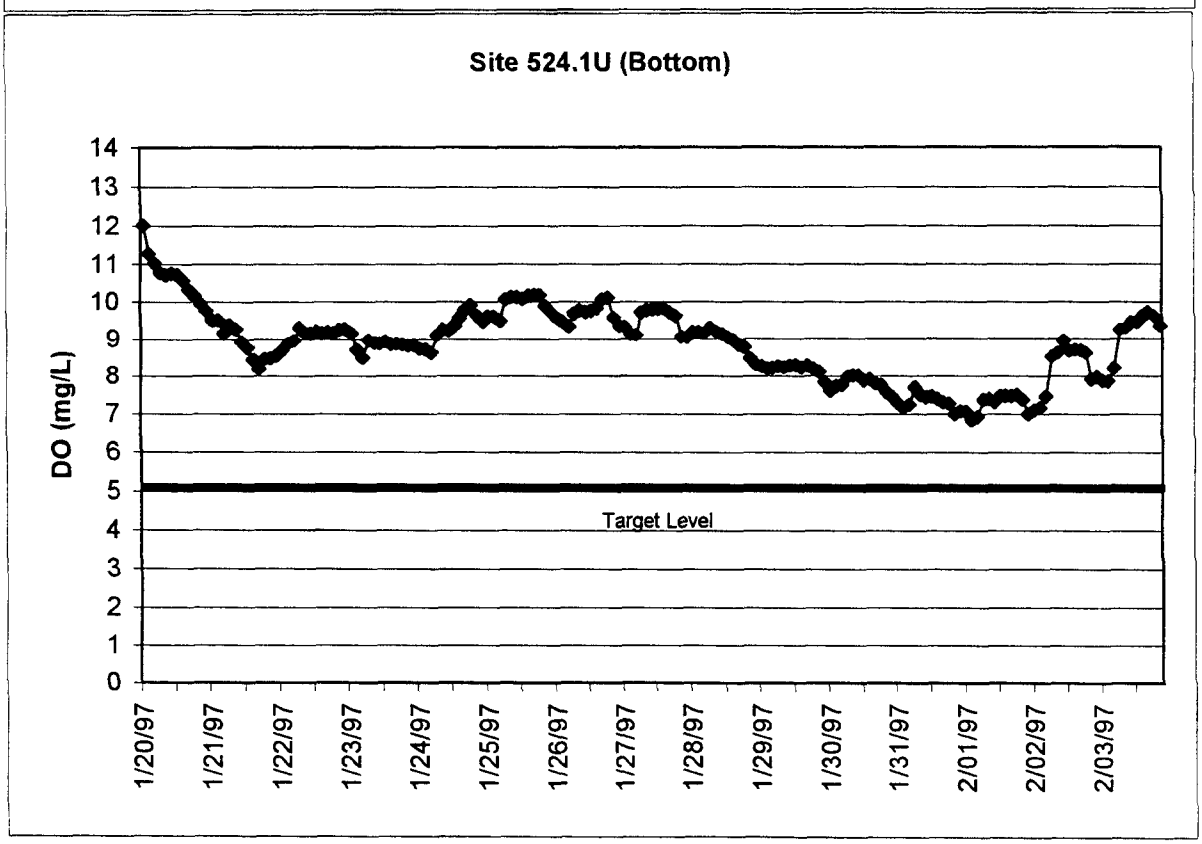
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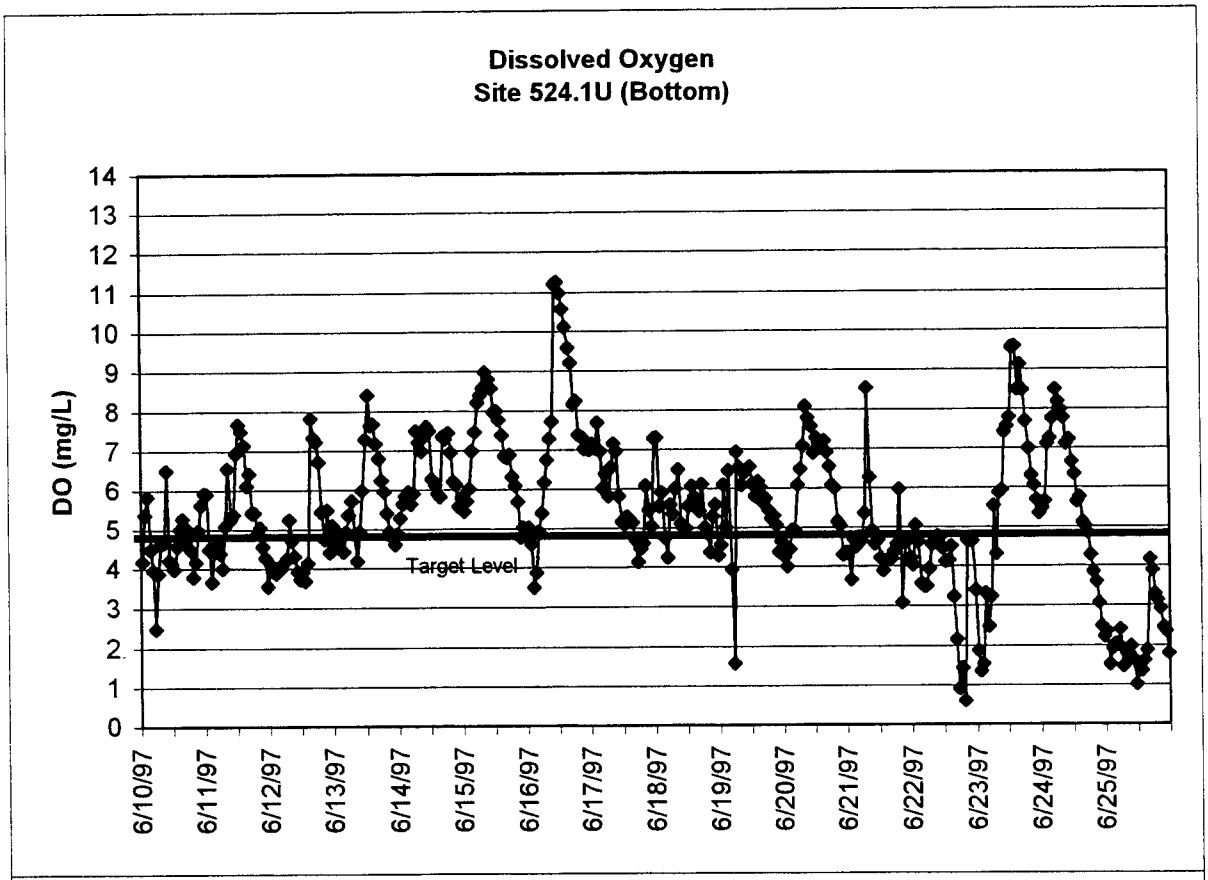
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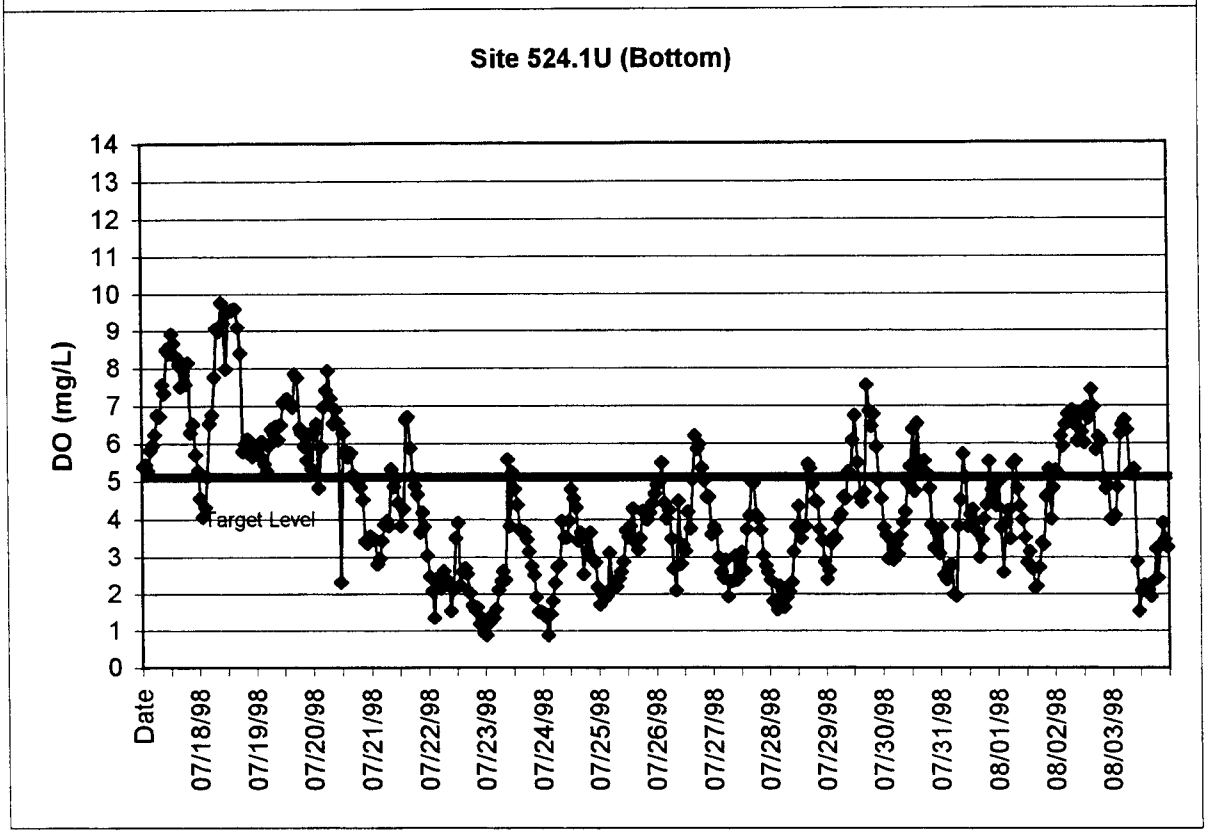
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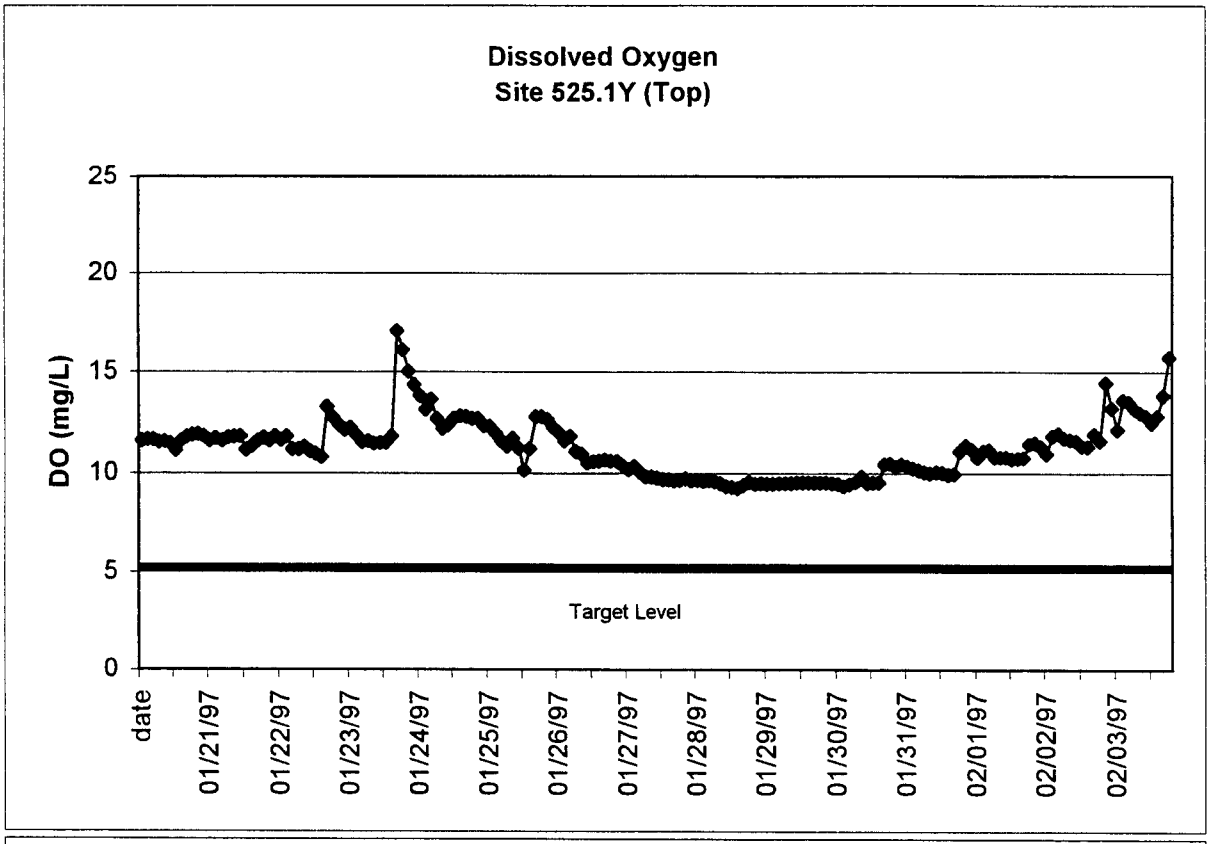
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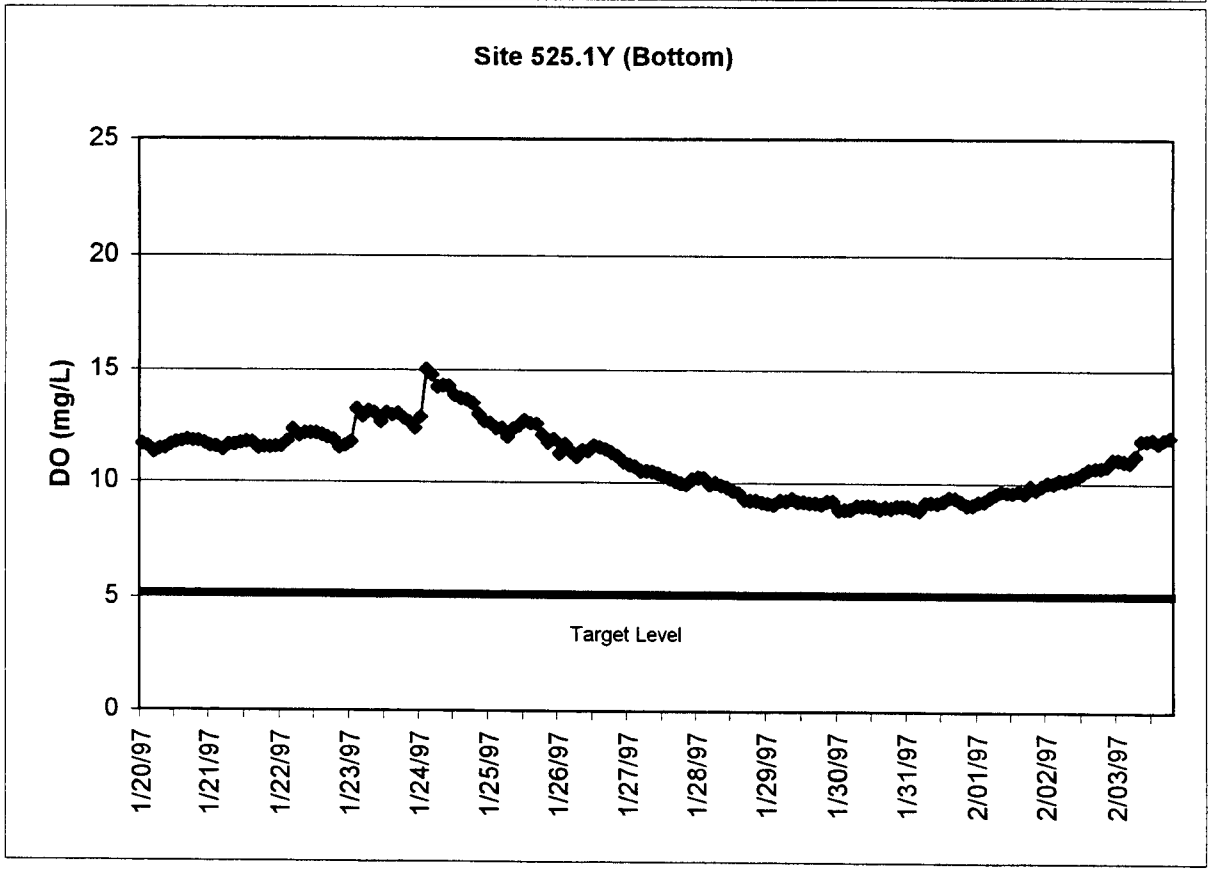
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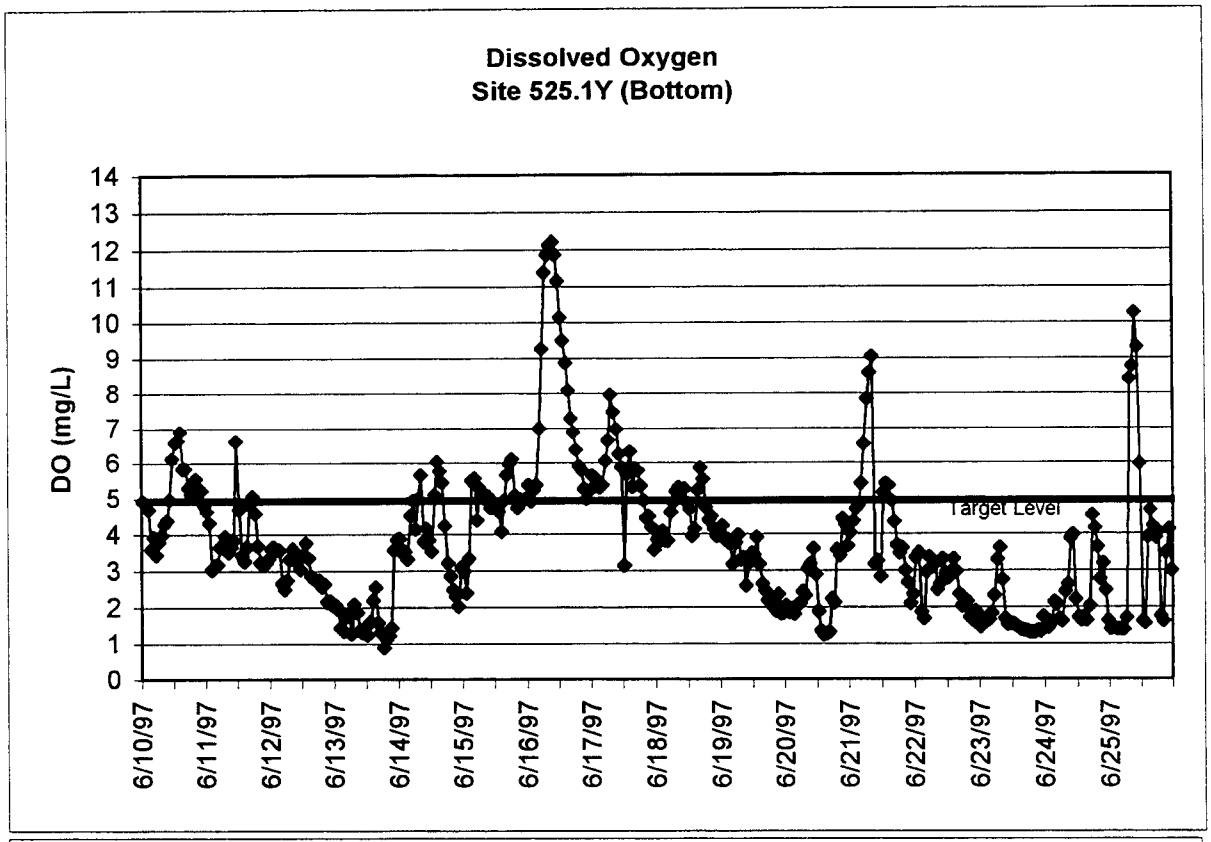
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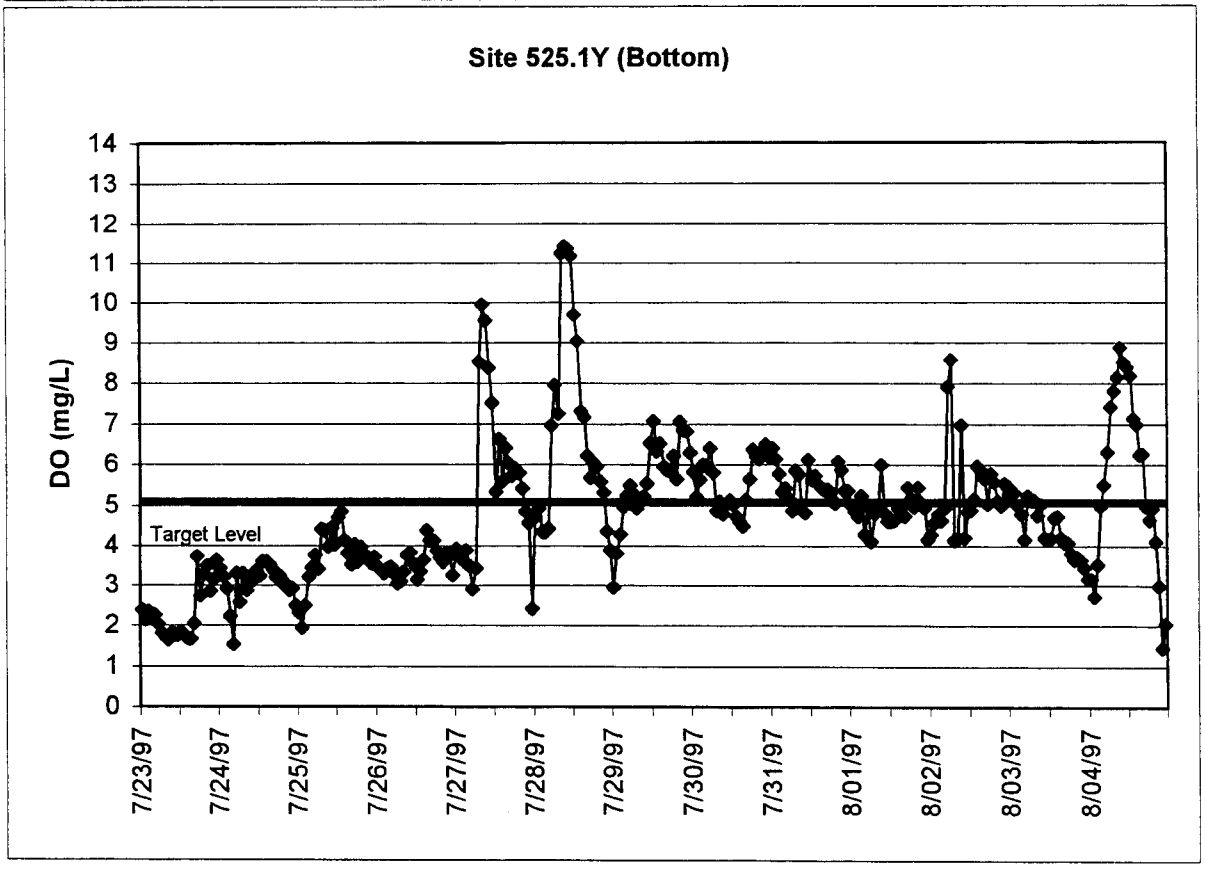
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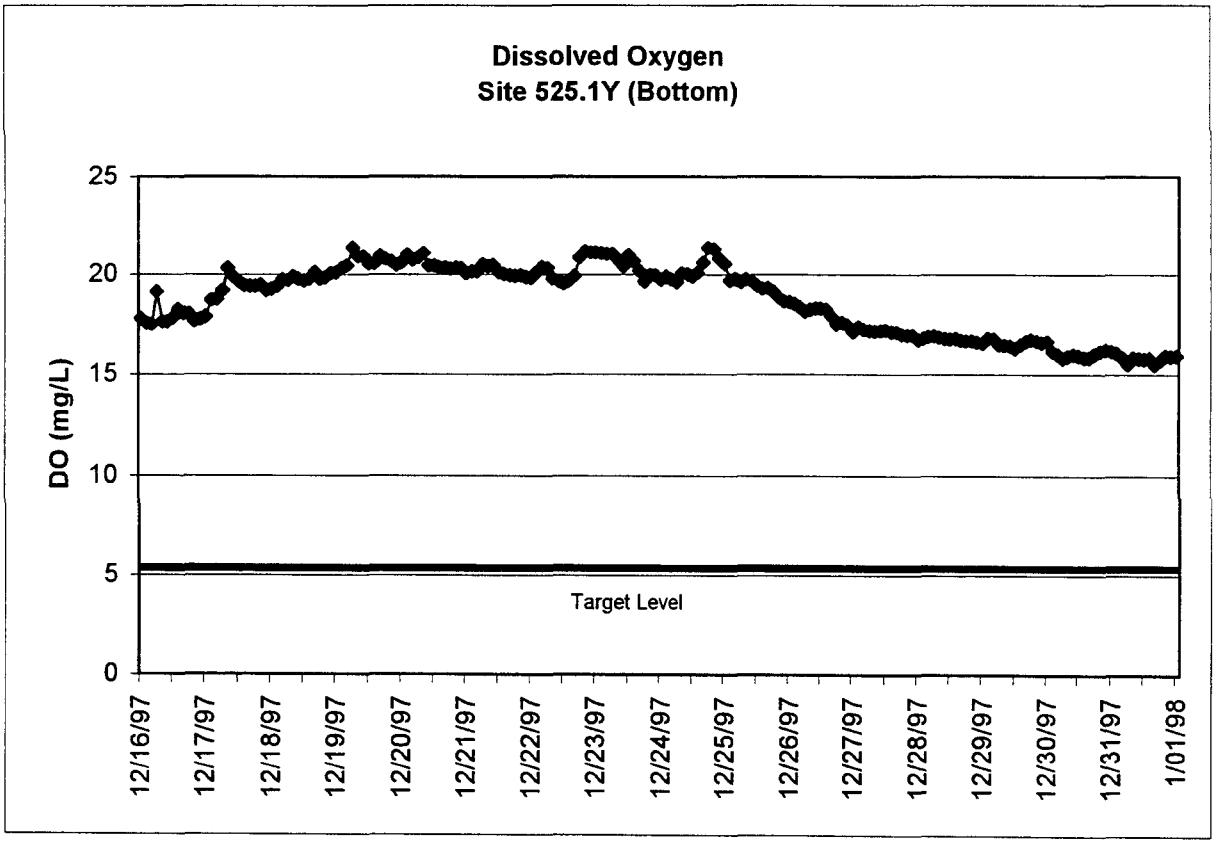
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APPENDIX E

