



**US Army Corps  
of Engineers**  
St. Paul District

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# **OPERATION AND MAINTENANCE MANUAL**

## **ENVIRONMENTAL MANAGEMENT PROGRAM (HREP)**

### **POOL 8 ISLAND CONSTRUCTION PHASE I**

## **VERNON COUNTY, WISCONSIN**

**DECEMBER 1993**

## PREFACE

The Pool 8, Phase I Island Construction Habitat Rehabilitation and Enhancement Project, constructed by the Corps of Engineers, was completed in June 1993. In accordance with Section 906(e) of the Water Resources Development Act of 1986 and the policies set forth in the Fourth and Fifth Annual Addendums, the U.S. Fish and Wildlife Service has the responsibility for operation and maintenance. The Corps of Engineers has prepared this manual to assist in fulfilling the operation and maintenance tasks.

The manual and appendices contain the latest approved agreements, maps, drawings, tables, and references pertinent to operation and maintenance of this project. Project evaluation features, a Corps responsibility, have also been included (appendix E) in order to provide a full perspective of post-construction project activities. Suggested monitoring that could be performed by others is also presented in this appendix.

The project as designed and constructed will improve fish and wildlife habitat in selected backwater areas of lower pool 8. However, continued successful functioning of the project will depend upon the manner in which the project is maintained. Careful inspection and proper maintenance can help accomplish that goal.

The planning, design, and construction of the project was the result of an extensive cooperative and coordination effort on the part of the involved Federal and State agencies and the public. The continuation of this cooperation and coordination as part of the operation and maintenance of the project will be important to the success of the project and is strongly encouraged.

DEPARTMENT OF THE ARMY  
St. Paul District, Corps of Engineers  
180 East Kellogg Boulevard, Room 1421  
St. Paul, Minnesota 55101-1479

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMEMENT PROGRAM

POOL 8 ISLAND CONSTRUCTION, PHASE I  
POOL 8, UPPER MISSISSIPPI RIVER  
VERNON COUNTY, WISCONSIN

OPERATION AND MAINTENANCE MANUAL

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## INTRODUCTION

This manual has been prepared to serve as a guide for the operation and maintenance of the Pool 8 Island Construction Rehabilitation and Enhancement Project in Vernon County, Wisconsin. Operation and maintenance instructions for the major features of the project are presented. These instructions are consistent with the general procedures found in the Pool 8 Definite Project Report dated June 1989. This manual has been written for project and management personnel familiar with the project. It does not contain detailed information which is common knowledge to personnel or which is presented in other existing manuals or regulations.

The intent of the maintenance instructions is to present preventive maintenance information consisting of systematic inspections and subsequent corrective actions which should ensure long-term use of project features. A timely maintenance program prevents major damage to constructed features by early corrective action.

For ease in use, this manual is divided into two sections.

Part I. This section describes the project features and provides historical information on the project.

Part II. This section gives details on the operation and maintenance of the project.

The planning, design, and construction of the project was the result of an extensive cooperative and coordination effort on the part of the involved Federal and State agencies and the public. The continuation of this cooperation and coordination as part of the operation and maintenance of the project will be important to the success of the project and is strongly encouraged.

## PART I - PROJECT FEATURES AND CONSTRUCTION HISTORY

### AUTHORIZATION AND LOCATION

The Pool 8 Island Construction project (Phase I) was authorized under the provisions of the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99- 662). This is the first of several projected island construction projects envisioned for this pool of the Mississippi River. The study and construction of any additional islands in lower pool 8 will take place over a period of years. Due to the size of this reach of the river, the potentially large number of islands that could be constructed (and associated high costs), and the opportunity to gain knowledge through staged construction, the project was broken down into five phases. Information on these subsequent phases will be added to this manual as additional islands are completed.

The Phase I project area is located in pool 8 of the Upper Mississippi River, just downstream from the city of Brownsville, Minnesota and across from Stoddard, Wisconsin. It is in the lower end of the pool along the right side of the navigation channel between river miles 678.8 and 685.3. The project lies within the Upper Mississippi River National Wildlife and Fish Refuge in a closed portion of the refuge.

Because the Phase I project is located on Federal lands managed as a National Wildlife Refuge, operation and maintenance are to be carried out in compliance with Section 906(e) of the 1986 Water Resources Development Act and policies set forth in the Fourth and Fifth Annual Addendums.

## DESCRIPTION OF PROJECT

### General

Prior to construction of the lock and dam system, what is now known as lower pool 8 was made up of sloughs, marshes, meadows, and low-lying floodplain forests. Following inundation (1939) a narrow rim of islands existed along the main channel of the Mississippi River in lower pool 8. The number and size of these islands have dramatically decreased since the early 1940's. The islands historically acted as barriers which reduced flow into backwater areas and broke up wind and wave action. Currently the area provides valuable habitat for wildlife, including waterfowl, wading birds, muskrats, and eagles and fish of the families centrarchidae, perchidae, and ictaluridae. It is especially important as a resting and feeding area to migratory waterfowl. This is primarily due to the presence of emergent and submerging aquatic vegetation on the downstream side of the remaining islands. In recent years there has been an increasing loss in island mass as well as a reduction in aquatic vegetation.

The entire project was designed to restore and stabilize existing islands as well as create new islands in order to protect valuable backwater areas by reducing wind generated waves and turbidity within these portions of lower pool 8. The island construction was also designed to provide stable land masses that could be used by waterfowl as nesting and loafing areas. The Definite Project Report/Environmental Assessment (SP-4), Pool 8 Island Construction, Phase I Habitat Rehabilitation and Enhancement Project, June 1989 and subsequent Environmental Assessment, Design Changes to Pool 8 Island Construction, Phase I, dated March 1991, provide details on the overall project.

## Design Considerations

For Phase I the prime criterion in determining the general location of these islands was to take advantage of existing high ground wherever possible. Other guidelines which were followed included: (a) the use of existing aquatic vegetation, islands, and underwater remnant islands for shoreline protection of the new islands where possible; (b) maximize fish and wildlife benefits through the consideration of wind direction, river flows, and navigation; (c) minimize filling behind the existing islands as much as possible; (d) geotechnical considerations; and (e) minimize the affects on the 100 year flood elevation. With Phase I then, the existing islands were used for most of the layout. The additional island was positioned to connect to existing islands remnants and to take advantage of the protection that could be received from aquatic vegetation which currently grows along the main channel.

The proposed island height was based on numerous factors. As part of this decision-making process, the following information was used: (a) islands in lower pools 7, 8, and 9 that are relatively stable typically have top elevations of 4 feet or more above the average water surface elevation; (b) islands that have been severely eroded initially had top elevations less than 3 feet above the average water surface elevation; (c) use of the island by wildlife requires that inundation by floods be minimized; and (d) construction costs discourages consideration of higher top elevations. Using all of this, an elevation approximately equivalent to the 10-year flood event was selected. In the Phase I area, the island elevation was to vary from 634.8 feet msl for the downstream newly created island to 635.1 feet msl for rehabilitation of the existing horse-shoe shaped island.

The key island design consideration from the standpoint of erosion control was selection of the island cross section and those areas which would require the additional protection afforded by riprap. The top width of the islands was selected based on the topography of the existing islands, coupled with island stability and economic considerations. Riprap was placed only in sections where it appeared that erosive forces required additional protection. Placement was based on flow considerations and field investigations. All non-riprapped island areas were constructed with a berm. This feature was added to the design to help create a stable back slope over time. On the non-riprapped portions of the islands, it is anticipated that wave and ice action will change the shape of these areas from season to season. The erosive action will eventually produce a beach having a slope of about 1 vertical to 10 horizontal along a majority of the inner island area. However, ice forces will continue to cause the buildup of ridges along the beach in the winter, and wave action will break them down in the summer. The berm slopes were designed to combine ease of construction with what nature would most likely create over time. In this and other pools, field investigations indicated that side slopes under water are usually about 1 foot vertical for every 12 feet horizontal. Construction of this type of slope would be very difficult and costly because of underwater construction, so a cross section was selected to most closely reflect this final slope.

### Islands

Under stage 1 construction (see Construction History), the existing horseshoe-shaped island on the right descending bank of the main channel at river mile 687.5 was raised and extended. Construction extended downstream from the island apex approximately 1,000 feet on the main channel side, and approximately 2,400 feet along a secondary channel known as Raft Channel.

Under stage 2 construction the main channel leg of the horseshoe-shaped island was extended an additional 2,850 downstream. The extension of this island leg blocked an old preinundation side channel called Benover Slough. The opening to Benover Slough was moved downstream about 1,200 feet. A second 6,000-foot long island was constructed downstream of the new slough opening between river miles 685.4 and 686.5. This second island is in the shape of a dogleg to provide protection from wind generated waves moving up from the southeast. In addition, material was added to Grassy Island (river mile 685.2) to stabilize the island against further erosion. As built drawings showing details of the constructed islands are contained in Appendix A. The as-built drawings for Phase I, Stage 2 depict island conditions shortly after construction, but prior to the summer flood of 1993. The summer flood resulted in some minor erosion and deposition that resulted in localized changes to the typical cross sections for various island reaches.

The island elevations varied somewhat from the design elevations, but were within the required tolerance. As part of the evaluation and monitoring procedures cross sections of the entire complex were surveyed. The constructed island elevations as well as other information on specific points along the island can be found in appendix A (as-built drawings). The top elevation of the islands is, on the average, about 4.7 feet above the normal water surface in the project area.

The configuration of the islands as well as fill material used for construction varied along the length of the island. The minimum top width was 50 feet, with expansions up to 100 feet in a some areas. From the top of the islands, side slopes were 1 foot vertical for each 3 feet horizontal in areas where riprap was placed. In the remaining areas along the islands the side slope was 1 foot vertical for every 5 feet horizontal. At an elevation

approximately 2 feet above normal pool, the side slopes decreased dramatically to form a 30-foot-wide berm which gradually slopes about 1 foot vertical for every 20 feet horizontal. Then, from a point about 1 foot above normal pool, the side slopes again changed to approximately 1 foot vertical for every 6 feet horizontal (angle of repose). For the type of material used in the island construction refer to the as-built drawings.

Rock riprap on geotextile fabric was only be required in selected reaches of the islands system. This included the head of the horseshoe-shaped island, the ends of all islands, and the turning point of the dogleg on the new island.

Topsoil was placed on the upper portions of all constructed islands. No new topsoil or seeding required on the berm below elevation 631.75, since the height of the berm is within range of normal wave action. The topsoil was seeded to provide interim protection by establishment of a temporary cover crop. Willows were planted along the length of the island where no riprap had been placed to provide additional erosion protection.

About 156,500 cubic yards of sand material and 56,000 cubic yards of fine material was used in construct the islands. A total of about 6,650 cubic yards of rock riprap and 7,000 square yards of geotextile were placed in the construction of the project.

## CONSTRUCTION HISTORY

Phase I of the Pool 8 Island Project was constructed in two stages. For stage 1, the Corps of Engineers used the Dredge Thompson to place approximately 99,000 cubic yards of sand on the existing horseshoe-shaped island. This material was taken from the main 9-foot navigation channel the summer of 1989 as part of the Corps' ongoing channel maintenance work. A contract was then awarded to J.F. Brennan Co. Inc, P.O. Box 2557, La Crosse, Wisconsin 54602 in August, 1990, to shape the sand material and added topsoil, seed, and rock where required. Stage 1 construction was completed in June 1991.

In September 1991 a contract was awarded to Lametti & Sons, Inc., P.O. Box 375, Hugo, Minnesota 55038 for stage 2 construction. Under this contract the horseshoe-shaped island was extended, the new dogleg island constructed, and materials added to Grassy Island. Island construction under stage 2 was completed in October 1992 and seeding in June 1993. Grassy Island was reseeded in September 1993.

## PART II - OPERATION AND MAINTENANCE

### GENERAL RESPONSIBILITIES AND PROCEDURES

#### Approved Responsibilities

Operation and maintenance responsibilities for the Pool 8 Island habitat project were originally outlined in the Definite Project Report. The acceptance of these responsibilities was formally recognized by an agreement signed by the U.S. Fish and Wildlife Service (USFWS) and the St. Paul District, Corps of Engineers. This agreement, dated 5 June 1990, is contained in Appendix B. The capability of the USFWS to carry out the maintenance responsibilities described below will be contingent upon the passage of sufficient appropriations by Congress.

#### District Manager

Typically, the responsibility for USFWS habitat projects will be given to the district manager in charge of that portion of the appropriate National Wildlife Refuge. For the Pool 8 project, the current address for the district manager is District Manager, U.S. Fish and Wildlife Service, P.O. Box 415, La Crosse, Wisconsin 54601. Hereafter, for the purposes of this manual, when describing responsibilities, etc., the term "District Manager" will be used.

#### Improvements or Alterations

It is understood that improvements and alterations to any portion of the habitat project that would affect the ability of that element to function as intended to meet the project's habitat goals and objectives would be coordinated with other involved agencies.

## Procedure for Reviewing Operation and Maintenance Responsibilities

The District Engineer or his representative will be kept informed on operation and maintenance activities for the Pool 8 Habitat Project through a periodic inspection of the project by the Corps and through analysis of an annual inspection checklist submitted by the USFWS. (Specific information contained in this checklist is found in Appendix C.) The Corps will inspect the project with a USFWS representative at least every other year and at other times as may be required. The Corps should contact the District Manager so that a mutually convenient date can be set up for the joint inspection. The findings of these inspections will be transmitted to the USFWS and could include recommendations for any remedial work considered necessary to maintain the habitat project in a satisfactory operating condition. Any agreed upon remedial work should be completed as soon as possible by the USFWS as provided in the Memorandum of Agreement between the USFWS and the Corps.

### Annual Report

A checklist report covering inspection, operation, and maintenance of the habitat project shall be submitted each year to the District Engineer. The USFWS may send the Pool 8 Island report in conjunction with reports on other habitat projects for which it has responsibility. If so desired, these reports can be sent to the Corps with the annual Cooperative Agreement Report which is done every April by the USFWS. A sample copy of the form for the Pool 8 Island Habitat Project can be found in Appendix C. Besides completion of the inspection checklist, each individual report should briefly summarize the condition of the entire system, including any maintenance work done during the past 1-year period.

## **OPERATION**

Currently, no specific actions are required for operation of the Pool 8 Island project.

## **MAINTENANCE**

### **General Inspection and Maintenance**

The established points and times at which the required inspections presented below should be made were developed through coordination between the Corps of Engineers and the USFWS during the preparation of plans and specifications for this project. After the habitat project has been in operation for 5 years, the Corps and the USFWS will review these inspection activities for adequacy in meeting project goals. If the design goals discussed under "Description of Project, Design Considerations" have not been achieved in spite of proper maintenance, continued operation and maintenance of this project could be discontinued by mutual written agreement of the two Government agencies.

The following inspection of the project should be made by the District Manager:

**Inspection:** Islands should be visually inspected to insure that they are functionally intact. The general condition of the islands should be noted. If photographs were taken on site, these should accompany the submitted report. Any significant loss of riprap should be replaced to prevent erosion problems. Should any filter cloth underlying the riprap become exposed to the light, this riprap should be replaced immediately. Some erosion of the berm on the back (southern) side of the islands is anticipated. If there is erosion on the upper portion of the island (above the

berm) such that the condition of the unprotected (nonriprapped) side slopes of the islands is in question, it is suggested that the Corps geotechnical staff be consulted prior to proceeding with any repairs.

Time of year: This inspection can be made at the discretion of the District Manager. Similar inspections should be made after any flood whose elevation exceeds 634.0 feet (NGVD, 1912 adj.) at Brownsville, Minnesota, or after any major storm that results in sustained winds of 40 MPH or greater for one hour as recorded at the La Crosse airport.

Frequency: A minimum of once a year. The frequency for island inspection will be subject to review by the USFWS and Corps and could change upon mutual agreement of both parties.

### Repair Materials

Materials required for use in maintaining the project are as follows:

1. Borrow material for island construction was originally obtained from a number of sources. For the location of the borrow sites see the as-built drawings in appendix A.

- a. Satisfactory sand replacement material for repair of the islands include all soils except those which have greater than 5% of soil classified in ASTM D 2487 as Pt, OH, OL, MH or CH. (These are commonly known as peats, clays and organics.) The material should be free from ice, snow, frozen earth, trash, debris, organic material, stones larger than 6 inches in any diameter, and vegetable material. An attempt should be made when placing any fill material to compact it to the same degree as the surrounding fill.

b. Satisfactory fine-grained replacement material would be materials with not less than 50 percent by weight, in place, passing the No. 200 sieve.

2. To protect the embankment from erosion, riprap has to be replaced. Gradations of rock fill for maintenance are given in Appendix D and are the same as was used during construction of the islands. As-built drawings should be consulted for placement of riprap and thickness of rock.

3. If geotextile fabric becomes torn and thereby loses its protective function, the surrounding riprap should be removed to expose the unharmed fabric such that the new section of fabric overlaps the old by 36 inches. To assist in proper procurement and installation of the geotextile fabric, applicable portions of the original specifications have been included in Appendix D.

#### **INSPECTIONS, TESTS, AND OPERATIONS FOLLOWING MAJOR STORMS OR FLOODS**

##### **General**

As stated in the Memorandum of Agreement between the USFWS and the Corps, the Corps will be responsible for any mutually agreed upon repair and rehabilitation of the Pool 8 Island project that exceeds the annual maintenance requirements and that may be needed as a result of a specific storm or flood. The islands will be inspected as previously described, following flood events producing a water surface elevation greater than 634.0 feet (NGVD, 1912 adj.) at Brownsville, Minnesota. They should also be inspected after any major storm that results in sustained winds of 40 MPH or greater for one hour as recorded at the La Crosse airport. Inspection following either of these types of events should note any significant damage to the islands.

### Project Rehabilitation/Abandonment

Should inspection of the project area following a major flood or natural disaster disclose substantial damage to the entire project that appears to exceed the annual operation and maintenance as specified in this manual and the Definite Project Report, the Corps and USFWS should meet and discuss the appropriate course of action in light of original project design. The inspections by the District Manager (summarized in the submitted checklist) and the joint inspections with the Corps will be the basis for determining maintenance responsibility by the U.S. Fish and Wildlife Service versus potential rehabilitation by the Corps of Engineers. With regard to the latter, the options of rehabilitation or abandonment of the project may be considered at this time. Any decision would be carried forth only upon written mutual agreement of the USFWS and the Corps. The Wisconsin Department of Natural Resources should be consulted prior to coming to any final determination on a course of action.

