

## UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM

## **OPERATION AND MAINTENANCE MANUAL**

# SPRING LAKE ISLANDS HABITAT REHABILITATION AND ENHANCEMENT PROJECT

Pool 5 Upper Mississippi River Buffalo County, Wisconsin

November 2012

#### PREFACE

The Spring Lake Habitat Rehabilitation and Enhancement Project, constructed by the Corps of Engineers, was completed in June 2006. In accordance with Section 906(e) of the Water Resources Development Act of 1986, and policies set forth in the Fourth and Fifth Annual Addenda, the U.S. Fish and Wildlife Service has responsibility for the operation and maintenance of project features located on the Upper Mississippi River National Wildlife and Fish Refuge. The Corps of Engineers has prepared this manual to assist the U.S. Fish and Wildlife Service in fulfilling this responsibility.

The manual and appendices contain the latest information pertinent to operation and maintenance of this project. The project as designed and constructed will improve the quality of habitat for a variety of fish and wildlife species in the Spring Lake area of pool 5. The planning, design, and construction of the project were the result of a cooperative 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 recommended.

#### DEPARTMENT OF THE ARMY St. Paul District, Corps of Engineers 180 5th Street East, Suite 700 St. Paul, Minnesota 55101-1678

#### UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM

#### SPRING LAKE ISLANDS, POOL 5, UPPER MISSISSIPPI RIVER BUFFALO 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 Spring Lake Islands Habitat Rehabilitation and Enhancement Project (The Project) in Buffalo County, Wisconsin. Operation and maintenance instructions presented are consistent with the general procedures found in the Spring Lake Islands Definite Project Report dated August 2003. 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.

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.

## **PART I - PROJECT FEATURES AND CONSTRUCTION HISTORY**

### AUTHORIZATION AND LOCATION

The Spring Lake project 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). The project is located in the lower portion of pool 5 at Buffalo City, Wisconsin. The project lies within the Upper Mississippi River National Wildlife and Fish Refuge (Refuge). Project drawings (appendix A) show the location of the project.

The project is located on Federal lands managed as a National Wildlife Refuge. As such, operation and maintenance of those features 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 Addenda.

#### DESCRIPTION OF THE PROJECT

## General/Background

The Spring Lake Islands Habitat Rehabilitation and Enhancement Project is the second and final phase of a multi-phase effort to restore the backwater area of Spring Lake. Since 1939, over 90 percent of the island acreage in the Spring Lake area had been lost to erosion. Accompanying the island loss was a decline in habitat quality for the backwater fish community, migratory waterfowl, and a wide variety of other wildlife that use islands and shallow protected aquatic habitats.

The primary feature of the project was restoration of about 10,000 lineal feet of islands/mudflats covering about 36 acres. A single rock sill will help enclose the upper portion of Spring Lake and reduce flows to create the more quiet water conditions conducive to a healthy backwater fish community.

The Definite Project Report and Integrated Environmental Assessment (SP-25), Habitat Rehabilitation and Enhancement Project, August 2003, provides additional details on the project.

For the purpose of this O&M manual the two islands (Island E1 and E3) constructed for channel maintenance are not part of this manual.

## **Design Considerations**

The islands were designed to serve a number of functions in the 500-acre Spring Lake area. The most important of these are to (1) restore habitat diversity; (2) reduce flows and current velocities, especially during the winter; and (3) reduce the effects of wind and wave action. All of the islands contribute to improving habitat diversity. Islands 1, 2, and 4, in conjunction with the rock sill, were designed to reduce flows entering Spring Lake. They also serve to protect the area from winds. Interior Island 3 primarily serves the function of protection from the dominant winds during the summer growing season. This interior island was located in a manner to channel flows within to maintain the deeper areas that exist within Spring Lake. Maintaining a diversity of water depths within the bay is desirable from a fish habitat perspective.

A number of considerations went into the basic island cross section. Island width is necessary to provide the mass to withstand river forces and insure the islands do not breach or erode away during the 50-year project life. However, excessive width was undesirable from the perspective of cost control. Total island widths ranged from approximately 60 feet to 145 feet, depending upon island location and height. These were considered to be the minimum widths necessary to insure stable islands.

Habitat objectives of the project included the creation and/or enhancement of summer and overwintering habitats for Centrarchids. A large amount of fine borrow was dredged from within the upper area of Spring Lake as a result. Borings had shown that the vast majority of the accessible borrow material within the upper area was fine materials. From a stability and constructability perspective it is not desirable to place fine materials in the water. Therefore, the bases of the islands above the normal summer water surface elevation() were constructed of granular fill (sand).

The bulk of the material (fine fill) placed above the sand had no special requirement other than it had to be borrowed from within Spring Lake. The top 12 inches of the fine fill had the requirement that no less than 40 percent of the material had to pass a 0.075 mm sieve. The purpose of this requirement was to ensure sufficient fine material content for good vegetation growth.

Island heights varied for two reasons. First, on the exterior islands 1, 2 and 4 it is desirable to have the islands decrease slightly in elevation from the upstream to the downstream to ensure they overtop at about the same time. This prevents concentration of overtopping flows that could lead to erosion problems. Secondly, varying heights were desired to create different habitat conditions for vegetation. For example, the upper portion of Island 2 is 1-foot higher than the lower portion of Island. Different vegetation communities have developed on the islands because of these elevation differences.

The interior and exterior edges of the islands consist of sand berms constructed to above normal summer water elevation. These sand berms are designed to be sacrificial in the sense that some erosion is expected, as wave action will erode this material and create a stable beach zone. Erosion of the islands is controlled by rock vanes, groins, and bio-engineering. The end result is a stable scalloped shoreline.

Rock bank protection was used to protect the ends of the islands. For those island ends more exposed to erosive forces and for the connections with the rock sills, a round end design was used. On one end of Islands 2 and 3 a flat end design was used. The flat end design is more economical, the trade-off being that it is not as effective as the round end design in preventing erosion on the back side where the rock protection ends. The trade-off was considered acceptable in these locations because they are well protected sites.

Two turtle mounds were placed on Island 3 and one each on islands 1 and 2. The mounds are areas that are all granular fill material which provides sand substrate for turtle nesting.

Wildlife Loafing Structures (dead trees) were placed at all four islands. These structures provide a place for birds to rest and for a shallow water fish refuge. Two different details for the loafing structures were used. The trees located in areas more susceptible to being swept away used rock to anchor the structures while the others did not.

A rock sill was designed to complement the islands in reducing flow into the upper area of Spring Lake. Since the entire complex will be overtopped at certain times by high water, the rock sill was designed with a lower top elevation than the islands to serve as a hard point for initial overtopping. This minimizes erosion potential on the islands from overtopping flows. The rock sill was designed with a top elevation of 661.0. It was designed to be overtopped by the 50-percent chance (2-yr) event. The purpose is to allow high water events to flow through and promote the scouring of fine sediments from the bay.

A notch was placed in the rock sill with a bottom elevation of 658.0 to allow a flow of 10 cubic feet per second into the upper area of Spring Lake for water quality purposes. Monitoring of the flows will be done by the Wisconsin DNR

#### **CONSTRUCTION HISTORY**

The contract for the Spring Lake Islands project was awarded in August 2004 to L.W. Matteson, Inc., #1 South Point, P.O. Box 667, Burlington, Iowa 52601-0667.

Construction began on 25 October 2004 and was substantially completed on 5 July 2006. In addition, final project clean-up was completed at that time.

Construction Issues –

- 1. The material for the mudflats was to be a combination of granular and, random and fines. Because the specifications were not specific enough the contractor was going to use primarily granular material. A modification was execute to enlarge the fine borrow area so the above mixture of materials was placed in each mudflat.
- 2. In the spring of 2005 a pool wide drawdown (approximately 1.5 feet) was initiated by Operations Division. The purpose behind this drawdown was to mimic the occurrence of low water that would occur naturally on the Upper Mississippi River if it were not impounded and regulated to maintain adequate water depths for commercial navigation. This drop in water level did hamper the contractor's ability to move their large hydraulic dredge into and out of the Spring Lake complex.
- 3. In addition to using the dredge to pump granular material to build the Spring Lake Islands, an option was built into the contract so the dredge would also provide channel dredging services near historic dredge cuts to support navigation during the drawdown. The supplemental granular material dredged from the navigable channel was placed a few miles upstream to create two O&M islands, E and E1. These island features are not part of this manual.

Initial seed mixes and willows were planted in the spring of 2006. Two seed mixes were used on the islands (Appendix D). Trees and shrubs species typical to floodplain forests were planted on the islands in April of 2008. Tree and shrub plantings maps can be found in appendix F. These trees and shrubs included red-osier dogwood, nannyberry, highbush cranberry, ninebark, swamp white oak, silver maple, and hackberry.

The construction cost of the project was \$3,436,473. Approximate material quantities were as follows:

234,915 cubic yards
51,390 cubic yards
23,656 cubic yards
6,622 tons
13,442 tons

#### PART II - OPERATION AND MAINTENANCE

#### GENERAL RESPONSIBILITIES AND PROCEDURES

#### Approved Responsibilities

Operation and maintenance responsibilities for the Spring Lake Islands project were originally outlined in the Definite Project Report for the project. 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, is contained in appendix B. The capability of the USFWS to carry out the responsibilities described below will be contingent upon the passage of sufficient appropriations by Congress.

#### District Manager

Typically, the USFWS operation and maintenance responsibility for habitat projects located within the Refuge is given to the District Manager in charge of the Refuge District where the project is located. For the Spring Lake Islands project, the current address for the District Manager is 51 East Fourth Street, Room 101, Winona, Minnesota 55987. Hereafter, for the purposes of this manual, when describing responsibilities, etc., the term "District Manager" will be used.

## **Inspections**

The District Engineer or his representative will be kept informed on operation and maintenance activities for the Spring Lake Islands project through periodic inspection of the project by the Corps and through review of an annual report submitted by the USFWS. A representative of the Corps will coordinate the periodic inspection in advance with the USFWS. The first inspection will occur within 5 years after project completion. Subsequent inspections will occur at 5-year intervals. After the first 10 years of project operation, the Corps and the USFWS will jointly review the inspection plans and make any appropriate revisions.

The findings of the periodic 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 condition. Any agreed upon remedial work should be completed as soon as possible by the USFWS as described in the Memorandum of Agreement between the USFWS and the Corps.

An inspection of the project should be made by the District Manager (or a designated representative) once a year as a minimum. The frequency for inspection will be subject to review by the USFWS and Corps and could change upon mutual agreement of both parties. The timing of the inspection can be made at the discretion of the District Manager. No special inspections are required after high water events as they occur on an almost annual basis. The annual inspections should be sufficient to reveal any problems or damage caused by high water events.

#### Annual Report

An annual report covering inspection of the habitat project shall be submitted to the St. Paul District, attn: Construction-Operations Division, at the end of the calendar year. The report should briefly summarize the condition of the project and any maintenance or repairs required during the reporting period.