TECHNICAL COMPUTATIONS

Table E-1

Potters Marsh Fisheries Habitat

Dredged Channels	Depth, Ft [1]				Fisheries Habitat, Acre-Ft
	Year 0	Year 2			
		Maximum	Minimum	Average	
Segment 1 (S1) [2]	10				34
Profile		10	7	9	30
Cross Sections					
1A		10.0	9.0	9.5	
1B		10.8	7.1	9.0	
Average Cross Sections		10.4	8.0	9.2	30
Sediment Trap [3]	10				3
Profile		NA	NA	NA	
Cross Section 1C		8.2	6.0	7.1	2
Segment 2 (S2)	8	6			109
Profile		8	3	6	77
Cross Sections					
3C West		6.4	6.0	6.2	
2B East		7.9	5.9	6.9	
2B West		7.3	4.1	5.7	
2A East		8.4	7.4	7.9	
2A West		9.1	6.9	8.0	
Average Cross Sections		7.8	6.0	6.9	91
Segment 3 (S3) [3]	8				119
Profile		7	2	6	84
Cross Sections					
3D East		7.7	3.3	5.5	
3C East		7.9	4.5	6.2	
3B		7.2	5.0	6.1	
3A East		3.3	3.1	3.2	
3A West		7.1	4.7	5.9	
Average Cross Sections [4]		7.5	4.4	5.9	83
Deep Holes	12				62
Profile		11	7	9	45
Cross Sections					
3E		11.9	9.2	10.6	
3D West		8.9	8.2	8.6	
Average Cross Sections		10.4	8.7	9.6	48
		Total at Year 0 [5]			290
		Total at Year 2 (Profile) [5]			206
		Total at Year 2 (Cross Sections) [5]			222

[1] Profile depths were obtained July 1997. Cross section data was obtained March 1998.

[2] Segment 1 purpose is for sediment control.

[3] Segment 3 includes additional shallow dredging (4' deep, 2,180' long) to compensate for a topsoil shortage.

[4] Does not include 3A East (shallow dredging)

[5] Total fisheries habitat does not include Segment 1 or the Sediment Trap. Difference in acre-feet is due to rounding.

Table E-2

Potters Marsh Resting and Feeding Areas

Pothole [1]	Length, Ft	Width, Ft	Resting and Feeding Areas [2]	
			Ft^2	Acres
1	230	59	12,273	0.28
2	143	55	6,561	0.15
3	258	64	15,785	0.36
4	337	68	20,000	0.46
5	240	70	15,415	0.35
6	340	73	22,610	0.52
7	325	95	25,518	0.59
8	198	76	10,692	0.25
9	250	250	47,360	1.09
10	169	50	7,239	0.17
11	310	39	15,047	0.35
12	285	77	22,500	0.52
13	290	58	14,890	0.34
14	337	48	13,881	0.32
15ab	290	71		
15cd	330	91		
15 all			35,513	0.82
16	312	39	14,924	0.34
17	210	88	17,025	0.39
18	328	114	21,551	0.49
19	349	54	19,787	0.45
20 [3]	NA	NA	17,981	0.41
			Total [2]	8.64

[1] Potholes 1-10, 12, 15, and 17 were mechanically excavated. Potholes 11, 13, 14, 16, 18, and 19 were blasted.

[2] Areas were determined from aerial orthophotography.

[3] Pothole 20 was not surveyed.

APPENDIX F

PHOTOGRAPHS OF PROJECT FEATURES

POTTERS MARSH EMP-HREP PROJECT
PERFORMANCE EVALUATION

PHOTOGRAPHS OF PROJECT FEATURES

PLATE 1: This plate shows examples of two features of the Potters Marsh HREP–dredged channels and potholes. **Panorama A** (photos taken July 17, 1997) was taken looking southward from the CPS berm along one of the dredged channels. The network of dredged channels provides areas of deeper water within and adjacent to the shallow, vegetated side channel and embayment areas. Emergent wetland plants such as arrowhead (*Saggitaria latifolia*) and bulrush (*Scirpus sp.*) dominate the shallow aquatic habitat on either side of the dredged channel, while rooted floating aquatic plants such as lotus (*Nelumbo lutea*) and water lily (*Nymphaea tuberosa*) are present along the edges of the channel.

Panorama B (photos taken September 4, 1996) shows a view of one of the pothole features. The potholes provide isolated areas of open water surrounded by herbaceous and/or woody vegetation cover. These features were intended to enhance nesting and feeding opportunities for migratory waterbirds in the Potters Marsh area.

PLATE 2: All of these photos were taken on September 4, 1996, with the exception of Photo D, which was taken on July 17, 1997. Two of the photos show structural components of the CPS. **Photo A** shows the water control inlet used to bring water into the CPS. **Photo B** shows the outlet to the stoplog structure used to drain the CPS. The remaining two photos show examples of less desirable vegetation that require ongoing effort by Refuge management staff to control their encroachments into the project area. **Photo C** shows a seedling cottonwood (*Populus deltoides*) which has invaded higher elevated portions of the CPS. **Photo D** shows purple loosestrife (*Lythrum salicaria*), a non-native, aggressive invader of wetlands which if uncontrolled can grow into dense monotypic stands that displace much of the desirable native vegetation.

PLATE 3: These photos were all taken on September 4, 1996, and show examples of naturally occurring vegetation within and adjacent to the CPS. **Photo A** shows a mixture of three species of vegetation naturally colonizing the CPS: blue vervain (*Verbena hastata*), seedling cottonwood (*Populus deltoides*), and straw-colored nutsedge (*Cyperus strigosus*). Blue vervain is a native forb that is a frequent colonizer of wetland sites. Seedling cottonwood is generally considered an undesirable invader of open grasslands and disturbed sites. Straw-colored nutsedge is one of a group of wetland plant species referred to as "moist soil" vegetation. **Photo B** shows a dense growth of straw-colored nutsedge. The seeds and tubers of this species are eaten by wildlife. **Photo C** shows specimens of another "moist soil" plant, commonly called wild millet or barnyard grass (*Echinochloa sp.*). **Photo D** shows a view of the interior of the CPS and the variety of

aquatic and wetland vegetation encountered there. Shallow water areas support lotus, water lily and arrowhead, while lower ground elevations support growths of nutsedge, blue vervain and other species. Invasion of higher elevations by seedling cottonwoods can be seen in the background.

PLATE 4: These photos all show examples of vegetation found on the berm and grassland areas of the CPS. All were taken on July 17, 1997, except for **Photo C,** which was taken on September 4, 1996, and shows a specimen of arrowhead growing on the crown of the CPS berm. Although normally an obligate wetland species, arrowhead was apparently present in the seed bank of the dredged material used to construct the berm and naturally revegetated the site in the first year following construction. This species was not encountered on top of the CPS berm during the July 1997 site visit. **Photo B** shows some of the grasses that comprise the dominant cover of the berm and grassland areas. **Photo A and Photo D** show two prairie forbs encountered on the berm: black-eyed susan (*Rudbeckia hirta*) in Photo B and purple prairie clover (*Petalostamun purpureum*) in Photo D.

PLATE 5: These photos were taken on October 2, 1997 and show a view of the CPS grassland and one of the pothole features. **Photo A** shows a hunter's blind located at the edge of one of the two potholes closest to the CPS. **Photo B** shows a specimen of little bluestem (*Schizachyrium scoparium*), one of the warm season grass species planted on the CPS. This species was encountered during the October 2 site visit, although it was not identified during earlier inspections.

PLATE 6: These photos were taken on October 2, 1997, and show a view of the CPS grassland and one of the pothole features. **Photo A** is another view looking eastward of the pothole shown on Plate 5, Photo A. **Photo B** shows warm season grass species such as sideoats grama, blue grama, and New England aster (*Aster novae angliae*) that were encountered during the October 2nd site visit, although they were not identified during earlier inspections.

PLATE 7: These photos show the specimen of decurrent false aster (*Boltonia decurrens*) encountered on the CPS on October 2, 1997. Plants of this species can grow in excess of 6 feet in height. This species is Federally listed as threatened and has not previously been recorded as occurring in Whiteside or Carroll Counties, either in historical records or in more recent (1980s) surveys. This plant was located in proximity to some volunteer smartweed (*Polygonum sp.*), which can be seen in **Photo A.** Details of the inflorescences, some of which were past blooming on October 2, can be seen in **Photo B.**

A

B

PLATE 1

A

C

B

D

PLATE 2

A

C

B

D

PLATE 3

A

C

B

D

PLATE 4

A

B

PLATE 5

A

B

PLATE 6

A

B

PLATE 7

APPENDIX G

REFERENCES

REFERENCES

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

(1) *Definite Project Report with Integrated Environmental Assessment (R-9), Potters Marsh Rehabilitation and Enhancement, Pool 13, Upper Mississippi River, Carroll and Whiteside Counties, Illinois*, April 1992 (DPR). 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 13, River Miles 522.5-526, Potters Marsh*, September 1993, Contract No. DACW25-93-C-0115. This document was prepared to provide sufficient detail of project features to allow construction of the hydraulically dredged channels, mechanically excavated sediment trap, confined placement of hydraulically dredged material, well and stoplog structure, project access road, and mechanically excavated and blasted potholes by a contractor.

(3) *Operation and Maintenance Manual, Potters Marsh Rehabilitation and Enhancement, Upper Mississippi River Environmental Management Program, Pool 13, River Miles 522.5-526, Carroll and Whiteside Counties, Illinois*, March 1997. This manual was prepared to serve as a guide for the operation and maintenance of the Potters Marsh project. Operation and maintenance instructions for major features of the project are presented.

(4) Letter from Mr. Gary L. Loss, Corps of Engineers, to Mr. William Hartwig, USFWS, dated March 1997, transmitting shop drawings and formally transferring the Potters Marsh project to the USFWS.

(5) Letter from Mr. Marvin E. Moriarty, USFWS, to Colonel Charles Cox, Corps of Engineers, dated March 1997, accepting the transfer of the Potters Marsh project from the Corps to the USFWS.

(6) Gent, R. 1997. Waterfowl and wading bird use of potholes at the Potters Marsh Habitat Rehabilitation and Enhancement Project, Upper Mississippi River, Pool 13, Reprinted by U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin, October 1997. LTRMP 97-R021. 10 pp.