### Project Monitoring and Evaluation

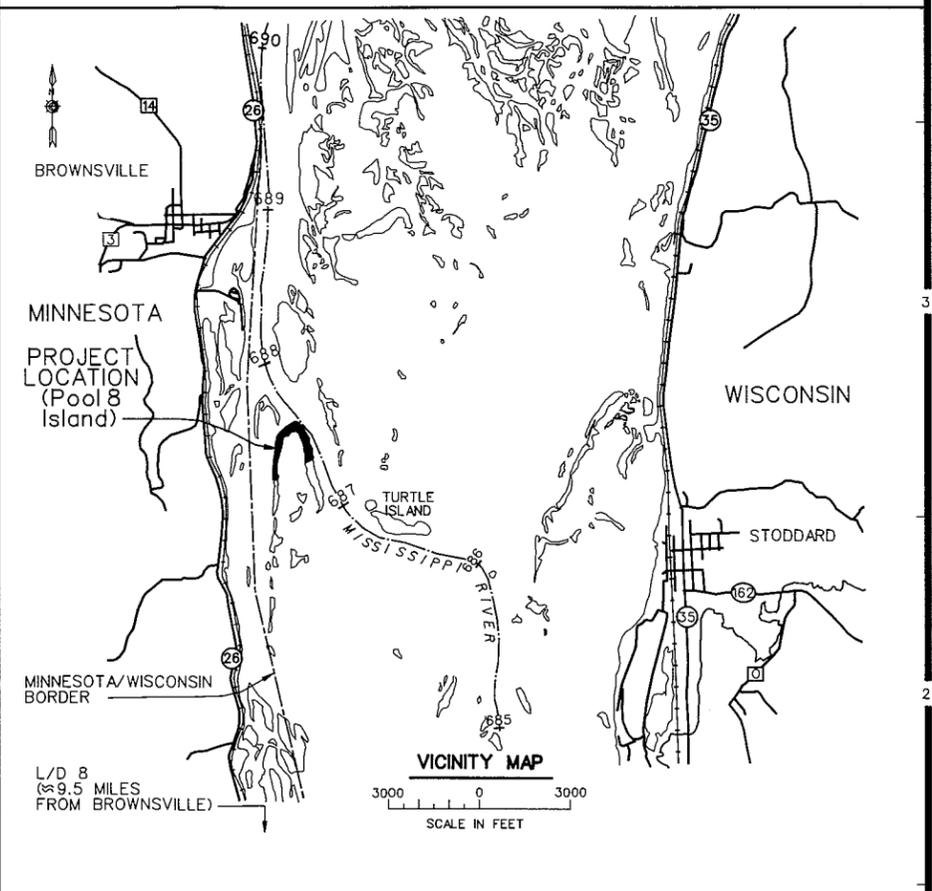
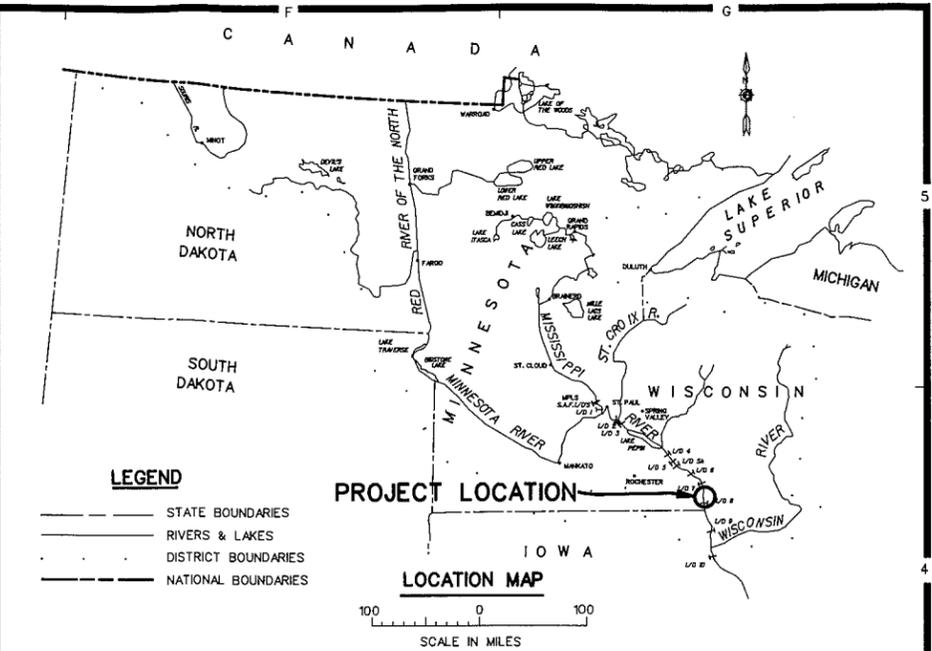
An evaluation plan has been established for the Pool 8 Island project to help determine the extent to which the design meets the habitat improvement objectives. Information from this analysis will also be used, if required, when ascertaining whether rehabilitation or abandonment of portions of this project would be the wisest choice. Project evaluation is a Corps responsibility. Work for all habitat projects is limited to measuring changes in physical, water quality, and vegetation habitat conditions. Monitoring beyond the scope of the Corps project evaluation (to determine the response of fish and wildlife to habitat changes, and monitoring for longer duration or in a larger area) will be conducted at the discretion of the sponsoring agency. For the Pool 8 Island project, Corps monitoring will consist of evaluating the

aquatic plant community (both emergent and submergent) in the vicinity of the newly created islands; evaluating plant growth on the islands themselves; and measuring flow, depth, and dissolved oxygen in the channels. The evaluation plan is presented in Appendix E of this manual. Included is a section on potential evaluation parameters that may be measured by others. If any of this work is performed by the USFWS or the Wisconsin Department of Natural Resources, it can be submitted to the Corps. The USFWS can submit information in conjunction with the annual report for operation and maintenance.

**APPENDIX A**

**PROJECT DRAWINGS**

DRAWING INDEX		
DRAWING	SHT.	DESCRIPTION
M-P8- 10/ 7	1	LOCATION, VICINITY MAP & DRAWING SCHEDULE
M-P8- 10/ 8	2	GENERAL PLAN (AERIAL)
M-P8- 10/ 9	3	GENERAL PLAN (AERIAL)
M-P8- 61/ 16	4	BASELINE LAYOUT
M-P8- 61/ 17	5	PLAN VIEW
M-P8- 61/ 18	6	TYPICAL FINISHED GRADE CROSS SECTIONS
M-P8- 61/ 19	7	CROSS SECTIONS @ STA. 22+00W THRU 28+00W
M-P8- 61/ 20	8	CROSS SECTIONS @ STA. 16+00W THRU 20+00W
M-P8- 61/ 21	9	CROSS SECTIONS @ STA. 10+00W THRU 14+00W
M-P8- 61/ 22	10	CROSS SECTIONS @ STA. 6+00W THRU 8+00W
M-P8- 61/ 23	11	CROSS SECTIONS @ STA. 4+00W THRU 8+00E, AND TYPICAL RIPRAP SECTIONS
M-P8- 61/ 24	12	CROSS SECTIONS @ STA. 2+00E THRU 8+00E
M-P8- 61/ 25	13	CROSS SECTIONS @ STA. 9+40E THRU 14+00E



ENGINEER MANAGER  
 CHIEF SPECS. AND TECH. SUPPORT SECTION  
 CHIEF GENERAL ENGINEERING SECTION  
 CHIEF STRUCTURAL SECTION  
 CHIEF MECH/ELECT/ARCHT SECTION  
 CHIEF HYDRAULICS SECTION  
 CHIEF HYDROLOGY SECTION  
 CHIEF GEOTECHNICAL DESIGN SECTION

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET

APPROVAL RECOMMENDED: *[Signature]* CHIEF DESIGN BRANCH

APPROVAL RECOMMENDED: *[Signature]* CHIEF EDRG BRANCH

APPROVED: *[Signature]* CHIEF ENGINEERING DIVISION

APPROVED: *[Signature]* COL. CORPS OF ENGINEERS

SYMBOL	AS-BUILT AS OF COMPLETION DATE	DATE	APPROVAL
		6/91	<i>[Signature]</i>

DESIGNED BY: WPR  
 DRAWN BY: KJL  
 CHECKED BY: JJG

SUBMITTED BY: *[Signature]*  
 CHIEF GEN ENG SECTION

SCALE: AS SHOWN  
 DATE: JUNE 1990

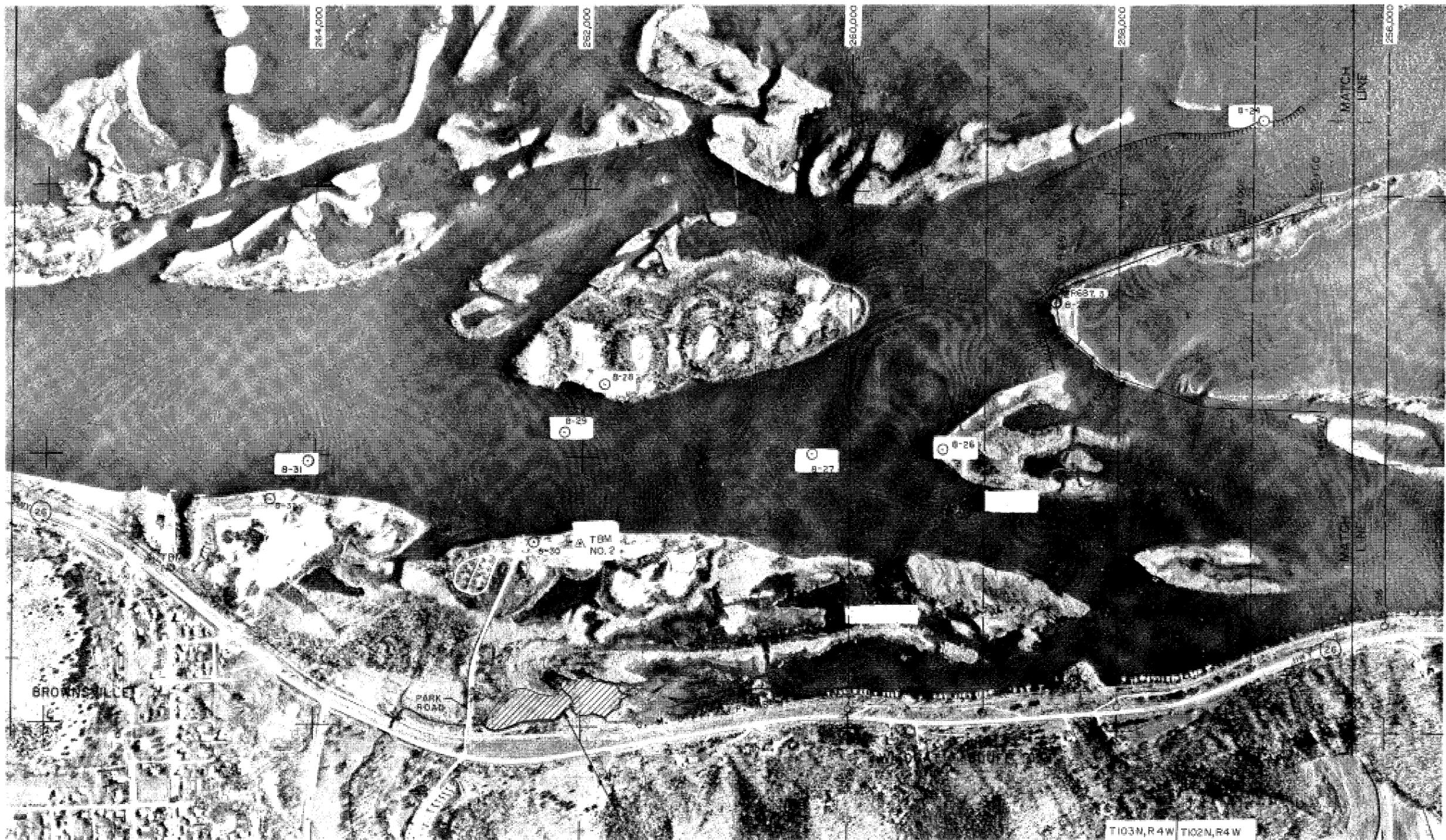
SPEC. NO. DACW37-90-B-0042

DEPARTMENT OF THE ARMY  
 ST. PAUL DISTRICT, CORPS OF ENGINEERS  
 ST. PAUL, MINNESOTA

ENVIRONMENTAL MANAGEMENT PROGRAM  
 MISSISSIPPI RIVER  
 POOL 8  
 POOL 8 ISLAND CONSTRUCTION-PHASE I  
 LOCATION AND VICINITY MAP AND  
 DRAWING INDEX

CAD ID: POOL8IND.DGN (6-12-90)

DRAWING NUMBER  
 M-P8-10/7  
 SHEET 1 OF 13



MARTINEZ MAPPING AND ENGINEERING, INC.

DATE OF PHOTOGRAPHY NOV. 7, 1981.

MANDATORY TOPSOIL BORROW AREA  
(SEE NOTES 2 & 3)

NOTE: TBM #1 CHISELED DOWNSTREAM CORNER BOTTOM STEP EL. 640.28 NGVD. 1912 ADJ.  
TBM #2 CHISELED X UPSTREAM CORNER RIVERWARD CORNER SLAB SHELTER HOUSE EL. 634.53 NGVD. 1912 ADJ.

- NOTE:**
- SEE DWG 61/16 FOR BASELINE INFORMATION.
  - REMOVE MATERIAL FROM INSIDE HATCHED AREA ONLY. LIMITS WILL BE STAKED BY OTHERS.
  - ACCESS TO TOPSOIL BORROW AREA FROM PARK ROAD, AS DIRECTED BY CONTRACTING OFFICER.
  - THE MANDATORY TOPSOIL BORROW AREA IS THE ONLY TOPSOIL BORROW AREA PERMITTED.

CONTROL POINTS					
HUB	AZIMUTH (S)	DISTANCE	COORDINATES		ELEVATION
			NORTH	EAST	
8-23			254,576.38	2,725,330.76	
8-24	161°51'41"	2,478.09	256,931.32	2,724,559.29	
8-25	138°28'04"	2,062.55	258,475.31	2,723,191.73	
8-26	127°08'48"	1,388.82	259,313.96	2,722,084.71	
8-27	177°41'11"	973.96	260,287.13	2,722,045.39	
8-28	198°03'36"	1,632.99	261,839.67	2,722,551.64	
8-29	129°09'01"	468.01	262,135.15	2,722,188.70	
8-30	105°08'23"	850.54	262,357.29	2,721,367.68	

CONTROL POINTS					
HUB	AZIMUTH (S)	DISTANCE	COORDINATES		ELEVATION
			NORTH	EAST	
8-30			262,357.29	2,721,367.68	
8-31	199°08'03"	1,793.21	264,051.43	2,721,955.46	
8-32	134°38'01"	374.68	264,328.72	2,721,674.60	
8-33	217°37'49"	2,761.17	266,515.48	2,723,360.47	
8-34	96°36'45"	697.51	266,595.80	2,722,667.60	
8-35	115°26'12"	867.61	266,968.45	2,721,884.09	

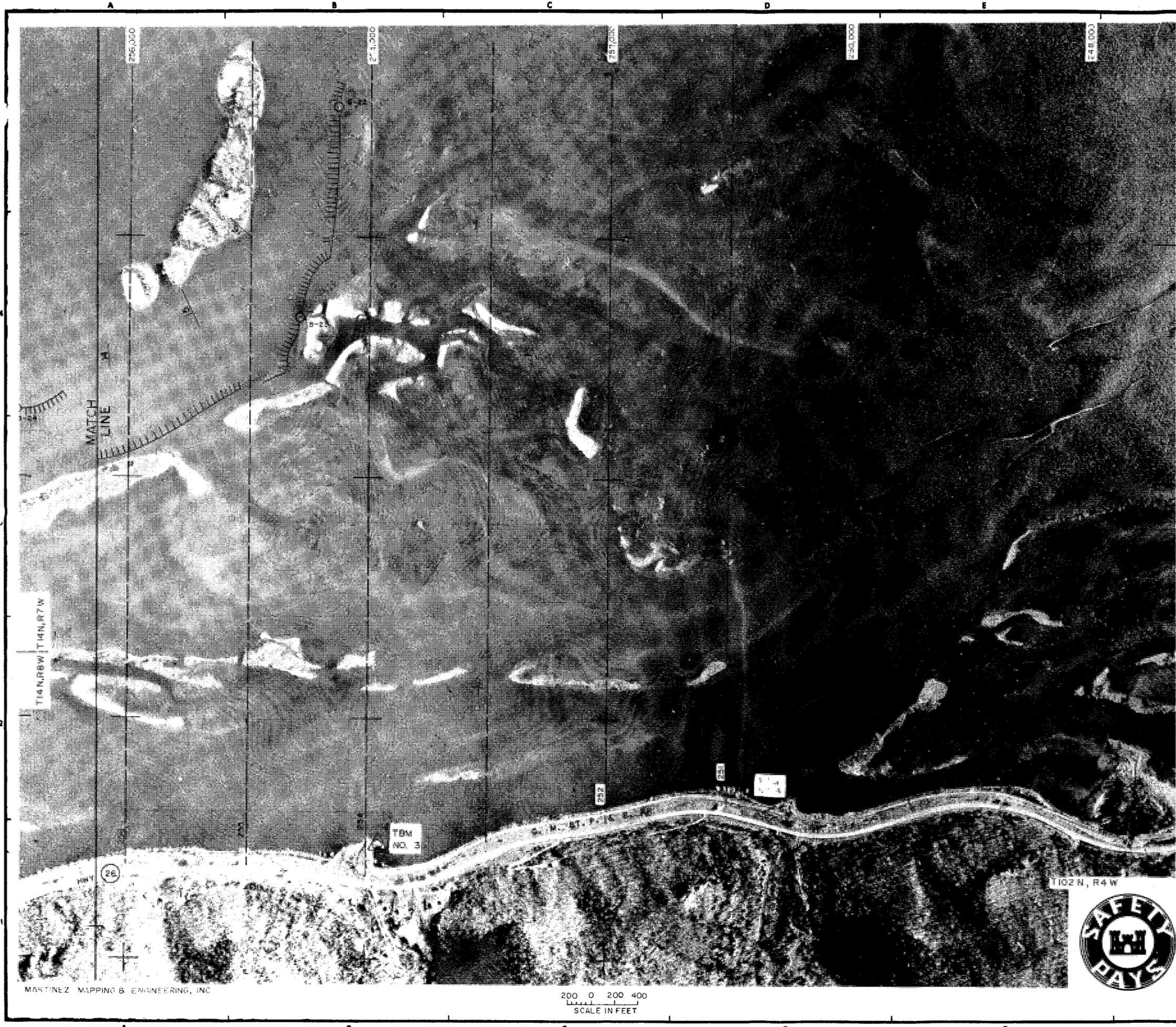
COORDINATES BASED ON MINNESOTA STATE PLANE GRID SYSTEM, SOUTH ZONE.



200 0 200 400  
SCALE IN FEET



AS-BUILT AS OF COMPLETION DATE		6-91	
AMENDED IN ACCORDANCE WITH AMENDMENT NO. 1		6-90	
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER POOL 8 - VERNON COUNTY, WISCONSIN		
DRAWN BY: SJR	POOL 8 ISLAND CONSTRUCTION - PHASE I		
CHECKED BY: JJC	GENERAL PLAN AERIAL		
SUBMITTED BY:	APPROVED BY:	DATE	
		JUNE 1990	
		SCALE: AS SHOWN	DPC NO. DACW37-90-B-0042
		DRAWING NUMBER M-P8-10/8	
		SHEET 2 OF 13	



CONTROL POINTS				
HUB	AZIMUTH (S)	DISTANCE	COORDINATES	
			NORTH	EAST
8-17	143°05'37"	1,882.68	247,617.72	2,730,685.61
8-18	233°52'20"	1,227.45	249,123.14	2,729,855.04
8-19	165°35'19"	3,909.69	249,846.83	2,730,246.45
8-20	136°21'18"	1,189.53	253,633.50	2,729,873.40
8-21	82°31'37"	1,682.52	254,491.28	2,728,755.43
8-22	99°44'19"	1,779.05	254,275.45	2,727,084.17
8-23	161°51'41"	2,478.09	254,576.38	2,725,330.76
8-24	138°28'04"	2,062.55	256,931.32	2,724,559.29
8-25	127°08'48"	1,388.82	258,475.31	2,723,191.73

NOTE: TBM \*3 PBW2, RR SPIKE IN POLE ELEV. 635.86  
1912 ADV. NGVD.  
TBM \*4 PBW1 RR SPIKE IN DOWNSTREAM SIDE  
OF POWER POLE ELEV. 641.43  
1912 ADV. NGVD.

COORDINATES BASED ON MINNESOTA STATE PLANE GRID  
SYSTEM, SOUTH ZONE.

DATE OF PHOTOGRAPHY: NOV. 7, 1981.