## **OPERATION**

There are no required operational requirements associated with the Spring Lake Islands project.

LD 5 Dike Gates/Culverts Operations - There are opportunities to evaluate if closing the three gates in the culverts along the dike affect winter current velocities, especially at the channel near Island 3. This closure (Dec-Mar) is performed by LD personnel at the request of the Wisconsin DNR.

## MAINTENANCE

Because of the relatively straightforward nature of the project, only a few maintenance instructions are considered necessary.

Not all project features will require maintenance. The U.S. Fish and Wildlife Service will maintain the project necessary for the project to function properly and provide the benefits for which it was designed. Categorization of project feature maintenance as either "critical," "non-critical," or "dynamic" was established in the Definite Project Report. Critical features are those that must be maintained for structural integrity or for the feature to provide the majority of the habitat benefits for which it was designed. Non-critical features are those where minor change is acceptable and the need for maintenance will be considered on a case-by-case basis.

Dynamic features are those where river forces will be allowed to shape the features with no future maintenance anticipated. Categorizations of project features are listed below:

#### Critical – Must Be Maintained or Repaired

Rock sill tie-in points with islands Rock end protection Rock groin or vane tie-in points with islands Rock sill notch kept clear of significant debris that reduce flow Major damage to rock sills

### Non-Critical - Maintained or Repaired if Determined Necessary

Individual rock groins or vanes Island shorelines Minor damage to rock sills

Dynamic – No Maintenance

Mudflats Sand tips on islands Borrow sites Access channels

Pertinent sections of the construction specification are contained in appendix C to be used as applicable in procuring replacement rock or other materials.

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

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 Spring Lake Islands project that may be needed as a result of a specific storm or flood.

Should inspection of the project area following a major flood or natural disaster disclose substantial damage to the project, the Corps and USFWS will meet and discuss the appropriate course of action in light of original project design. 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. Included within such agreement would be a description of the agreed upon course of action and funding responsibilities, if any.

## PROJECT MONITORING AND EVALUATION

Performance monitoring of the Spring Lake Islands project will be conducted by the Corps of Engineers to help determine the extent to which the design meets the habitat improvement objectives. Information from this monitoring will also be used, if required, when ascertaining whether rehabilitation or abandonment of portions of this project would be the wisest choice.

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**APPENDIX A** 

#### **PROJECT DRAWINGS**





## VERTICAL CONTROL

## HORIZONTAL CONTROL

COORDINATES FOR HORIZONTAL CONTROL POINTS LISTED BELOW SHALL BE VERIFIED BY THE CONTRACTOR:

NEISKA: E 1,937,134.88557, N 16,055,883.59355 P 125: E 1,942.803.39129, N 16,073,126.50198 WEAVER: E 1,923,650.41778, N 16,060,789.43675

		CONSTRUCTION DRAWING INDEX	
SHEET REF. NO	. SHT	DESCRIPTION	DRAWING NO
G-001	1	COVER SHEET - LOCATION & VICINITY MAPS	
G-002	2	DRAWING INDEX & LEGEND	M-P5-00/00
C-001	3	ISLANDS 1 - 4 & ROCK MOUND SITE LAYOUT & DREDGING PLAN	M-P5-00/00
C-002	4	ISLANDS E1 & E3 SITE LAYOUT & DREDGING PLAN	M-P5-60/03
C-003	5	ISLAND 1 AND ROCK MOUND 4 PLAN	M-P5-60/03
C-004	6	ROCK MOUNDS 1-3 PLAN	M-P5-60/03
C-005	7	ISLAND 2 PLAN	M-P5-60/03
C-006	8	ISLAND 3 PLAN	M-P5-60/03
C-007	9	ISLAND 4 PLAN	M-P5-60/03
C-008	10	ISLAND E1 PLAN	M-P5-60/03
C-009	11	ISLAND E3 PLAN	M-P5-60/03
C-010	12	ISLAND E1 PROFILE	M-P5-60/03
C-011	13	ISLAND E3 PROFILE	M-P5-60/03
C-012	14	ISLAND 1-4 & ROCK MOUND TYPICAL SECTIONS	M-P5-60/04
C-013	15	ISLAND E1 SECTIONS	M-P5-60/04
C-014	16	ISLAND E3 SECTIONS	M-P5-60/04
C-015	17	GROINS, VANES & END/BANK PROTECTION TYP SECS & DETLS	M-P5-60/04
C-016	18	MISCELLANEOUS TYPICAL SECTIONS	M-P5-60/04
C-017	19	ISLANDS 1 - 4 ALIGNMENT TABLES	M-P5-60/04
C-018	20	ISLAND E1 ALIGNMENT TABLE	M-P5-60/04
C-019	21	ISLAND E3 ALIGNMENT TABLE	M-P5-60/04
L-001	22	ISLANDS 1 - 4 PLANTING & SEEDING PLAN	M-P5-60/04
L-002	23	ISLAND E1 PLANTING & SEEDING PLAN	M-P5-60/04
L-003	24	ISLAND E3 PLANTING & SEEDING PLAN	M D5 C0/05
			M-P5-60/05
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	REFERENCE DRAWING INDEX	
DRAWING NO.	DESCRIPTION	I.D. NO.
P5-2002-1	FLOW DURATION CURVES - JANUARY - JUNE	D5POOLD_D1
P5-2002-2	FLOW DURATION CURVES - JULY - DECEMBER	D5P00LD_D2
P5-2002-3	FLOW HYDROGRAPHS - 1993 - 1997	D5POOLD_H1
P5-2002-4	FLOW HYDROGRAPHS - 1998 - 2002	D5P00LD_H2
PLATE 6-2	BORING LOGS: 99-8M THRU 99-14M	SPBT210002
PLATE 6-3	BORING LOGS: 99-15M THRU 99-19M	SPBT210003
PLATE 6-4	BORING LOGS: 03-20M THRU 03-27M	SPBT210004
PLATE 6-5	BORING LOGS: 03-28M THRU 03-31M	SPBT210005

В

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5 N 18.062.601 E 13.941.744 ROCK SILL	US Army Corps of Engineers St. Paul District
LOCATION OF VEST 03-2214 E 1.942/03230 E 1.942/03230 E 1.942-303	10/2007 LKT Date Appr.
ROCK MOUND 1 	BUILT AS OF COMPLETION DATE AUG 2006 Description
62.24 6 <sup>33</sup>	Symbol
FISH HABITAT IMPROVEMENT AND MANDATORY FINES & RANDOM BORROW AREA B DREDGE TO 654.0	eeigned by: Date: Activity Rav. CrVJJ57KLL Dute: 2004 Rav. wn by: Ekd by: Soliciterion No.: KT BkU, Withority: Drawing Number: Withority: Drawing Number: Withority: Proc Dute Dute ie Nume: W-P5-60-030-003-M5-A-C-10103 ie Nume: W-P5-60-030-003-M5-A-C-10103 Nume: W-P5-60-030-030-M5-A-C-10103 Nume: W-P5-60-030-030-M5-A-C-1003 Nume: W-P5-60-030-030-M5-A-C-1000-030-M5-A-C-1003 Nume: W-P5-60-030-M5-A-C-1000-030-M
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E FINISHED FISH HABITAT IMPROVEMENT EXCAVATION ALL BE CONTINUOUS. CEPT WHERE REQUIRED FOR ISLAND ACCESS, EXCAVATION NOT PERMITED WITHIN 50' OF NEW ISLANDS AND ISTING SHORELINE, AND 100' OF EXISTING DIKES. LESS OTHERWISE NOTED, ISLAND AND BORROW AREA CESS DREDGING SHALL BE LIMITED TO A MAXIMUM WIDTH 40' AND SHALL NOT BE BELOW EL. 654.0. MAJOR PORTION OF THE SPRING LAKE BACKWATERS IS OWN TO CONTAIN SUBMERGED TREE STUMPS. STUMPS COUNTERED DURING ACCESS/BORROW DREDGING SHALL PLACED AS FOLLOWS: AREA A & C - PLACE STUMPS ADJACENT AND DOWN- STREAM OF ACCESS/BORROW AREA. AREA B & D - PLACE STUMPS ADJACENT OR IN BORROW AREA.	CONSTRUCTION DRAWING CONSTRUCTION DRAWING MISSISSIPPING LER : PAOL 5 MISSISSIPPINCER : POOL 5 MISSISSIPPINCE : ANOL 5 BUFFALO COUNTY, WISCONSIN ENVIRONMENTAL ISLANDS 1-4 & ROCK MOUND SITE LAYOUT & DREDGING PLAN
	Sheet reference number: C-001 Sheet 3 of 24



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	ISLAND DIMENSIONS (FEET)								
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00	С	_	—	· · · · ·	_	-	-	662.5	
	B1	-	—	—				662.0	
	В	50	35		42.5	65	115	662.0	
00	Α	20	5	40	5	45	115	663.0	
00	A	30	5	40	5	45	125	663.0	
	A	20	10	45	10	30	, 115	664.0	
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	B1			I	-	_	_	662.0	
50	В	50	35	1	42.5	65	115	662.5	
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EXISTING GROUND

