



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

---

## **Appendix E: Civil - Site**

---

Fargo-Moorhead Metropolitan Area  
Flood Risk Management Project

**Wild Rice River Structure**

Engineering and Design Phase

P2# 370365

Doc Version: FTR ATR Sponsor Review

**11 January 2019**

This page is intentionally left blank

---

# Appendix E: Civil - Site

## Table of Contents

E.1 GENERAL .....	1
E.2 WILD RICE RIVER STRUCTURE LAYOUT .....	1
E.3 DEMOLITION .....	1
E.4 DAM EMBANKMENT .....	1
E.5 SITE GRADING .....	2
E.6 PRE-FORMED SCOUR HOLE.....	2
E.7 CONCRETE EROSION PROTECTION PAD.....	2
E.8 ACCESS ROAD LAYOUT.....	2
E.8.1 Geometric Design Criteria – Access Roads .....	2
E.9 UTILITY RELOCATIONS.....	3
E.9.1 Overhead Electric.....	3
E.9.2 Buried Communication Lines .....	3
E.9.3 Water Mains.....	3
E.9.4 Drain Line .....	3
E.10 VEGETATION FREE ZONE (VFZ) .....	3
E.11 REAL ESTATE/WORK LIMITS.....	4
E.12 TECHNICAL GUIDELINES AND REFERENCES .....	4
E.13 REFERENCE DOCUMENTS .....	4
E.14 PROJECT LOCATION.....	5
E.15 ENGINEERING DRAWINGS FOR CIVIL FEATURES AND SITE WORK .....	7

This page is intentionally left blank

# Appendix E: Civil - Site

## E.1 GENERAL

Civil design for this project will include demolition, dam embankment, site grading, excavated material pile, access road layout, utility relocations, and civil design at structures, general grading and storm water pollution prevention. This section summarizes the proposed layout, method of analysis, and support for preparation of the plans, specifications, and cost estimate.

## E.2 WILD RICE RIVER STRUCTURE LAYOUT

The Wild Rice River Structure is located along the Dam Embankment Control Line at Station A348+60. The dam embankment (centerline EL 931.75 adjacent control structure) will connect to the east and west limits of the proposed structure. Details of the Wild Rice River Structure design can be found in the Appendix F.

## E.3 DEMOLITION

Demolition will involve removal of an existing road core of 173<sup>rd</sup> Avenue SE and clearing and grubbing the limits of work. Several fiber optic lines running parallel to the east side of 173<sup>rd</sup> Avenue SE will be abandoned by others. These abandoned lines will require removal. One water main, running parallel to the west side of 173<sup>rd</sup> Avenue SE will require removal. A drain line emptying into the existing Wild Rice River will also be abandoned by others and will require removal. An overhead power line will be removed by others.

## E.4 DAM EMBANKMENT

The dam embankment shall connect to the Wild Rice River Structure dam walls on the east and west sides of the structure. The dam embankment centerline has a construction elevation of 930.65-933.70 to allow for settlement. Dam embankment top width is 15 feet west of 173<sup>rd</sup> Avenue and 20 feet wide east of 173<sup>rd</sup> Avenue with side slopes of 1V:4H. The dam wall bridge is 23 feet wide across the structure. The top of the dam embankment shall have a cross-slope of 2% for drainage and a 15-20 foot wide gravel surface (8 inches thick). The elevations indicated on the profiles are referenced to the centerline of the dam embankment.

At the connection to the structure, the dam walls shall extend 10 feet into the dam embankment for a secure connection between dam embankment and dam walls.

## **E.5 SITE GRADING**

Site grading consists of Wild Rice River Structure excavation, excavation for the drainage ditch as well as final grading to allow drainage away from the dam embankment. Other grading is covered in demolition for removal of the 173<sup>rd</sup> Avenue SE road core. Drainage Ditch DD runs parallel along the west side of 173<sup>rd</sup> Ave SE and will connect the existing drainage ditch to the proposed ditch (by others) adjacent the Dam Embankment. This ditch has a minimum 10' bottom width with 1v:4h side slopes.

The engineered channel ties into the existing Wild Rice River with a 30 foot channel bottom. Upstream, the channel increases to 100 feet wide (adjacent the upstream apron) between station W16+00 to W13+00. Downstream, the channel increases to 90 feet wide downstream of the structure between station W4+00 and W 6+00. The channel remains at 90 feet wide within the structure. The channel will have 1V:7H side slopes on both the west and east banks.

## **E.6 PRE-FORMED SCOUR HOLE**

The 3-D modeling determined a need for a pre-formed scour hole. The pre-formed scour hole will be immediately downstream of the stilling basin. It will drop to an elevation of 866.57 using a 1V:5H slope. The pre-formed scour hole will maintain elevation 866.57 over 200 feet. After 200 feet, it will slope up at a 1V:5H to elevation 886.50. The pre-formed scour hole will have 1V:7H side slopes on both the west and east banks. See Appendix C and D for additional information.