**GENERAL LEGEND**

- EXISTING SUBMERGED BANK PROTECTION
- BL BASELINE
- SL SHORELINE
- $\frac{631.5}{51}$  ELEVATION  
DISTANCE FROM BASELINE

AS-BUILT AS OF COMPLETION DATE		6-91	<i>[Signature]</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER POOL 8 - VERNON COUNTY, WISCONSIN		
DRAWN BY: SJR	POOL 8 ISLAND CONSTRUCTION - PHASE I		
CHECKED BY: JJG	GENERAL PLAN		
SUBMITTED BY:	AERIAL		
APPROVED BY:	DATE		
		JUNE 1990	
		SCALE	SPEC. NO.
		AS SHOWN	DACW37-90-B-0042
		DRAWING NUMBER	
		M-P8-10/9	
		SHEET 3 OF 13	

MARTINEZ MAPPING & ENGINEERING, INC

200 0 200 400  
SCALE IN FEET



AS-BUILT

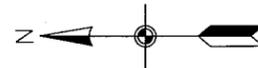
E 2,726,000

E 2,725,000

E 2,724,000

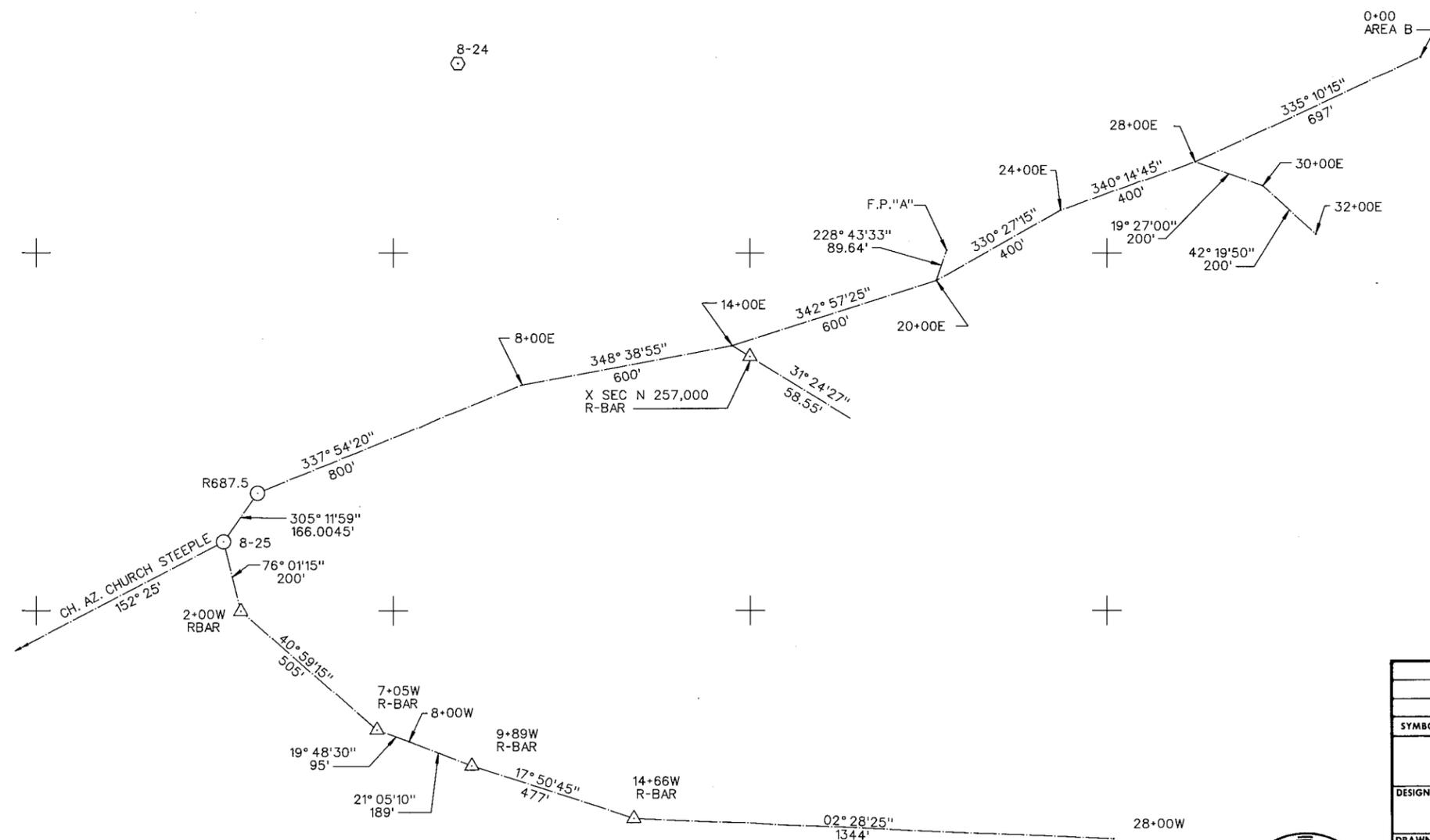
E 2,723,000

E 2,722,000

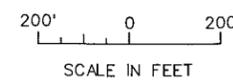


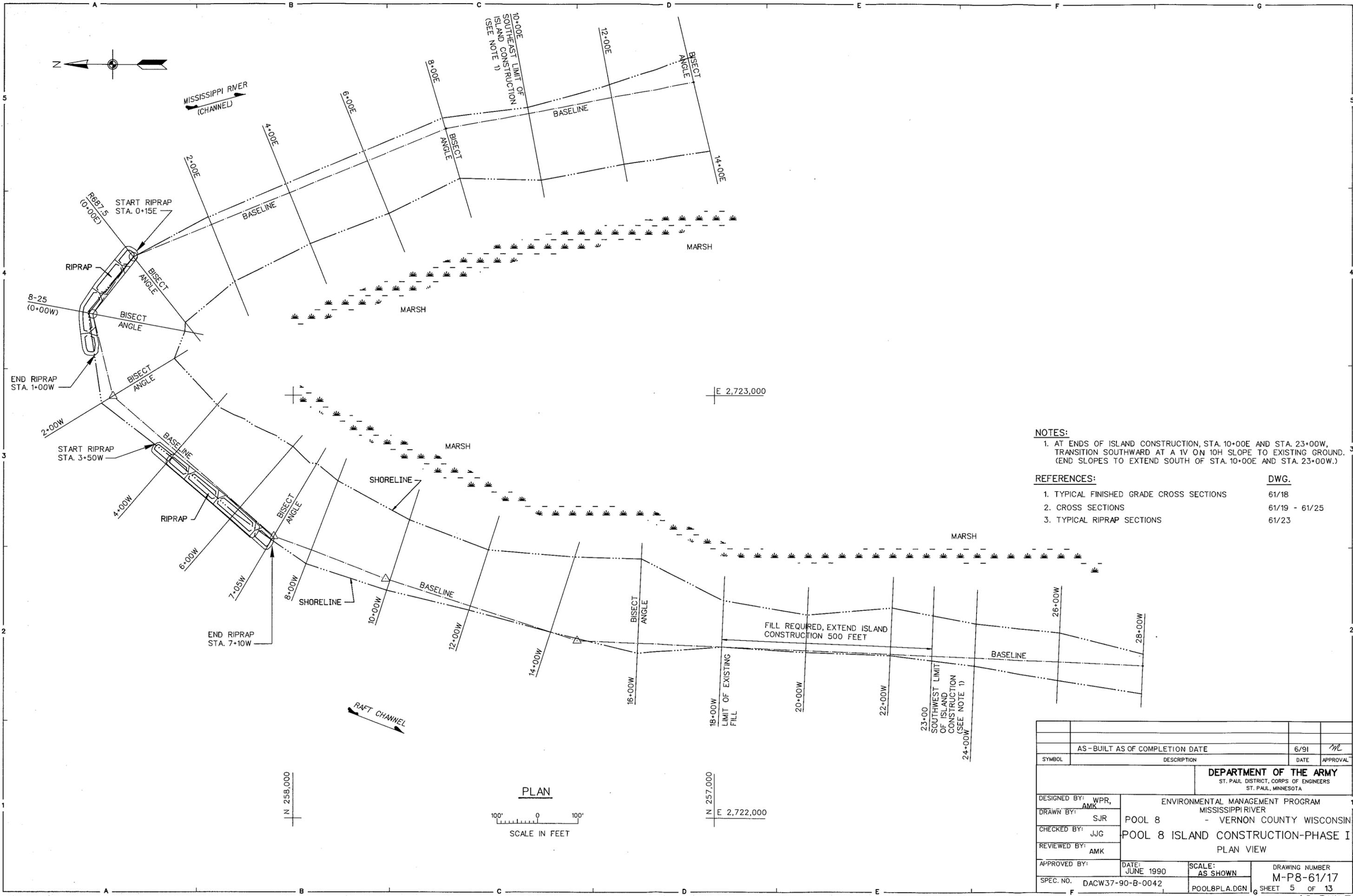
EAST BANK CONTROL POINTS				
POINT	NORTH COORDINATE	EAST COORDINATE	DISTANCE	AZIMUTH (S)
R687.5	258,379.620	2,723,327.380	800.000	337° 54' 20"
8+00E	257,638.3679	2,723,620.280	600.000'	348° 38' 55"
14+00E	257,050.1105	2,723,740.411	600.000	342° 57' 25"
20+00E	256,476.4597	2,723,922.266	400.000	330° 27' 15"
24+00E	256,128.4751	2,724,119.513	400.000	340° 14' 45"
28+00E	255,752.0145	2,724,254.707	200.000	19° 27' 00"
30+00E	255,563.4280	2,724,188.111	200.000	42° 19' 50"
32+00E	255,415.5736	2,724,053.429		
28+00E	255,752.0145	2,724,254.707	697.000	335° 10' 15"
0+00 AREA B	255,119.4425	2,724,547.387		

WEST BANK CONTROL POINTS				
POINT	NORTH COORDINATE	EAST COORDINATE	DISTANCE	AZIMUTH (S)
Ref. Az. (Church Steeple)				152° 25' 00"
8-25E	258,475.31	2,723,191.73	200.000	76° 01' 15"
2+00W	258,426.9962	2,722,997.653	505.000	40° 59' 15"
7+05W	258,045.7956	2,722,666.427	95.000	19° 48' 30"
8+00W	257,956.417	2,722,634.234	189.000	21° 05' 10"
9+89W	257,780.0723	2,722,566.237	477.000	17° 50' 45"
14+66W	257,326.0234	2,722,420.057	1344.000	02° 28' 25"
28+00W	255,983.2757	2,722,362.051		



AS-BUILT AS OF COMPLETION DATE		6/91	<i>ML</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: SJR	POOL 8 - VERNON COUNTY WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION-PHASE I BASELINE LAYOUT		
SUBMITTED BY:	APPROVED BY:	DATE: JUNE 1990	
USTATION POOL8BAS.DGN 6-12-90	SCALE AS SHOWN	SPEC. NO. DACW37-90-B-0042	DRAWING NUMBER M-P8-61/16
SHEET 4 OF 13		AS-BUILT	





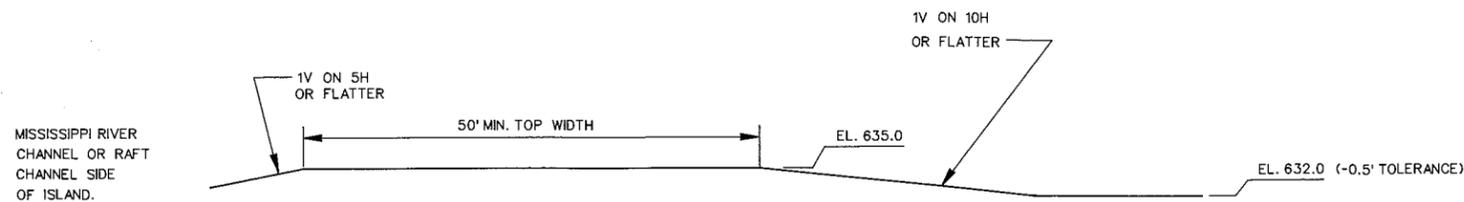
**NOTES:**  
 1. AT ENDS OF ISLAND CONSTRUCTION, STA. 10+00E AND STA. 23+00W, TRANSITION SOUTHWARD AT A 1V ON 10H SLOPE TO EXISTING GROUND. (END SLOPES TO EXTEND SOUTH OF STA. 10+00E AND STA. 23+00W.)

**REFERENCES:**

DESCRIPTION	DWG.
1. TYPICAL FINISHED GRADE CROSS SECTIONS	61/18
2. CROSS SECTIONS	61/19 - 61/25
3. TYPICAL RIPRAP SECTIONS	61/23

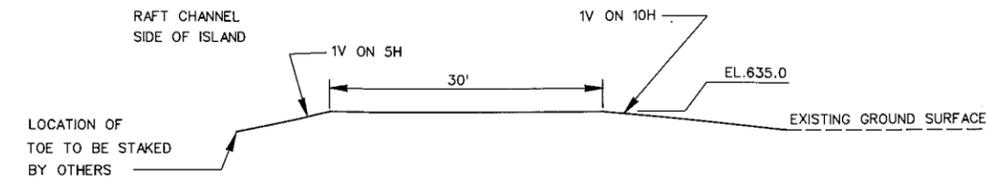
**PLAN**  
 SCALE IN FEET  
 100' 0 100'

AS-BUILT AS OF COMPLETION DATE		6/91	ML
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR, AMK	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: SJR	- VERNON COUNTY WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION-PHASE I		
REVIEWED BY: AMK	PLAN VIEW		
APPROVED BY:	DATE: JUNE 1990	SCALE: AS SHOWN	DRAWING NUMBER: M-P8-61/17
SPEC. NO. DACW37-90-B-0042	POOL8PLA.DGN	SHEET 5 OF 13	AS-BUILT

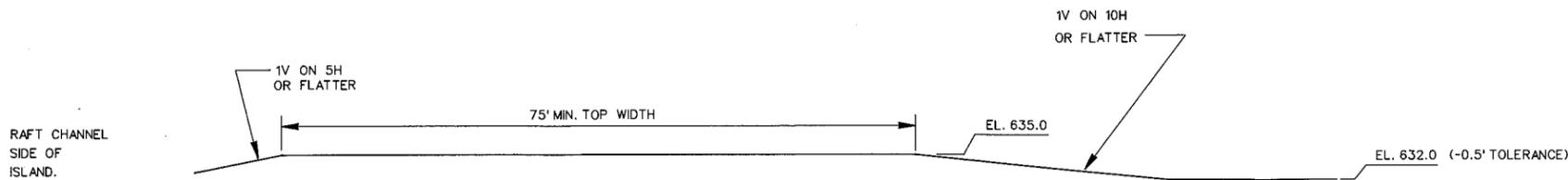


**TYPICAL FINISHED GRADE CROSS SECTION**  
 STA.10+00E TO STA.9+50W NO SCALE

NOTE: TRANSITION TOP WIDTH SMOOTHLY BETWEEN STA.9+50W TO STA.10+00W.

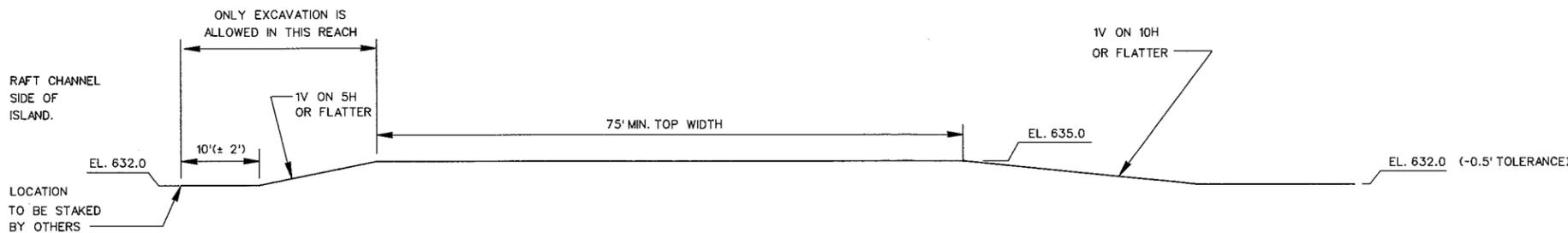


**TYPICAL FINISHED GRADE CROSS SECTION**  
 STA.18+00W TO STA.23+00W NO SCALE



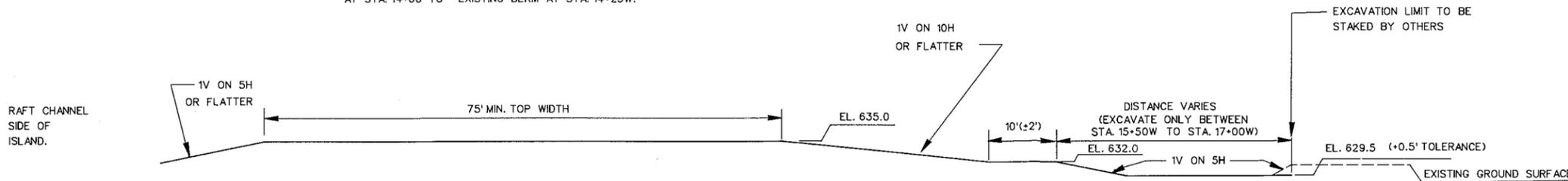
**TYPICAL FINISHED GRADE CROSS SECTION**  
 STA.10+00W TO STA.10+75W AND STA.14+25W TO STA.15+50W NO SCALE

NOTE: TRANSITION CHANNEL-SIDE BERM WIDTH SMOOTHLY FROM EXISTING BERM AT STA. 10+75W TO 10 FT. WIDE AT STA. 11+00W.



**TYPICAL FINISHED GRADE CROSS SECTION**  
 STA.11+00W TO STA.14+00W NO SCALE

NOTE: TRANSITION CHANNEL-SIDE BERM WIDTH SMOOTHLY FROM 10 FT. WIDE BERM AT STA. 14+00 TO EXISTING BERM AT STA. 14+25W.



**TYPICAL FINISHED GRADE CROSS SECTION**  
 STA.15+50W TO STA.17+00W NO SCALE

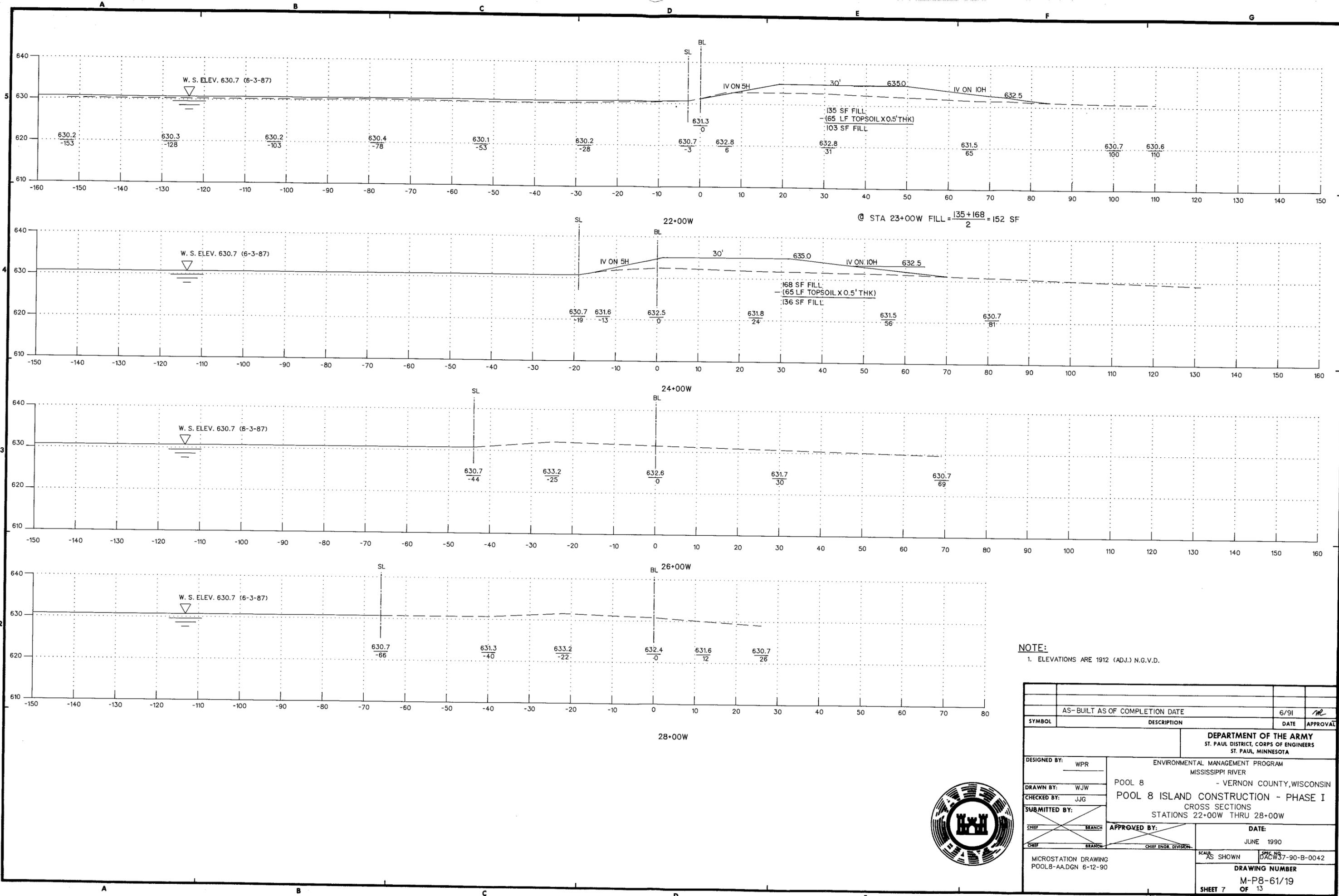
NOTE: TRANSITION ISLAND CROSS SECTION SMOOTHLY BETWEEN STA.17+00W TO 18+00W.