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	ISLAND	1			-					_							
	CURVE	STATION	TL	LC	CD	DC	RC	BEARING	NORTHING	EASTING							
		I-1 0+00.00 POB							16060857.673	1944252.766							
D	2	I-1 1+38.63 PC I-1 2+47.66 PI I-1 3+51.52 PT	138.6313	212.8897	30°29'39″	14°19'26″	-400.000	N 41° 43′ 54″ W	16060961.129 16061042.496 16061075.779	1944160.487 1944087.911 1943984.085							
	4	I-1 7+52.93 PC I-1 9+09.76 PI I-1 10+41.95 PT	222.1283	289,0180	55°11′54″	19°05'55″	300.000	N 12°13 33 W	16061198.314 16061246.189 16061396.145	1943601.838 1943452.493 1943406.568							
	6	I-1 12+64.07 PC I-1 14+84.17 PI I-1 16+43.85 PT	155.7691	379.7745	72°31′54″	19°05′55″	-300.000	N 89°33′33″ W	16061608.536 16061818.984 16061820.677	1943341.521 1943277.070 1943056.980							
		I-1 17+99.62 POE							16061821.876	1942901.216							
	ISLAND	2							-								
	CURVE	STATION	TL	LC	CD	DC	RC	BEARING	NORTHING	EASTING							
		I-2 0+00.00 POB	1205,8785					N 18º14'50" W	16057897.645	1943876.655							
	2	I-2 12+05.88 PC I-2 14+32.50 PI I-2 16+31.43 PT	127 0195	425,5501	48°45′52″	11°27′33	500.000	N 70°71/02″ E	16059042.885 16059258.112 16059453.343	1943499.072 1943428.113 1943543.191		÷				đ	
С	4	I-2 17+58.45 PC I-2 18+38.87 PI I-2 18+93.90 PT	156 9971	135.4578	77°36′42″	57°17'45″	100.000	S 71°52'16" E	16059562.766 16059632.045 16059607.023	1943607.691 1943648.527 1943724.954			ţ	;			
	6	I-2 20+50.90 PC I-2 21+55.67 PI I-2 22+57.46 PT	142 0239	206.5549	23°40′10″	11°27′33″	500,000	S 48º 12/06# E	16059558.172 16059525.572 16059455.741	1943874.158 1943973.728 1944051.835							
		I-2 23+99.48 POE	142.0233					3 40 12 00 L	16059361.080	1944157.714							
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_	CURVE	STATION	TL	LC	CD	DC	RC	BEARING	NORTHING	EASTING							
		I-3 0+00.00 PDB	670 4404						16058576.302	1944729.810							
	2	I-3 6+32.41 PC I-3 7+36.66 PI I-3 8+24.61 PT	416 4278	192.1962	55°03′37″	28°38′52″	-200.000	N 26°14'47" E	16059143.511 16059237.010 16059328.350	1945009.483 1945055.584 1945005.341							
В	4	I-3 12+41.03 PC I-3 13+70.11 PI I-3 14+70.28 PT	974.5644	229.2488	65°40'30″	28°38′52″	200.000	N 36°51'41" E	16059693.221 16059806.316 16059909.589	1944804.639 1944742.429 1944819.859							
	6	I-3 24+44.85 PC I-3 27+22.10 PI I-3 28+92.45 PT	229 4501	447.6045	85°29'10"	19°05′55″	300.000	S 57 70 / 00 // 5	16060689.328 16060911.153 16060762.810	1945404.480 1945570.797 1945805.023							
	8	I-3 31+21.90 PC I-3 32+07.49 PI I-3 32+90.54 PT	464.4441	168.6354	24°09'19"	14°19'26″	400.000	S 33° 29' 50" E	16060640.043 16060594.248 16060522.874	1945998.867 1946071.174 1946118.411							
		I-3 37+54.98 POE	404.4441					5 33 29 50 E	16060135.569	1946374.736							
	ISLAND	4	· · · · · · ·					<b>I</b>									
	CURVE	STATION	TL	LC	CD	DC	RC	BEARING	NORTHING	EASTING							
		I-4 0+00.00 POB	533 134 4					N 30844/37# W	16055471.779	1944842.066							
	2	I-4 5+33.13 PC I-4 5+50.05 PI I-4 5+66.82 PT	773.0394	33.6916	12°52'09″	38°11′50″	150.000	N 19°22'24" W	16055922.700 16055937.008 16055952.967	1944557.637 1944548.612 1944543.000							
A	4	I-4 13+39.86 PC I-4 14+80.47 PI I-4 15+65.79 PT	493 7664	225.9274	86°17′52″	38°11′50″	150.000		16056682.235 16056814.882 16056869.992	1944286.566 1944239.924 1944369.282							
		I-4 20+49.56 POE	403.1004					1 1 66 55 29 E	16057059.600	1944814.342							

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	US Army Corps of Engineers St. Paul District
	Appr.
	10/2007 Date
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	DEPARTMENT OF THE ARMY I ST. PAUL DISTRICT CORPS OF ENGINEERS ST. PAUL, MINNESOTA ST. PAUL, MINNESOTA UTM ZONE 15 UTM ZONE 15 UTM ZONE 15 UTM 20NE 15
	CONSTRUCTION DRAWING SISPRICE - POOL 5 MISSISPRICE - POOL 5 BUFFALO COUNTY, WISCONSIN ENVIRONMENT AL ISLANDS 1 - 4 ALIGNMENT TABLES
	Sheet reference number: C-017 Sheet 19 of 24

![](_page_30_Figure_0.jpeg)

**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 SPRING LAKE ISLANDS PROJECT BUFFALO 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 (USFWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Spring Lake Islands 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. The project area is managed by the USFWS and is on land managed as a national wildlife refuge. 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 Spring Lake Islands project are 100 percent Federal, and pursuant to Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, all costs of operation and maintenance for the Spring Lake Islands project are 100 percent Federal.

#### **III. GENERAL SCOPE**

The project to be accomplished pursuant to this MOA shall consist of rehabilitating and improving the fish and wildlife habitat in lower pool 5 of the Mississippi River. The project consists of constructing four islands, one rock sill and protection for three existing islands and one peninsula. Dredging would occur in Spring Lake to improve habitat conditions for the backwater fish community.

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The purpose of these structures is to improve fish and wildlife habitat by reducing flows in the area, improving conditions for the growth of aquatic plants, and increasing overall habitat diversity by restoring islands lost to erosion and protecting existing islands from additional erosion.

#### IV. RESPONSIBILITIES

A. The DOA is responsible for:

1. <u>Construction</u>. Construction of the project features to include necessary stabilization and vegetation measures.

2. <u>Major Rehabilitation</u>. The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Integrated Definite Project Report and Environmental Assessment, Spring Lake Island Habitat Rehabilitation and Enhancement Projects, dated August 2003, and that is needed as a result of specific storm or flood events.

3. <u>Construction Management</u>. Subject to and using funds appropriated by the Congress of the United States, and in accordance with Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, the DOA will construct the Spring Lake Island project as described in the Integrated Definite Project Report and Environmental Assessment, Spring Lake Island Habitat Rehabilitation and Enhancement Projects, dated August 2003, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The USFWS 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 the DOA encounters potential delays related to construction of the project, the DOA will promptly notify the USFWS of such delays.

4. <u>Maintenance of Records</u>. The 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. The DOA shall maintain such books, records, documents, and other evidence for a minimum of 3 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 USFWS.

B. The USFWS is responsible for operation, maintenance, and repair. Upon completion of construction as determined by the District Engineer, St. Paul, the USFWS shall accept the project and shall operate, maintain, and repair the project as defined in the Integrated Definite Project Report and Environmental Assessment entitled "Spring Lake Island Habitat Rehabilitation and Enhancement Project," dated August 2003, in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580.

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#### 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 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.

- USFWS: Regional Director U.S. Fish and Wildlife Service Bishop Henry Whipple Federal Building 1 Federal Drive Fort Snelling, Minnesota 55111-4056
- DOA: District Engineer U.S. Army Corps of Engineers, St. Paul District 190 Fifth Street East St. Paul, Minnesota 55101-1638

#### 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

ROBERT L. BALL Colonel, Corps of Engineers District Engineer

DATE: 15 DEC OR

BY:

Charles M. Wooley Acting Regional Director BY: N **ROBYN THORSON Regional Director** U.S. Fish and Wildlife Service DATE:

#### **III. FINDING OF COMPLIANCE WITH RESTRICTIONS ON DISCHARGE**

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. The proposed fill activity would comply with the Section 404(b)(1) guidelines of the Clean Water Act. The placement of fill is required to provide the desired benefits.

3. There are no practical and feasible alternatives to the placement of fill in the proposed sites that would meet the objectives and goals of this project.

4. The proposed fill activity would comply with State water quality standards. The disposal operation would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

5. The proposed projects would not harm any endangered species or their critical habitat.

6. The proposed fill activities would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing. The proposed activities would not adversely affect plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity, and stability and on recreational, aesthetic, and economic values would not occur.

7. To minimize the potential for adverse impacts, dredged material not required to construct project features would be trucked to an approved upland placement site. Because the proposed action would result in few adverse effects, no additional measures to minimize impacts would be required.

8. On the basis of this evaluation, I specify that the proposed disposal site complies with the requirements of the guidelines for discharge of fill material.

Cinquest Date

ROBERT L. BALL Colonel, Corps of Engineers District Engineer
Environmental and Economic Analysis Branch Planning, Programs and Project Management Division

# FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, the St. Paul District, Corps of Engineers, has assessed the environmental impacts of the following project.

# SPRING LAKE ISLANDS HABITAT REHABILITATION AND ENHANCEMENT PROJECT POOL 5, UPPER MISSISSIPPI RIVER BUFFALO COUNTY, WISCONSIN

The proposed actions for this Habitat Rehabilitation and Enhancement Project are: construct rock features to protect existing terrestrial and aquatic habitat in upper Spring Lake; construct four island features in Spring Lake to protect/enhance wetland and aquatic habitat; construct four mud flat/shallow-water habitats to increase habitat diversity and provide suitable locations for dredged material placement; dredge within Spring Lake to provide material for island construction and to allow construction equipment access to the project features. The goals of these actions are to improve habitat conditions for backwater fish, waterfowl, shorebirds, and to a limited extent, other organisms such as riverine fish, mussels, and turtles.

This Finding of No Significant Impact is based on the following factors: the proposed project would have minor long-term beneficial impacts on the aquatic environment and fishery resources; short-term minor adverse impacts to the aquatic and terrestrial environment from construction activities; and minor beneficial impacts on the economic and social environment.

The environmental review process indicates that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared.

13 August 2003 Date

Robert L. Ball Colonel, Corps of Engineers **District Engineer** 



APPENDIX C

# **INSPECTION CHECKLIST**

# **Inspection Checklist**

# **SPRING LAKE ISLANDS**

Habitat Rehabilitation and Enhancement Project Pool 5 - Upper Mississippi River

TO: U.S. Army Corps of Engineers ATTN: CEMVP-PM-A 180 Fifth Street East, Suite 700 St. Paul, Minnesota 55101-1678

Inspected by:			Date:
Type of Inspection:	() Annual () () Other	Spring Flood —	
I. ISLANDS			
A. ISLAND 1 (W ( ) Erosi	Vater Snake) on - location(s)		
() Vege	tation Management Needed Describe:		
( ) Displ	aced Riprap		
() Ripra	p Needed - estimate of quantity	CY	
() Displ	aced Rock Groin	CN	
() Rebu () Debr	is Removal Needed	CY	
Tuesday, Janua	ary 08, 2013		

# B. ISLAND 2 (Bulrush)

( ) Erosion - location(s) \_\_\_\_\_

# ( ) Vegetation Management Needed

Describe:

# ( ) Displaced Riprap

- ( ) Riprap Needed estimate of quantity \_\_\_\_\_ CY
- ( ) Displaced Rock Groin/Vanes
- ( ) Rebuild Rock Groin/Vanes est. of quantity \_\_\_\_\_ CY

\_\_\_\_\_

( ) Debris Removal Needed

# C. ISLAND 3 (Deep Hole)

( ) Erosion - location(s) \_\_\_\_\_

# ( ) Vegetation Management Needed

Describe: \_\_\_\_

() Displaced Riprap

- ( ) Riprap Needed estimate of quantity \_\_\_\_\_ CY
- () Displaced Rock Groin/Vanes

