



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

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# Supplemental Environmental Assessment

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## Design Modifications to the Fargo Moorhead Metropolitan Area Flood Risk Management Project



U.S. Army Corps of Engineers  
St. Paul District  
September 2013

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# Supplemental Environmental Assessment

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## **List of Attachments**

Section 404(b)(1) Evaluation Supplement 1  
Programmatic Agreement Amendment No. 1  
Finding of No Significant Impact (FONSI)

## **List of Appendices**

Appendix A – Project Alignment  
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# 1 SUMMARY

The Red River basin in eastern North Dakota and along the western Minnesota border has a long history of flooding due to the unique hydrology of the area. Three large rivers, the Red River of the North, the Wild Rice River (ND), and the Sheyenne River, converge in the Fargo-Moorhead metropolitan area and contribute to extensive flooding. The Federally Recommended Plan (FRP) for the flood risk management project consists of a 36-mile diversion channel (six miles of which is a connecting channel) around the west side of the city of Fargo, a staging area, and approximately 12 miles of tie-back levees. The FRP is described as the Locally Preferred Plan (LPP) in the Final Feasibility Report and Environmental Impact Statement (FEIS) dated July 2011; a Record of Decision was signed on April 3, 2012.

Detailed engineering and design studies conducted since the completion of the FEIS have resulted in several proposed modifications to the Project. The proposed modifications identified since the FEIS include: (1) diversion channel modifications, including alignment shifts<sup>1</sup> and channel cross-section modifications; (2) the addition of levees and floodwalls in downtown Fargo; and (3) a ring levee around the towns of Oxbow, Hickson, and Bakke, ND, which are immediately adjacent to each other. A Supplemental Environmental Assessment and a Supplemental Clean Water Act Section 404(b)(1) evaluation (Attachment 1) have been prepared to address the potential effects associated with the proposed modifications. Information presented in the FEIS dated July 2011 is incorporated by reference. An environmental review indicates that while the proposed modifications would result in some changes in the location, timing, and magnitude of effects on some resources, there would not be an appreciable change in the overall types and scope of impacts from what was described in the FEIS.

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<sup>1</sup> The proposed southern alignment shift also includes gates on the diversion inlet structure.

## 2 PURPOSE AND NEED FOR ACTION

### 2.1 Introduction and Background

The Fargo-Moorhead Metropolitan Area Flood Risk Management Project (Project) is located in Cass County, North Dakota and Clay County, Minnesota. The Federally Recommended Plan (FRP) is the Locally Preferred Plan (LPP) described in the FEIS, which consists of a diversion channel system including, but not limited to: excavated channels; a diversion inlet control structure; tie-back embankments; river control structures on the Red and Wild Rice (ND) Rivers; an upstream staging area; hydraulic structures on tributaries; community ring levees, non-structural features (such as fee acquisitions, relocations, or raising individual structures); recreational features (such as multipurpose trails and pedestrian bridges); and environmental mitigation projects located inside and outside the Project area. For purposes of this Environmental Assessment, references to the FEIS alignment and the FEIS generally are intended to reference the LPP as described in the FEIS.

Detailed engineering and design studies conducted since the completion of the FEIS have led to several proposed modifications to the LPP. Modifications to the Project fall into three general categories: (1) diversion channel modifications, including alignment shifts<sup>2</sup> and channel cross-section modifications (2) the addition of levees and floodwalls in downtown Fargo; and (3) a ring levee around the towns of Oxbow, Hickson, and Bakke, ND, which are immediately adjacent to each other. Figure 1 shows the location of the proposed modifications.

Proposed diversion channel modifications include changes in alignment of the diversion channel to reduce the severity of bends, improve constructability, and/or reduce impacts. In association with changes in the alignment, Storage Area 1 and the structure on Wolverton Creek would be eliminated. Other modifications to the diversion channel would include the additions of gates to the diversion inlet control structure and modifying the cross-section of the diversion channel to address geotechnical, sediment transport, and constructability considerations.