**NOTES:**

- ELEVATIONS ARE 1912(ADJ) N.G.V.D.
- 4" TO 8" TOPSOIL TO BE PLACED ON TOP AND SIDE SLOPES OF ISLAND TO EL. 632.5 INCLUDING THE END SLOPES, EXCEPT WITHIN AREAS OF RIPRAP AND AREAS OUTSIDE THE DESIGNATED WORK LIMITS.
- FINISHED GRADE TOLERANCE FOR TOP OF ISLAND, INCLUDING TOPSOIL, IS EL. 635.0 ± 0.5'
- WORK LIMITS ON THE MISSISSIPPI RIVER CHANNEL SIDE, RAFT CHANNEL SIDE, AND MARSH SIDE OF THE ISLAND WILL BE STAKED BY OTHERS, INCLUDING VEGETATED AREAS THAT ARE NOT TO BE DISTURBED.



AS-BUILT AS OF COMPLETION DATE		6/91	ML
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: JSH AMK, JJG	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: FJB	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: WPR, AMK	POOL 8 ISLAND CONSTRUCTION - PHASE I		
SUBMITTED BY:	TYPICAL FINISHED GRADE CROSS SECTIONS		
CHEF	BRANCH	APPROVED BY:	DATE: JUNE 1990
CHEF	BRANCH	CHIEF ENGR. DIVISION	SCALE: AS SHOWN SPEC. NO. DACW37-90-B-0042
CAD FILE: POOL8-TYP.DGN PLOT DATE: 6-12-90		DRAWING NUMBER M-P8-61/18	
		SHEET 6 OF 13	

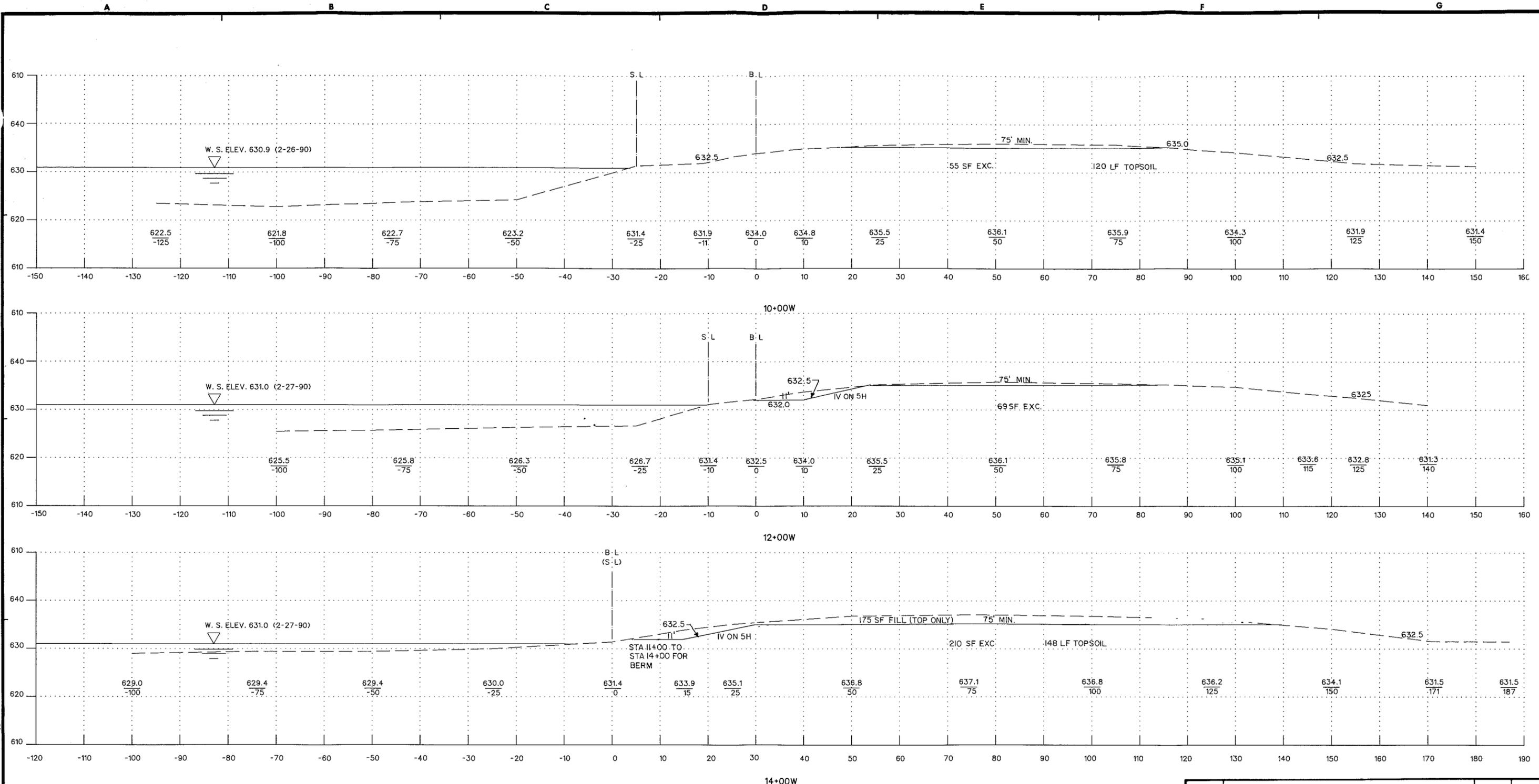


**NOTE:**  
 1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.

AS-BUILT AS OF COMPLETION DATE		6/91	<i>ML</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: WJW	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION - PHASE I CROSS SECTIONS		
SUBMITTED BY:	STATIONS 22+00W THRU 28+00W		
APPROVED BY:	DATE: JUNE 1990		
SCALE: AS SHOWN	SPEC. NO. DACW 37-90-B-0042		
MICROSTATION DRAWING POOL8-AA.DGN 6-12-90	DRAWING NUMBER M-P8-61/19		
	SHEET 7 OF 13		



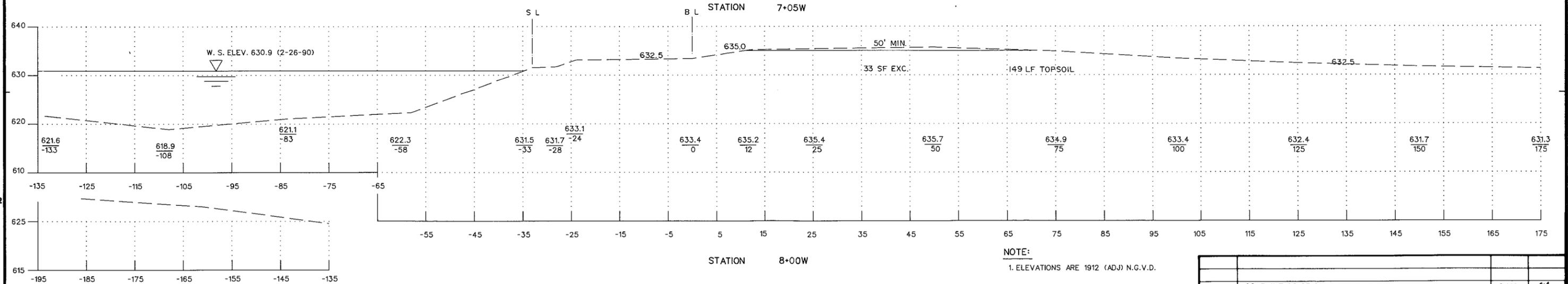
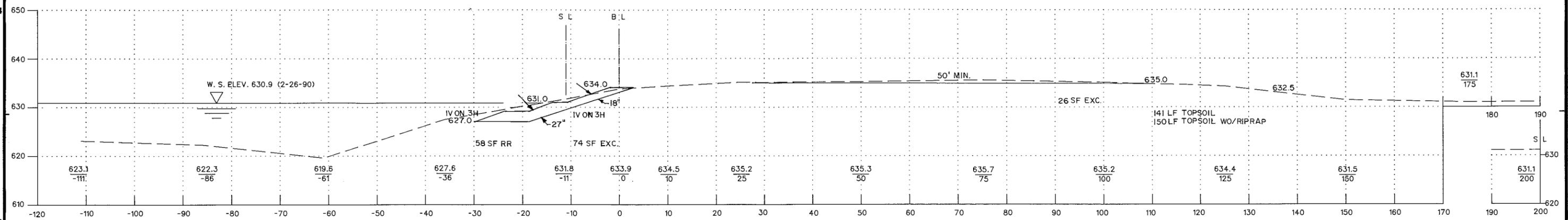
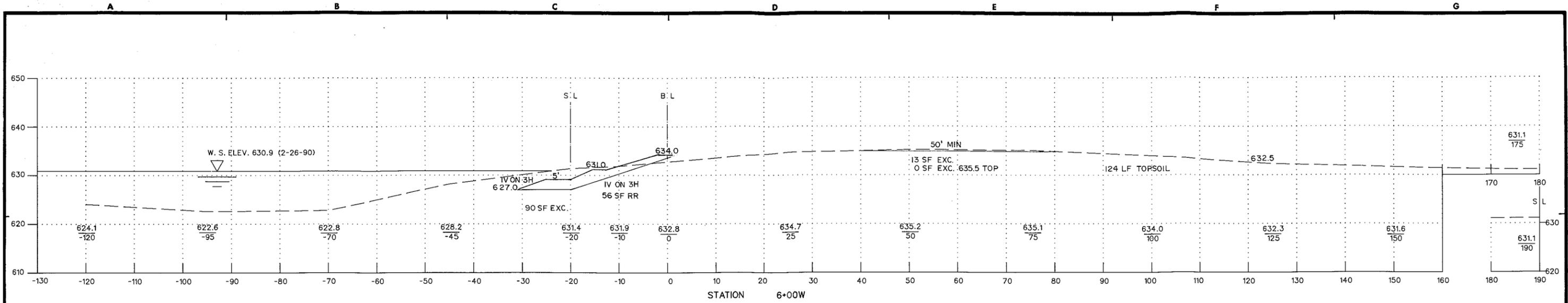




**NOTE:**  
1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.



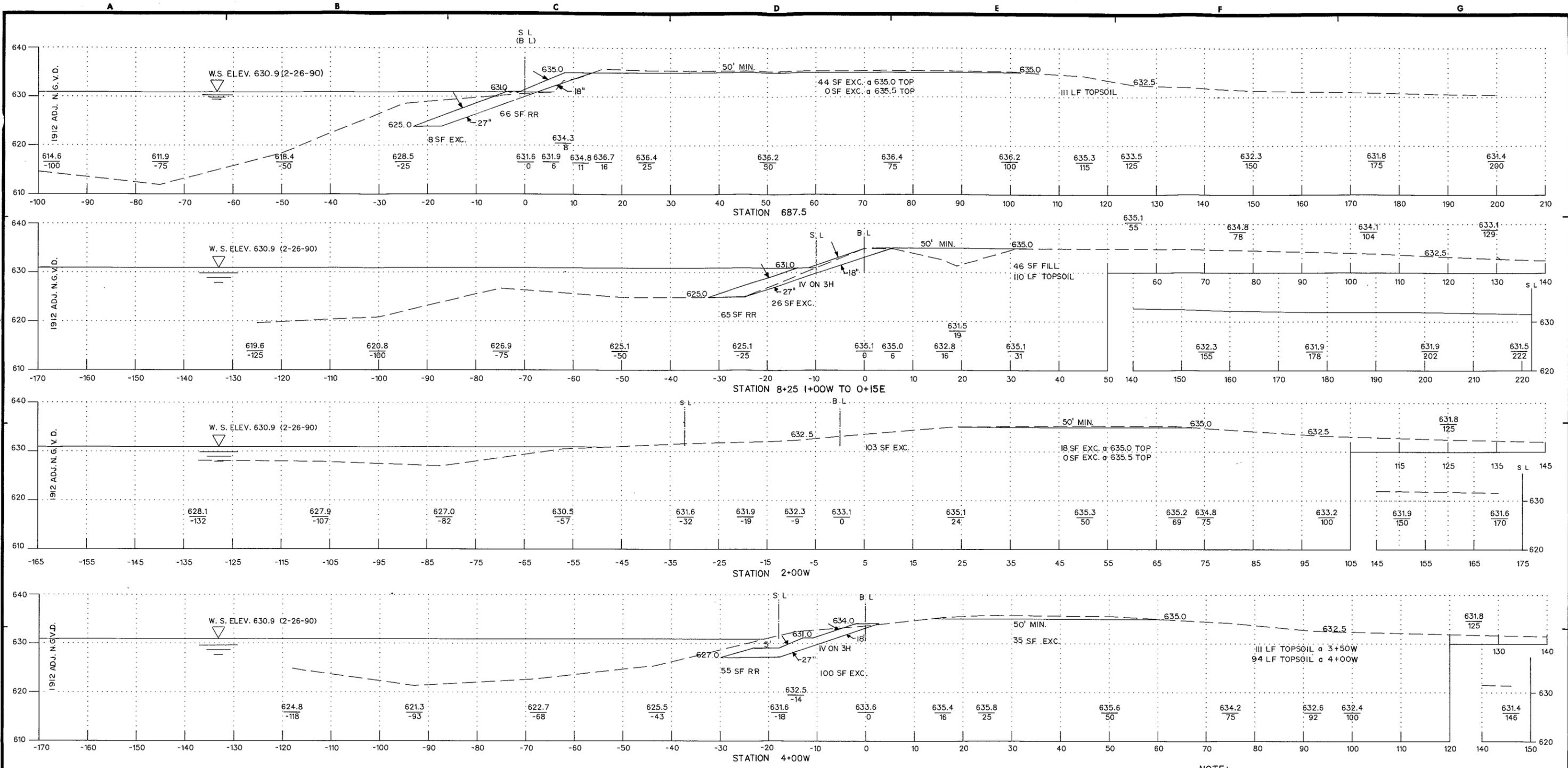
AS-BUILT AS OF COMPLETION DATE		6/91	<i>WJW</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: WJW	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION - PHASE I		
SUBMITTED BY:	CROSS SECTIONS STATIONS 10+00W THRU 14+00W		
CHIEF	BRANCH	APPROVED BY:	DATE:
			JUNE 1990
CAD FILE: POOL8-AC 6-12-90		SCALE: AS SHOWN	SPEC. NO. DACW37-90-B-0042
		DRAWING NUMBER M-P8-61/21	
		SHEET 9 OF 13	



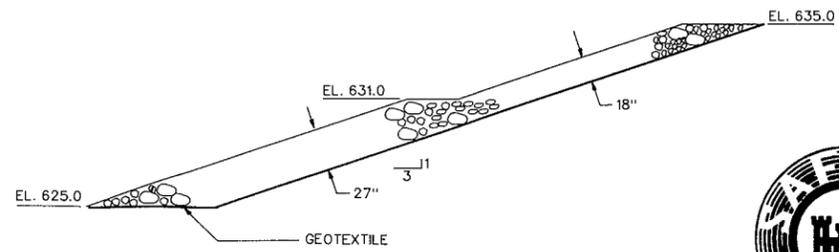
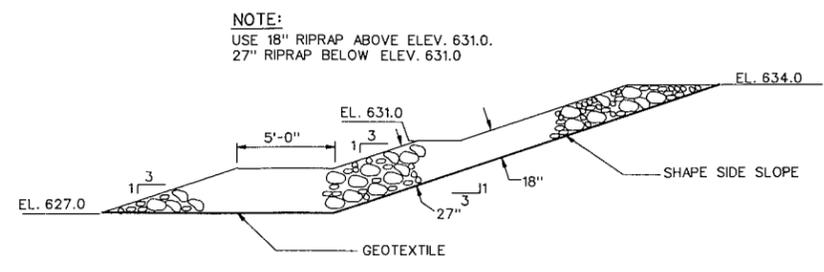
NOTE:  
1. ELEVATIONS ARE 1912 (ADJ) N.G.V.D.



AS-BUILT AS OF COMPLETION DATE		6/91	<i>M</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: WJW	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION - PHASE I		
SUBMITTED BY:	CROSS SECTIONS		
	STATIONS 8+00W THRU 6+00W		
APPROVED BY:	DATE:		JUNE 1990
CAD FILE: POOL8-AD 6-12-90	SCALE: AS SHOWN	DACW57-90-B-0042	
DRAWING NUMBER M-P8-61/22		SHEET 10 OF 13	

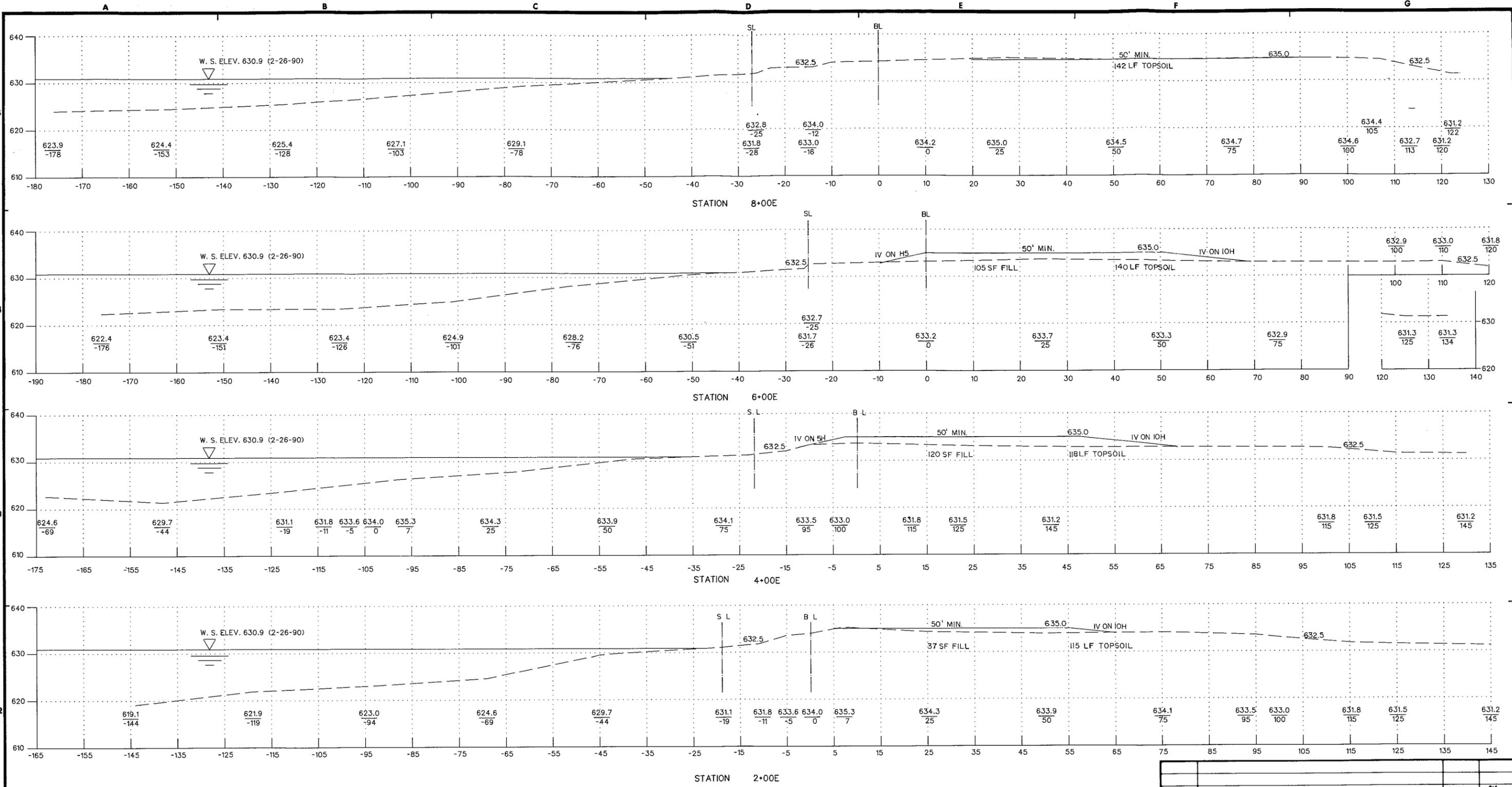


NOTE:  
1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.