Tuesday, January 08, 2013

( ) Rebuild Rock Groin/Vanes - est. of quantity \_\_\_\_\_ CY

( ) Debris Removal Needed

# D. ISLAND 4 (Snipe)

( ) Erosion - location(s) \_\_\_\_\_

# ( ) Vegetation Management Needed

Describe: \_\_\_\_\_

# () Displaced Riprap

- ( ) Riprap Needed estimate of quantity \_\_\_\_\_ CY
- ( ) Displaced Rock Groin/Vanes
- ( ) Rebuild Rock Groin/Vanes est. of quantity \_\_\_\_\_ CY
- () Debris Removal Needed

# II. ROCK MOUNDS

- ( ) Displaced Riprap
- ( ) Riprap Needed estimate of quantity \_\_\_\_\_ CY

# III. ROCK SILL

- () Displaced Riprap
- ( ) Riprap Needed estimate of quantity \_\_\_\_\_ CY
- () Debris Removal Needed (including woody vegetation)

Tuesday, January 08, 2013

# IV. OTHER ITEMS (List)

A. Maintenance performed during the past year (include cost)

B. Maintenance required (include itemized estimate of cost to repair)

C. Other comments

Tuesday, January 08, 2013

APPENDIX D

**REPLACEMENT SPECIFICATIONS** 

# SECTION 00830 - ATTACHMENTS

# ATTACHMENT NO. B

# MATERIAL SOURCES

June 2004

W912ES-04-B-0003

# SPRING LAKE ISLANDS, POOL 5 APPROVED RIPRAP SOURCES

QUARRY NAME AND OPERATOR	QUARRY LOCATION	<u>NOTES</u>
Highway 43 Quarry Milestone Materials 920 Tenth Ave. North Onalaska, WI 54650 (608) 783-6411	NW ¼, Sec. 16 T106N, R7W Winona County, Minnesota	1, 2
Feltes Quarry (aka: Kamla Quarry) Kraemer Company 820 Wachter Ave., Plain, WI 53577 (608) 546-2255	SE ¼, NE ¼, Sec. 6 T20N, R10W Buffalo County, Wisconsin	1, 2
Raatz Quarry Kraemer Company 820 Wachter Ave., Plain, WI 53577 (608) 546-2255	SW ¼, Sec. 12 T20N, R11W Buffalo County, Wisconsin	1, 2
Senn Quarry Kraemer Company 820 Wachter Ave., Plain, WI 53577 (608) 546-2255	Se ¼, Sec. 4 T19N, R11W, Buffalo County, WI	1, 2
Weaver Quarry Milestone Materials 920 Tenth Ave. North Onalaska, WI 54650 (608) 783-6411	SE ¼, NE ¼, Sec. 25 T109N, R10W Wabasha County, Minnesota	1, 2
Wender Quarry Kraemer Company 820 Wachter Ave., Plain, WI 53577 (608) 546-2255	SE ¼, Sec 3; and NE ¼. Sec 10 T20N, R112W, Buffalo County, WI	1, 2
US GOVERNMENT FURNISHED Rock Borrow Site	L&D 5 Dike	

NOTES:

1. Systematic blasting shall be preformed in order to minimize deleterious cracks in the final product.

2. Processing riprap with a vibrating grizzly is a minimum requirement.

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# DIVISION 02 - SITE CONSTRUCTION

## SECTION 02388

# STONE PROTECTION (RIPRAP)

# 01/02

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  - 1.1 REFERENCES
  - 1.2 SUBMITTALS

### PART 2 PRODUCTS

- 2.1 STONE SOURCES AND EVALUATION
  - 2.1.1 Government Provided Rock Borrow Site
  - 2.1.2 Alternate Sources
  - 2.1.3 Acceptance of Materials
- 2.2 RIPRAP
  - 2.2.1 General
  - 2.2.2 Production
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  - 2.3.1 Geogrid Reinforcement
- 2.3.2 Geogrid Properties
- 2.4 SOURCE QUALITY CONTROL
  - 2.4.1 Sampling Requirements
  - 2.4.2 Riprap Gradation Testing
  - 2.4.2.1 Riprap Test Method A
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PART 3 EXECUTION

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W912ES-04-B-0003

# SECTION 02388

# STONE PROTECTION (RIPRAP) 01/02

### PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 127	(2001) Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
ASTM C 136	(2001) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 295	(1998) Petrographic Examination of Aggregates for Concrete
ASTM D 4791	(1999) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4992	(1994; R 2001) Evaluation of Rock to be Used for Erosion Control
ASTM D 5312	(1992; R 1997) Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions
ASTM D 6092	(1997) Specifying Standard Sizes of Stone for Erosion Control
ASTM D 6825	(2002) Placement of Riprap Revetments
CORPS OF ENGINEERS (COE)	)
EM 1110-2-2302	(1990) Construction with Large Stone

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44 (1997) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Material Sources; G, GT

The Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish stone. The Contractor shall state in writing methods of processing and handling riprap, and shall notify the Contracting Officer when production methods are changed.

SD-03 Product Data

Geogrid Data;

Catalog cuts or technical data sheet shall be submitted for the geogrid showing that the product meets the specifications.

SD-06 Test Reports

Gradation Test;

Gradation Test Results for riprap. Riprap gradation testing results shall be submitted on the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP and the gradation curve (ENG FORM 4055). A blank copy of each form is included at the end of this section.

SD-07 Certificates

Certified Weight Scale Tickets;

Copies of all certified weight scale tickets shall be furnished to the Contracting Officer at a frequency as directed. The tickets do not need to be formally submitted through the submittal process.

## PART 2 PRODUCTS

## 2.1 STONE SOURCES AND EVALUATION

Stone and aggregate materials shall be produced from the sources listed in Section 00830 ATTACHMENTS. If the Contractor proposes to furnish materials from a source not listed, the Government Geologist will make such investigations and evaluations as necessary to determine whether or not materials with acceptable durability can be produced from the proposed source. The rock supplied shall be produced from one rock formation to provide a product of uniform appearance. The Contractor shall not supply rock from various formations, or mix field-stone with quarried rock, unless approved by the Contracting Officer. It is the Contractor's responsibility to determine that the stone source or combination of sources selected is capable of providing the quality, quantities and gradation needed and at the rate needed to maintain the scheduled progress of the work.

### 2.1.1 Government Provided Rock Borrow Site

The drawings indicate an mandatory source of approximately 3,000 cubic yards of rock borrow material which the Contractor shall use for the

Wildlife Loafing Structures only. Riprap from the Government provided rock borrow site is not required to meet the gradation requirements at the end of this section. The rock borrow is located on the Lock and Dam 5 Dike in an area inaccessable to the river. Dredging an access to the rock borrow site will not be permitted. The rock borrow would have to loaded and transported to a location accessible to the river. The Contractor will be responsible for any damage to the dike caused by loading and/or transporting the rock borrow material and will be required to repair and/or restore the dike to its original pre-project condition. The Contractor must keep the security gate at the end of the dike locked at all times or provide a security person to check vehicles entering or existing. The point of contact for this rock borrow site is: Daniel J. Schmidt at Lock and Dam No. 5, Telephone: (507) 689-2101.

# 2.1.2 Alternate Sources

a. Evaluation by Site Inspection. If the Contractor proposes to furnish stone from an unlisted source, the Government will evaluate the alternate source and reply within 30 days. A quarry investigation shall be performed by a Government geologist or engineer. If the source is an undeveloped quarry or if the operation has been dormant for more than one year such that the quary face is weathered, the Contractor shall expose fresh rock for 20 feet horizontally and for the full height of the face proposed for production, prior to the field evaluation. The Government will consider service records for stone of a similar size, placed in a similar thickness and exposed to weathering under similar conditions as are anticipated for this contract. The Government may choose to accept the source based on rock classification, geologic evaluation, and service records show that the stone is durable to the satisfaction of the Government.

b. Evaluation by Test Data. If sufficient information is not available, the Government will reconsider the alternate source if evaluation is supplemented by sampling and testing. This will require an additional 60 day evaluation period. If the Contractor wishes to pursue the alternate source, the Government will notify the Contractor of required testing and evaluation criteria. Criteria for acceptance will consider criteria in EM 1110-2-2302, but will also consider characteristics of rock found in nearby quarries. Some common test procedures that may be considered include:

Unit Weight and Absorption (ASTM C 127). Petrographic Examination (ASTM C 295 and ASTM D 4992). Resistance to Freezing and Thawing (ASTM D 5312).

c. Sampling and Testing. Samples from alternate sources shall be taken by a representative of the quarry under the supervision of the Contracting Officer. Information provided with the samples shall include the location and stratigraphy within the quarry from which the sample was taken. The Contractor shall ship the samples to a laboratory identified by the Contracting Officer. The Government will be responsible for testing costs associated with one quarry per project; and the Contractor shall be responsible for testing costs for additional sources.

# 2.1.3 Acceptance of Materials

Acceptance of a source of stone is not to be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Contracting Officer. The Contracting Officer also reserves the right to reject individual units of

produced specified materials in stockpiles at the quarry, all transfer points, and at the project construction site when such materials are determined to be unsuitable.

## 2.2 RIPRAP

Riprap gradation shall meet the requirements for R40 riprap indicated on the attached ENG FORM 4055. The stone shall be well graded within the limits specified.

### 2.2.1 General

All stone shall be durable material. Stone for riprap shall have a specific gravity not less than 2.55. Stone shall be of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. It shall be free from cracks, blast fractures, bedding, seams and other defects that would tend to increase its deterioration from natural causes. A hairline crack that is defined as being detrimental shall have a minimum width of 4 mil and shall be continuous for one-third the dimension of at least two sides of the stone. The stone shall be clean and reasonably free from soil, quarry fines, and shall contain no refuse. Any foreign material adhering to or combined with the stone as a result of stockpiling shall be removed prior to placement. The maximum aspect ratio (greatest dimension:least dimension) of any piece of stone for size ranges shall be not greater than 3:1 when measured across mutually perpendicular axis. ASTM D 4791 shall be used as a guide to perform the test.

### 2.2.2 Production

Riprap shall be handled and selectively loaded onto trucks in a manner to avoid segregation and provide a distribution of stone sizes consistent with the gradation band and test samples. Each truckload shall be representative of the gradation requirements.

## 2.3 GEOGRIDS

## 2.3.1 Geogrid Reinforcement

Geogrid shall be a geosynthetic manufactured for reinforcement applications. The geogrid shall be a regular network of integrally connected polymer tensile elements. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. The geogrid shall be manufactured with 100% virgin resin consisting of polyethylene, polypropylene or polyester and with a maximum of 5% in-plant regrind material. Polyester resin shall have a minimum molecular weight of 25,000 and a carboxyl end group number less than 30. Polyethylene and polypropolyene shall be stabilized with long term antioxidants.

# 2.3.2 Geogrid Properties

The geogrid shown in the approved shop drawing shall meet the long term design strength requirements used in the design and shall meet the properties listed in Table 2. The geogrid strength requirements represent minimum average roll values in the machine direction.