APPENDIX H

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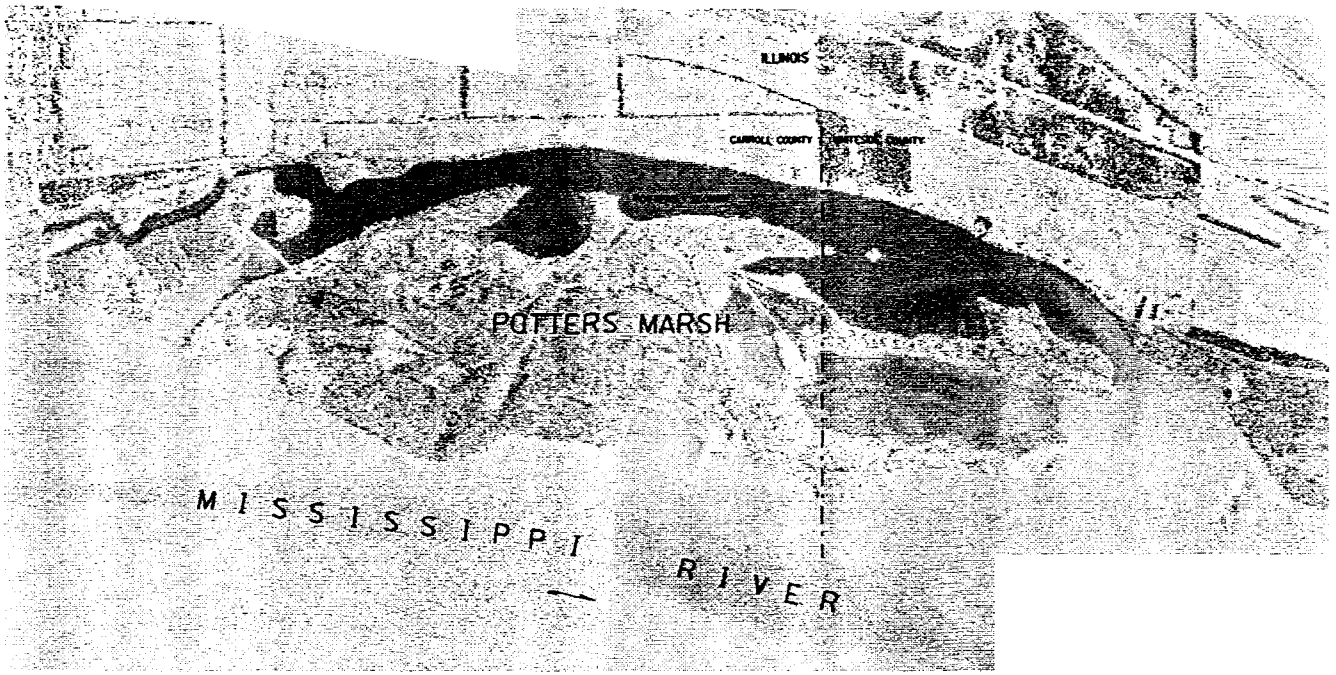
PLATES



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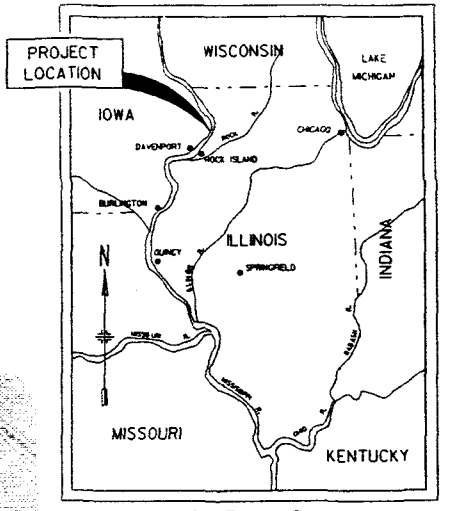

VICINITY MAP

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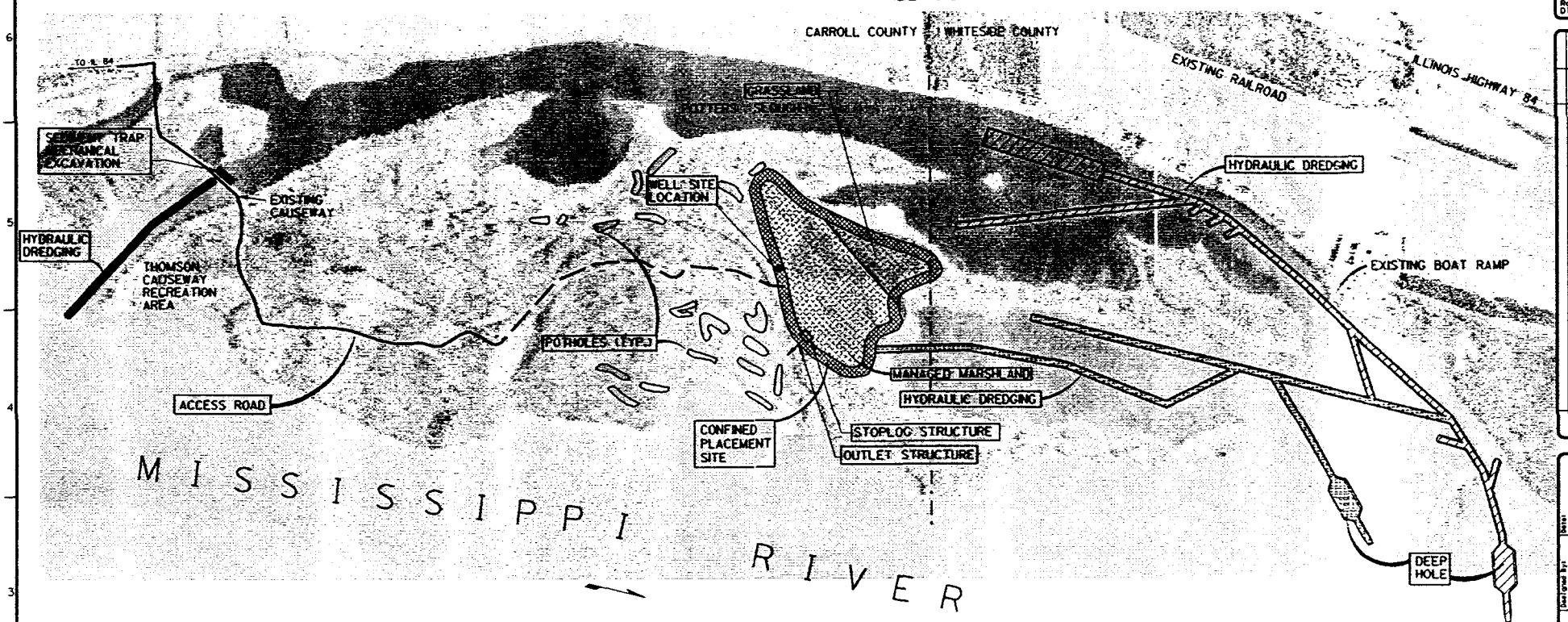
Drawn By: SDB
Checked By: CCK/KJD
Traced By: BLK
Date:
Scale: AS SHOWN
Drawing Code:
Identification Number:

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOLS 13 - RIVER MILE 521.5 - 528.5
POTTERS MARSH

GENERAL PLAN & VICINITY MAP

PLATE 1



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US Army Corps of Engineers Rock Island District

No.	Description	Date	Approved
	Revisions		

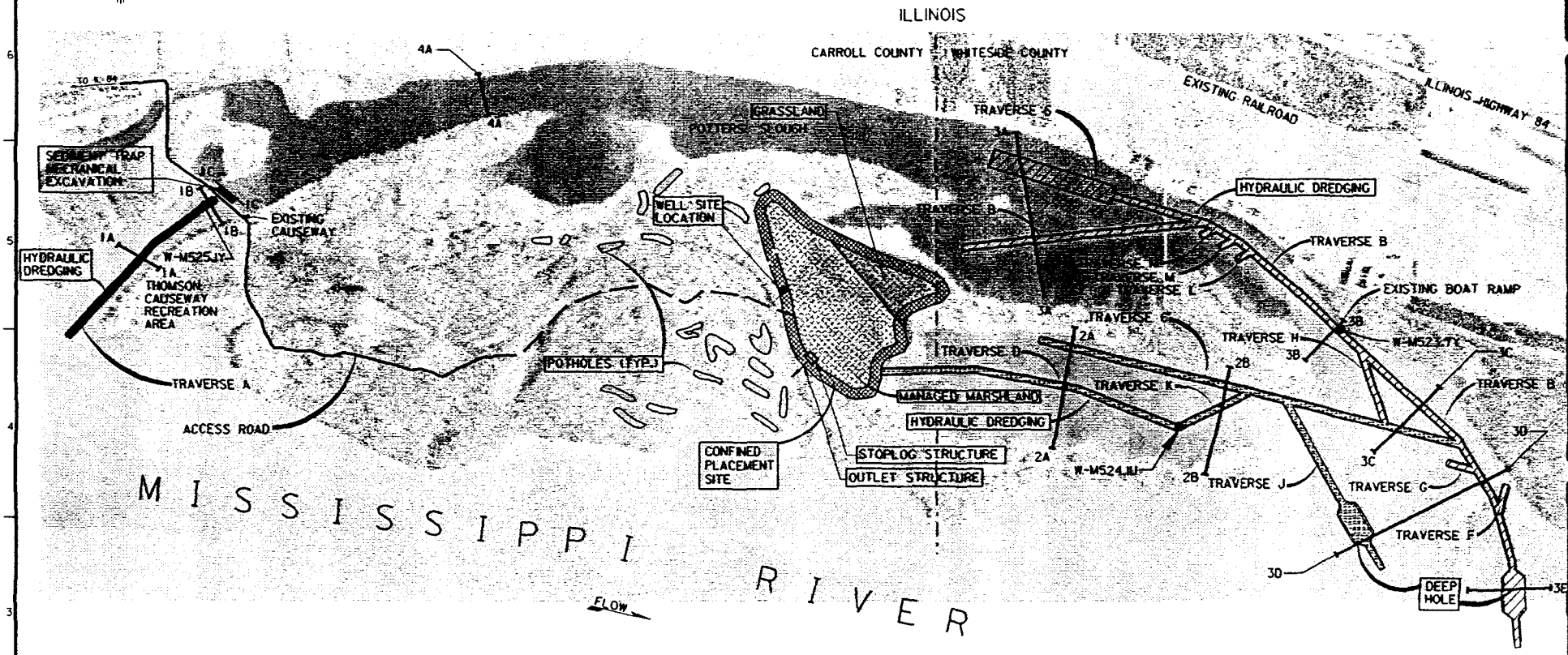
Designed By: CCK/KJD
Drawn By: SDB
Checked By: CCK/KJD
Revised By: BLK
Dates:
Scales: AS SHOWN
Drawing Codes:
Set/Tot/Tot/Tot Numbers:

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

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13: POOR MILE 523.5-526.5
POTTERS MARSH

PROJECT FEATURES

PLATE 2



TYPE OF MEASUREMENT

POINT

● WATER QUALITY

SEDIMENTATION TRANSECT

SEDIMENTATION

500 0 500 1000 1500

SCALE IN FEET

LEGEND

SEGMENT 1

SEGMENT 2

SEGMENT 3

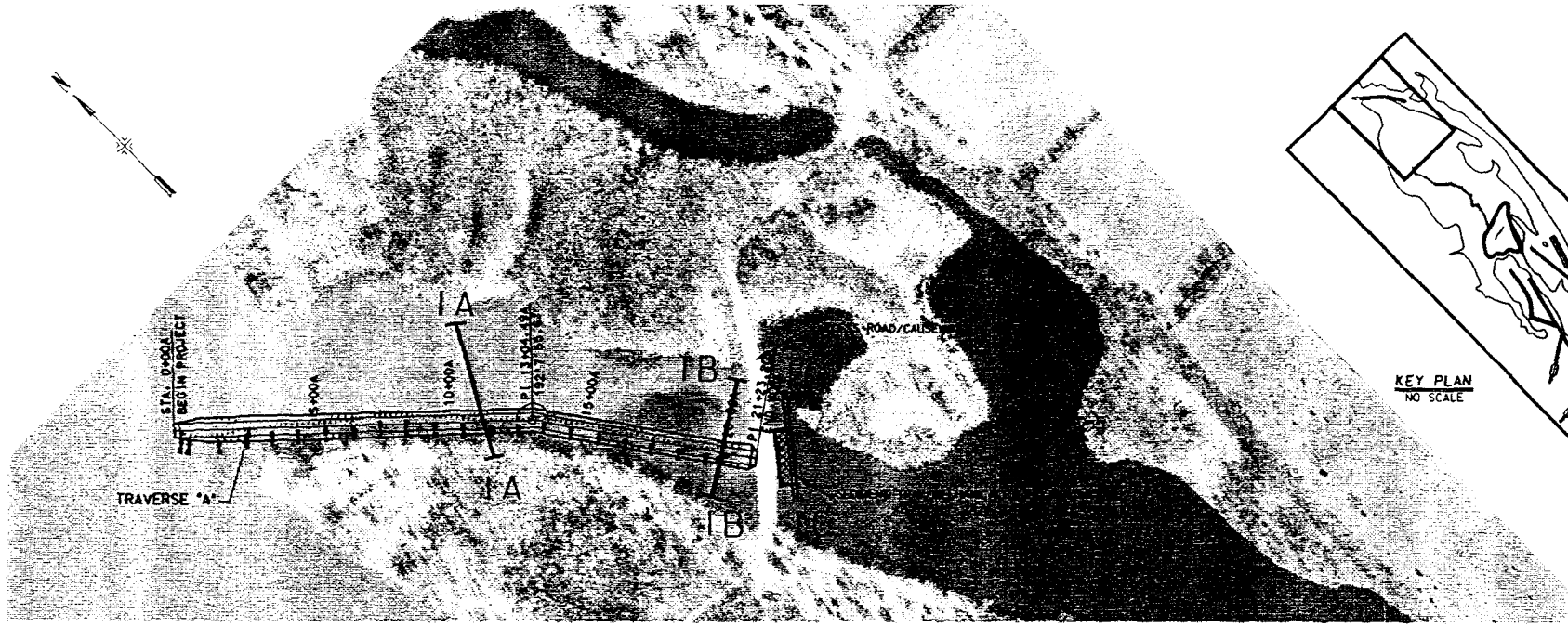
US Army Corps of Engineers Rock Island District

U.S. ARMY ENGINEER DISTRICT ROCK ISLAND, ILLINOIS

ENVIRONMENTAL INVESTIGATION PROGRAM POOL 13 - MISSISSIPPI RIVER MILE 523.5-526.5 POTTERS MARSH

MONITORING PLAN

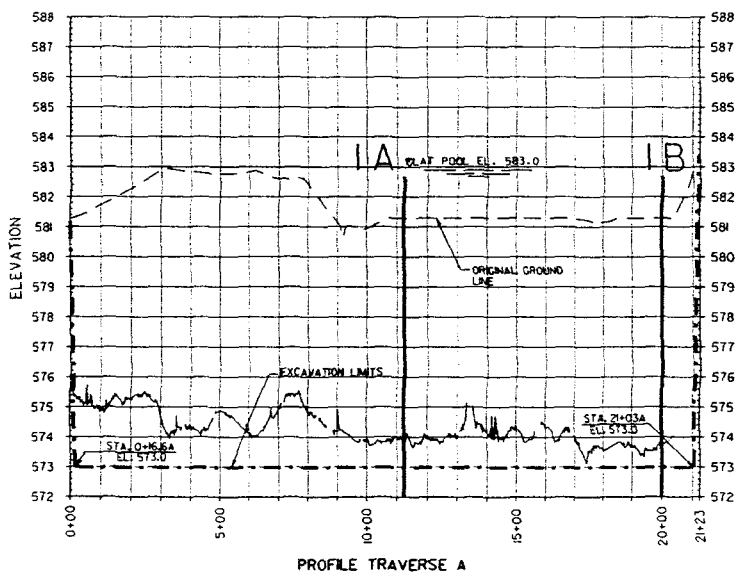
PLATE 3



PLAN

200 100 0 200 400FT

SCALE



PROFILE TRAVERSE A

LEGEND:

ORIGINAL — — —

1995 — · — · —

1997 ———

US Army Corps of Engineers Rock Island District

No.	Description	Date	Approved
	Revisions		

Designed by: CCK/KJD | Scale: AS SHOWN

Drawn by: SDB | Drawing Date:

Checked by: CCK/KJD | Serialization Number:

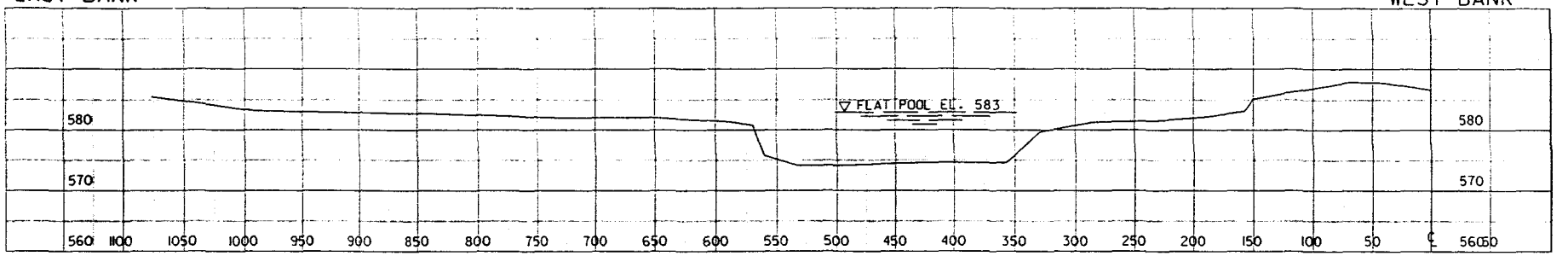
Serialized by: BLK

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

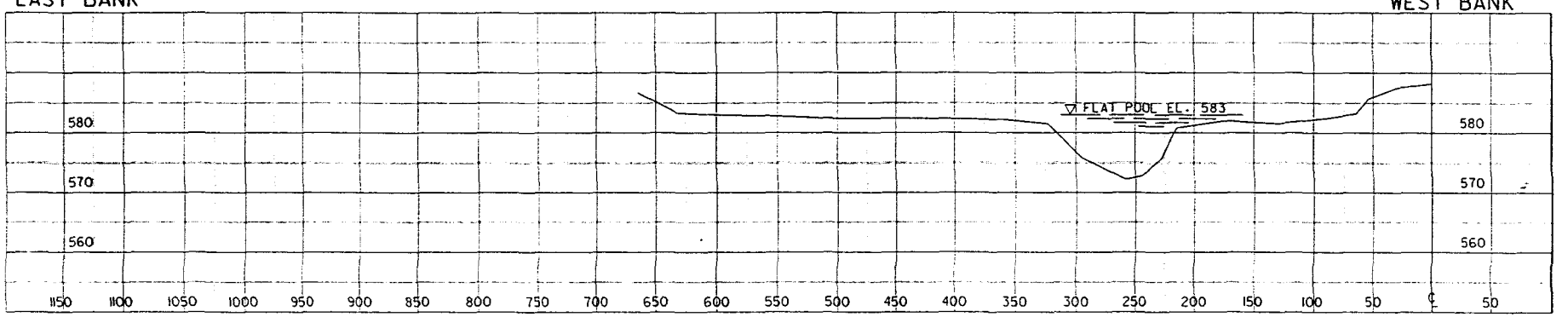
ENVIRONMENTAL INVESTIGATIONAL PROGRAM
POOLS 13, NAVIGATION PROJECT MILES 535.5-526.5
POTTERS MARSH