AS-BUILT AS OF COMPLETION DATE		6/91	MLC
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR, JSH, AMK	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: FJB, WJW	POOL 8 VERNON COUNTY, WISCONSIN		
CHECKED BY: JYG, AMK	POOL 8 ISLAND CONSTRUCTION - PHASE I CROSS SECTIONS		
SUBMITTED BY:	STATIONS 4+00W THRU 687.5 + TYP. RIPRAP SECTIONS		
APPROVED BY:	DATE: JUNE 1990		
CAD FILE: POOL8-AE 6-12-90	SCALE AS SHOWN		DACW37-90-B-0042
<b>DRAWING NUMBER</b> M-P8-61/23		<b>SHEET 11 OF 13</b>	

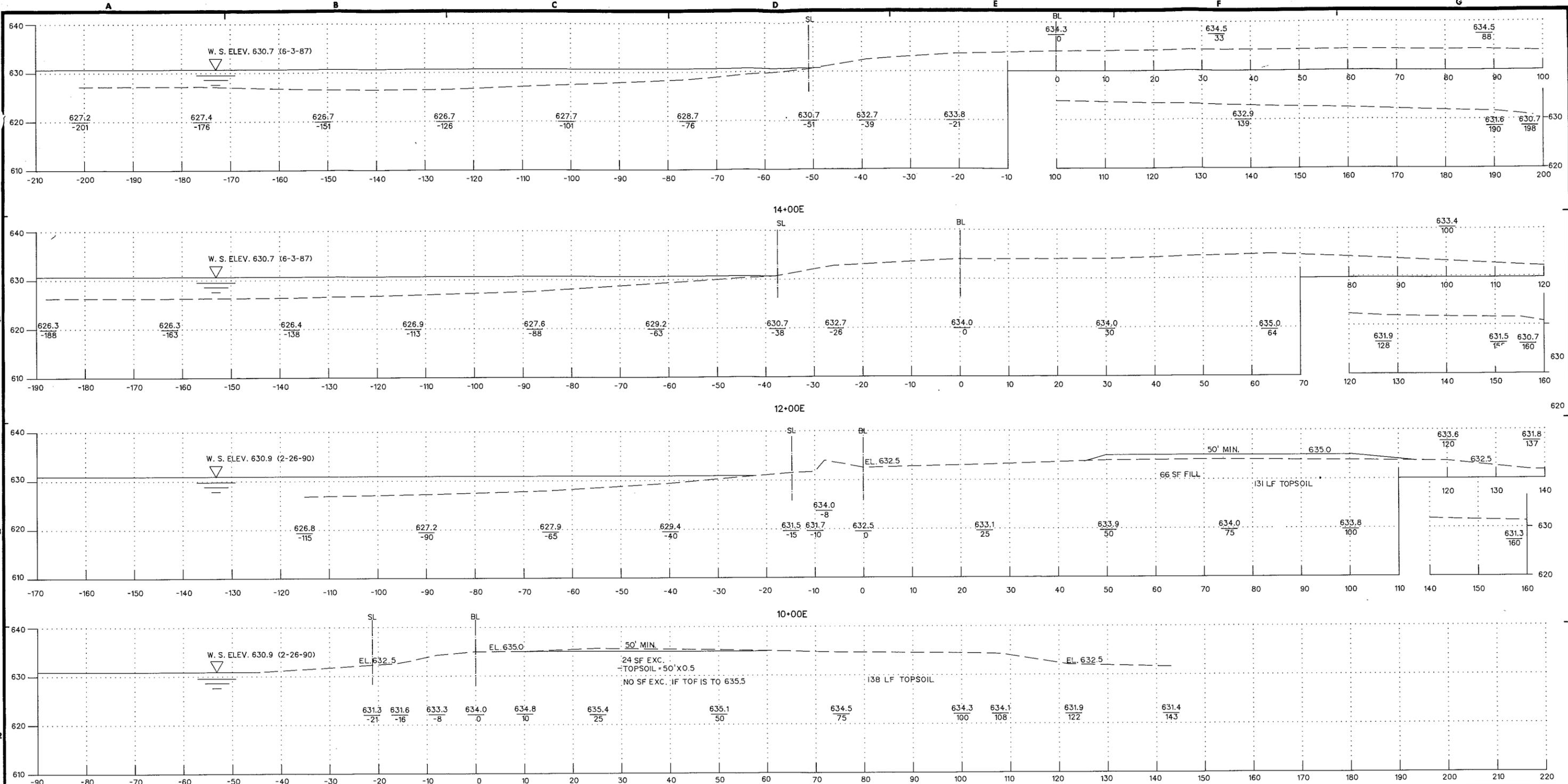
AS-BUILT



NOTES:  
1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.



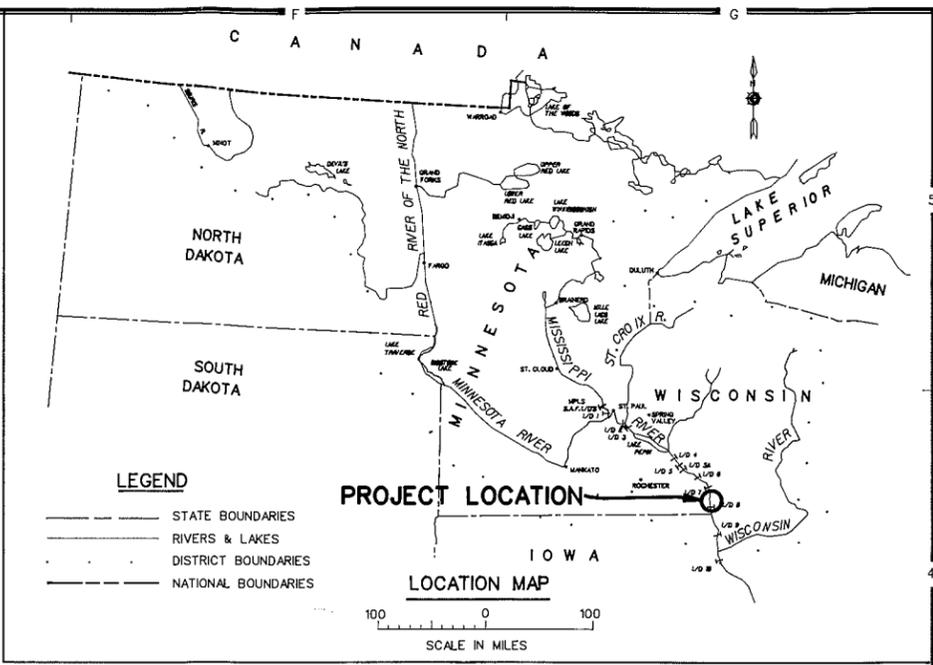
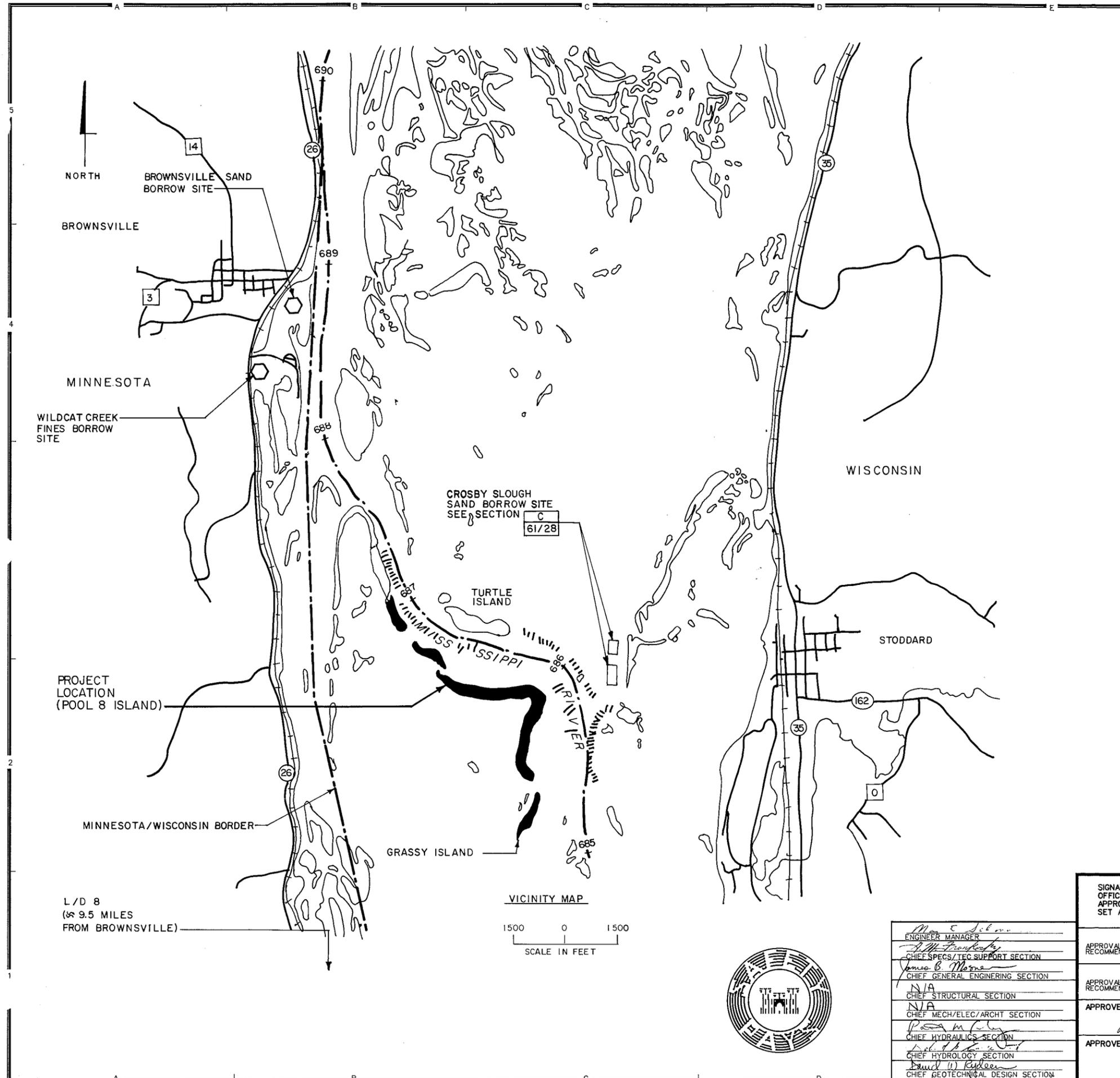
AS - BUILT AS OF COMPLETION DATE		6/91	<i>M</i>
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: FJB	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: JJC	POOL 8 ISLAND CONSTRUCTION - PHASE I		
SUBMITTED BY:	CROSS SECTIONS STATIONS 2+00E THRU 8+00E		
CHIEF	BRANCH	APPROVED BY:	DATE: JUNE 1990
CHIEF MICROSTATION DRAWING POOL8-AF.DGN 6-15-90	CHIEF ENGR. DIVISION		SCALE AS SHOWN DATE: 6-15-90
		DRAWING NUMBER M-P8-61/24	
		SHEET 12 OF 13	



**NOTE:**  
 1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.

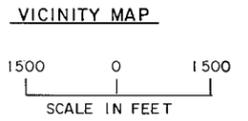


AS - BUILT AS OF COMPLETION DATE		6/91	MC
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM MISSISSIPPI RIVER		
DRAWN BY: WJW	POOL 8 - VERNON COUNTY, WISCONSIN		
CHECKED BY: JJG	POOL 8 ISLAND CONSTRUCTION-PHASE I		
SUBMITTED BY:	CROSS SECTIONS STATIONS 9+40E THRU 14+00E		
APPROVED BY:	DATE: JUNE 1990		
SCALE AS SHOWN	SPEC. NO. DACW37-90-B-0042		
<b>DRAWING NUMBER</b> M-P8-61/25			
SHEET 13 OF 13			



DRAWING INDEX		
DRAWING	SHT.	DESCRIPTION
M-P8-10/10	1	LOCATION, VICINITY MAP & DRAWING INDEX
M-P8-61/26	2	PROJECT PLAN AND CONTROL DATA
M-P8-61/27	3	ISLAND SECTIONS
M-P8-61/28	4	RIPRAP/BERM TRANSITION PLAN, SECTIONS & CROSBY SLOUGH SAND BORROW TYR. SECT.
M-P8-61/29	5	PARTIAL CLOSURE STRUCTURE PLAN & SECTIONS
M-P8-61/30	6	GRASSY ISLAND PLAN & SECTIONS
REFERENCE DRAWINGS		
M-P8-10/11		BORING LOCATION
M-P8-10/12		BORING LOCATION
M-P8-10/13		BORING LEGEND, GENERAL NOTES, LOGS 87-1M THRU 87-4M
M-P8-10/14		BORING LOGS 87-5M THRU 87-8M AND 90-9M THRU 90-11M
M-P8-10/15		BORING LOGS 90-12M THRU 90-18M
M-P8-10/16		BORING LOGS 90-19M THRU 90-25M
M-P8-10/17		BORING LOGS 91-26M THRU 91-32M
M-P8-10/18		BORING LOGS 91-33M THRU 91-39M
M-S8-13/93-115		GRASSY ISLAND AND POOL 8 X-SECTIONS

L/D 8  
(9.5 MILES  
FROM BROWNSVILLE)



*M. E. Johnson*  
 ENGINEER MANAGER  
*J. M. [Signature]*  
 CHIEF SPECS/TEC SUPPORT SECTION  
*James B. [Signature]*  
 CHIEF GENERAL ENGINEERING SECTION  
 N/A  
 CHIEF STRUCTURAL SECTION  
 N/A  
 CHIEF MECH/ELEC/ARCHT SECTION  
*[Signature]*  
 CHIEF HYDRAULICS SECTION  
*[Signature]*  
 CHIEF HYDROLOGY SECTION  
*Paul W. [Signature]*  
 CHIEF GEOTECHNICAL DESIGN SECTION

SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDEXED ON THIS SHEET  
 APPROVAL RECOMMENDED: *Charles P. [Signature]*  
 CHIEF DESIGN BRANCH  
 APPROVAL RECOMMENDED: *[Signature]*  
 CHIEF ED-GH BRANCH  
 APPROVED: *Alan Kumpula*  
 CHIEF ENGINEERING DIVISION  
 APPROVED: *[Signature]*  
 COL. CORPS OF ENGINEERS

AS - BUILT AS OF COMPLETION DATE	9/93
SYMBOL	DESCRIPTION
DESIGNED BY: WPR	ENVIRONMENTAL MANAGEMENT PROGRAM — MISSISSIPPI RIVER POOL 8 - VERNON COUNTY, WISCONSIN <b>POOL 8 ISLAND CONSTRUCTION</b> PHASE I, STAGE 2 LOCATION AND VICINITY MAP AND DRAWING INDEX
DRAWN BY: JJZ	
CHECKED BY: JJJ	
SUBMITTED BY:	
SCALE: AS SHOWN	DATE: JULY 1991
SPEC. NO. DACW37-91-B-0009	CAD ID: POOL8IND.DGN (1-2-91)
	DRAWING NUMBER M-P8-10/10
	SHEET 1 OF 6

AS-BUILT

AFTER ISLAND CONSTRUCTION, PLUGS OF SATISFACTORY COARSE-GRAINED FILL MATERIAL TO BE CONSTRUCTED ACROSS ACCESS CHANNEL AT DISTANCES OF 100' & 400' FROM ISLAND SHORELINE. USE SAME CONFIGURATION AS PLUGS IN NORTH-SOUTH LEG FINES BORROW SITE.

50' MAXIMUM TOP WIDTH

START ISLAND CONSTRUCTION STA. 0+00

OUTLINE OF ISLAND CONSTRUCTION OUTLINE IS APPROXIMATE, VARIES WITH BOTTOM ELEVATION  
ISLAND CONTROL LINE

END ISLAND CONSTRUCTION STA. 87+43.39

HORIZONTAL CONTROL POINTS				
HUB	SOUTH AZIMUTH	DISTANCE	COORDINATES	
			NORTH	EAST
8-21			254,494.28	2,728,752.40
8-22	82° 31' 37"	1,682.52	254,275.45	2,727,084.17
8-23	99° 44' 19"	1,779.05	254,576.38	2,725,330.76
8-24	161° 51' 41"	2,478.09	256,931.32	2,724,559.29

CONTROL POINTS FOR CENTERLINE OF ISLAND										
POINT	BEARING	DISTANCE IN FEET	COORDINATES		STATIONING		CURVE DATA			
			NORTH	EAST	PC	PT	Δ	R	T	L
PI-1	N88° 5' 50.46"W	280.73	250,790.00	2,728,115.00	0+00.00					0.00
PI-2	N1° 8' 20.22"E	1228.00	250,799.32	2,727,834.42	0+00.00	4+43.10	89° 14' 10"	284.50	280.73	443.10
PI-3	N28° 26' 35.53"E	1345.04	252,027.08	2,727,858.83	4+43.10	23+01.64	27° 18' 15"	3900.00	947.27	1858.54
PI-4	S82° 54' 18.50"W	661.07	253,209.76	2,728,499.46	23+77.50	27+40.48	125° 32' 17"	165.66	321.92	362.98
PI-5	S82° 17' 58.04"W	2038.36	253,128.11	2,727,843.44	27+40.48	34+16.78	10° 47' 43"	3589.39	339.15	676.30
PI-6	N32° 15' 3.97"W	692.11	253,259.67	2,725,809.33	44+23.88	57+03.90	54° 2' 54"	1356.93	692.11	1280.02
PI-7	N34° 31' 36.59"E	230.11	253,845.00	2,725,440.00		57+03.90				0.00
PI-8	N18° 27' 49.31"W	391.64	254,034.58	2,725,570.42	59+34.01					0.00
PI-9	N80° 36' 14.50"W	649.80	254,406.06	2,725,446.39	59+34.01	66+38.97	62° 8' 25"	650.00	391.64	704.96
PI-10	N30° 18' 56.85"W	258.16	254,512.15	2,724,805.31	66+38.97	71+21.70	50° 17' 17"	550.00	258.16	482.73
PI-11	N33° 33' 10.60"W	441.69	254,735.00	2,724,675.00		71+21.70				0.00
PI-12	N34° 47' 16.84"W	517.59	255,103.09	2,724,430.88	75+63.39					0.00
PI-13	N7° 35' 24.38"W	432.09	255,528.17	2,724,135.57	78+87.50	82+67.16	27° 11' 52"	799.80	193.48	379.66
PI-14	N16° 41' 7.40"W	238.62	255,956.48	2,724,078.50	82+67.16	87+43.39	9° 5' 43"	3000.00	238.62	476.23
PI-15			256,185.05	2,724,009.99		87+43.39				0.00

STATIONS OF GROIN CENTERLINES NORTH/SOUTH LAG OF ISLAND

NAVIGATION (EAST) CHANNEL SIDE	BACKWATER (WEST) SIDE
4+00	1+30
5+80	2+20
7+60	3+10
9+40	4+90
11+20	6+70
13+00	8+50
14+80	10+30
16+60	12+10
18+40	13+90
20+20	15+70
22+00	17+50

SEE DWG M-P8-61/30 GRASSY ISLAND FOR GROIN DETAIL SHEET 6 OF 6

LEGEND

-  ISLAND ACCESS AREA
-  BORROW AREA
-  EXISTING SUBMERGED BANK PROTECTION

ACCESS REACHES FOR ISLAND CONSTRUCTION

- STA. 0+00 TO GRASSY ISLAND
- STA. 25+25 TO STA. 25+75
- STA. 58+00 ENTRY POINTS FOR CONSTRUCTION (70 FOOT WIDE)
- STA. 72+50 ENTRY POINTS FOR CONSTRUCTION (70 FOOT WIDE)
- STA. 84+10

NOTES:

1. DATE OF AERIAL PHOTOGRAPH: NOV. 7, 1981.
2. COORDINATES BASED ON MINNESOTA STATE PLANE GRID SYSTEM, SOUTH ZONE.
3. TBM NO. 1 PBW 2, RR SPIKE IN POLE, ELEV. 635.86, 1912 ADJ. N.G.V.D. TBM NO. 2 PBW 1, RR SPIKE IN DOWNSTREAM SIDE OF POWER POLE, ELEV. 641.43, 1912 ADJ. N.G.V.D.
4. WORK LIMITS FOR ISLAND CONSTRUCTION: 5' FROM TOE OF NEW ISLAND TEMPLATE ON ALL SIDES OF ISLAND, EXCEPT AT RIPRAP, BORROW, AND ACCESS AREAS.
5. MAXIMUM TOP WIDTH OF ISLAND ACCESS CHANNELS IS 50 FEET.