### TABLE 2 - GEOGRID PROPERTIES

PROPERTY	REQUIREMENT	DESIGNATION
Tensile Strength at 5 % Strain	4,000 lbs/ft	ASTM D 6637

The Cross Machine dimension of aperture shall be less than or equal to three (3) inches. The Machine direction dimension of aperture shall be less than or equal to ten (10) inches.

### 2.4 SOURCE QUALITY CONTROL

Gradation tests shall be performed by the methods and at the frequency listed below. A satisfactory gradation test shall be obtained prior to any hauling and delivery of materials. All tests, including failing tests shall be submitted. Tests performed on material which do not meet gradation and shape requirements will not be counted as part of the tests required. The Contracting Officer shall be informed immediately of test results and draft copies of test results shall be furnished at the Contracting Officers request.

# 2.4.1 Sampling Requirements

The Contracting Officer shall direct the time and location of sampling, unless waived. Samples shall be taken from stockpiles or loaded trucks, and not directly from conveyers or chutes.

### 2.4.2 Riprap Gradation Testing

a. Notification. The Contracting Officer shall be informed 24 hours before each riprap test.

b. Testing Frequency. At least 1 gradation test shall be performed per 5,000 tons.

c. Sample Size. The sample shall have a minimum gross weight not less than 25 times the maximum stone size in the specified gradation (25 \* W  $_{100}$ ).

# 2.4.2.1 Riprap Test Method A

Test method A shall consist of weighing all stones larger than 5 pounds in a sample. Five to seven weight classes shall be selected within the range of stone sizes. Each stone shall be weighed and recorded on the Work Sheet for Gradation Analysis of Riprap Method A; and the calculations on the worksheet shall be performed and recorded. A plot of the gradation shall be completed on ENG FORM 4055 in accordance with accepted practice for soil and aggregate gradations.

# 2.4.2.2 Riprap Test Method B

Test method B shall consist of separating the stones into 5 to 7 piles, ordered by size. The sample shall be separated on a clean, hard surface that is free of smaller stones that could become mixed with the sample. The stones shall be visually screened to place them into appropriate piles. All stones shall be separated and placed into a pile before weighing. After separating, the smallest and largest rock in each pile shall be weighed and recorded. The stones shall be adjusted as necessary so that

TROT

the weight classes do not overlap. After adjustment is adequate and weight classes have been established, each pile of stone shall be weighed and recorded on the Work Sheet for Gradation Analysis of Riprap Method B; and the calculations on the worksheet shall be performed and recorded. A plot of the gradation shall be completed on ENG FORM 4055 in accordance with accepted practice for soil and aggregate gradations.

### 2.5 STOCKPILES

Stockpiles shall be formed by a series of layers or truckload dumps, where the rock essentially remains where it is placed. Subsequent layers shall be started 10 feet from the edge of the previous layer so that the rock will not roll down the edges of the pile. Any stone which has become contaminated with soil or refuse shall not be put into the work unless the contaminating material has been removed prior to placement.

### PART 3 EXECUTION

Riprap shall generally be placed in general accordance with ASTM D 6825. Where discrepancies occur, this specification shall govern.

## 3.1 CONSTRUCTION TOLERANCES

Work shall generally meet the required elevations, slope and grade; and the outer surfaces shall be even and present a neat appearance.

a. Subgrades. Areas on which stone protection will be placed shall be graded and/or dressed to conform to cross sections shown on the contract drawings within 6 inches above or below the neat lines. The surface shall be reasonably smooth to match tolerances normally obtained by rough grading with bladed equipment. For subaqueous construction in greater than 3 feet of water, the tolerance shall be 6 inches.

b. Layer Thickness. The layer thickness tolerance shall be plus 8 inches or minus 4 inches. Any layers found to be less than 80% of the specified thickness shall be corrected. This tolerance shall only be exceeded on isolated spot checks, and if the tolerance is commonly exceeded, the Contractor shall change construction methods to improve the quality control. If it is necessary to estimate riprap quantities for changes, the volume shall be based on neat line dimensions and the plan dimension for thickness. A conversion factor of 1.5 tons/CY shall be used to determine quantity requirements, unless otherwise directed by the Contracting Officer.

c. Surface Tolerances. The finished surface tolerance above the neatline shall generally not deviate from the lines and grades shown by more than half (1/2) the average stone dimension of the gradation range. Riprap that has a rough and uneven surface shall be reworked by hand to stabilize stones that wobble and are out of tolerance, except where the Contracting Officer approves use of equipment. Rearranging of individual stones shall be required to the extent necessary to obtain a well-graded distribution of stone sizes.

## 3.2 FOUNDATION PREPARATION

Foundation areas shall be excavated or filled to the lines and grades shown. Filling shall be with earth similar to the adjacent material and shall be well compacted. Immediately prior to placing riprap, the prepared subgrade will be inspected by the Contracting Officer unless waived; and no

material shall be placed thereon until that area has been approved.

# 3.3 PLACEMENT OF GEOGRID

Geogrid shall be placed over the logs as shown on the drawings. Geogrid shall be a minimum of eight feet in width perpendicular to the length of the logs, without any splices.

# 3.4 PLACEMENT OF RIPRAP

3.4.1 Constructing Rock Groins, Vanes and Slope Protection

Upon completion of placing a section of granular fill material for island construction, the Contractor shall construct the rock groins, vanes or slope protection for that island within 30 days. In no case shall any island, or part thereof, go unprotected over the winter.

# 3.4.2 Layer Requirements

Riprap shall be placed in a manner which will produce a well-graded mass of rock with the minimum practicable percentage of voids. The large stones shall be well distributed. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones.

### 3.4.3 Construction Methods

Unsegregated stone shall be placed in a systematic manner. Riprap shall be placed to its full course thickness in one operation and in such manner as to avoid displacing underlying material. Placement shall typically begin at the bottom of the area to be covered and continue up slope. Subsequent loads of material shall be placed against previously placed material in such a manner as to ensure a relatively homogenous mass. Final finish of slope shall be performed as the material is placed.

Placing riprap in layers will not be permitted. Placing riprap by dumping it into chutes, or by any method likely to cause segregation of the various sizes, shall not be permitted. Placing riprap by dumping it at the top of the slope and pushing it down the slope shall not be permitted. No equipment shall be operated directly on the completed stone protection system. Dump trucks shall be equipped with bottom hinged tailgates if rock is directly placed into position with the trucks.

# 3.4.4 Rockfill Placement on Geogrid

Rockfill shall be placed over the geogrid by methods that do not tear, puncture, or reposition the geogrid. Equipment shall be operated so as to minimize the drop height of the stone without contacting and damaging the geogrid. Generally this will be about 1 foot of drop from the bucket to the placement surface. Rockfill shall be placed so that stones do not roll downhill.

## 3.4.5 Riprap Placement in Water

Riprap to be placed under water shall be placed in a systematic manner so as to ensure a continuous uniform layer of well-graded stone of the required thickness. Riprap to be placed under water shall be placed with a drop height less than 2 feet. Riprap shall not be cast across the surface of the water. The equipment shall be capable of reaching the placed material to monitor the water depth and surface coverage.

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### 3.5 MAINTENANCE

The Contractor shall maintain the stone protection and underlying works until accepted by the Contracting Officer. When appropriate, the Contractor shall place stone protection in a timely manner to reduce risk of scour. Any material displaced prior to acceptance and due to the Contractor's negligence or neglect shall be replaced at the Contractor's expense.

# 3.6 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain quality control for all work performed at the job site under this section to assure compliance with contract requirements. The Contractor shall maintain records of quality control tests, inspections and corrective actions. Quality control measures shall cover all construction operations including, but not limited to, the placement of all materials to the slope and grade lines shown and in accordance with this section.

In addition to the Contractor's system to establish and maintain quality control for stone placement operations, the following information shall be recorded and promptly provided to the Contracting Officer on request:

a. Record tonnage of stone placed in completed sections of the work and check quantity for compliance with design sections.

b. Check for uniform thickness of material layers.

-- End of Section --



 $\mathrm{an}(k) = k^{-1} k$ 

# WORK SHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD A

Project Name:

Date:

Riprap Type:	Test No.	1. a
Source, Quarry, or Pit:		1. C
Sample Location:	Test Made By:	

	Part 1. Wo	eigh all stoi	nes larger t	han 5 poun	ids and rec	ord.	
(1) PASSING WT.							5 lbs.
(2) RETAINED WT.						5 lbs.	PAN
(3)						1	=======
	+						
							÷
*** <b>**</b> *							
the law and for the part into							
		5.					
		* .	·				
•======							· end tall, that any new pay my
· ·							
*****							
(4) TOTALS							
Rows (1) & (2) Enter 5 to Row (3) List weight of ear Row (4) Add all individual	h stone. Attach a stone weights list	additional sheets i ted in each colum	5%, 50%, 30%, a if necessary. in.	na 15% iiner poir	115.		an a
(5) WEIGHT CLA	SSES	(6)	)	(7)	····	(8)	
PASSING	RETAINED	TOTAL	, /EIGHT	CUMMU	ATIVE		
(stone wt.	(stone wt.	EACH C	LASS	WEIGHT	PASSING	PASS	NG
in lbs.)	in lbs.)	(lbs	.)	(lbs	s.)	(%	
			·				
5 lbs.	5 lbs. PAN						
SAMPLET	ΟΤΔΙ						
			1 (0)				-
Column (5) Enter same w	verynt classes use	o in Rows (i) and Dow (4)	ц <i>с).</i>				

2

Column (6) Enter weights of material from Row (4)

Column (7) Add column (6) from bottom up to get cumulative weight passing.

Column (8) Divide column (7) by sample total to get total percent passing.

# WORK SHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD B

Project Name:

Riprap Type: Source, Quarry, or Pit:

Source, Quarry, or Pit: Sample Location:

> Part 1. Separate rock into 5 to 7 piles, ordered by size. The largest pile should contain 2 to 5 stones. Intermediate piles between the largest stones and those smaller than 5 pounds should be approximately equal in total weight. Separate all stones before weighing.

Date:

Test No.

Test Made By:

# Part 2. Summary Table.

(1) WEIGHT CLA	SSES	(2)	(3)	(4)
PASSING	RETAINED	TOTAL WEIGHT	CUMMULATIVE	TOTAL PERCENT
(stone wt.	(stone wt.	EACH CLASS	WEIGHT PASSING	PASSING
in lbs.)	in Ibs.)	(lbs.)	(lbs.)	(%)
	5 lbs.			
5 lbs.	PAN			
SAMPLE T	OTAL		ger bei im im in bir in bir	ant an part an part and and any
Column (1) Weight the smallest and largest stone in each pile. If weight classes overlap, adjust stones as necessary and repeat.				

Column (2) Weigh the total amount of rock in each pile and record.

Column (3) Add column (2) from bottom up to get cumulative weight passing.

Column (4) Divide column (3) by sample total to get total percent passing.