## **E.7 CONCRETE EROSION PROTECTION PAD**

See Structural Appendix for design description and Appendix C for Hydraulic description.

## **E.8 ACCESS ROAD LAYOUT**

Access to the dam embankment and control structure shall be from a remaining portion of 173<sup>rd</sup> Avenue SE from the northwest. On either side of the structure there is a gravel turn around area to provide adequate access for maintenance vehicles and maintenance crane vehicle. The access roads will have a width of 20 feet and shall be paved with 8 inches of gravel. Access roads will have a cross-slope of 2%.

### **E.8.1 Geometric Design Criteria – Access Roads**

The geometric design criteria and guidance used for the design of the access and maintenance roads is summarized below:

- Design will accommodate design crane – TADANO ATF 100G-4 110T
- 20' wide with 8" thick ND Class 13 gravel surface.
- Grade of ramp should be no steeper than 1:10.
- Design Speed of vertical curves 15 mph minimum.
- Design Length of vertical curves 120 ft. minimum.

- Side slopes should not be less than 1:4 to allow grass cutting equipment to operate.
- The turnaround area for city vehicles on 173<sup>rd</sup> Avenue SE has a radii of 60’.
- Minimum turning radii at access roads is 50’.
- Minimum turning radii at structure is 52’.

## **E.9 UTILITY RELOCATIONS**

Utility relocations will comply with the Draft FMM Southern Embankment Utility Relocation Requirements MFR, and local/state requirements. All relocations will be performed prior to construction. Utility relocation plans will be provided to the contractor as a plan reference document.

### **E.9.1 Overhead Electric**

Overhead electrical lines will be relocated by the utility owner prior to project construction. Demolition of existing lines and poles will be the responsibility of the utility owner.

### **E.9.2 Buried Communication Lines**

Buried Communication lines will be relocated by the utility owner prior to project construction. Existing lines will be abandoned in place by the Utility Company and removed by the Contractor during construction. The removals will be included in the plans.

### **E.9.3 Water Mains**

An existing water main will be temporarily re-routed to the west of the embankment by the utility owner prior to project construction. Existing water main will be abandoned in place by the Utility Company and removed by the Contractor during construction. The removals will be included in the plans.

### **E.9.4 Drain Line**

An existing drain line will be relocated by the utility owner prior to project construction. Existing drain line will be abandoned in place by the Utility Company and removed by the Contractor during construction. The removals will be included in the plans.

## **E.10 VEGETATION FREE ZONE (VFZ)**

The Vegetation Free Zone (VFZ) will comply with the requirements in ETL 1110-2-583, as well as the criteria set forth in project specific guidance documents such as the Memo for Record (MFR) FMM Vegetation Free Zone, and Dam vs Levee Criteria. The VFZ will be a minimum of 50’ from the toes of the dam embankment. A VFZ shall also be maintained adjacent to the Wild Rice River structure and outlet channel. The VFZ shall extend from the structure edge to 50 feet beyond the dry and wet side toes of the dam. The vegetation free zone shall include the entire outlet channel and extend to a distance of 50 feet from the top of the bank of the outlet channel. The VFZ lines will not be shown in

the Wild Rice River Structure contract documents, but will be defined in the O&M documents provided to the local sponsor at project completion.

## E.11 REAL ESTATE/WORK LIMITS

Fee title real estate will be set at 50' from the toe of the outermost project feature which includes excavated material piles, access roads, and the local drainage ditch. Temporary easements are as shown in the Real Drawings and are adequate for construction. Temporary easements will be used for a variety of construction purposes, including temporary storage of stripped topsoil. Temporary easements will also be shown for the contractor staging areas. The access roads will be included in the fee title real estate. Fee title and temporary easements will be shown on the real estate plans. The construction plans identify only the outermost work limit that typically represents the temporary easement.

## E.12 TECHNICAL GUIDELINES AND REFERENCES

1. ***A/E/C CADD Standard***, Release 3.0; U.S. Army Engineer Research and Development Center, Vicksburg, MS; September 2006.
2. ***A/E/C CADD Standard Supplement***, Release 6.2.0; U.S. Army Corps of Engineers, St. Paul District; July 2004.
3. ***A Policy on Geometric Design of Highways and Streets***, Fifth Edition; pp. 131-229, 231-234, and 380-389; American Association of State Highway and Transportation Officials (AASHTO); 2004.
4. ***United States National CAD Standard***, Version 4.0; National Institute of Building Sciences; July 2009.
5. ***Guidelines for Geometric Design of Very Low-Volume Local Roads***, American Association of State Highway and Transportation Officials (AASHTO); 2001