REFERENCES:

1. ISLAND SECTIONS 61/27
2. RIPRAP / BERM TRANSITION PLAN AND SECTIONS AND CROSBY SLOUGH BORROW TYPICAL SECTION. 61/28
3. PARTIAL CLOSURE PLAN AND SECTIONS. 61/29
4. GRASSY ISLAND PLAN AND SECTIONS. 61/30

DWG.

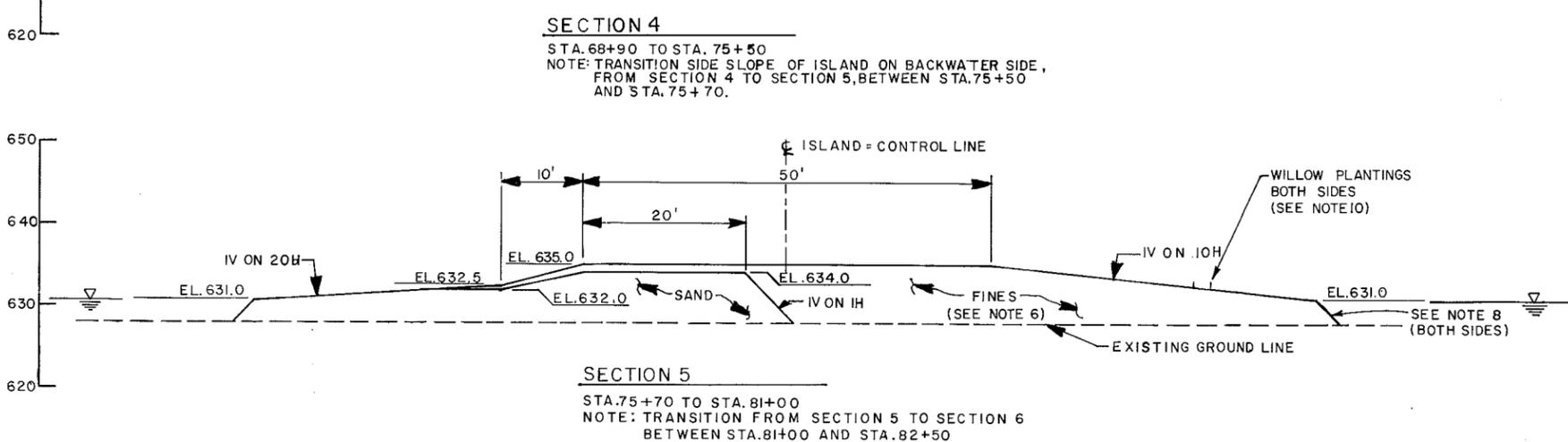
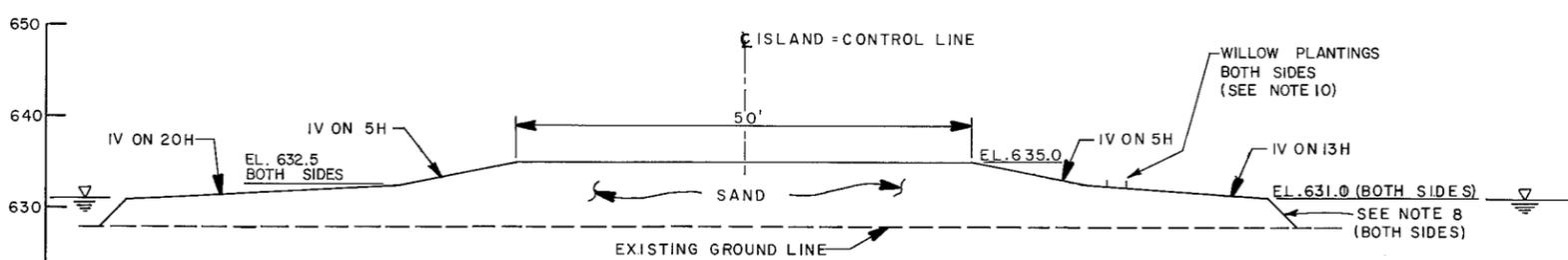
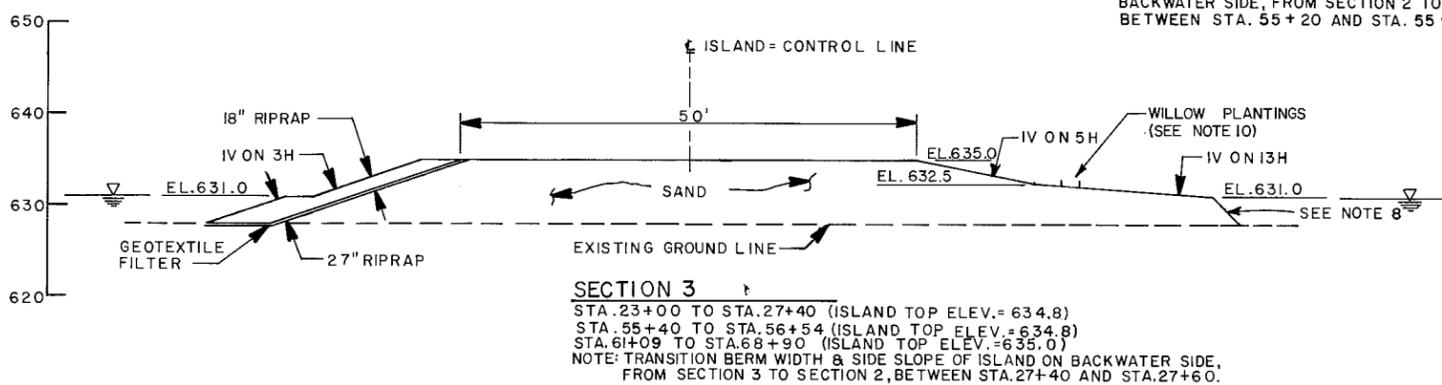
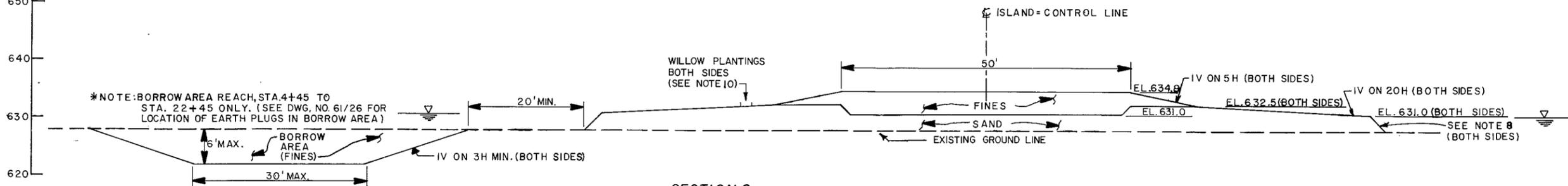
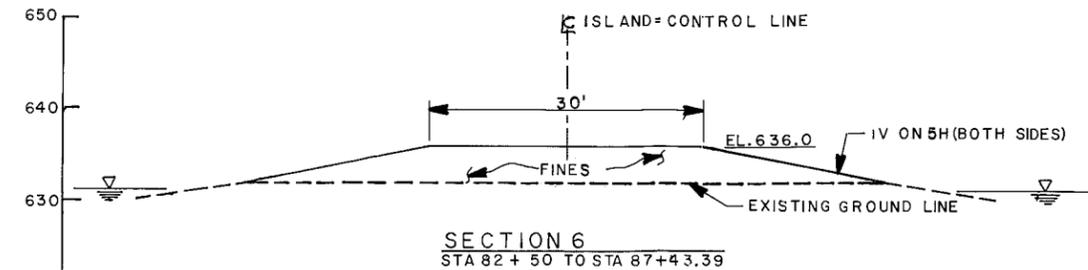
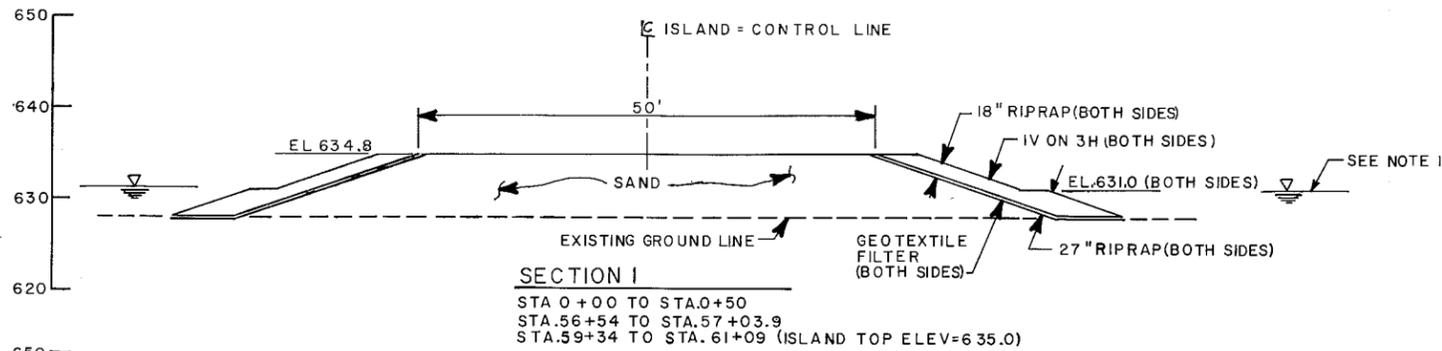
- 61/27
- 61/28
- 61/29
- 61/30



PLAN

400' 0 400'  
SCALE IN FEET

AS - BUILT AS OF COMPLETION DATE		9/93
SYMBOL	DESCRIPTION	DATE APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
DESIGNED BY: JSH,	ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER	
DRAWN BY: AMK, JJG	POOL 8 VERNON COUNTY, WISCONSIN	
CHECKED BY: JMC	POOL 8 ISLAND CONSTRUCTION - PHASE I, STAGE 2	
SUBMITTED BY:	PROJECT PLAN AND CONTROL DATA	
APPROVED BY:	DATE:	
	JULY 1991	
SCALE:	AS SHOWN	SPEC. NO.
DRAWING NUMBER M-P8-61/26		
SHEET 2 OF 6		



**NOTES:**

1. LOCATION OF WATER SURFACE ON ALL SECTIONS IS APPROXIMATE AND FOR VISUAL REFERENCE ONLY, FOR HYDROGRAPH AND DURATION CURVE INFORMATION SEE SECTION J, ATTACHMENT NO. 5, OF SPECIFICATIONS.
2. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.
3. EXISTING AVERAGE GROUND ELEV. APPROX. 628 ±.
4. 6" OF FINES (TOLERANCE ± 2") TO BE PLACED ON TOP AND SIDE SLOPES OF ISLAND DOWN TO EL. 631.75 (SECTIONS 1 THRU 4), EXCEPT WITHIN AREAS OF RIPRAP AND FINES. SECTIONS SHOW FINISHED GRADE INCLUDING FINES.
5. EXISTING ISLANDS ALONG THE PROPOSED ISLAND ALIGNMENT ARE TO BE SHAPED AND/OR FILLED TO CONFORM TO THE RELEVANT ISLAND SECTION(S). RIPRAP IN AREAS OF EXISTING ISLANDS WAS PLACED TO ELV. 628. EXISTING ISLANDS OUTSIDE THE NEW ISLAND TEMPLATE WERE LEFT AS FOUND.
6. EXISTING GROUND SETTLEMENT/DISPLACEMENT AVERAGING 1' BENEATH THE CROWN OF THE ISLAND TAPERING TO 0' AT THE TOE OF THE ISLAND IS ANTICIPATED BETWEEN STA. 0+00 TO STA. 50+00.
7. MECHANICAL PLACEMENT OF FINES IS MANDATORY FOR SECTION 5 REACH.
8. PAYMENT SLOPE AT TOE OF ISLAND IS IV ON 1H.
9. SECTIONS TAKEN LOOKING DOWN STREAM.
10. WILLOWS TO BE PLANTED BETWEEN ISLAND ELEVATIONS 632.0 TO 632.5 IN 2 ROWS WITH 2' SPACING BETWEEN ROWS AND WILLOWS STAGGER ROWS.

**REFERENCES:**

1. RIPRAP / BERM TRANSITION PLAN AND SECTIONS.

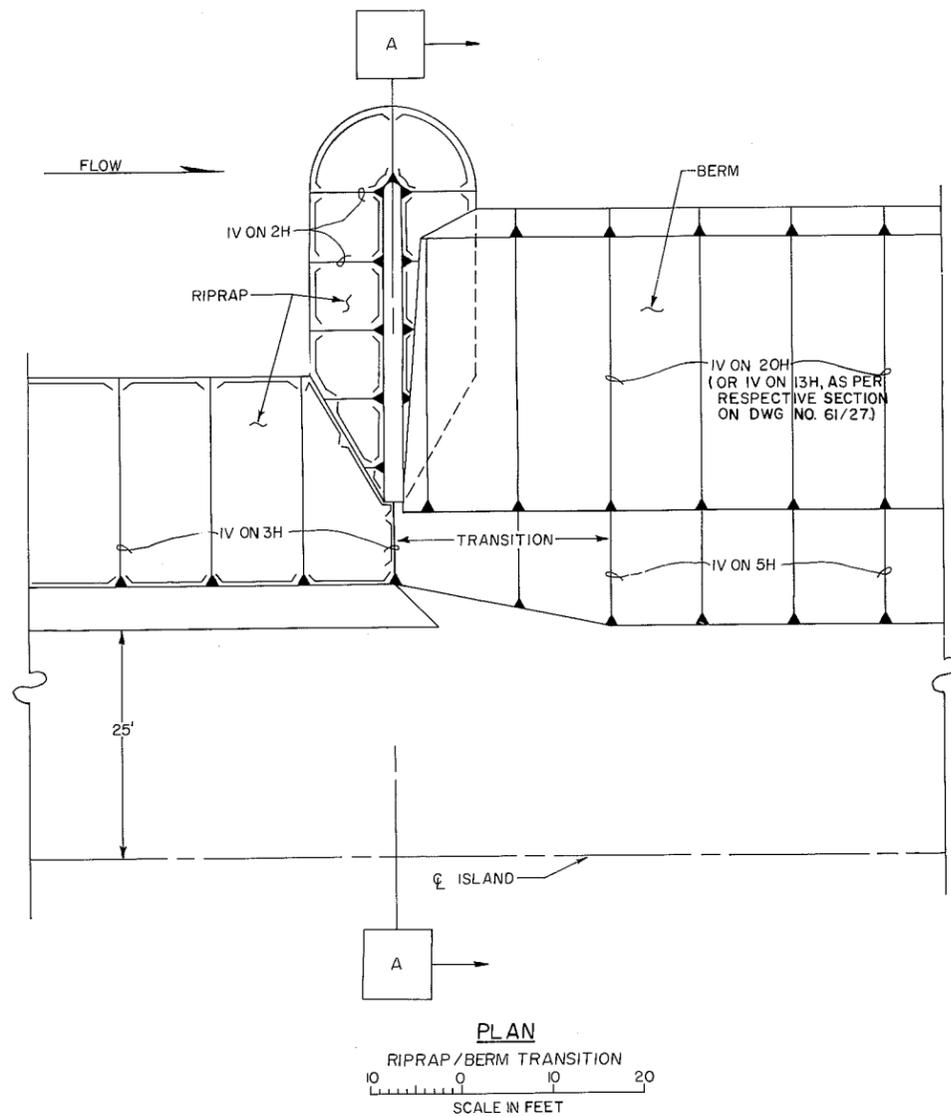
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61 / 28

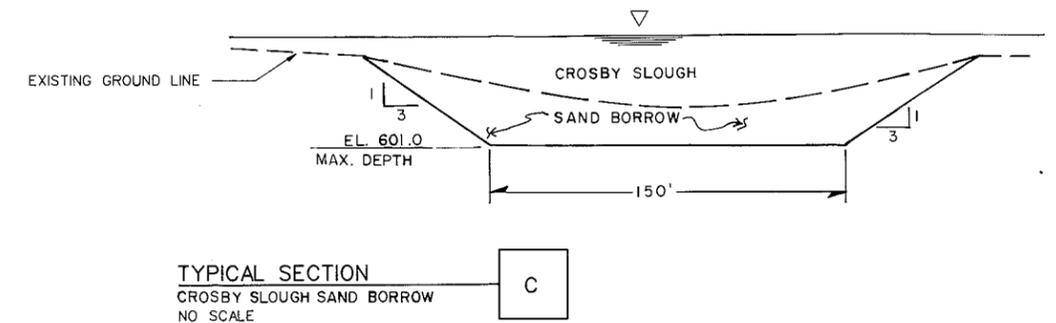


AS-BUILT AS OF COMPLETION DATE		9/93	
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY:	JSH, AMK, JJG	ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL 8 VERNON COUNTY, WISCONSIN	
DRAWN BY:	JJZ	<b>POOL 8 ISLAND CONSTRUCTION - PHASE I, STAGE 2</b> ISLAND SECTIONS	
CHECKED BY:	JJZ		
APPROVED BY:	CHIEF BRANCH	DATE:	JULY 1991
APPROVED BY:	CHIEF ENGR. DIVISION	SCALE:	AS SHOWN
DRAWING NUMBER		SPEC NO.	
M-P8-61/27			
SHEET 3		OF 5	

AS-BUILT



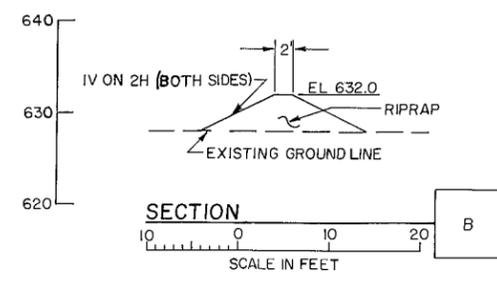
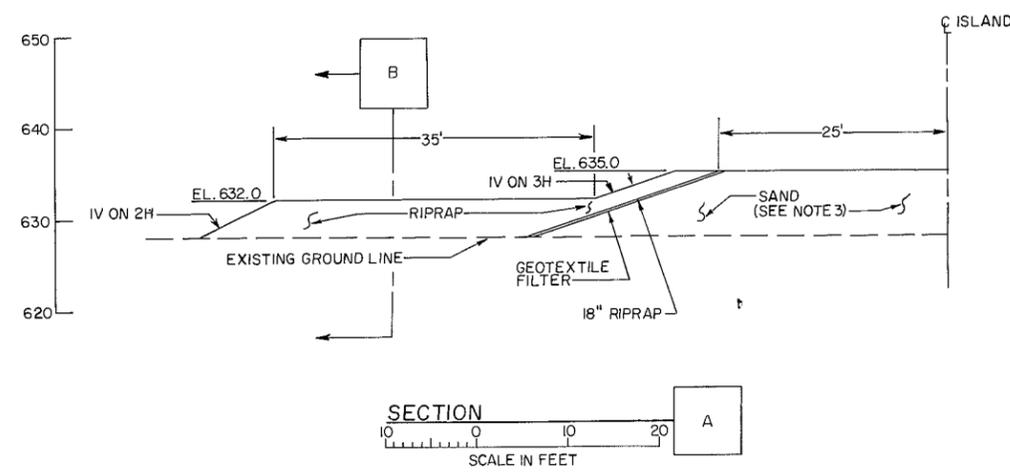
**NOTE:**  
CROSBY SLOUGH SAND BORROW AREA CONSISTS OF TWO REACHES, 600' & 350' IN LENGTH WITH 300' SPACING BETWEEN THE REACHES, ALONG THE CENTER OF CROSBY SLOUGH CHANNEL; LOCATED ~1100 FEET EAST OF CROSBY SLOUGH DAYMARK (R.M. 685.9). CENTER LINE OF BORROW AREA WILL BE STAKED BY OTHERS.