Floodwalls and levees in downtown Fargo were identified as a possible project component in the FEIS but detailed information regarding the alignment and top elevation were not available at the time the FEIS was completed. Implementation of this component would allow more flows to pass through town and reduce the frequency of the operation of the Red River and Wild Rice River control structures.

The FEIS identified that some communities upstream of Fargo and Moorhead would be affected by the staging of floodwaters and identified that properties would be acquired in fee or ring levees would be implemented for affected communities. The non-Federal sponsors have identified that they wish to pursue a ring levee as the preferred approach for Oxbow, Hickson and Bakke, ND.

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<sup>2</sup> The proposed southern alignment shift also includes gates on the diversion inlet structure.

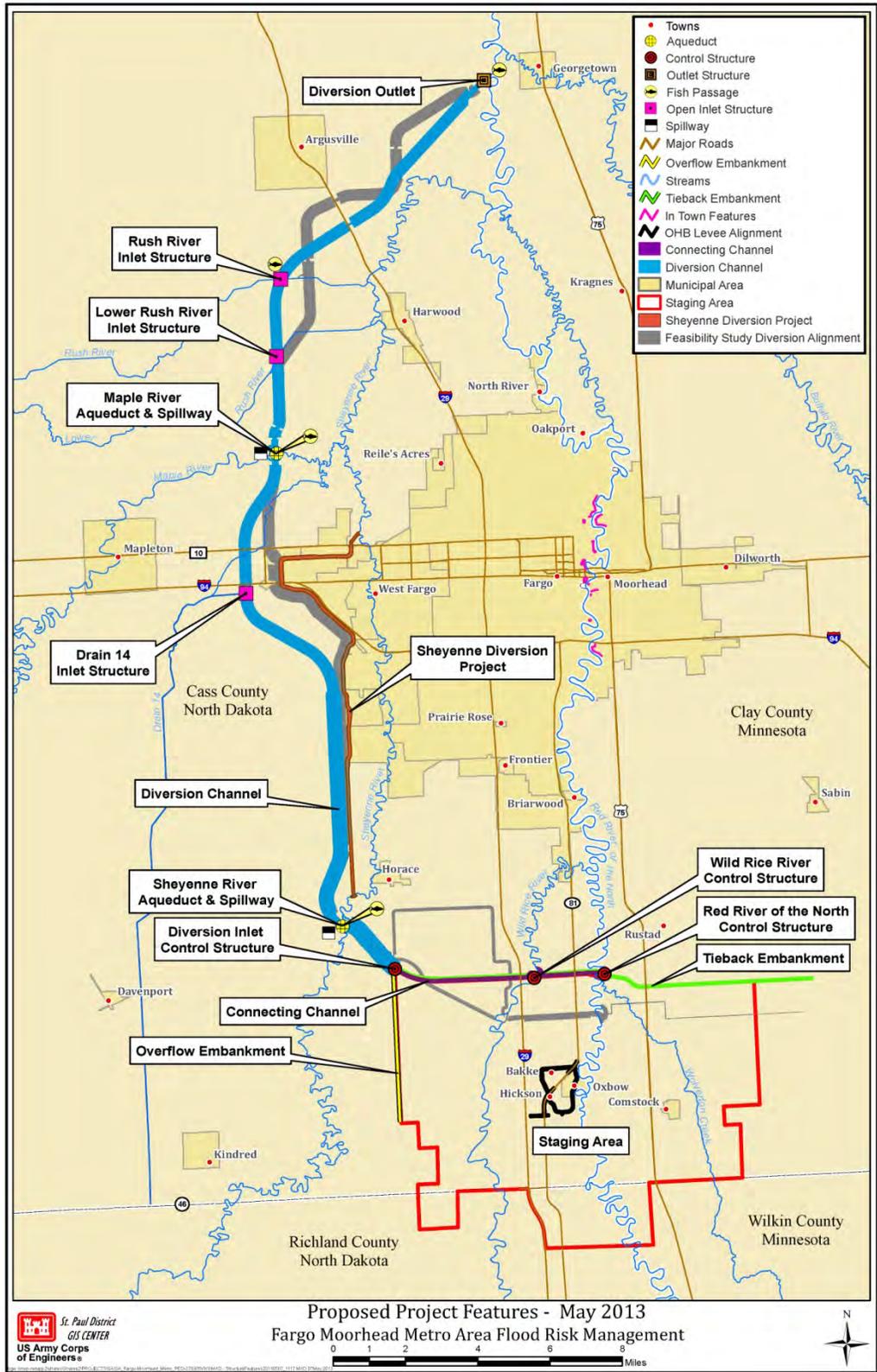


Figure 1: Proposed modifications to the diversion alignment, in-town levees, and ring levee at Oxbow, Hickson and Bakke

## **2.2 Purpose for Action**

Advanced engineering and design studies identified the need to modify several aspects of the project design to optimize the function, constructability, and safety of the diversion channel and to reduce environmental impacts of the Project.

### 3 ALTERNATIVES CONSIDERED

Alternatives to the LPP were evaluated in chapter 3 of the FEIS. This Environmental Assessment addresses proposed modifications for the diversion channel, including alignment shifts and channel cross-section modifications; in-town levees; and the Oxbow/Hickson/Bakke ring levee. As this Environmental Assessment is intended to be a concise document, generally the alternatives that were considered and dismissed, as well as the analysis of those alternatives, are addressed in the appendices. The no action alternative and the proposed alternative are described below. A description of the Project that includes the proposed modifications and a discussion of project operation are also included in this section.

#### 3.1 Alternatives for Diversion Channel Modifications

During the design phase of the Project, opportunities to improve the diversion channel alignment were identified. For purposes of the proposed modifications, the diversion channel was divided into three sections: the Northern Alignment (from the Maple River to the Red River Outlet), the Western Alignment (from the Sheyenne River to