DREDGE PLAN AND PROFILE STA. 0+00A TO STA. 21+53A

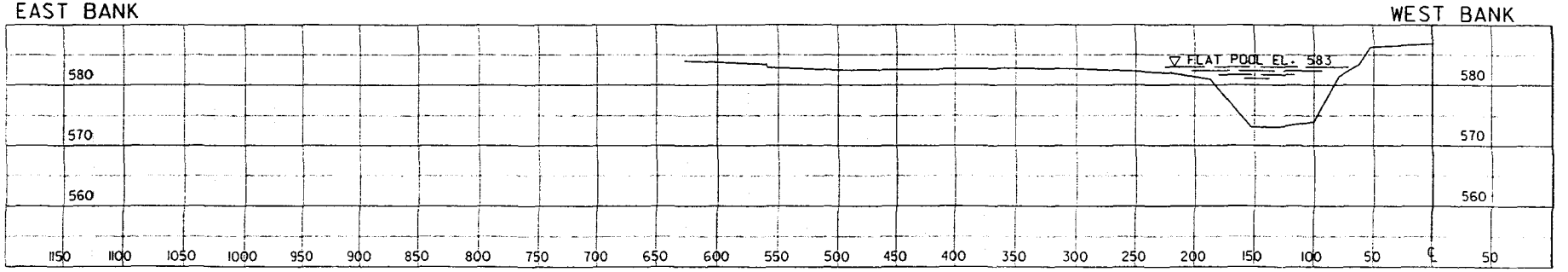
PLATE 4



SECTION 1C



SECTION 1B



SECTION 1A

LEGEND:

1A — SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES, MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

US Army Corps of Engineers Rock Island District

Symbol	Date	Approved	Description Revisions

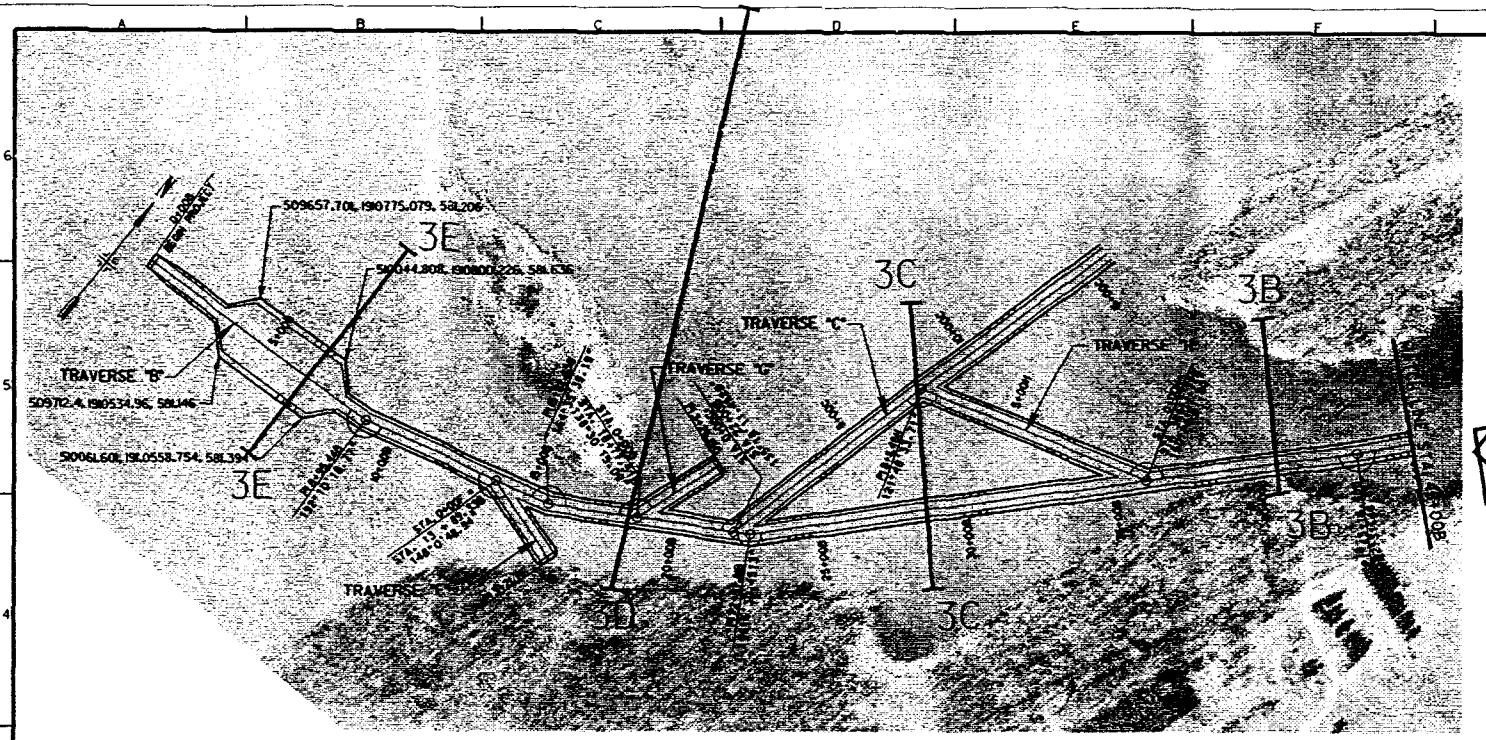
Designed by CCK	Date 4 MAY 1998		
Drawn by YPQ	Scale AS SHOWN	Drawing Name	Satisfaction Number
Checked by CCK			
Reviewed by GLK			

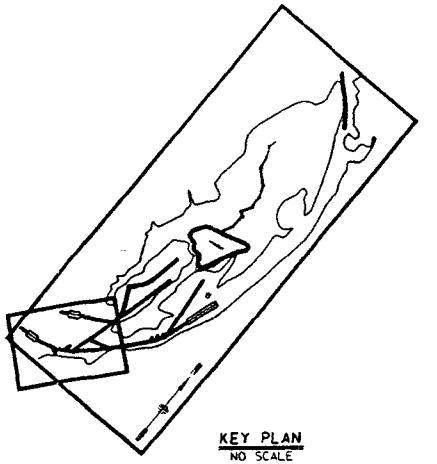
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT
POOL 13-RIVER MILE 523.5-526.5
POTTERS MARSH

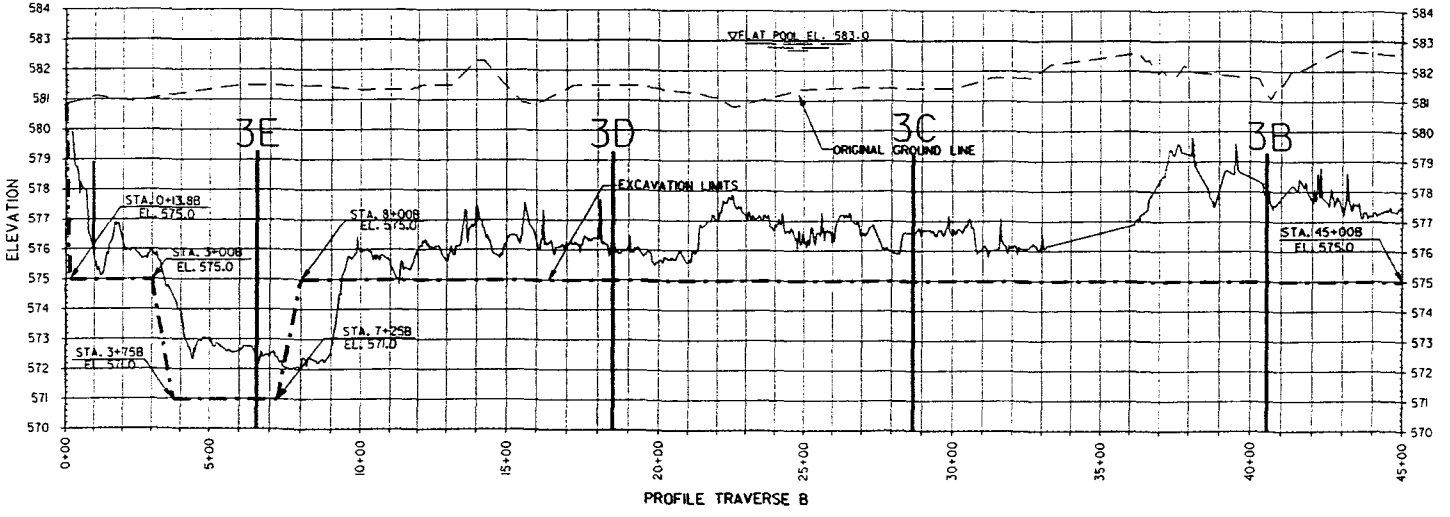
COMPOSITE SEDIMENTATION CROSS SECTIONS I

PLATE 5





KEY PLAN
NO SCALE



LEGEND:
ORIGINAL
1995
1997

US Army Corps of Engineers
Rock Island District

No.	Description	Date	Approved
	Revisions		

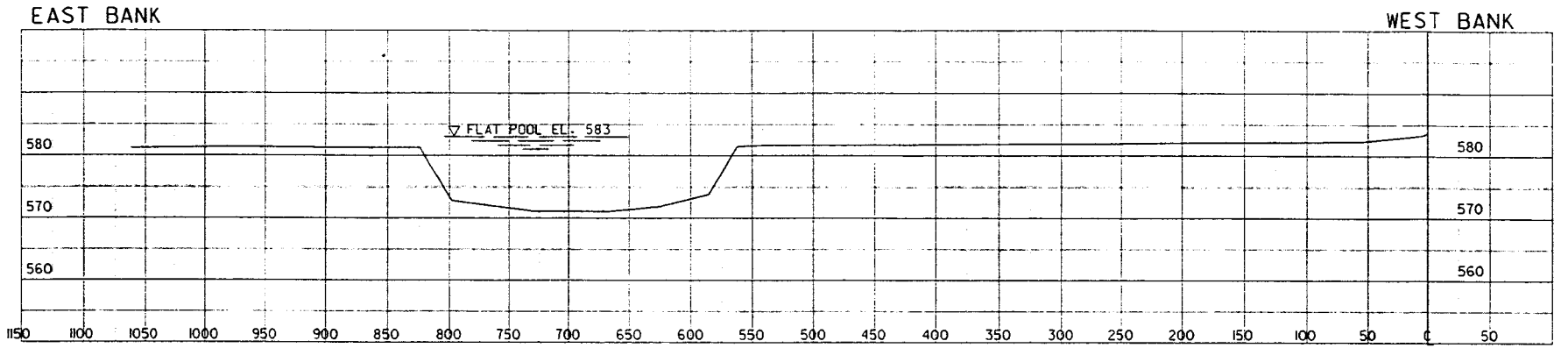
Designed By: CCK/KJD
Drawn By: SDB
Checked By: CCK/KJD
Reviewed By: CCK/KJD
Date:
Scales: AS SHOWN
Drawing Code:
Specification Number:
BLK

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

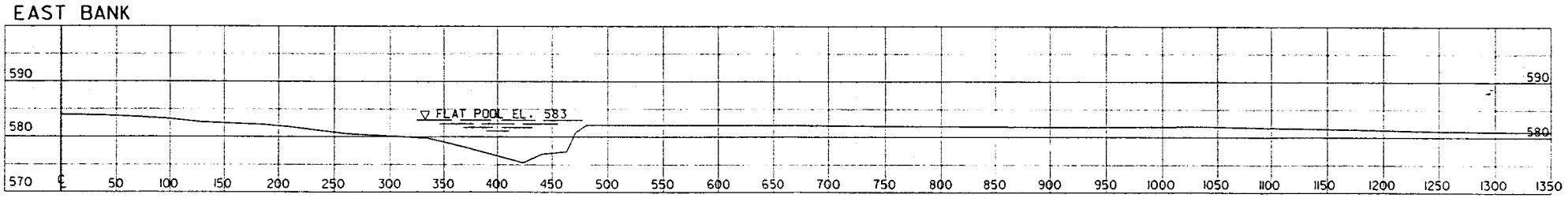
ENVIRONMENTAL MANAGEMENT PROGRAM
POOLS 15, KOFFERS MARSH

DREDGE PLAN AND PROFILE STA. 0+00B TO STA. 45+00B

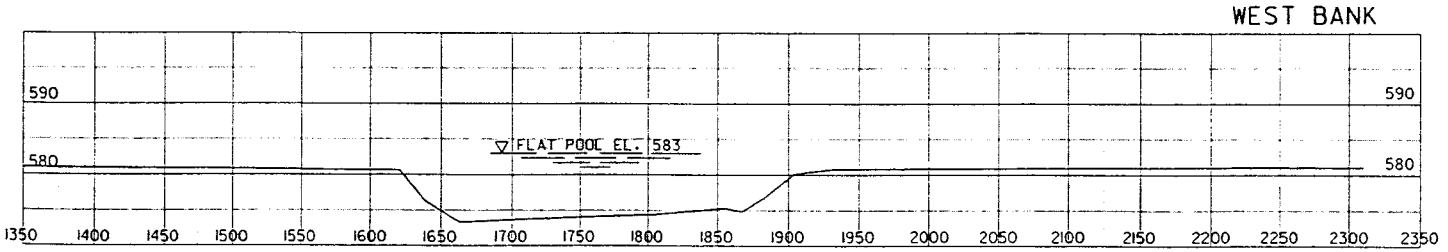
PLATE 6



SECTION 3E



SECTION 3D



SECTION 3D

LEGEND:

1A — SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES. MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

U.S. Army Corps of Engineers
Rock Island District

Symbol	Date	Description of Revisions

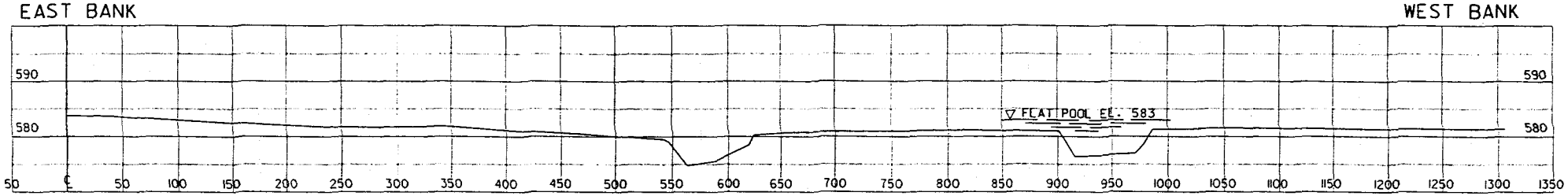
Designed by: CCK — Date: 4 MAY 1998
Drawn by: TPD — Scale: AS SHOWN
Checked by: CCK — Drawing Code:
Reviewed by: BLK — Sedimentation Number:

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

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT
POOL 13-RIVER MILE 523.5-526.5
POTTERS MARSH

COMPOSITE SEDIMENTATION CROSS SECTION

PLATE 7



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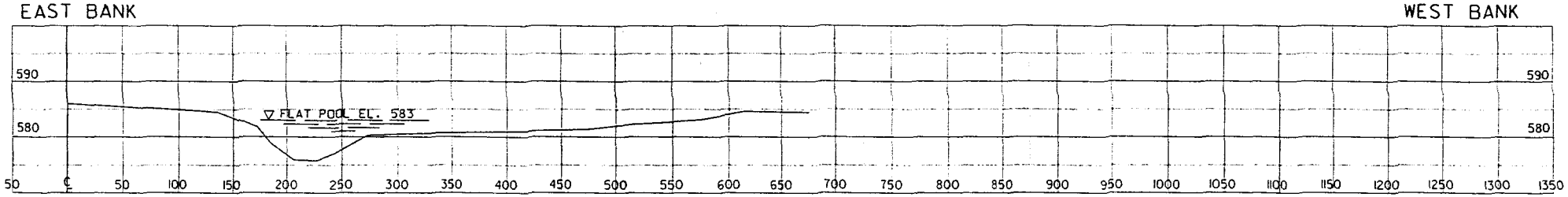


SECTION 3B

LEGEND:

1A SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES, MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

US Army Corps of Engineers Rock Island District

Symbol	Description	Date	Approved
	Revisions		

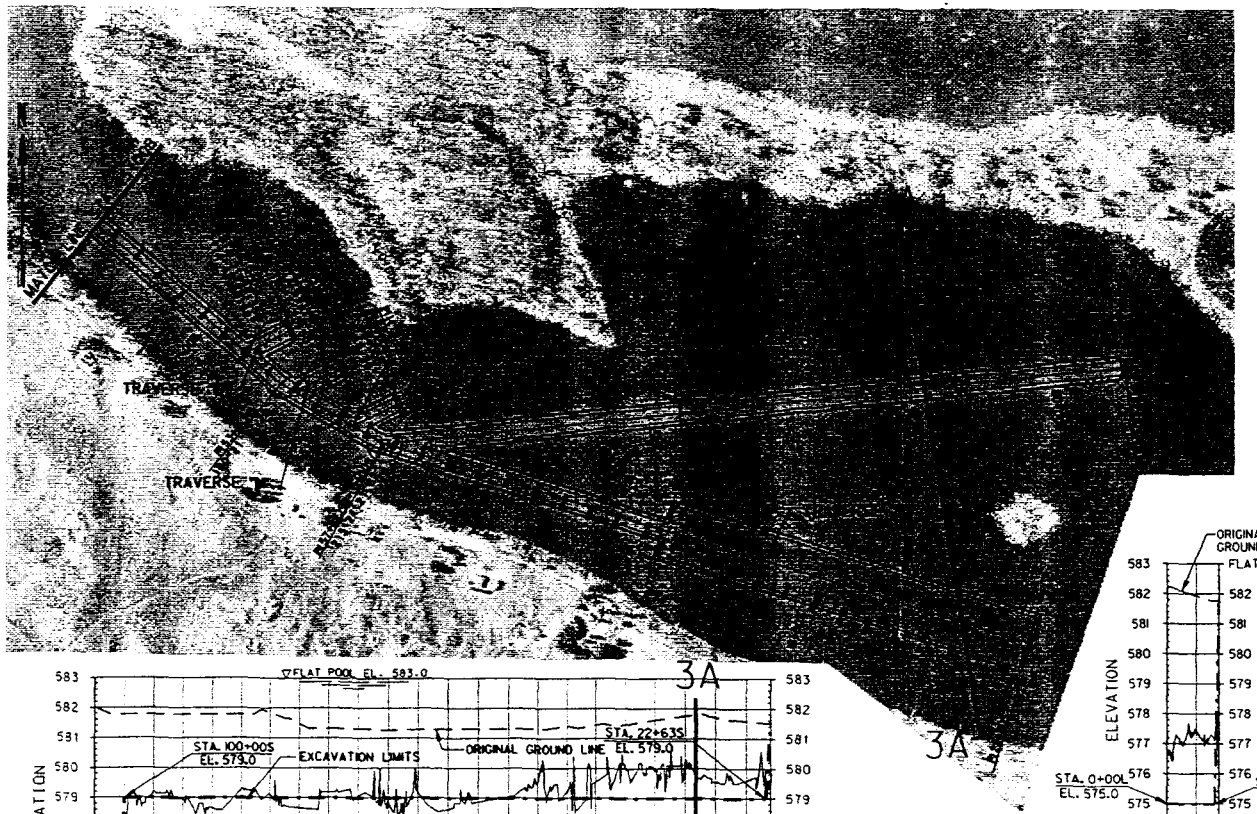
Designed by: CCK
Drawn by: TPD
Checked by: CCK
Reviewed by: BLK
Date: 4 MAY 1998
Scale: AS SHOWN
Drawing Code:
Installation Number:

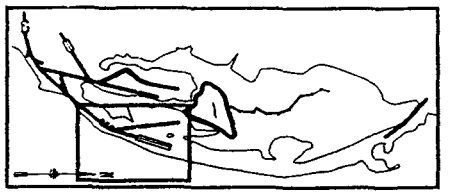
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT
POOL 13-RIVER MILE 523.5-526.5
POTTERS MARSH

COMPOSITE SEDIMENTATION CROSS SECTIONS

PLATE 8





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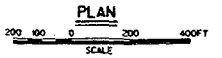
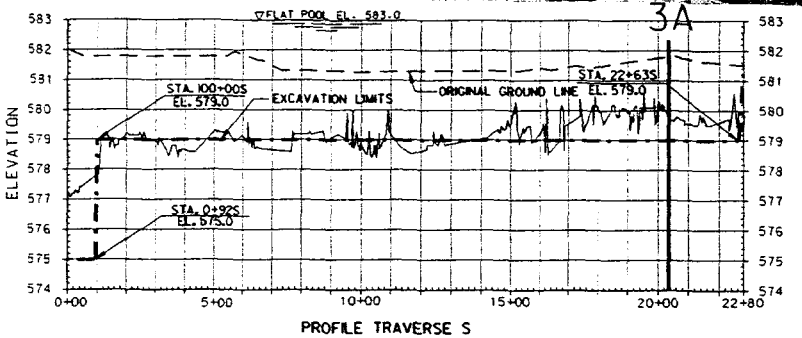
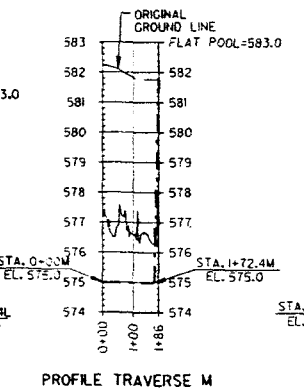
NO SCALE





PROFILE TRAVERSE S

PROFILE TRAVERSE L



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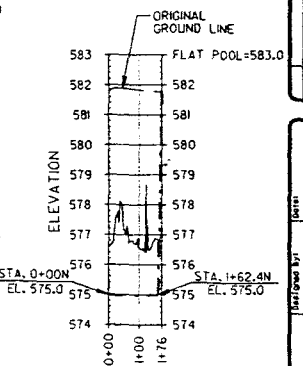
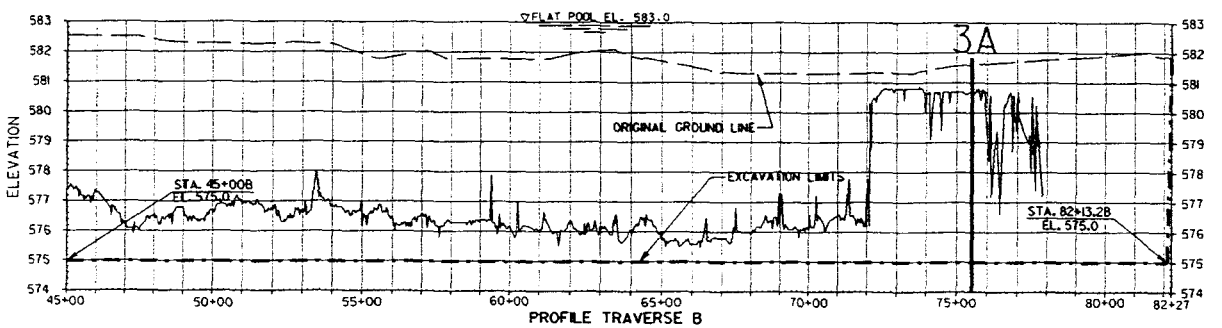


PROFILE TRAVERSE N



PROFILE TRAVERSE B

LEGEND:

ORIGINAL — — —

1995 — · — · —

1997 ———

U.S. Army Corps of Engineers
Rock Island District

No.	Description	Date	Approved
	Revisions		

Designed by: CCK/KJD	Scale: AS SHOWN		
Drawn by: SDB	Drawing Code:		
Checked by: CCK/KJD	Certification Number:		
Sectioned by: BLK			

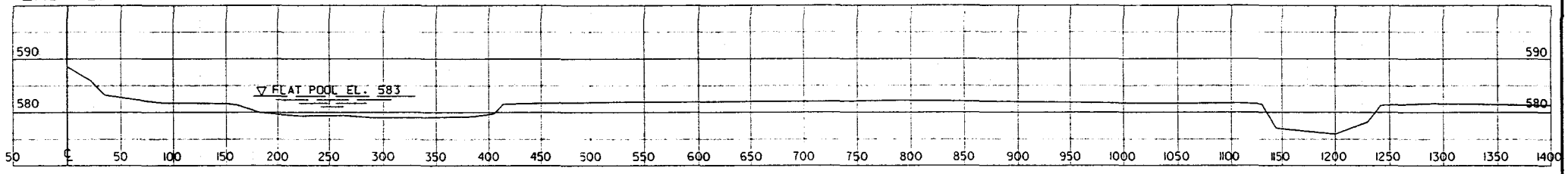
U.S. ARMY ENGINEER DISTRICT
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS

ENVIRONMENTAL MANAGEMENT PROGRAM
UPPER MISSISSIPPI RIVER SYSTEM
POOL 13 - NAVIGATION MILE 521.5-526.4
POTTERS MARSH

DREDGE PLAN AND PROFILE TRAVERSES B,L,M,N,AND S

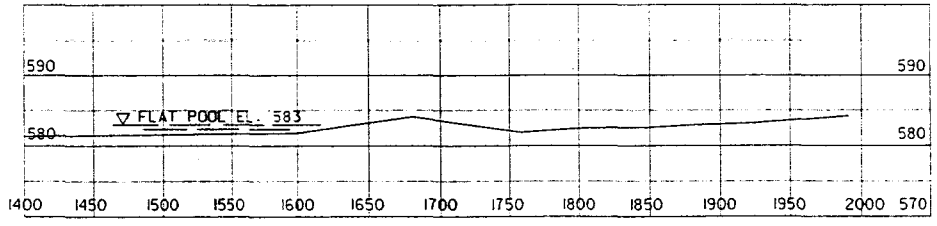
PLATE 9

EAST BANK



SECTION 3A

WEST BANK



SECTION 3A

LEGEND:

1A — SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES, MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

US Army Corps of Engineers Rock Island District

Symbol	Date	Approved	Description Revisions

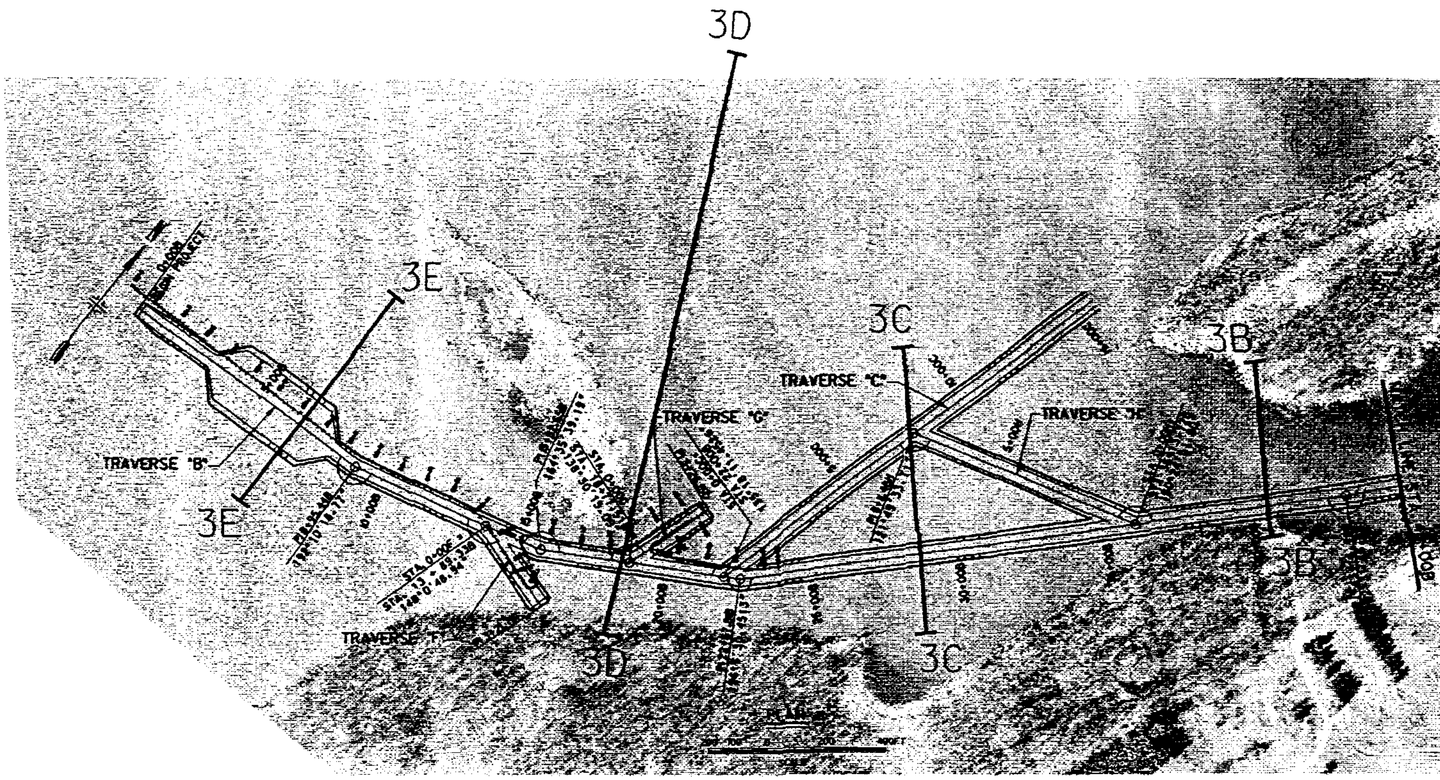
Designed by: CCK
Drawn by: TPD
Checked by: CCK
Reviewed by: BLK
Date: 4 MAY 1998
Scale: AS SHOWN
Drawing (Use)
Sattelite Number:

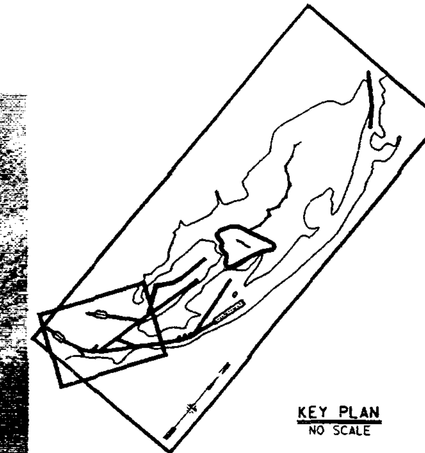
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT POOL 13-RIVER MILE 523.5-526.5 POTTERS MARSH

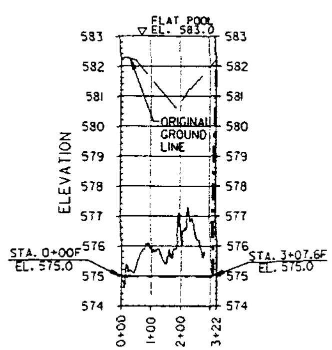
COMPOSITE SEDIMENTATION CROSS SECTION

PLATE 10

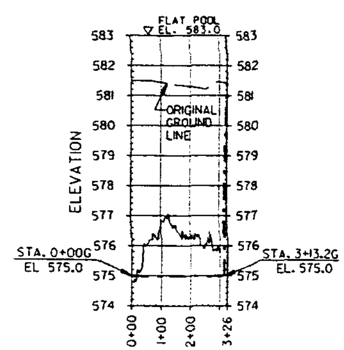




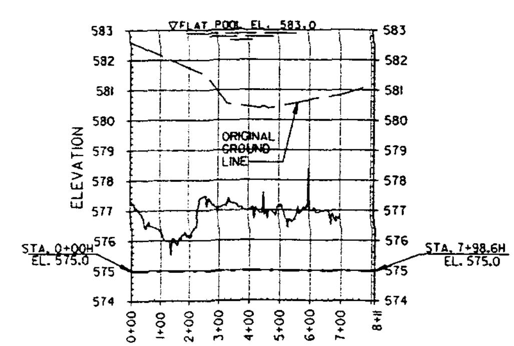
KEY PLAN
NO SCALE



PROFILE TRAVERSE F



PROFILE TRAVERSE G



PROFILE TRAVERSE H

LEGEND:

ORIGINAL — — —
1995 — · — ·
1997 ———

NOTE:

FOR SEDIMENTATION CROSS SECTIONS, SEE PLATES 7 AND 8.

US Army Corps of Engineers
Rock Island District

Symbol | Description | Date | Approved
Revisions

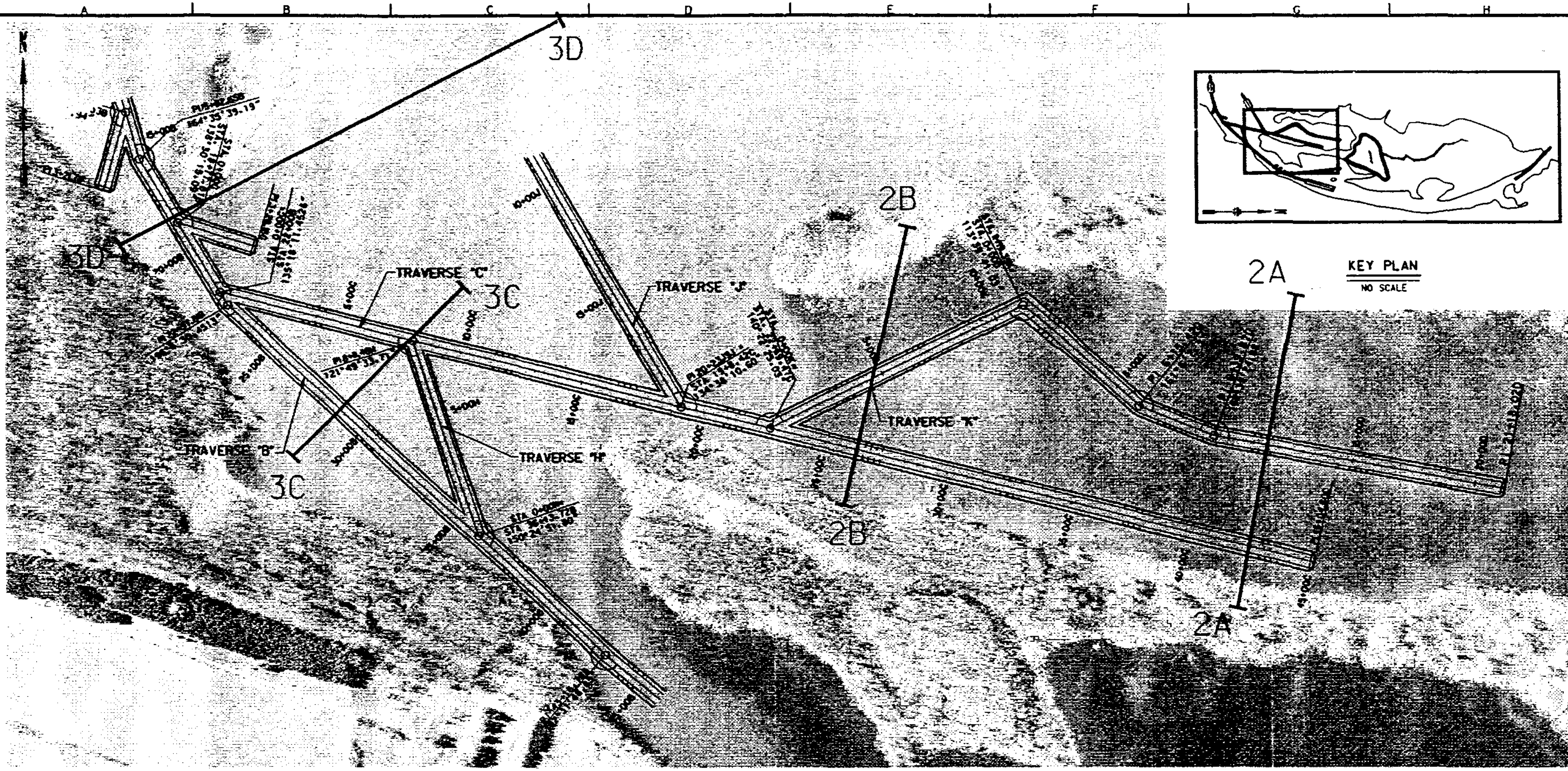
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed By: CCK/KJD
Drawn By: SDB
Checked By: CCK/KJD
Reviewed By: BLK
Date:
Scale: AS SHOWN
Drawing Code:
Solicitation Number:

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 523.5-526.5
POTTERS MARSH

DREDGE PLAN AND PROFILE TRAVERSES F,G,AND H

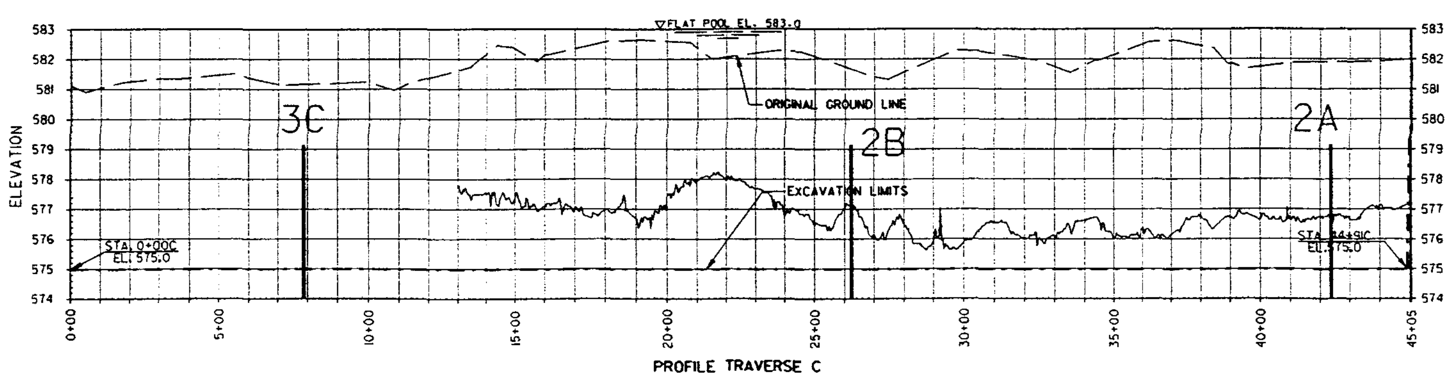
PLATE 11



KEY PLAN
NO SCALE

PLAN

200 100 0 200 400FT
SCALE



PROFILE TRAVERSE C

LEGEND:

ORIGINAL	— — —
1995	— · — · ·
1997	———

NOTE:

FOR SEDIMENTATION CROSS SECTIONS 3C AND 3D. SEE PLATES 7 AND 8.