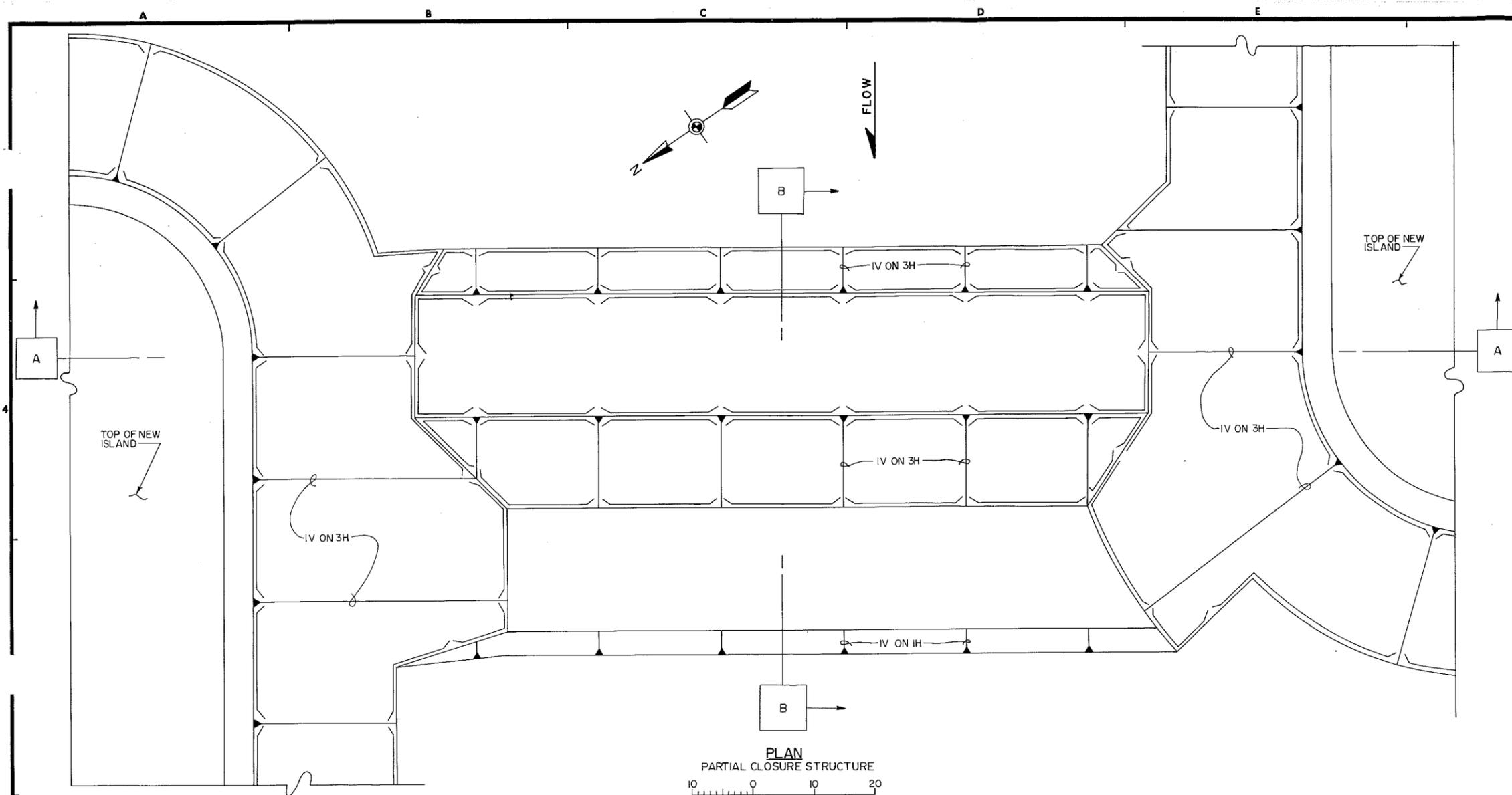
**RIPRAP / BERM TRANSITION LOCATIONS**

- STA. 00+50 (BOTH SIDES OF ISLAND)
- STA. 23+00 (NAVIGATION SIDE OF ISLAND)
- STA. 27+50 (NAVIGATION SIDE OF ISLAND)
- STA. 55+30 (NAVIGATION SIDE OF ISLAND)
- STA. 56+54 (BACKWATER SIDE OF ISLAND)
- STA. 61+90 (BACKWATER SIDE OF ISLAND)
- STA. 68+90 (NAVIGATION SIDE OF ISLAND)

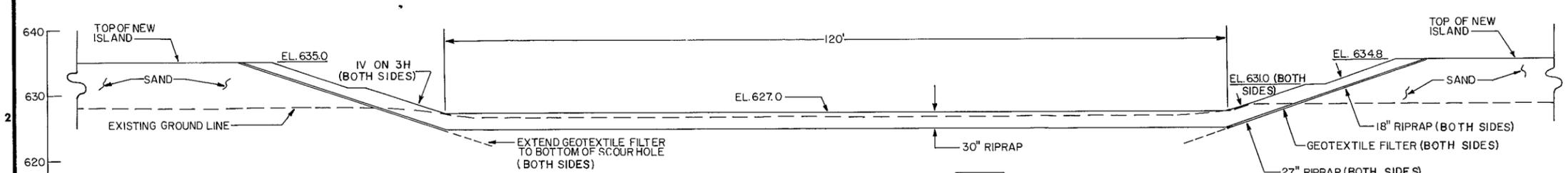
- NOTES:**
1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.
  2. EXISTING AVERAGE GROUND ELEV. APPROX. 628
  3. FOR SECTION 2 REACHES, ISLAND FILL IS COMBINATION OF FINES AND SANDS.



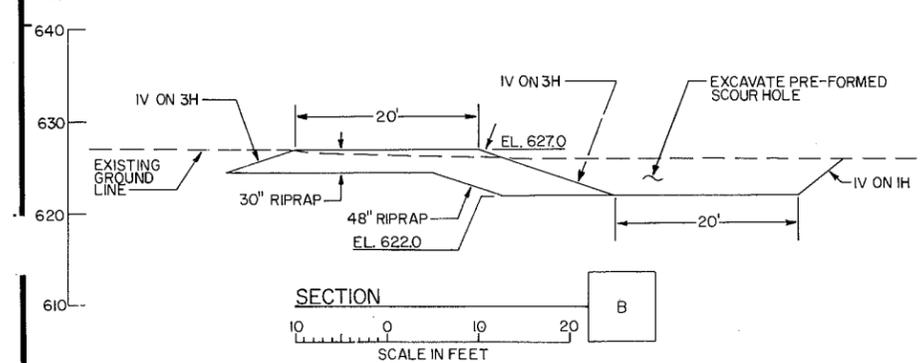
AS - BUILT AS OF COMPLETION DATE		9/93	
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
DESIGNED BY: JSH, AMK, JJC	ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL 8	VERNON COUNTY, WISCONSIN	
DRAWN BY: JMC	POOL 8 ISLAND CONSTRUCTION - PHASE I, STAGE 2		
CHECKED BY: JJC	RIPRAP/BERM TRANSITION, PLAN AND SECTIONS		
SUBMITTED BY:	AND CROSBY SLOUGH SAND BORROW TYPICAL SECTION		
CHIEF	BRANCH	APPROVED BY:	DATE:
CHIEF	BRANCH	CHIEF ENGR. DIVISION	JULY 1991
SCALE AS SHOWN		SPEC. NO.	
DRAWING NUMBER			
M-P8-61/28			
SHEET 4		OF 6	



**PLAN**  
PARTIAL CLOSURE STRUCTURE  
SCALE IN FEET



**SECTION**  
SCALE IN FEET

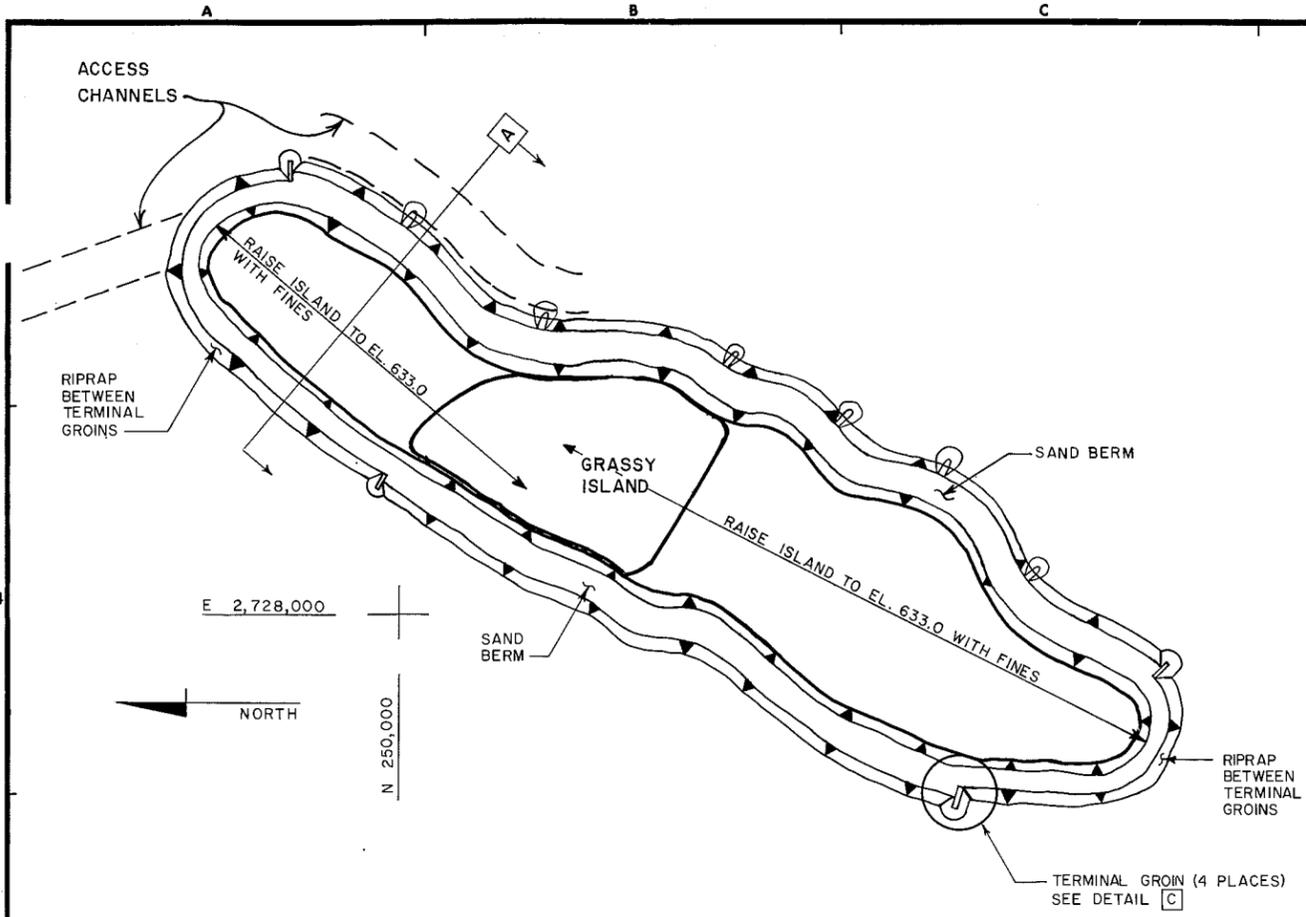


**SECTION**  
SCALE IN FEET

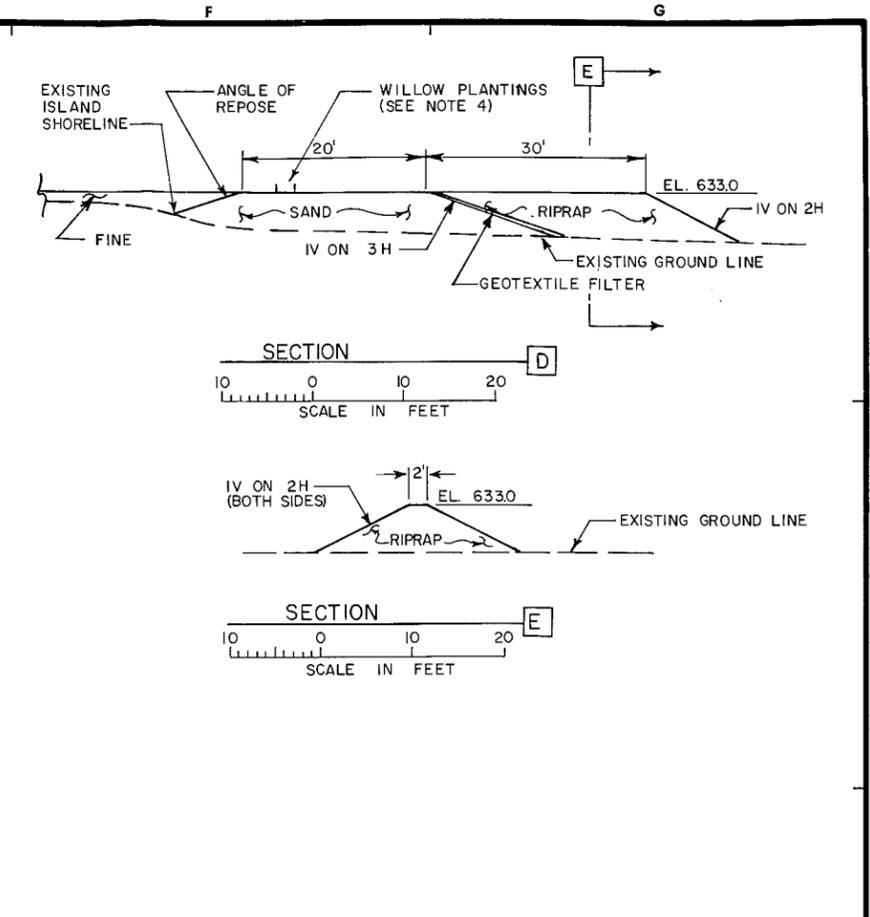
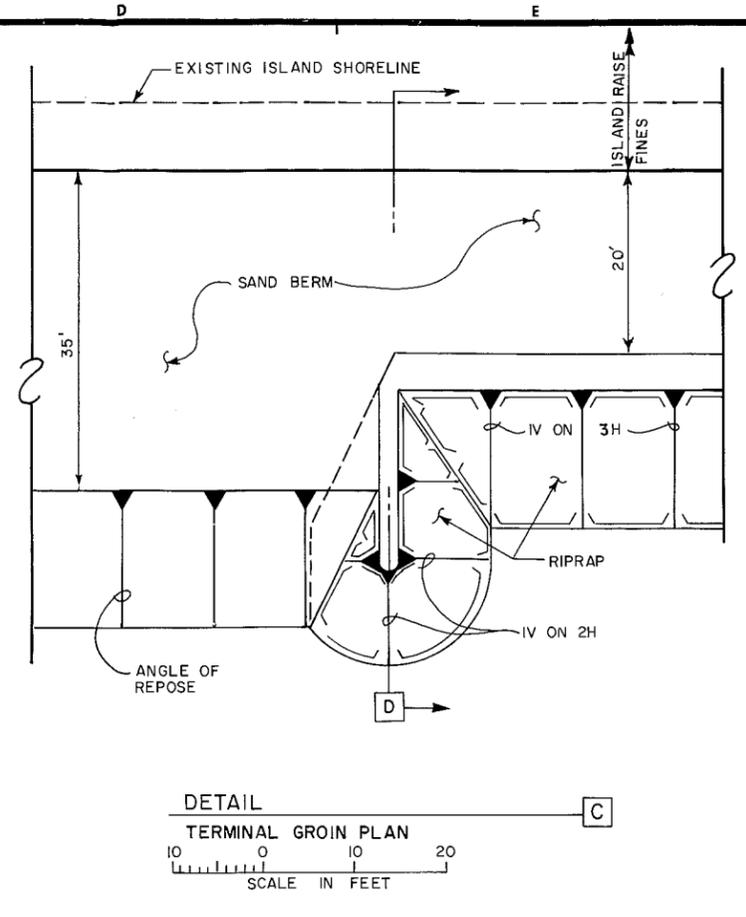
**NOTES:**  
1. ELEVATIONS ARE 1912 (ADJ.) N.G.V.D.



AS - BUILT AS OF COMPLETION DATE		9/93
SYMBOL	DESCRIPTION	DATE APPROVAL
<b>DEPARTMENT OF THE ARMY</b> ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
DESIGNED BY: JSH, AMK, JJG	ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL 8	VERNON COUNTY, WISCONSIN
DRAWN BY: JMC	<b>POOL 8 ISLAND CONSTRUCTION - PHASE I, STAGE 2</b>	
CHECKED BY: [Signature]	PARTIAL CLOSURE STRUCTURE PLAN AND SECTIONS	
SUBMITTED BY:	APPROVED BY: [Signature]	DATE: JULY 1991
CHIEF	BRANCH	SCALE: AS SHOWN SPEC. NO.
CHIEF	BRANCH	DRAWING NUMBER M-P 8-61/29
		SHEETS OF 6

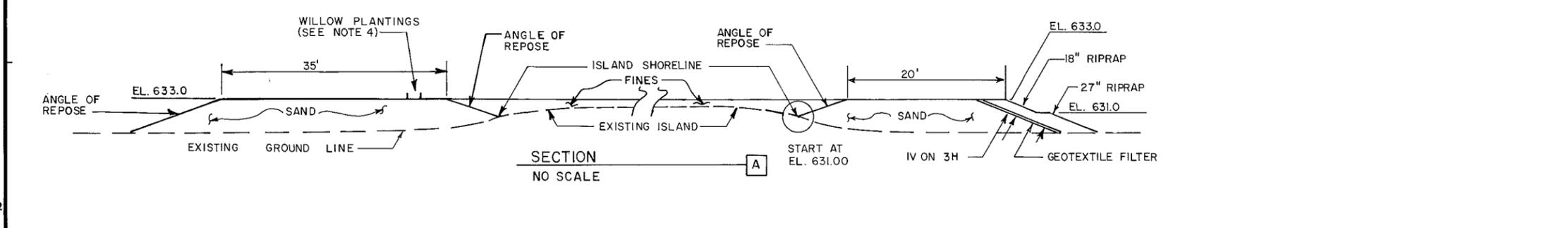


PLAN  
GRASSY ISLAND  
NO SCALE



NOTES:

- ELEVATIONS ARE 1912(ADJ.) NGVD.
- EXISTING AVERAGE GROUND ELEV. APPROX. 628', BELOW BERMS.
- 6" OF FINES (TOLERANCE ±2") TO BE PLACED ON TOP AND SIDE SLOPES OF ISLAND DOWN TO EL. 631.75, EXCEPT WITHIN AREAS OF RIPRAP. SECTIONS SHOW FINISHED GRADE INCLUDING FINES.
- WILLOWS TO BE PLANTED OVER THE BACK (EXISTING ISLAND SIDE) 10 FEET OF THE SAND BERM IN 2 ROWS WITH 2' SPACING BETWEEN ROWS AND WILLOWS, STAGGER ROWS (EXCEPT REACHES WHERE SAND BERM IS RIPRAPPED).
- FINAL ISLAND SHAPE AND SIZE IS AS SHOWN ON AS BUILT CROSS SECTIONS. AS BUILT CROSS SECTIONS ARE ON MYLAR FOR FUTURE REFERENCE.
- A. GROINS SHALL BE 40 FT. LONG, 10 FT. KEYED INTO THE ISLAND.  
B. KEYED AREA SHALL BE BURIED WHEN COMPLETED.  
C. EXCESS EXCAVATION SHALL BE DISTRIBUTED ALONG THE SHORELINE ON THE ORIGINAL SLOPE.  
D. GROIN CROSS SECTION SHALL BE AS SHOWN ON DRAWING M-PB-61/30, SECTION E, EXCEPT THE TOP ELEVATION SHALL BE 632.00.  
E. GROIN SPACING SHALL BE AS FOLLOWS FROM THE EXISTING DOWNSTREAM GROIN:  
100'  
200'  
300'  
450'  
600'  
750'  
900'



AS-BUILT AS OF COMPLETION DATE		9/93
SYMBOL	DESCRIPTION	DATE APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
DESIGNED BY: JSH, AMK, JJG	ENVIRONMENTAL MANAGEMENT PROGRAM-MISSISSIPPI RIVER POOL 8 VERNON COUNTY, WISCONSIN	
DRAWN BY: GRS	POOL 8 ISLAND CONSTRUCTION-PHASE I, STAGE 2 GRASSY ISLAND PLAN AND SECTIONS	
CHECKED BY:		
SUBMITTED BY:		
APPROVED BY:	DATE:	
	JULY 1991	
SCALE:	AS SHOWN	SPEC. NO.
DRAWING NUMBER M-P8-61/30		
SHEET 6 OF 6		

**APPENDIX B**

**MEMORANDUM OF AGREEMENT**

MEMORANDUM OF AGREEMENT  
BETWEEN  
THE UNITED STATES FISH AND WILDLIFE SERVICE  
AND  
THE DEPARTMENT OF THE ARMY  
FOR  
ENHANCING FISH AND WILDLIFE RESOURCES  
OF THE  
UPPER MISSISSIPPI RIVER SYSTEM  
AT THE  
POOL 8 ISLAND CONSTRUCTION - PHASE I  
VERNON COUNTY, WISCONSIN

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (FWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Pool 8 Island (Phase I) separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features for the Pool 8 Island Construction project are 100% Federal, and all operation, maintenance, repair, and rehabilitation costs are to be cost shared 75% Federal and 25% non-Federal.