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## DIVISION 02 - SITE CONSTRUCTION

# SECTION 02922

# SEEDING

### 11/03

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# 3.8 FINAL ACCEPTANCE

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3.8.1 Preliminary Inspection 3.8.2 Final Inspection

-- End of Section Table of Contents --

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### SECTION 02922

# SEEDING 11/03

# PART 1 GENERAL

The drawings contain landscape plans which indicate the locations for the various seed mixes. Turfed areas which have been damaged during the contract operations, shall be restored following the requirements in this section, at no additional cost to the Government.

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act

(1995) Federal Seed Act Regulations Part 201

### MINNESOTA DEPARTMENT OF TRANSPORTATION (MNDOT)

MNDOT 3882

(2000) Mulch Material, Standard Specifications for Construction

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Literature;

The Contractor shall submit manufacturer's literature discussing physical characteristics, applications, guarantees, and installation of the seed, mulch, and fertilizer. The Contractor shall submit manufacturer's literature for equipment showing application and installation instructions.

SD-06 Test Reports

Seed Test;

The Contractor shall submit test reports for a purity and germination test following the Association of Official Seed Analysts (AOSA) rules for each seed mixture. The test reports shall indicate the purity percentage and germination percentage for each species.

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Quantity Check;

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Maintenance Record;

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

SD-07 Certificates

Certificates of Compliance;

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. Seed. Mixture percentage, percent pure live seed, percent germination, weed seed content, and date tested.
- b. Mulch. Composition and source.
- 1.3 DELIVERY, INSPECTION, STORAGE, AND HANDLING
- 1.3.1 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed materials shall be delivered in manufacturer's original, unopened containers with labels and tags intact and legible. Seed that is wet, moldy, or bears a test date more than five months old, shall be rejected. Unacceptable materials shall be removed from the job site.

1.3.2 Storage

Materials shall be stored in areas provided by the Contractor. The storage areas shall be made accessible to the Contracting Officer so that application rates can be verified. Seed, lime, and fertilizer shall be stored in cool, dry locations away from contaminants. Chemical treatment materials shall be stored according to manufacturer's instructions and not with seed.

1.3.3 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

# 1.3.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

#### PART 2 PRODUCTS

#### 2.1 SEED

Substitutions will not be allowed without written request from the Contractor and approval from the Contracting Officer. The mixing of seed may be done by the seed supplier prior to delivery, or on site in the presence of the Contracting Officer.

#### 2.1.1 Seed Classification

All seed weights are given as Pure Live Seed (P.L.S.) State-certified seed of the latest season's crop, local genotype from within 200 miles of the jobsite, shall be provided in original sealed packages bearing the producer's guaranteed analysis for mixture percentage, purity, germination, weed seed content, and inert material. Labels shall be in conformance with AMS Seed Act and applicable state seed laws.

#### Permanent Seed Species and Mixtures 2.1.2

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Permanent seed species and mixtures shall be proportioned by weight as follows:

	SEED	MIX	1	
_	 			

		Seeding Rate
Common Name	Botanical Name	(ounces per acre)
Virginia wild rye	Elymus virginicus	48.0
Canada wild rye	Elymus canadensis	48.0
Switchgrass	Panicum virgatum	32.0
Indiangrass	Sorghastrum nutans	16.0
Prairie cordgrass	Spartina pectinata	3.0
Black-eyed susan	Rudbeckia hirta	2.0

## SEED MIX 2

		Seeding Rate
Common Name	Botanical Name	(ounces per acre)
Big bluestem	Andropogon gerardii	25.5
Little bluestem	Andropogon scoparius	25.5
Sideoats grama	Bouteloua curtipendula	25.5
Rough dropseed	Sporobolus compositus	1.0
Virginia wild rye	Elymus virginicus	25.5
Canada wild rye	Elymus canadensis	25.5
Switchgrass	Panicum virgatum	4.0
Indiangrass	Sorghastrum nutans	25.5
Prairie cordgrass	Spartina pectinata	2.0
Black-eyed susan	Rudbeckia hirta	3.0
Evening primrose	Oenthera biennis	2.0
Purple prairie clover	Dalea purpurea	3.0
Brown-eyed susan	Rudbeckia triloba	2.0
Yellow coneflower	Ratibida pinnata	2.0
Bergamot	Monarda fistulosa	1.0
Blue vervain	Verbena hastata	1.5
Hoary vervain	Verbena stricta	1.5
Sky blue aster	Aster oolentangiensis	0.5
Frost aster	Aster pilosus	0.5
Showy sunflower	Helianthus laetiflorus	0.5

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### 2.1.3 Temporary Seed Species

Seed species for winter erosion protection, temporary surface erosion control, or overseeding shall consist of 100 pounds per acre of oats if seeded by mid-August or 15 pounds of annual rye per acre if seeded in the fall. For spring seeding use 40 pounds of oats per acre for a cover crop.

# 2.1.4 Quality

Weed seed shall be a maximum 1 percent by weight of the total mixture. Innoculent shall consist of the proper bacteria applied in the amount and manner recommended by the manufacturer to all legumes in the seed mix.

### 2.2 MULCH

2.2.1 Straw Mulch

Mulches shall be free from weeds, mold, and other deleterious materials. Mulch shall meet the requirements of MNDOT 3882, Type 3 or equivalent, and consist of clean grain straw (i.e., oats, wheat) that is certified by the Minnesota Crop Improvement Association (MCIA) (www.mncia.org) to be weed free. All mulch bales shall be in an air-dried condition at the time of delivery and shall have an MCIA inspection tag attached indicating that the mulch has passed inspection. Note that MNDOT Type 3 mulch shall consist of oats or wheat only. Other mulch types such as cereal rye, introduced pasture grasses, legumes, hay, etc., are not acceptable as Type 3 mulch. Dry mulching material which breaks and does not bend is unacceptable. Mulch shall have a consistency for placing with commercial mulch blowing equipment.

### 2.3 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements in concentrations toxic to plant life.

# 2.4 SPECIAL SEEDING AND MULCHING EQUIPMENT

### 2.4.1 Equipment

Only pneumatic-tired tractors shall be permitted on areas having topsoil. Special equipment such as mulch spreaders may be used if approved by the Contracting Officer. The request for approval shall be made well in advance of the planned planting date and shall include full information on equipment and materials.

### 2.4.2 Seed Mix

The seed mix shall be planted using a Truax or equal seed drill, or a Truax "Seed Slinger" or equal broadcast seeder.

#### PART 3 EXECUTION

# 3.1 INSTALLING SEED TIME AND CONDITIONS

# 3.1.1 Notification

The Contractor shall notify the Contracting Officer 48 hours in advance of

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beginning seeding or any changes in turf establishment operations.

# 3.1.2 Seeding Time

The permanent seed mixtures shall be installed from April 20 to June 15. No finished construction area shall be left untopsoiled and unseeded during the winter months. When substantially complete areas are not seeded within the specified seeding times, a temporary winter cover shall be placed.

## 3.1.3 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

### 3.2 SITE PREPERATION

The Contractor shall verify that the finished grades are as indicated on the drawings.

# 3.2.1 Tillage

After each area required to be seeded has been brought up to the required grade, the area shall be tilled to a depth of at least four inches by plowing, disking, harrowing, or other approved operations only during periods when, in the opinion of the Contracting Officer, beneficial results are likely to be obtained, Undulations or irregularities in the turfing area surfaces shall be leveled before the next turfing operation. Soil compacted by construction equipment or soil on compacted cut slopes or grades shall be pulverized to a minimum depth of four inches by disking or tilling before applying seed.

### 3.3 SEEDING

Prior to installing seed, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

### 3.3.1 Equipment

Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage.

### 3.3.2 Broadcast Seeding

In areas inaccessible to drill seeding, seeding shall be accomplished with approved broadcast equipment. Seed shall be uniformly broadcast at the rate specified for the mix. Half the total rate of seed application shall be sown with sower moving in one direction, and the remainder with sower moving at right angles to first sowing. Seed shall be covered a maximum 1/4 inch depth by disk harrow, steel mat drag, cultipacker, or other approved device. Seed shall not be broadcast when wind speed exceeds 5 miles per hour. a garasa y

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# 3.3.3 Drill Seeding

Drill seeding shall be accomplished with approved equipment with drills set not more than 6 inches apart. Seed shall be uniformly drilled to a depth of 1/4 inch at the rate specified for the mix. Row markers shall be used with the drill seeder. The drilling equipment shall be maintained with half full seed boxes during the seeding operations. When slopes exceed 1 vertical on 5 horizontal, baffle plates spaced not more than 6 inches apart shall be installed in the seed box.

## 3.3.4 Firming Soil

Immediately after seeding operations have been completed, the newly seeded surfaces shall be compacted by a cultipacker, roller or other approved equipment weighing 90 to 100 pounds per foot of roller. Under certain condition, the Contracting officer will direct that rolling be delayed from 15 to 30 minutes following planting in order to avoid falling the soil in the roller or squeezing water out of furrows. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic-tired roller shall be used. a roller having tires of sufficient size shall be used, or sufficient passes of the roller shall be made, to cover the soil surface completely. (

### 3.3.5 Applying and Anchoring Mulch

Immediately after the seeding has been completed, mulch shall be spread uniformly in a continuous blanket at a rate of 1 1/2 tons per acre. Mulch shall be spread by hand, manure spreader, modified grain combine with straw-spreader attachment, or a blower-type mulch spreader. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. Mulch shall not be bunched. Immediately following the spreading, the mulch shall be anchored to the soil by a V-type wheel land packer, a scalloped-disk land packer designed to force mulch into the soil surface, or other suitable equipment. The number of passes needed, not to exceed three, will be determined by the Contracting Officer. All areas seeded on any given day must be mulched on that same day. If for whatever reason seeding is not possible on all or any portion of the project site, mulch shall still be applied to aid in erosion control and to prepare the site for the future native prairie planting by others.

### 3.4 RESTORATION AND CLEAN UP

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades, providing signage, or as directed. Excess and waste material shall be removed from the seeded areas and shall be disposed offsite.

### 3.5 TURF ESTABLISHMENT PERIOD

The Contractor shall be responsible for the proper care of seeded areas during the turf establishment period. The turf establishment period shall extend for 16 months after completion of the seeding operations on the entire project, unless the desired growth is established in a shorter period of time and shortening the period of Contractor's responsibility for acceptably established turf areas is authorized by the Contracting Officer.

### 3.6 MAINTENANCE

# 3.6.1 Mowing

The seeded areas shall be mowed during the first growing season when the height of the vegetation reaches 12 inches or when weeds start to seed, whichever comes first. It may be necessary to mow more than once during the first growing season. The second season the seeded areas should be mowed once in mid-June. Mowing should be to a height of 4 inches.