## E.13 REFERENCE DOCUMENTS

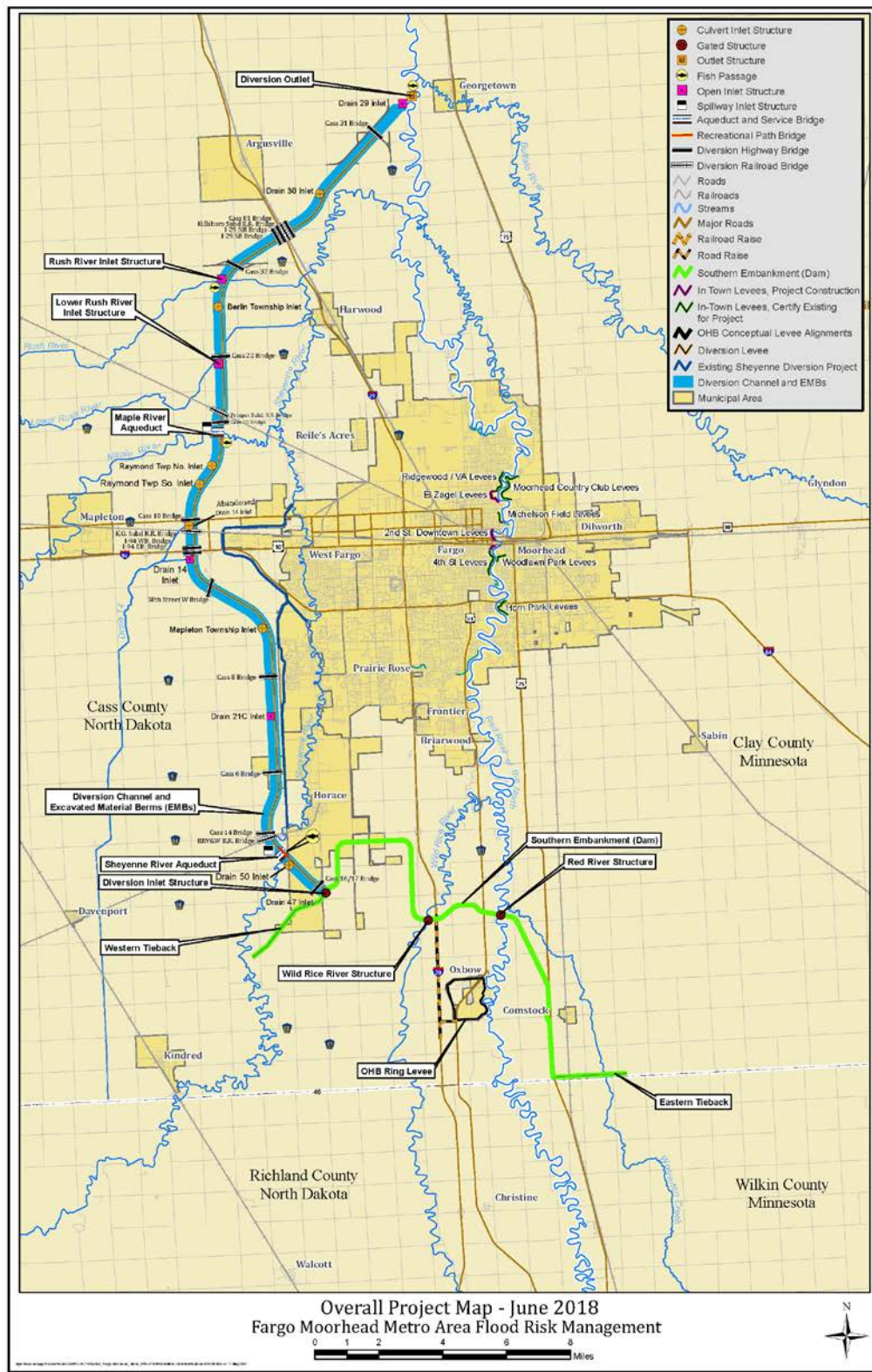
<b><i>Final Feasibility Study and Environmental Impact Statement</i></b> , Fargo-Moorhead Metropolitan Area Flood Risk Management, July 2011
<b><i>Value Based Design Charrette</i></b> , Fargo-Moorhead Metropolitan Area Flood Risk Management Project, Outlet & Diversion Reach 1, Cass County, ND, November 2011
<b><i>Value Engineering Study</i></b> , Fargo-Moorhead Metropolitan Area Flood Risk Management Project, Outlet & Diversion Reach 1, Cass County, ND, October 2011
<b><i>Reach Management Plan for Reach 1</i></b> , Fargo-Moorhead Metropolitan Area Flood Risk Management Project,
<b><i>Design Guidelines</i></b> for the overall FMM Project and Reach-Specific Design Guidelines



## **E.14 PROJECT LOCATION**

Figure E-1 shows the location of the proposed Wild Rice River Structure in relation to the overall project limits.

Figure E-1: Diversion Alignment and Features



## **E.15 ENGINEERING DRAWINGS FOR CIVIL FEATURES AND SITE WORK**

Drawings produced for this document utilized the following information:

- LIDAR Topographic Survey Data
- Corps of Engineers Field Survey Data
- MicroStation V8i model and sheet seed files
- Design files including cross-sections, alignments, and DTM files

Civil engineering plans prepared concurrent with this report are included in the Attachment 1.