US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

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

Designed By: CCK/KJD	Date:	
Drawn By: SDB	Scale: AS SHOWN	
Checked By: CCK/KJD	Drawing Code:	
Reviewed By: BLK	Solicitation Number:	

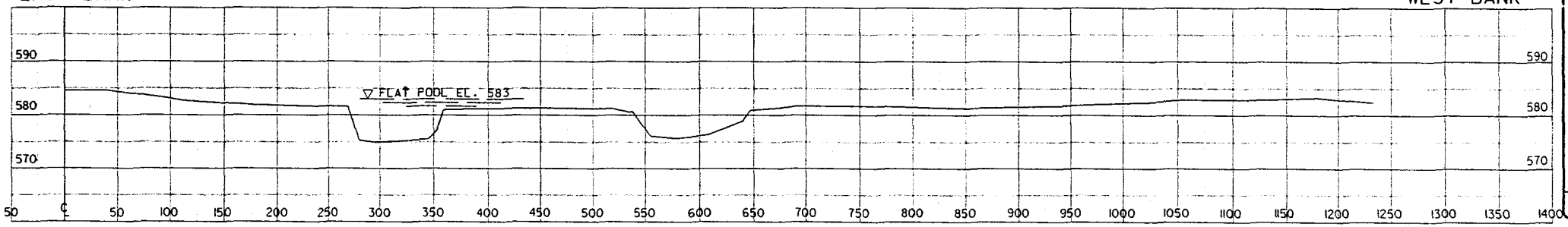
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 523.5-526.5
POTTERS MARSH

DREDGE PLAN AND PROFILE TRAVERSE C

PLATE 12

EAST BANK

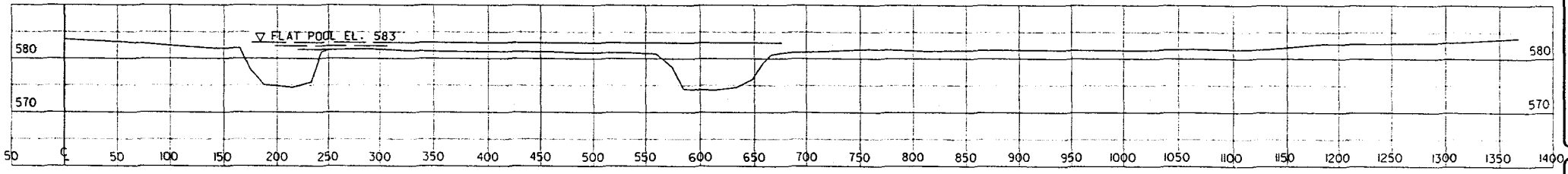
WEST BANK



SECTION 2B

EAST BANK

WEST BANK



SECTION 2A

LEGEND:

1A — SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES, MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

US Army Corps of Engineers Rock Island District

Symbol	Description Revisions	Date	Approved

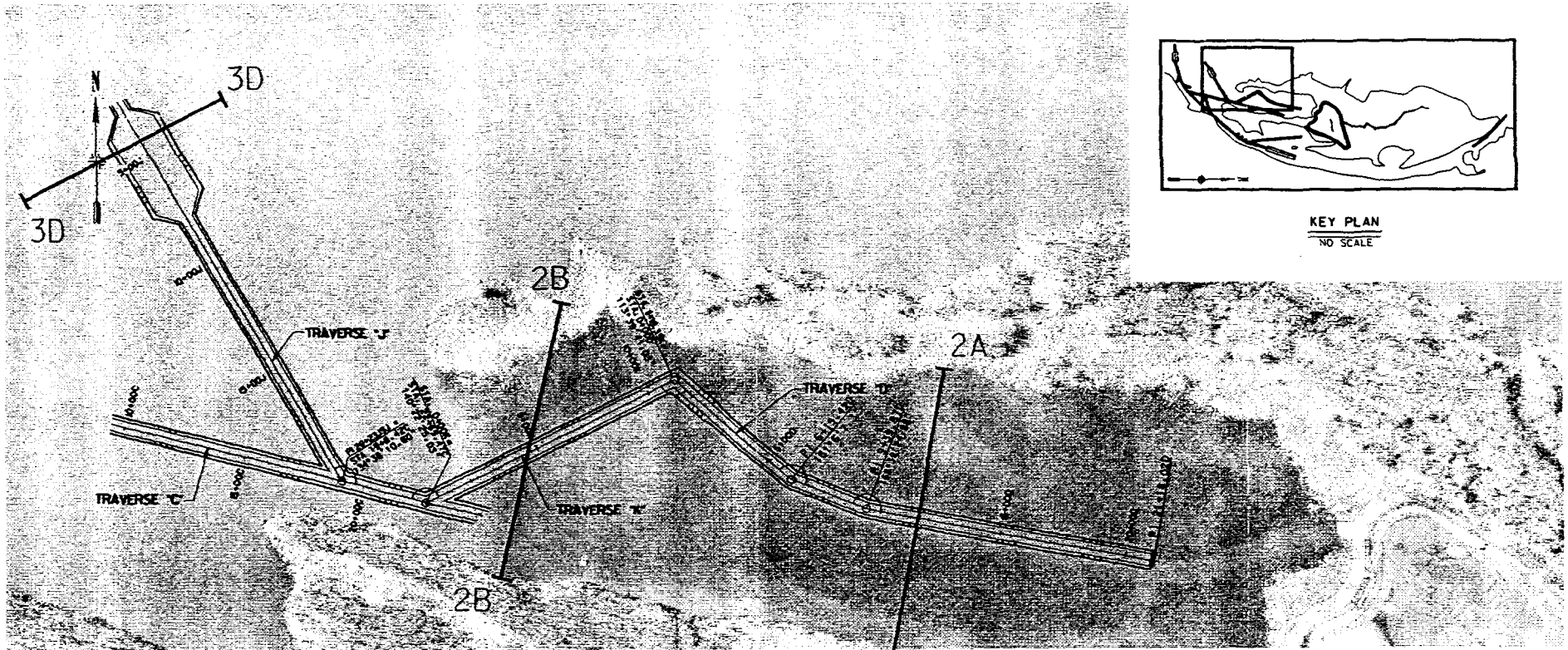
Designed By: CCK	Date: 4 MAY 1998		
Drawn By: TPD	Scale: AS SHOWN		
Checked By: CCK	Drawing Code:		
Reviewed By: BLK	Solicitation Number:		

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

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT
POOL 13-RIVER MILE 523.5-526.5
POTTERS MARSH

COMPOSITE SEDIMENTATION CROSS SECTIONS

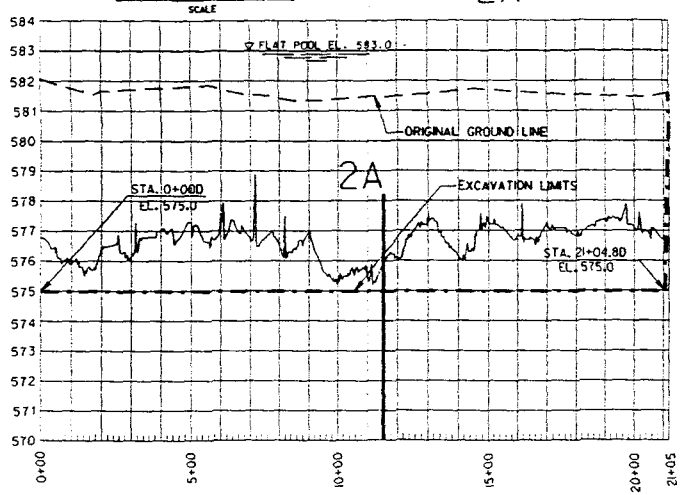
PLATE 13



PLAN

SCALE 200 100 0 200 400FT

KEY PLAN
NO SCALE



PROFILE TRAVERSE D

LEGEND:

ORIGINAL
1995
1997

NOTE:
FOR SEDIMENTATION CROSS SECTIONS. SEE PLATES 7 AND 13.

US Army Corps of Engineers Rock Island District

No.	Description	Date	Approved

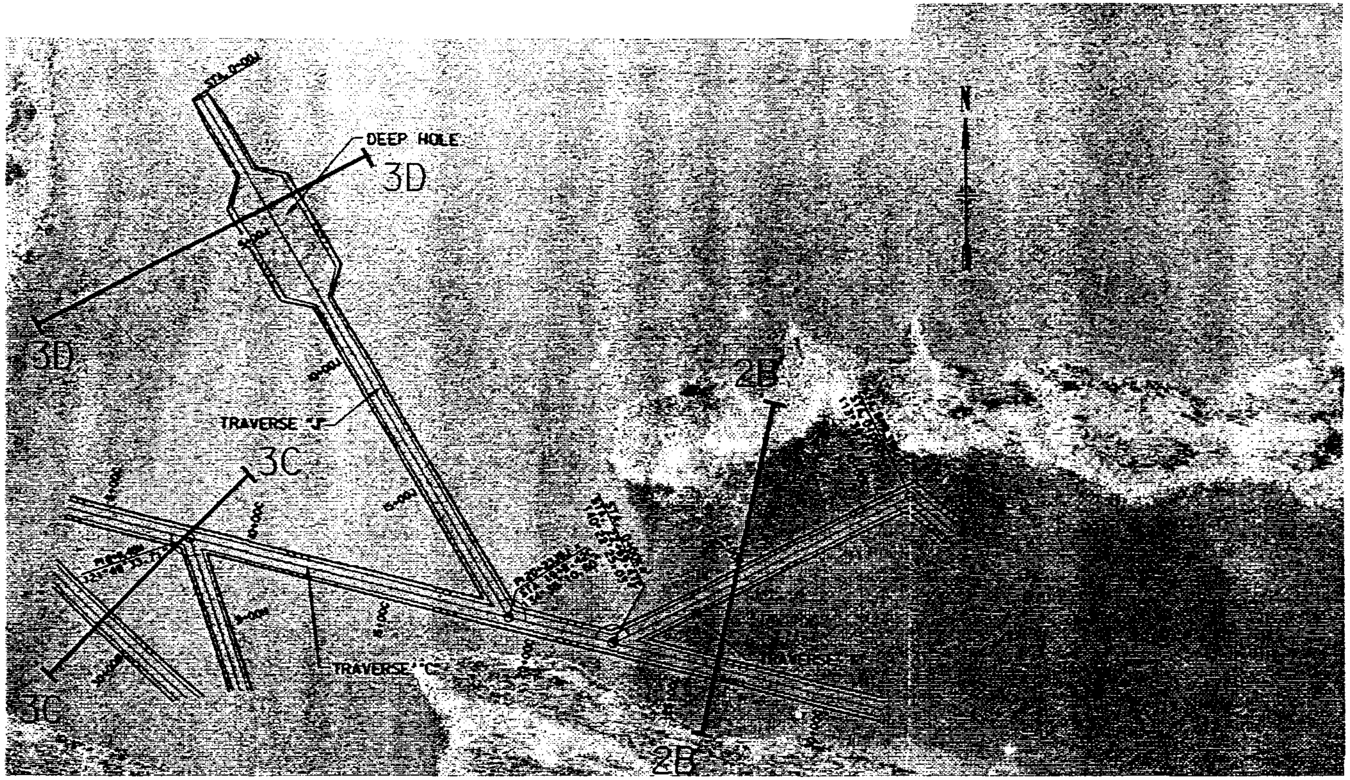
Designed by CCK/AJD
Drawn by SDB
Traced by CCK/AJD
Reviewed by BLK
Scale AS SHOWN
Drawing Code
Configuration Numbers

U.S. ARMY ENGINEER DISTRICT
ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13 - KYTE RIVER MILE 494.5 - 522.4
POTTERS MARSH

DREDGE PLAN AND PROFILE TRAVERSE D

PLATE 14



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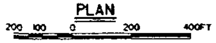
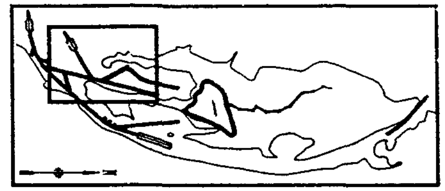
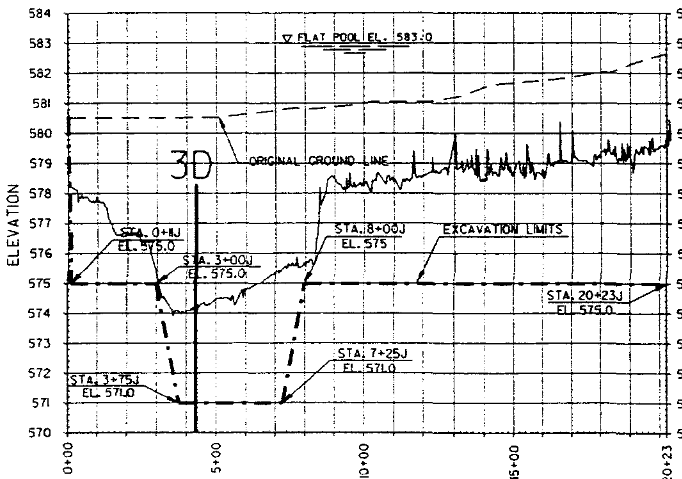


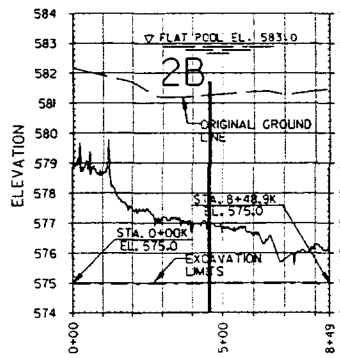


KEY PLAN

NO SCALE



PROFILE TRAVERSE J



PROFILE TRAVERSE K

LEGEND:

ORIGINAL	— — —
1995	— · — · ·
1997	———

NOTE:

FOR SEDIMENTATION CROSS SECTIONS, SEE PLATES 7, 8, AND 13.