## 3.6.2 Maintenance During Establishment Period

Seeded and mulched areas shall be maintained until all work or designated portions thereof have been completed and accepted. Any damage shall be repaired, and mulch material that has been removed by wind or other causes shall be replaced and secured. Maintenance shall include protecting the site from erosion and maintaining erosion control material. The maintenance period is defined as beginning when seed/mulch have been placed onto the site and terminating at the end of the contract performance period.

## 3.6.3 Erosion Control

The Contractor shall control erosion during the maintenance period by using ditch checks, sod swales, silt fences or other methods.

3.6.3.1 Repair

If any portion of the surface becomes rilled, gullied, damaged, or destroyed, that portion shall be repaired to re-establish the area without additional cost to the government.

### 3.7 QUALITY CONTROL

The Contractor shall establish and maintain a quality control system for the work under this section, in accordance with SECTION 01451, CONTRACTOR and QUALITY CONTROL, including but not limited to the following:

- (1) Materials:
  - (a) Seed
  - (b) Mulch
- (2) Seeding and mulching.
- (3) Maintenance
- (4) Repair of damaged areas.
- (5) Soil Erosion Control

A copy of the records of inspections and tests, as well as the records of corrective action taken, shall be furnished the Government as directed by the Contracting Officer.

### 3.8 FINAL ACCEPTANCE

3.8.1 Preliminary Inspection

Prior to the completion of the turf establishment period, a preliminary

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site inspection will be held by the Contracting Officer. The date for the inspection(s) will be established in writing. In September of the year following the establishment of turf in each area seeded with seed Mixtures 1 and 2, there shall be at least 3 plants of the required planted variety per square foot of each required turfed area. The acceptability of the established turf shall be determined in accordance with PARAGRAPH: TURF ESTABLISHMENT PERIOD. All unacceptable stands of turf shall be accepted upon meeting the 3 plants of the required planted variety per square foot.

# 3.8.2 Final Inspection

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A final inspection will be held by the Contracting Officer in order to determine that deficiencies noted in the above preliminary inspection(s) have been acceptably corrected. The time for the inspection will be established in writing.

-- End of Section --

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**APPENDIX E** 

# PROJECT OBJECTIVES AND MONITORING PLAN

TABLE 10-1 Meeting Project Goals and Objectives

	Project		
Goal	Objective	Met/Not Met	Discussion
Goal A - Improve lacustrine	A-1: Create overwintering habitat for centrarchids in	Partially Met	Overwintering habitat in excess of 30 acres in
habitat for backwater fish	three discrete areas with a minimum size of 20 acres		size created in two locations.
species in Spring Lake.	each; D.O. ≥ 5 mg/l; current velocity < 0.3 cm/sec over		
	80% of the area; suitable water temperatures; and		
	depths > 4 ft over 40% of area, >7 ft over 15% of the		
	area protected from dominant wind fetches.		9
	A-2: Create summer habitat for centrarchids in three	Met	The island restoration project is expected to
	discrete areas with a minimum size of 20 acres each:	mor	substantially improve growing conditions for
	D O > 5 mg/i; depths > 4 ft over 40% of area >7 ft over		aquatic vegetation. Dissolved ovvgen levels
	15%: connected to adjacent flowing water habitats		are expecte to be $> 5 \text{ mg/l}$
	aquatic vegetation cover in the range of 20-50%		
1			
÷	A-3: Create three discrete areas with a minimum size of	Met	The island shorelines, underwater slopes and
	5 acres each in size that support spawning, rearing and		protected areas will create substantial areas
	juvenile backwater fish species; D.O. ≥ 5 mg/l; current		with conditions favored by spawning
	velocity < 0.5 cm/sec; aquatic vegetation cover in the		Centrarchids and preferred habitat for juvenile
	range of 20-50%; substrates of sand and/or gravel.		fish of a variety of species.
	- · · · · ·		
Goal B - Restore puddle duck	B-1: Provide conditions important for the growth of	Met	32 acres of islands restored in a manner to
habitat in Spring Lake	emergent vegetation with water depths less than 2 feet,		improve growth conditions.
	protected from dominant wind fetches, and with current		
	velocities less than 0.5 feet per second.		
	B-2: Provide conditions important for the growth of	Met	32 acres of islands restored in a manner to
	submersed vegetation with water depths less than 4		improve growth conditions.
	feet, protected from dominant wind fetches.		
	B-3: Restore islands to meet puddle duck habitat	Met	32 acres of islands restored in a manner to
			improve puddle duck habitat needs.
	B-4: Provide 11 acres of sand/mudflats.	Met	11 acres provided.
	B-5: Provide waterfowl loafing sites (10-20 per acres).	Met	40,000+ linear feet of island shoreline created
			that will be availble for waterfowl loafing.
Goal C: Create habitat for	C-1: Provide a diversity of habitat conditions suitable for	Met	Restoration of 32 acres of islands in the manner
migratory birds, turtle nesting,	a wide variety of species.		proposed should result in substanial
mammals, reptiles, amphibians,			improvements in habitat diversity and habitat
and raptors.			quality for a wide variety of wildlife species.
Cool D. Enhance hat bet	O 2) Enhance habitat by arreting family start		
Gual D: Ennance habitat for	U-3, Enhance habitat by creating flowing channel	Met	ine project will create 40,000 linear feet of
mussele	scour and eddies: a variety of substrates; and		border flowing channel or are configured in a
mussels.	connective with other channels		manner to stimulate the formation of flowing
1	connectivevity with other Grannels.		channels
1			
1	1		

# **TABLE 12-1**

# **UMRS-EMP** Monitoring and Performance Evaluation Matrix

Type of		Responsible	Implementing	Funding	
Activity	Purpose	Agency	Agency	Source	Remarks
Problem Analysis	System-wide problem definit Evaluate planning assumptions.	USGS	USGS (UMESC)	LTRM	Lead into pre-project monitoring; define desired conditions for plan formulation.
Pre-project Monitoring	Identify and define problems at specific sites.	Sponsor	Sponsor	Sponsor	Should attempt to begin defining baseline.
Baseline Monitoring	Establish baselines for performance evaluation.	Corps	Field stations or sponsors thru Cooperative Agreements, or Corps.*	HREP	Should be over several years to reconcile perturbations.
Data Collection for Design	<ol> <li>Identify project objectives</li> <li>Design of project.</li> <li>Develop Performance</li> <li>Evaluation Plan.</li> </ol>	Corps	Corps	HREP	After fact sheet. Data may aid in defining baseline.
Construction Monitoring	Assure permit conditions met.	Corps	Corps	HREP	
Performance Evaluation Monitoring	Determine success of project	Corps	Field stations or sponsors thru Cooperative Agreements, sponsor thru O&M**, or Corps.*	HREP	After construction.
Analysis of Biological Responses to Projects	1. Determine critical impact levels, cause-effect relationships and long-term losses of significant habitat.	USGS s,	USGS (UMESC)	LTRM .	Biological Response Study tasks beyond scope of Performance Evaluation, Problem Analysis, and
	2. Demonstrate success or response of biota.	Corps	Corps/USGS (UMESC)/Others	HREP	Trend Analysis.

\*Choice depends on logistics. When done by the States under a Cooperative Agreement, the role of the EMTC will be to: (1) advise and assist in assuring QA/QC consistency, (2) review and comment on reasonableness of cost estimates, and (3) be the financial manager. If a private firm or State is funded by contract, coordination with the EMTC is required to assure QA/QC consistency.

\*\*Some limited reporting of information for some projects (e.g., waterfowl management areas) could be furnished by on-site personnel as part of O&M.

TABLE 12-2 POST-CONSTRUCTION MONITORING- SPRING LAKE ISLANDS

	Project	Enhancement	Unit of	Measurement	Monitoring	Projected
Goal	Objective	Feature	Measure	Plan	Interval	Cost/Effort
Goal A - Improve and maintain lacustrine habitat for backwater fish species.	A-1: Create overwintering habitat for Centrachids in three duscrete locations with a size of 20 acres; D.O. ≥ 5 mg/l: current velocity < 0.3 cm/sec; suitable water temperatures; depths > 4 ft over 40% of area and connected to flowing habitats.	Deep protected areas.	Acres, dissolved oxygen levels (mg/l), current velocities (cm/sec), water temperatures (degrees C), and depths (feet).	Dissolved oxygen, current velocity, water temperature, and depth during the winter.	Water depths would be monitored periodically as part of the LTRMP key pool monitoring program. The other parameters would be monitored 2, 5, 10, 20, 30, 40, and 50 years post-construction.	\$4,000
	A-2: Create summer habitat for centrarchids in three discrete areas with a minimum size of 20 acres each; D.O. > 5 mg/l; depths > 4 tf over 40% of area, >7 tf over 40% of area, >7 ft over 15%; connected to adjacent flowing water habitats aquatic vegetation cover in the range of 20-50%.	Islands	Dissoved oxygen (mg/l), aquatic vegetation.	Dissoved oxygen (mg/l), aquatic vegetation.	5 year intervals post-	Vegetation covered in the costs for B-1. Dissolved oxygen - \$2,000
	A-3: Create three discrete areas with a minimum size of 5 acres each in size that support spawning, rearing and juvenile backwater fish species; D.O. > 5 mg/l; current velocity < 0.5 cm/sec; aquatic vegetation cover in the range of 20- 50%; substrates of sand and/or gravel.	Islands	Dissoved oxygen (mg/l), aquatic vegetation.	Dissoved oxygen (mg/l), aquatic vegetation.	5 year intervals post- construction.	Covered in the costs for B-1.
Goal B - Restore puddle duck habitat in Spring Lake.	B-1: Provide conditions important for the growth of emergent vegetation with water depths less than 2 feet, protected from dominant wind fetches, and with current velocities less than 0.5 feet per second.	Islands	Emergent vegetation % cover and species; current velocities (ft/sec)	Emergent vegetation, and current velocities.	Emergent vegetation would be monitored at 5 year intervals. Current velocities would be measured 1 year post- construction.	\$10,000

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# TABLE 12-2 Cont'd POST-CONSTRUCTION MONITORING

	Project	Enhancement	Unit of	Measurement	Monitoring	Projected
Goal	Objective	Feature	Measure	Plan	Interval	Cost/Effort
	B-2: Provide conditions important for the growth of submersed aquatic vegetation with water depths less than 4 feet and protected from dominant wind fetches.	Islands	Submersed vegetation % cover and species	Submersed vegetation % cover and species	Submersed vegetation would be monitored at 5 year intervals.	Covered in the cost for B-1.
	B-3: Restore islands to meet puddle duck habitat needs.	Islands	Acres	Island area (visual and aerial photos).	1, 5, 10, 20, 30, 40, and 50 years post- construction.	Covered in the cost for B-1
	B-4: Provide 11 acres of sand/mudflats.	Mudflats.	Acres	Mudflat area (visual and aerial photos).	1, 5, 10, 20, 30, 40, and 50 years post- construction.	Covered in the cost for B-1
	B-5: Provide waterfowl loafing sites (10-20 per acres).	Mudflats and stumps.	Number	Presence or absence of features (visual and aerial photos).	1, 5, 10, 20, 30, 40, and 50 years post- construction.	Covered in the cost for B-1.
Goal C - Create habitat for migratory birds, turtle nesting, mammals, reptiles, amphibians, and raptors.	C-1: Create a diversity of habitat conditions suitable for a wide variety of species.	Islands	Islands (ac), beaches (If), mudflats (ac).	Visual and aerial photos.	1, 5, 10, 20, 30, 40, and 50 years post- construction.	Covered in the cost for B-1.
Goal D - Enhance habitat for riverine fish species and mussels.	D-1: Enhance habitat by creating flowing channel at least 2,000 feet; provide areas of scour and eddies; a variety of substrates; and connectivitywith other channels	Islands	Acres	Island area (visual and aerial photos).	1, 5, 10, 20, 30, 40, and 50 years post- construction.	Covered in the cost for B-1.