### III. GENERAL SCOPE

The Pool 8 Island Construction project to be accomplished pursuant to this MOA shall consist of raising, stabilizing, and extending an existing horseshoe-shaped island system. This will increase protection to the backwater area from wind induced waves and river current, as well as reduce suspended sediment loads entering these backwater areas. It is expected that these changes should preserve the 400 acres of backwater habitat currently protected by the present horseshoe-shaped island system. It should also lead to an increase in protected shallow and deep water habitat of 100 and 30 acres, respectively, with positive effects in an additional 355 acres.

### IV. RESPONSIBILITIES

#### A. DOA is responsible for:

1. Construction: Construction of the Project which consists of raising an existing horseshoe-shaped island system and creating one stable island along the existing island system. A second 5,000-foot-long island would be constructed immediately downstream of the first, with an opening left between the two islands to allow inflow via a major slough. Riprap would be placed on both islands through the slough area and also at the far downstream end of the newly created island.

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

3. Construction Management: Subject to and using funds appropriated by the Congress of the United States, DOA will construct the Pool 8 Island project - Phase I as described in the Definite Project Report, Pool 8 Island Construction - Phase I, Habitat Rehabilitation and Enhancement, dated June 1989, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The FWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the

contractor of a Notice to Proceed. If DOA encounters potential delays related to construction of the Project, DOA will promptly notify FWS of such delays.

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

B. FWS is responsible for:

1. Operation, Maintenance, and Repair: Upon completion of construction as determined by the District Engineer, St. Paul, the FWS shall accept the Project and shall operate, maintain, and repair the Project as defined in the Definite Project Report entitled "Pool 8 Island Construction - Phase I, Habitat Rehabilitation and Enhancement," dated June 1989, in accordance with Section 906(e) of the Water Resources Development Act, Public Law 99-662.

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

V. MODIFICATION AND TERMINATION

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

VI. REPRESENTATIVES

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

FWS: Regional Director

U.S. Fish and Wildlife Service  
Federal Building, Fort Snelling  
Twin Cities, Minnesota 55111

DOA: District Engineer

U.S. Army Engineer District, St. Paul  
1421 U.S. Post Office and Custom House  
St. Paul, Minnesota 55101-1479

VII. EFFECTIVE DATE OF MOA

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

THE DEPARTMENT OF THE ARMY

THE U.S. FISH AND WILDLIFE SERVICE

BY:



(signature)

ROGER L. BALDWIN  
Colonel, Corps of Engineers  
St. Paul District

BY:



(signature)

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

Date JUN 05 1990

Date APR 23 1990

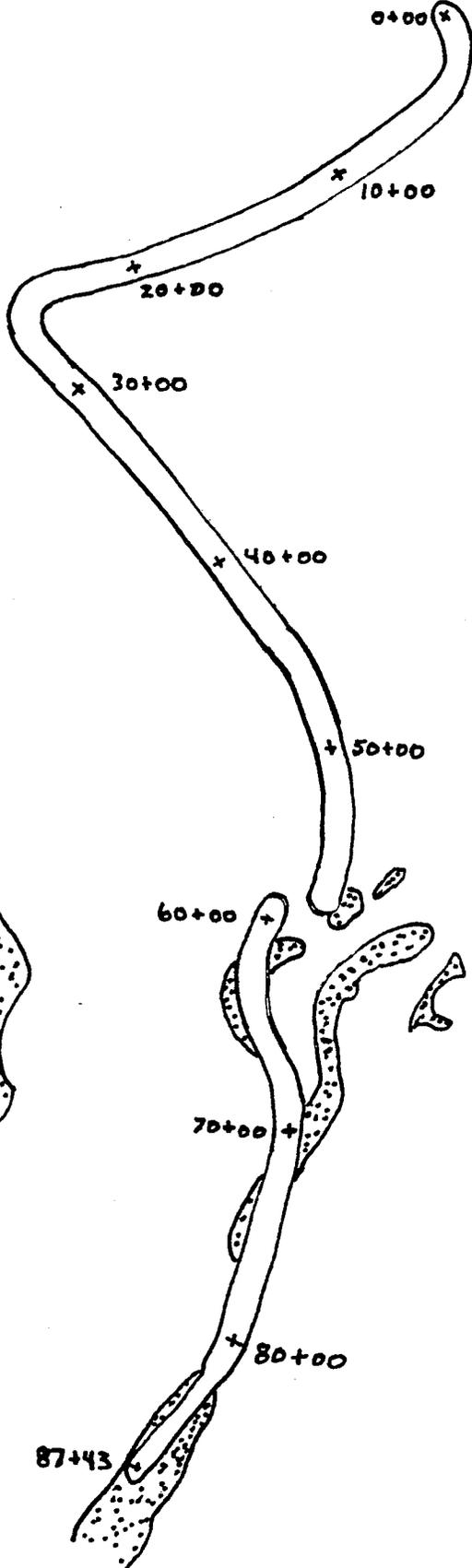
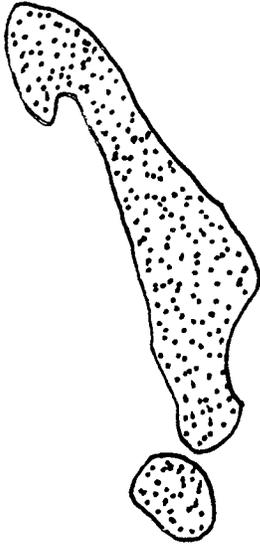
**APPENDIX C**

**CHECKLIST FORM COVERING INSPECTIONS**





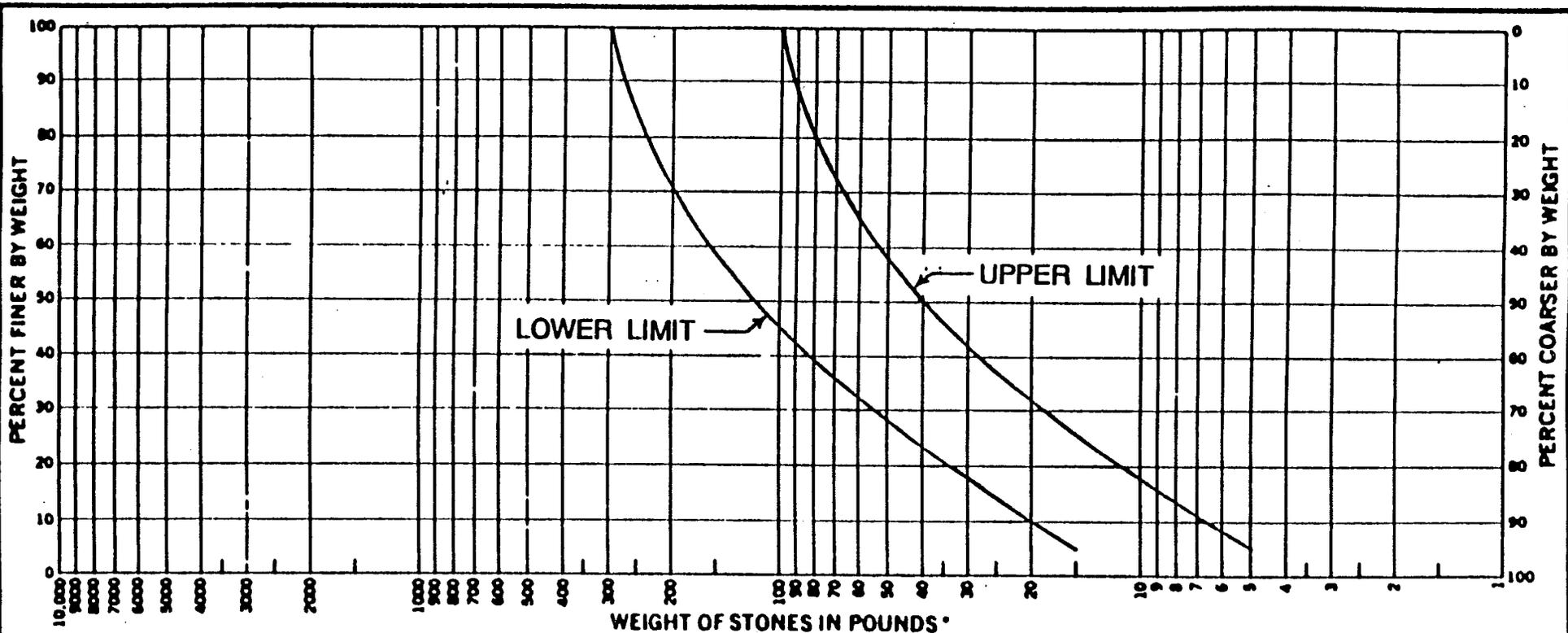
Turtle Island



87+43

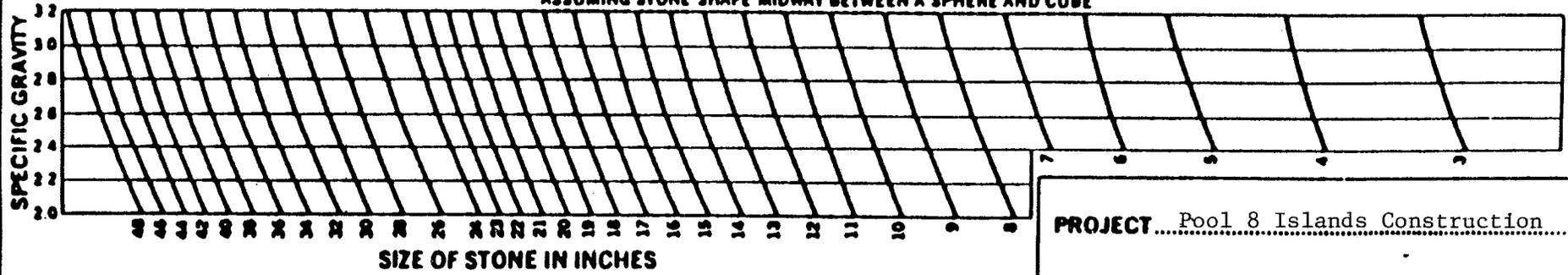
**APPENDIX D**

**REPLACEMENT SPECIFICATIONS**



WEIGHT OF STONES IN POUNDS\*  
 SPECIFIC GRAVITY OF ROCK.....

\*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE



PROJECT..... Pool 8 Islands Construction.....  
 .....

DATE..... August 1991.....

**RIPRAP GRADATION CURVES**

SECTION 2T - GEOTEXTILE USED AS FILTER

1. SCOPE: The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishing, hauling, and placing the geotextile, complete, as specified and shown, and maintaining the geotextile until placement of the stone protection cover is completed and accepted.

2. NOT USED.

3. APPLICABLE PUBLICATIONS: The current issues of the publications listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

3.1 American Society for Testing and Materials (ASTM):

- D 123-89C. Standard Terminology Relating to Textiles.
- D 1683-81. Failure in Sewn Seams of Woven Fabrics.
- D 3787-80A. Bursting Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test.
- D 3884-80. Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method).
- D 4439-87. Standard Terminology for Geotextiles.
- D 4491-89. Test Methods for Water Permeability of Geotextiles By Permittivity.
- D 4533-85. Trapezoid Tearing Strength of Geotextiles.
- D 4632-86. Breaking Load and Elongation of Geotextiles (Grab Method).
- D 4751-87. Determining Apparent Opening Size of a Geotextile.

3.2 U.S. Army Corps of Engineers:

- EM 1110-2-1906. Laboratory Soils Testing.  
(NOV 1970) &  
Chgs 1 & 2.

4. NOT USED.

5. SUBMITTALS. The following items shall be submitted in accordance with SECTION L.

5.1 Certificates of compliance as specified in PARAGRAPH: MATERIALS.

5.2 Samples as specified in PARAGRAPH: MATERIALS.

## 6. MATERIALS:

6.1 Geotextile: The geotextile shall be a woven or non-woven pervious sheet of plastic yarn as defined by ASTM D-123. The geotextile shall meet the physical requirements specified in Table No. 1. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide, or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic if necessary to make the filaments resistant to deterioration due to ultra-violet and heat exposure. The edges of the geotextile shall be finished to prevent the outer fibers from pulling away from the geotextile.

6.2 Seams: The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 36 feet wide. Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table No. 1) of the unaged geotextile in all principal directions.

6.3 Acceptance Requirements: All geotextile to be used shall be accepted on the following basis. The Contractor shall furnish the Contracting Officer, in duplicate, a certificate of compliance (mill certificate or affidavit) signed by a legally authorized official from the company manufacturing the geotextile. The certificate of compliance shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification. If requested by the Contracting Officer, the Contractor shall provide to the Contracting Officer geotextile samples for testing to determine compliance with any or all of the requirements in this specification. When samples are to be provided, they shall be submitted a minimum of 60 calendar days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as will be supplied for the contract, and shall be the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation.

7. SHIPMENT AND STORAGE: During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy duty protective covering.

8. INSTALLATION: The geotextile shall be placed in the manner and at the locations shown. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, or storage. The surface to receive the geotextile shall be prepared to a relatively smooth condition free of obstructions, depressions, debris and soft or low density pockets

of material. Erosion features such as rills, gullies, etc. must be graded out of the surface before geotextile placement. If erosion features should develop after placement of the geotextile and prior to placement of stone protection, the geotextile shall be removed, the surface regraded and the geotextile replaced by the Contractor at no additional cost to the Government. The geotextile shall be laid smooth and free of folds, wrinkles, or creases, but also free of tensile stress. Sections of geotextile shall be placed to provide a minimum width of 36 inches of overlap for each joint. The placement procedure below water shall avoid water entrapment under the geotextile during the stone placement and subsequent reduction of overlap at geotextile joints. For joints that run parallel to the shoreline, the upslope strips shall overlap the downslope strips. Temporary pinning of the textile to help hold it in place until the riprap is placed will be allowed. The temporary pins shall be removed as stone protection is placed to relieve high tensile stress which may occur during placement of stone protection on the geotextile. The placement procedure requires that the length of the geotextile be approximately 15 percent greater than the slope length. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. The geotextile shall be protected at all times during construction from contamination by surface run-off and any geotextile so contaminated shall be washed clean with water or replaced with uncontaminated geotextile. Geotextile damaged during its installation or during placement of stone protection shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 7 calendar days after placement of the geotextile: failure to comply with this requirement will require replacement of geotextile. The geotextile shall be protected from damage during the placement of stone protection. This may be accomplished by limiting the height of drop to less than 1 foot, by placing a cushioning layer of sand or gravel on top of the geotextile before placing the stone protection, or other methods approved by the Contracting Officer. Before placing the stone protection or other materials, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

9. QUALITY CONTROL: The Contractor shall establish and maintain quality control for all operations to assure compliance with the contract requirements and maintain records of his quality control for all construction operations, including but not limited to, the following:

- (1) Materials. Suitability, type and strength.
- (2) Construction. Layout, materials, handling, maintaining drainage, line and grade, installation, fabrication.
- (3) Testing for connection strength and long term allowable design load.
- (4) Certificate of Compliance.
- (5) Storing and Handling.

A copy of the records of inspections and test, as well as correctiv actions taken, shall be furnished to the Government as directed by the Contracting Officer.

10. MEASUREMENT AND PAYMENT: For purposes of payment, the installed geotextile will be measured in place to the nearest square yard of protected area as delineated on the drawings. Payment will be made at the contract unit price and will constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile. Payment for the following items shall be included in the contract unit price for geotextile and shall not be counted a second time in the process of determining the extent of geotextile placed:

- a. Material and associated equipment and operation used in laps, seams, or extra length;
- b. Securing pins and associated material, equipment, and operations;
- c. Material and associated equipment and operations used to provide cushioning layer of sand or gravel or both to permit increase in allowable drop height of stone materials.

No payment shall be made for geotextiles replaced because of contamination or damage due to Contractor fault or negligence.

11. BIDDING SCHEDULE ITEMS applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Geotextile	S.Y.

\* \* \* \*

TABLE NO. 1 - PHYSICAL REQUIREMENTS

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Acceptable Values</u>
Tensile Strength (unaged geotextile) <sup>+</sup>	ASTM D 4632 grab method using 1 inch by 2 inch jaws and a 12 inches per minute constant rate of traverse.	200 pound minimum in all principal directions.
Breaking Elongation (unaged geotextile) <sup>+</sup>	ASTM D 4632 determine apparent breaking elongation.	15 percent minimum in all principal directions.
Puncture Strength (unaged geotextile) <sup>+</sup>	ASTM D 3787 except polished steel ball replaced with a 5/16-inch diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.	80 pound minimum.
Abrasion Resistance	ASTM D 3884 Rubber-base abrasive wheels equal to CS-17 "Calibrase" by Taber Instrument Co; 1 kilogram load per wheel; 1000 revolutions, determine residual breaking load.	55 pound minimum residual breaking load in all principal directions.
Apparent Opening Size (AOS)	ASTM D-4751 determine apparent opening size.	No finer than U.S. Standard Sieve No. 120 and no coarser than U.S. Standard Sieve No. 30.
Tear Strength	ASTM D 4533 trapezoid tearing strength.	30 pounds minimum in all principal directions.

+Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

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**APPENDIX E**

**EVALUATION AND MONITORING PLAN**

## POOL 8 ISLANDS - PHASE I

### MONITORING AND PERFORMANCE EVALUATION

A monitoring plan for the project has been developed to directly measure the degree of attainment of project objectives. Monitoring activities will be closely coordinated with similar efforts by the Long Term Resource Monitoring (LTRM) program. The evaluation items are described below and a schedule presented in the following table.

1. Objective: One of the primary objectives of the project is to preserve and enhance the existing aquatic plant beds for fish and wildlife in the project area by improving water quality behind the islands and reducing sediment inflow into the protected area from the main channel. Specific objectives identified to increase the extent and quality of aquatic vegetation were:

a. Objective: Reduce inflow from the main channel by 75 percent, measured during periods of less than 10-year flood flows..

Evaluation: Flow measurements will be taken at selected sites and for a minimum of three selected discharges.

b. Objective: Reduce sedimentation in the project area and maintain bed elevation in the protected area.

Evaluation: A bed elevation survey in the protected area will be done at 3, 5 and 10 years after construction.

c. Objective: Increase photic zone in the protected area.

Evaluation: Measurement of the photic zone will be done the first two years after construction.

d. Objective: Increase the extent of shallow aquatic vegetation (less than 2.5 ft deep) by 100 acres and the extent of deep aquatic vegetation (greater than 2.5 ft. deep) by 30 acres. These habitats should be interspersed with flowing sloughs.

Evaluation: Aerial photographs of the project area will be interpreted, groundtruthed, and entered into the GIS after construction and every 2 years there after until 2002.

2. Objective: Maintain quality of existing fish habitat.

Evaluation: There was concern that the increase in aquatic vegetation and change in flow patterns in the protected area could affect the habitat quality of the area for fish by affecting dissolved oxygen (D.O.) levels during certain times of the year. Summer and winter D.O. monitoring will continue in the project area until 1995 and compared to previous data. Should adverse conditions develop due to project design, corrective measures will be considered.

3. Objective: Re-establish and maintain 15 acres of stabilized islands in the project area.

Evaluation: Erosion will be evaluated primarily by visual inspection of the islands through on-site visits. Surveys will be scheduled for identified potential erosion points along the islands. Field inspections will be done annually with surveys being done at 10 years after project completion or at the discretion of the evaluating team. Aerial photos will be taken, interpreted and entered into the GIS at 2 year intervals.

4. Objective: Re-establish a grass,shrub/herbaceous vegetative cover on the island in order to provide secondary wildlife benefits, especially for waterfowl nesting, The vegetation should have an average of 100 percent cover obscurity rating of 1.5 dm or greater within 2 years after construction.

Evaluation: Island vegetation will be surveyed and the density of potential duck nesting vegetation will de determined with the Robel method (height density pole). Surveys will be done every 2 years after construction until at least 1997.