US Army Corps of Engineers Rock Island District

Symbol	Description	Date	Approved

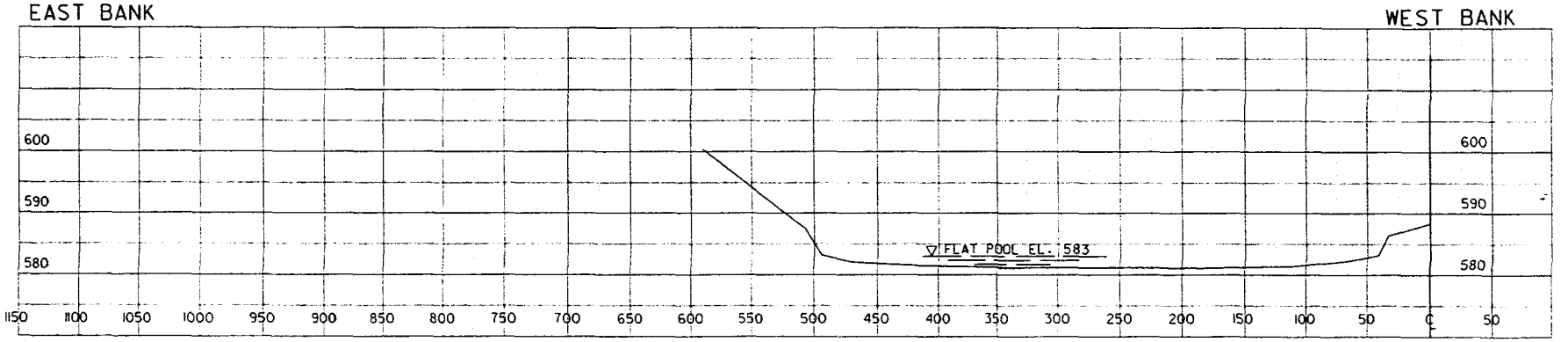
Revisions

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	Designed By: CCK/KJD	Date:
	Drawn By: SDB	Scale: AS SHOWN
	Checked By: CCK/KJD	Drawing Code:
	Reviewed By: BLK	Solicitation Number:

UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM POOL 13, RIVER MILE 523.5-526.5 POTTERS MARSH

DREDGE PLAN AND PROFILE TRAVERSES J AND K

PLATE 15



SECTION 4A

LEGEND:

1A — SEDIMENTATION CROSS SECTION REFERENCE NUMBER

NOTES:

1. POTTERS' MARSH EMP RANGES, MARCH 1998.
2. PROFILES LOOKING DOWNSTREAM.
3. FLAT POOL ELEVATION 583.0.

U.S. Army Corps of Engineers
Rock Island District

Description	Date	Approved
Revisions		

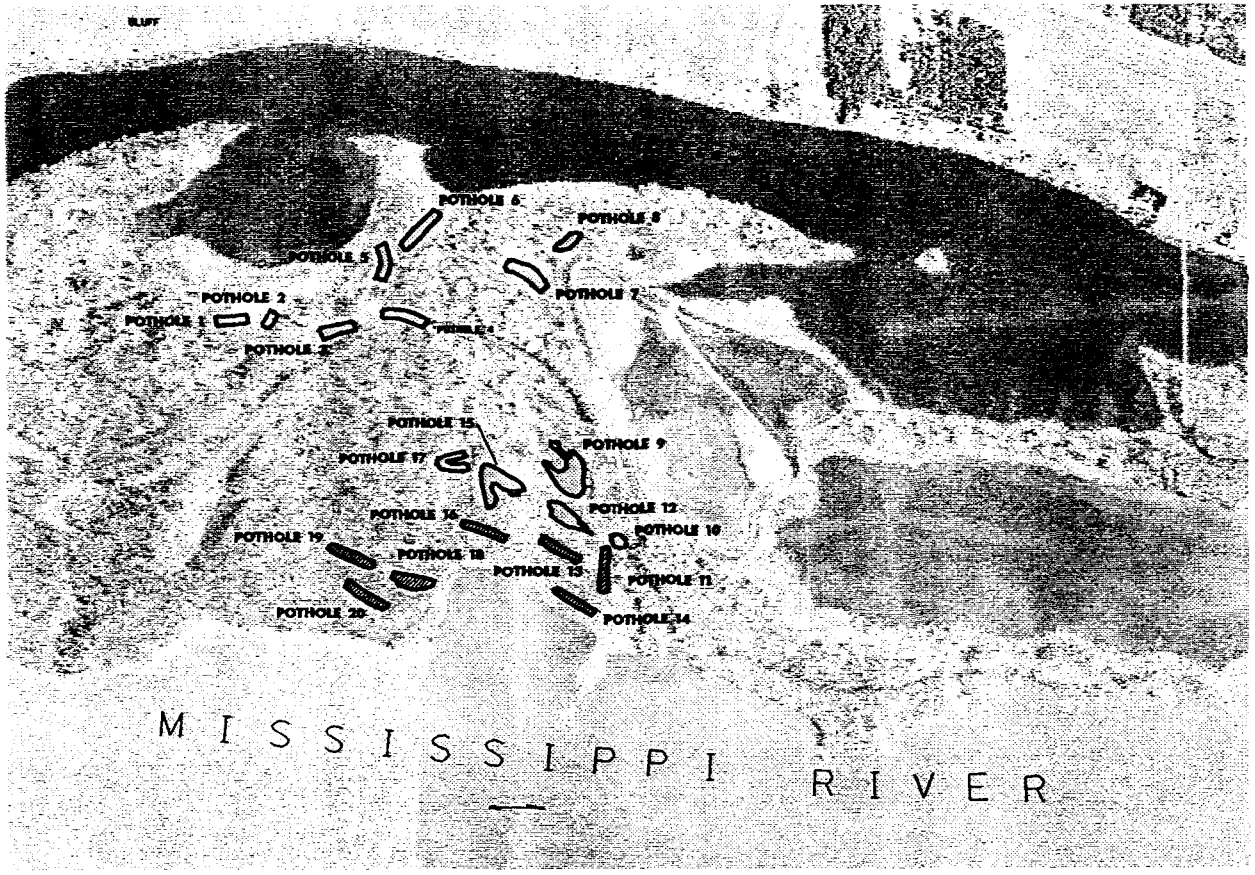
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

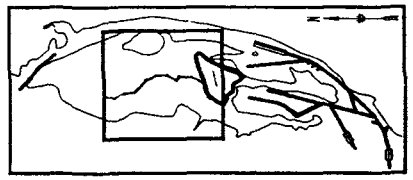
Designed by: CCK — Date: 4 MAY 1998
Drawn by: TPD — Scale: AS SHOWN
Checked by: CCK — Drawing Code:
Reviewed by: BLK — Solicitation Number:

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13-RIVER MILE 523.5-526.5
POTTERS MARSH

COMPOSITE SEDIMENTATION CROSS SECTIONS

PLATE 16





KEY PLAN

LEGEND

BLASTED POHOLES

MECHANICALLY EXCAVATED POTHOLES

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

Designed By: CCK/KJD
Drawn By: SDB
Checked By: CCK/KJD
Reviewed By: BLK
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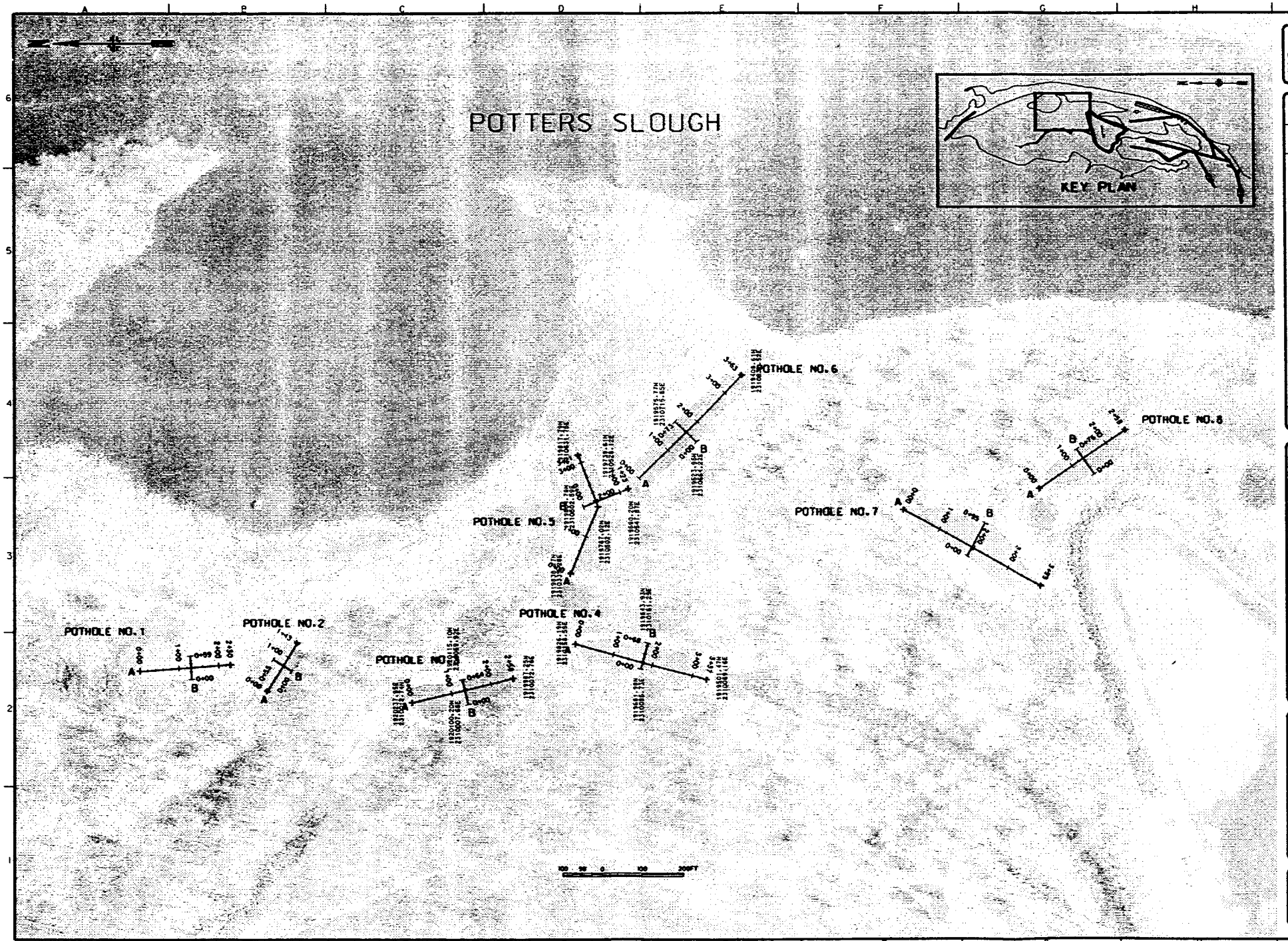
Identification Number:

Date | Description | Revisions

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOLS 13, 14, 15, & 16 (RM 573.5-526.5)
POTTERS MARSH

POTHOLE PLAN

PLATE 17



U.S. Army Corps of Engineers Rock Island District

No.	Description	Date	Approved
	Revisions		

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

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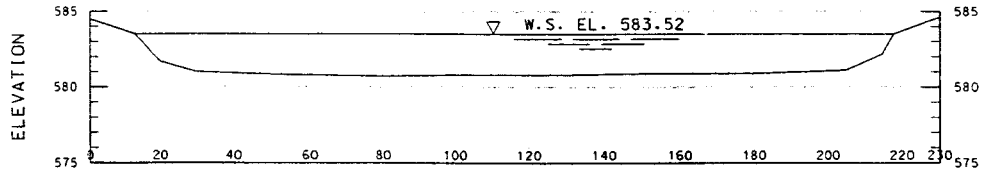
Drawn By: SDB		Drawing Code:	
Checked By: CCK/AJD		Installation Number:	
Reviewed By:		BLK	

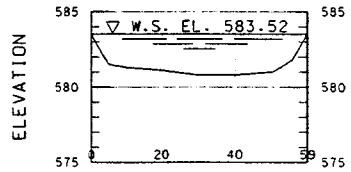
UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM POOL 15 - MYLE 523.5-526.5 POTTERS MARSH

PLAN VIEW POTHOLES 1-8

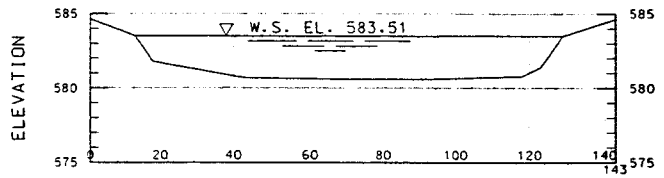
PLATE 18



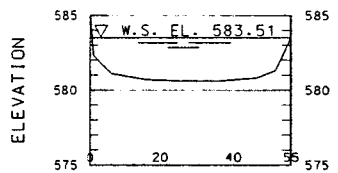
POTHOLE 1A



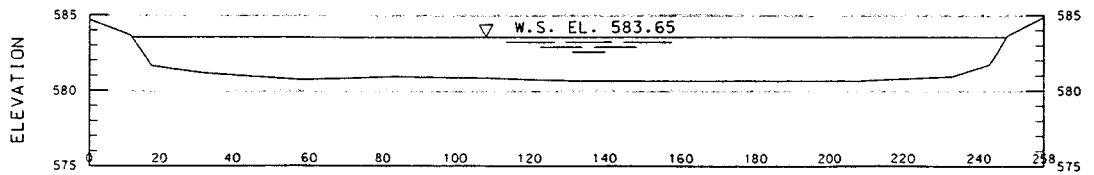
POTHOLE 1B



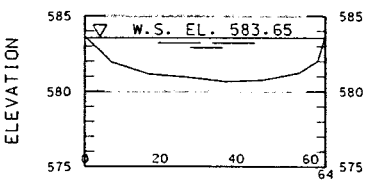
POTHOLE 2A



POTHOLE 2B



POTHOLE 3A



POTHOLE 3B

NOTE:

1. 1989. FIELD BOOK FC-89-44.
   1990-1991. FIELD BOOK FC-90-1
   FEB 4,1997. OD FIELD BOOK

U.S. ARMY ENGINEER DISTRICT
ROCK ISLAND, ILLINOIS

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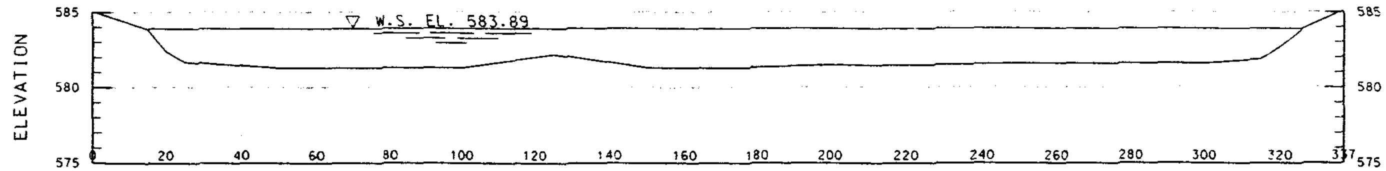
US Army Corps of Engineers
Rock Island District

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13 & ADJACENT REACHES
POTTERS MARSH

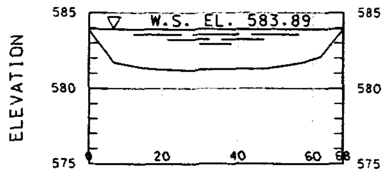
SEDIMENTATION TRANSECTS MECHANICALLY EXCAVATED POTHOLES 1-3

PLATE 19

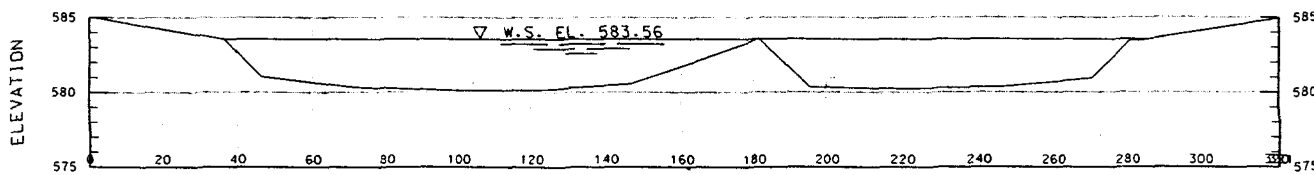
25-SEP-1998 13:13
d:\projects\mapping\sept13.dgn



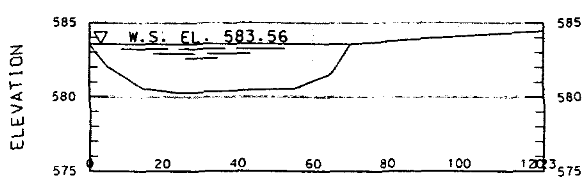
POTHOLE 4A



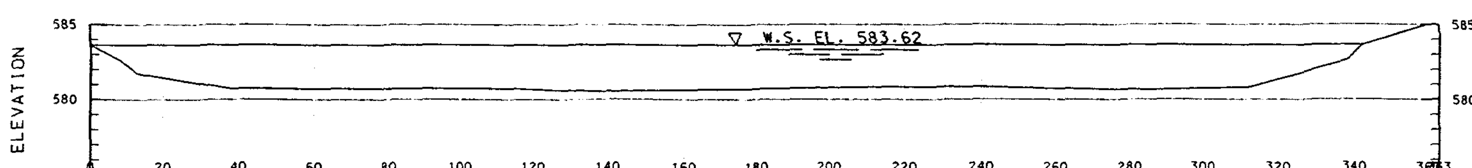
POTHOLE 4B



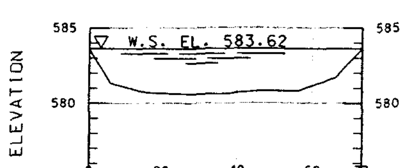
POTHOLE 5A



POTHOLE 5B



POTHOLE 6A



POTHOLE 6B

NOTE:

1. 1989. FIELD BOOK FC-89-44.
1990-1991. FIELD BOOK FC-90-1
FEB 4.1997. OD FIELD BOOK

US Army Corps of Engineers Rock Island District

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

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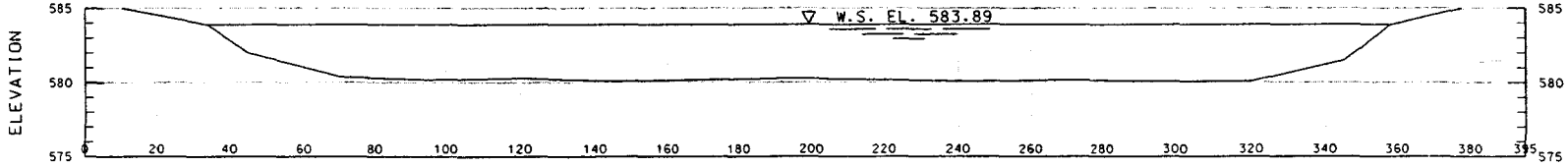
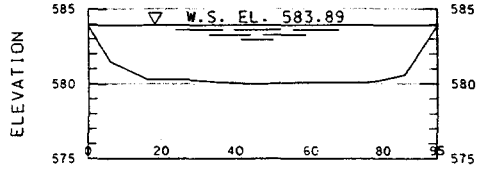
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 523.5-526.5
POTTERS MARSH

SEDIMENTATION TRANSECTS MECHANICALLY EXCAVATED POTHOLES 4-6

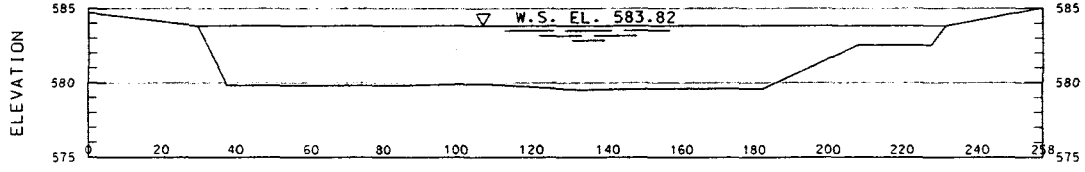
PLATE 20



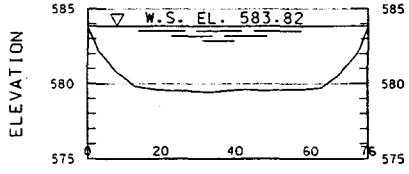
POTHOLE 7A



POTHOLE 7B



POTHOLE 8A



POTHOLE 8B

NOTE:

1. 1989. FIELD BOOK FC-89-44,
   1990-1991. FIELD BOOK FC-90-1
   FEB 4,1997. OD FIELD BOOK

US Army Corps of Engineers
Rock Island District

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	Revisions		

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

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UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13: NAVIDALE KY. 5-526.5
POTTERS MARSH