\* While the island complexes were designed to contribute to these desired habitat conditions as much as possible, no independent features are proposed for these objectives.
**APPENDIX F** 

TREE AND SHRUB PLANTING PLAN





## VERTICAL CONTROL

TBM TURKEY - EL. 671.36 (1912 MSL): SET 1"  $\times$  3" STEEL BAR ON RIVERSIDE SHOULDER OF EMBANKMENT 11.800' UPSTREAM OF LOCK AND DAM 5. TBM IS LOCATED @ FIRST LARGE PI UPSTREAM OF DAM, WHERE EMBANKMENT TURNS TOWARD NORTHEAST.

TBM TURKEYFOX - EL. 671.19 (1912 MSL): FOUND CHISELED SQUARE ON SOUTHWEST CORNER FENCED IN INLET STRUCTURE.

## HORIZONTAL CONTROL

COORDINATES FOR HORIZONTAL CONTROL POINTS LISTED BELOW SHALL BE VERIFIED BY THE CONTRACTOR:

NEISKA: E 1.937,134.88557, N 16,055,883.59355 P 125: E 1.942,803.39129, N 16,073,126.50198 WEAVER: E 1.923,650.41778, N 16,060,789.43675

		CONSTRUCTION DRAWING INDEX	
SHEET	SHT	DESCRIPTION	I.D. NO.
REF. NO.			
G-001	1	COVER SHEET - LOCATION & VICINITY MAPS	01-M5P-LA-COVER_G-101001.DGN
G-002	2	CONTRACT INDEX, REFERENCE INDEX, LEGENDS & SYMBOLS	02-M5P-LA-INDEX_G-602002.DGN
L-001	3	ISLAND 2 - TREE & SHRUB PLANTING PLAN	P001-M5P-ISLAND-2_L-LP-101001.DGN
L-002	4	ISLAND 3 - TREE & SHRUB PLANTING PLAN	P002-M5P-ISLAND-3_L-LP-101002.DGN
L-003	5	ISLAND 4 - TREE & SHRUB PLANTING PLAN	P003-M5P-ISLAND-4_L-LP-101003.DGN
L-004	6	PLANTING DETAILS	P004_M5P_DETAILS_L-001004.DGN
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		REFERENCE DRAWING INDEX	
SHEET REF. NO	. SHT	DESCRIPTION	I.D. NO.
BASIC CONTRA	CT		
G-001	1	COVER SHEET - LOCATION & VICINITY MAPS	01-M5P-G-101001
G-002	2	CONTRACT INDEX, REFERENCE INDEX, LEGENDS & SYMBOLS	02-M5P-G-602002
C-001	3	SITE LAYOUT AND DREDGING - PLAN	03-M5P-C-101003
C-002	4	ISLAND 1 AND ROCK MOUND 4 - PLAN	04-M5P-C-102004
C-003	5	ROCK MOUNDS 1-3 - PLAN	05-M5P-C-103005
C-004	6	ISLAND 2 - PLAN	06-M5P-C-104006
C-005	7	ISLAND 3 - PLAN	07-M5P-C-105007
C006	8	ISLAND 4 - PLAN	08-M5P-C-106008
C-007	9	ISLAND & ROCK MOUND - TYPICAL SECTIONS	09-M5P-C-307009
C-008	10	TYPICAL SECTIONS AND DETAILS	10-M5P-C-308010
C-009	11	GROIN, VANE & END/BANK PROTECTION - TYP SECS & DETLS	11-M5P-C-509011
C-010	12	ISLANDS 1-4 - ALIGNMENT TABLES	12-M5P-C-610012
L-001	13	ISLAND SEEDING AND WILLOW PLANTING PLAN	13-M5P-L-101013
OPTIONAL CON	TRACT	ITEMS	
C-011	14	ISLAND E3 (OPTIONAL) - SITE LAYOUT AND DREDGING	14-M5P-C-111014
C-012	15	ISLAND E3 (UPTIONAL) - PLAN	15-M5P-C-112015
C-013	16	ISLAND E3 (OPTIONAL) - PROFILE	16-M5P-C-213016
C-014	17	ISLAND E3 (OPTIONAL) - SECTIONS	17-M5P-C-314017
C-015	18	ISLAND E3 (OPTIONAL) - ALIGNMENT TABLE	18-M5P-C-615018
L-002	19	ISLAND E3 (OPTIONAL) - PLANTING & SEEDING PLANS	19-M5P-L-102019

	REFERENCE DRAWING INDEX	
DRAWING NO.	DESCRIPTION	I.D. NO.
P5-2002-1	FLOW DURATION CURVES - JANUARY - JUNE	D5P00LD_D1
P5-2002-2	FLOW DURATION CURVES - JULY - DECEMBER	D5P00LD_D2
P5-2002-3	FLOW HYDRDGRAPHS - 1993 - 1997	D5P00LD_H1
P5-2002-4	FLOW HYDROGRAPHS - 1998 - 2002	D5P00LD_H2
PLATE 6-2	BORING LOGS: 99-8M THRU 99-14M	SPBT210002
PLATE 6-3	BORING LOGS: 99-15M-THRU 99-19M	SPBT210003
PLATE 6-4	BORING LOGS: 03-20M THRU 03-27M	SPBT210004
PLATE 6-5-	BURING LOGS: 03-28M THRU 03-31M	SPBT210005

BOT. CONC. DIA. EL. MAX. MIN. ο.c. Т&В TYP. U.N.O.

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r. She	CONSTRUCTION DRAWING	DEPARTMENT OF THE ARMY	Designed bys LKT/DMS 0CT 2007	Rev.				$\overline{\square}$	US of st.
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eet ence iber <b>)0</b> o	ENVIRONMENTAL	Horizontal Coordinate System <sup>±</sup> UTM ZONE 15	Authority: ENVIRON MOMT PROG					Π	ny Co neers istric
р 	EE & SUDID 2	NAD 1983, US SURVEY FT	File Name: PO01-MP5-ISLAND-2_L-LP-00	1001.DGN					orp s
		MSL NGVD 1912 (ADJ)	Plot Scals: 1" = 200" Plot Date:		Symbol De	escription	Date	Appr.	5

ST	
TANICAL NAME	COMMENT
R SACCHARINUM	PLANT APPROX. 15' ON CENTER
TIS OCCIDENTALIS	PLANT APPROX. 15' ON CENTER
RCUS BICOLOR	PLANT APPROX. 15' ON CENTER



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r	CONSTRUCTION DRAWING SPRING LAKE ISLANDS		Designed by: DMS	Date: JUNE 2007 Rev.				П	US of St.
efe nu	MISSISSIPPIRIVER - POOL 5	CORPS OF ENGINEERS	Dwn by: Ckd by:	Solicitation No.:			_		Ar En Pau
sh er Im -(	BUFFALO COUNTY, WISCONSIN	ST. PAUL, MINNESOTA	LKT/DMS XXX	W912ES-07-Q-0019					gir gir
eet enc ber 00	FNVIRONMENTAI	Horizontal Coordinate System: UTM_ZONE_15	Authority: ENVIRON MGMT PROG	Drawing Number:					ny C neer istric
e 3	ISLAND 4	NAD 1983, US SURVEY FT	File Name;p003-MP5-iSLA	ND-4-L-LP-001003.DGN					orp s t
	IREE & SHRUB PLANTING PLAN	WEL NGVD 1912 (ADJ)	Plot Scale: 1" - 200'	Plot Date: 12 JUN 07	Symbol	Description	Date	Appr.	s

COMMENT	
PLANT APPROX. 8' ON	CENTER



- THE PLANTING DETAILS REPRESENT ADEQUATELY DRAINED SOIL CONDITIONS. THE CONTRACTOR SHOULD EXERCISE DISCRETION IN SETTING PLANTS I"-3" HIGHER IN POORLY DRAINED SOILS.
  ON 2:I SLOPES OR GREATER, DO NOT CONSTRUCT THE UPHILL HALF OF THE WATERING BASIN.
- 3. ON WET, POORLY DRAINED SOILS, DO NOT CONSTRUCT WATERING BASIN.
- 4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE DRAINAGE IN HEAVY,

POORLEY DRAINED OR IMPERVIOUS SOILS.

SHRUB AND TREE PLANTING DETAILS

(3)

(4)

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		SPE	RING	F A	LL
<u>^</u>		DECIDUOUS	EVERGREEN	DECIDUOUS	EVERGREEN
	1	APRIL 21 TO JUNE 1	APRIL 21 TO JUNE 1	0CT. 1 TO NOV. 1	AUG. 25 TO SEPT. 15
	2	APRIL 14 TO JUNE 1	APRIL 14 TO MAY 24	OCT. 1 TO NOV. 6	AUG. 25 TO SEPT. 15
	з 📕	APRIL 7 TO JUNE 1	APRIL 7 TO MAY 17	0CT. 10 TO NOV. 15	AUG. 25 TO SEPT. 15
$\mathbf{k}$	4	APRIL 1 TO MAY 25	APRIL 1 TO MAY 15	OCT. 15 TO NOV. 20	SEPT. 5 TO OCT. 1

NOTE: ACTUAL DATES MAY CHANGE DEPENDING UPON SEASONAL CONDITIONS AS DETERMINED BY THE ENGINEER. FALL PLANTING MAY NOT BE RECOMMENDED OR ALLOWED. SEE SPECIAL PROVISIONS FOR SPECIFIC PROJECT REQUIREMENTS.

OPTIMUM PLANTING DATE ZONES IN MINNESOTA

KEY	OTY	SIZE/ROOT	CO
TREES	840	1 1/2" BR	SIL
	30	1″ BR	HA
	40	1 1/2" BR	BU
	840	I 1/2" BR	S₩
SHRUBS	350	12"-18" BR	HIC
	270	12"-18" BR	NA
	350	12"-18" BR	NIN
	350	12"-18" BR	RE
	300	12"-18" BR	SIL

PLANT TYPE

TREES

SHRUBS

1" B.R

1 1/4" B.R. 1 1/2" B.R.

18" B.R