SEDIMENTATION TRANSECTS
MECHANICALLY EXCAVATED
POTHOLES 7,8

PLATE 21

US Army Corps of Engineers
Rock Island District

Symbol	Description	Date	Approved
	Revisions		

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

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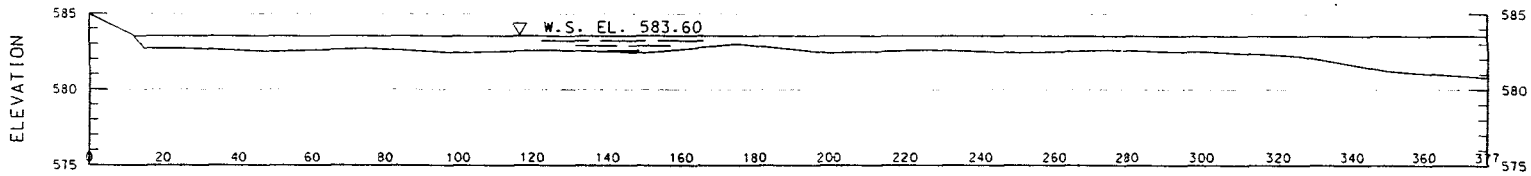
Reviewed by: BLK	Solicitation Number:

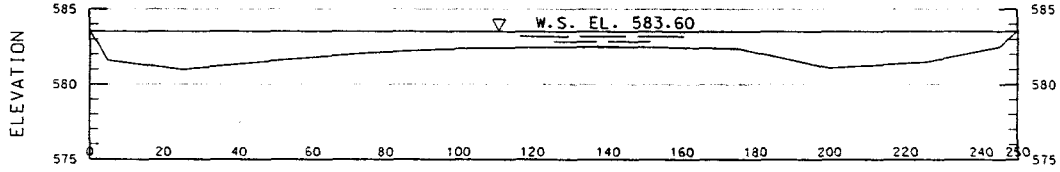
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 523.5-526.5
POTTERS MARSH

PLAN VIEW
POTHOLES 9-19

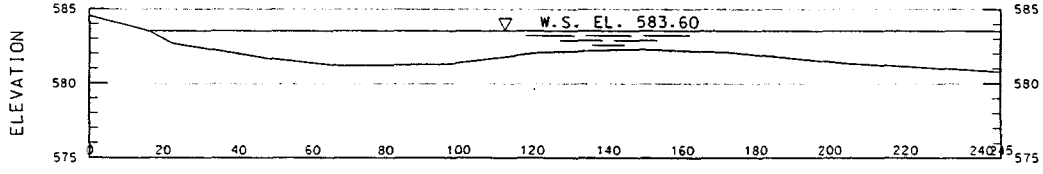
PLATE 22



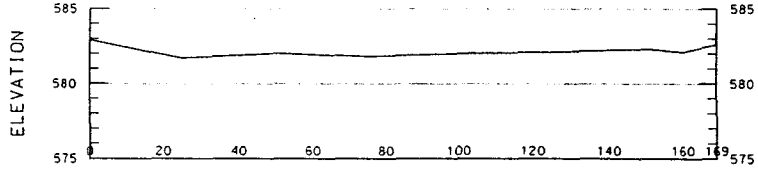
POTHOLE 9A



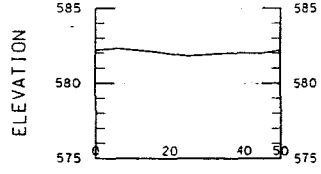
POTHOLE 9B



POTHOLE 9C



POTHOLE 10A - SEE NOTE 2

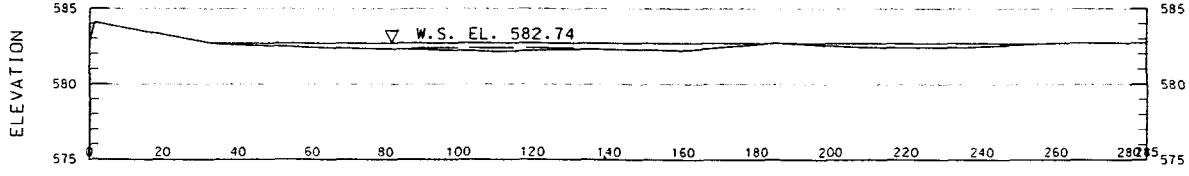


POTHOLE 10B

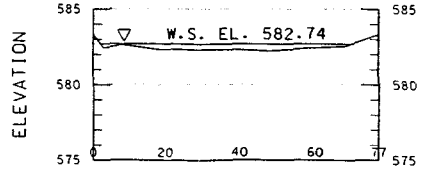
NOTE:

1. 1989, FIELD BOOK FC-89-44,
   1990-1991, FIELD BOOK FC-90-1
   FEB 4,1997, OD FIELD BOOK

2. NO WATER PRESENT IN
   POTHOLE 10 DURING
   2/6/97 SURVEY



POTHOLE 12A



POTHOLE 12B

US Army Corps of Engineers
Rock Island District

Revisions

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ROCK ISLAND, ILLINOIS

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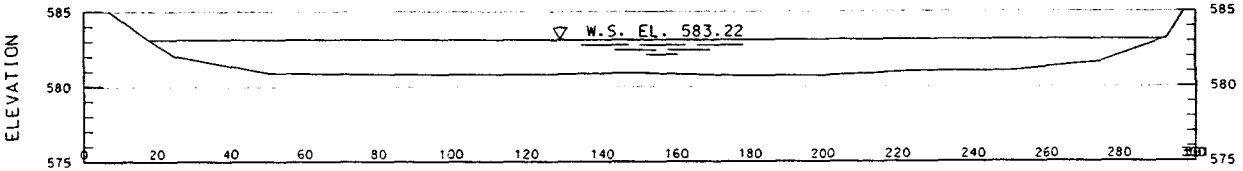
Reviewed by: BLK	Solicitation Number:

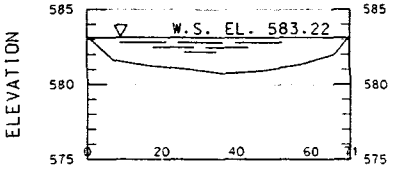
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13 - POTTERS MARSH

SEDIMENTATION TRANSECTS MECHANICALLY EXCAVATED POTHOLES 9, 10, 12

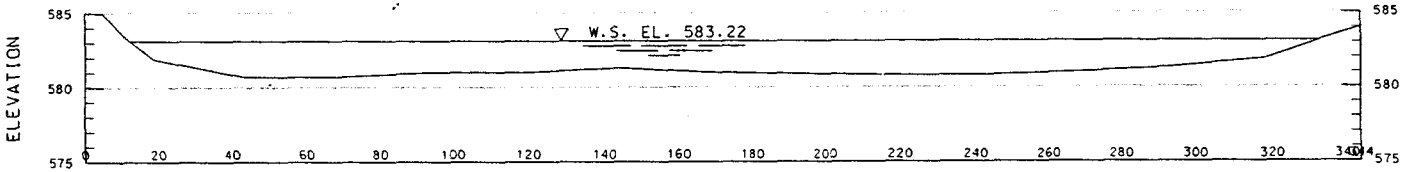
PLATE 23



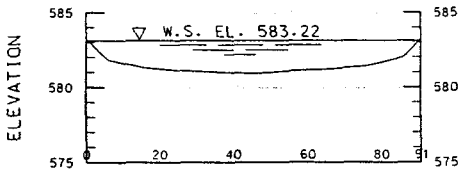
POTHOLE 15A



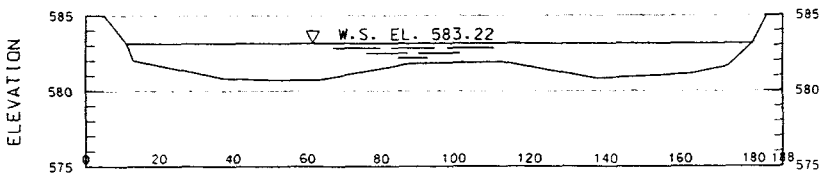
POTHOLE 15B



POTHOLE 15C



POTHOLE 15D



POTHOLE 15E

NOTE:

1. 1989. FIELD BOOK FC-89-44.
   1990-1991. FIELD BOOK FC-90-1
   FEB 4.1997. OD FIELD BOOK

US Army Corps of Engineers
Rock Island District

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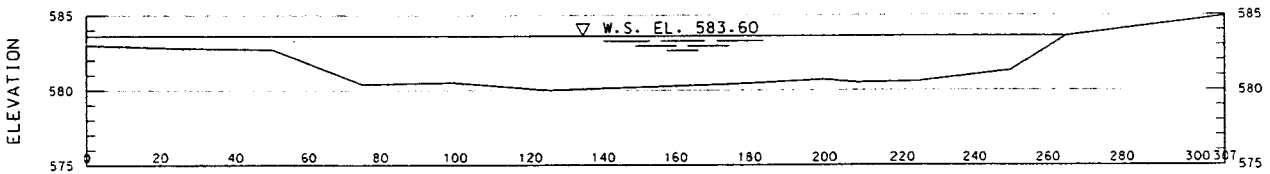
Checked by: CCK/KJD		Submission Numbers:	
Reviewed by: BLK			

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

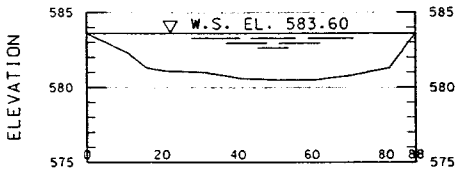
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13: RIVER MILE 523.5-526.5
POTTERS MARSH

SEDIMENTATION TRANSECTS MECHANICALLY EXCAVATED POTHOLE 15

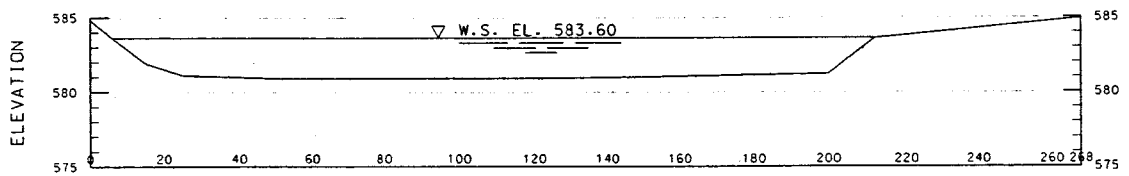
PLATE 24



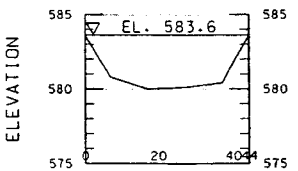
POTHOLE 17A



POTHOLE 17B



POTHOLE 17C



POTHOLE 17D

NOTE:

1. 1989. FIELD BOOK FC-89-44.
   1990-1991. FIELD BOOK FC-90-1
   FEB 4.1997. OD FIELD BOOK

US Army Corps of Engineers Rock Island District

Revisions

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

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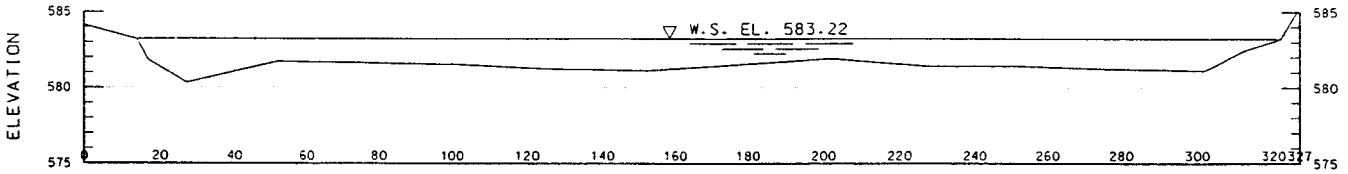
Checked By: CCK/KJD
Reviewed By: BLK
Scale: AS SHOWN
Drawing Code:
Calibration Number:

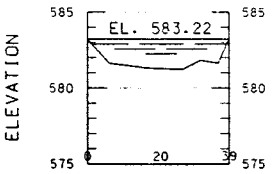
UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOLS 13, 14 & WING DIKE 130.5-138.5
POTTERS MARSH

SEDIMENTATION TRANSECTS
MECHANICALLY EXCAVATED
POTHOLE 17

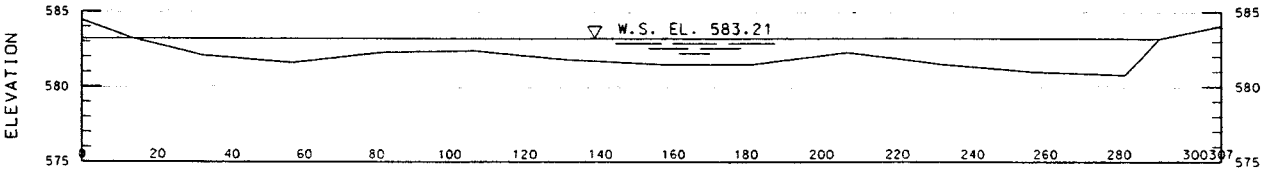
PLATE 25



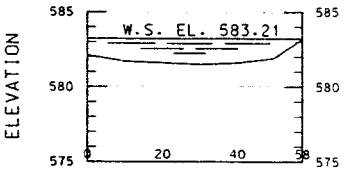
POTHOLE 11A



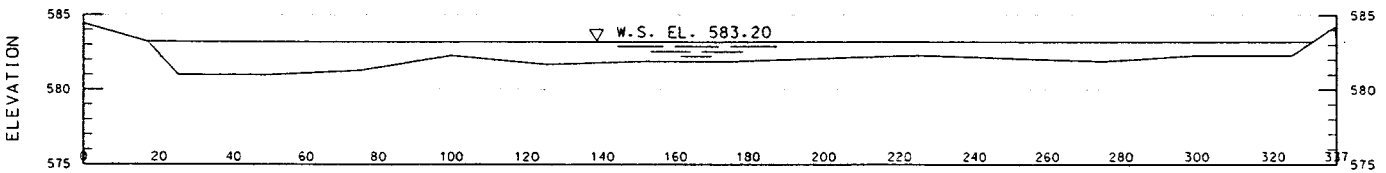
POTHOLE 11B



POTHOLE 13A



POTHOLE 13B



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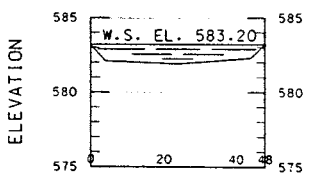
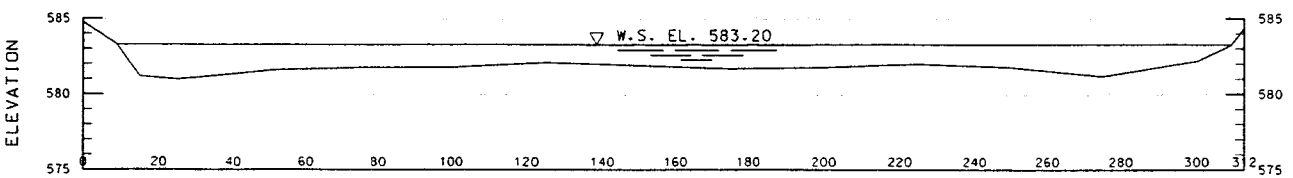
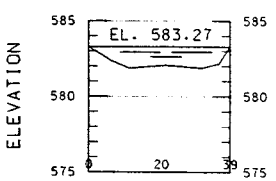


POTHOLE 14B



POTHOLE 16A



POTHOLE 16B

NOTE:

1. 1989. FIELD BOOK FC-89-44.
   1990-1991. FIELD BOOK FC-90-1
   FEB 4.1997. OD FIELD BOOK

US Army Corps of Engineers Rock Island District

Revisions

Symbol	Description	Date	Approved

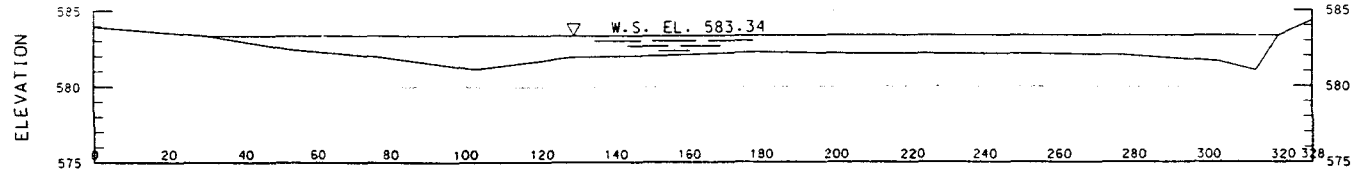
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS

Designed By	Date
CCK/KJD	
Drawn By	Scale
SDB	AS SHOWN
Checked By	Drawing Code
CCK/KJD	
Reviewed By	Installation Number
BLK	

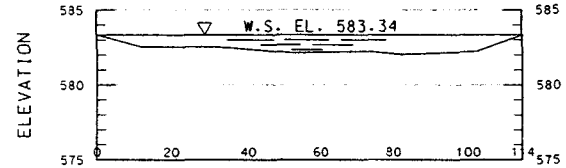
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 523.5-528.5
POTTERS MARSH

SEDIMENTATION TRANSECTS BLASTED POTHOLES 11, 13, 14, 16

PLATE 26



POTHOLE 18A



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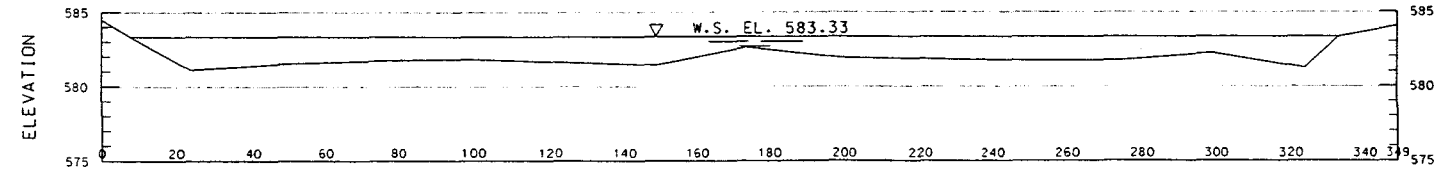
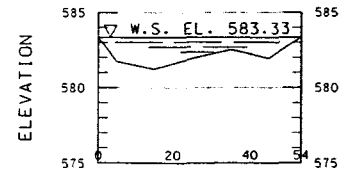


POTHOLE 19A



POTHOLE 19B

NOTE:

1. 1989. FIELD BOOK FC-89-44.
   1990-1991. FIELD BOOK FC-90-1
   FEB 4.1997. OD FIELD BOOK

US Army Corps of Engineers
Rock Island District

Revisions

Symbol	Description	Date	Approved

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

Designed by CCK/KJD | Scales AS SHOWN
Drawn by SDB | Drawing Code
Checked by CCK/KJD | Solicitation Number
Reviewed by BLK

UPPER MISSISSIPPI RIVER
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, POTTERS MARSH, S-526.5
POTTERS MARSH

SEDIMENTATION TRANSECTS BLASTED POTHOLES 18, 19

PLATE 27