the Maple River), and the Southern Alignment (the eastern extent of the tieback embankment in Minnesota to the Sheyenne River). Within each alignment section, alternate channel alignments were evaluated based on improved functionality, reduced cost, improved constructability or reduction in impacts. Appendix A provides information on the issues and opportunities identified for each alignment section, evaluation criteria, the alternatives evaluated and analysis of the alternatives, and the proposed alternative for each alignment section.

Following completion of the FEIS, additional modeling and design determined that the diversion channel cross-section should be modified to address geotechnical, sediment transport, and constructability considerations. Primary modifications included changes in the bottom width of the main channel and changes in the size of the low flow channel. Detailed information on the proposed channel design modifications is presented in Appendix D.

##### 3.1.1 ALIGNMENT SHIFTS

**No Action:** The no action alternative for all of the alignment shifts is to design and construct the diversion channel and all of the associated features as described for the LPP in the FEIS.

**Other Alternatives Considered:** Other alternatives that were considered and dismissed, as well as an analysis of the alternatives, is provided in Appendix A.

**Proposed Alternative:** The alignment presented in the FEIS and the alignment with the proposed diversion channel alignment modifications are shown in Figure 1. Generally the proposed alignment modifications reduce the sharp bends in the channel, which reduces concerns with debris and ice, shorten the overall length of the diversion channel and tieback embankments, reduce impacts associated with major highway crossings, improve constructability concerns with respect to sand lenses, highway crossings and railway crossings, and improve the operability of the Project. A description of the proposed diversion channel alignment modifications by section is below.

### **3.1.1.1 Northern Alignment**

The proposed modified alignment would shift the diversion channel to the southeast about 5,000 feet where the channel intersects Interstate 29, and the Rush River Hydraulic Structure would be moved about 5,000 feet to the west of the FEIS alignment (Figure 2). Several channel bends would be eliminated and replaced with straighter, more broadly sweeping curves, reducing the diversion channel length by one mile and project cost by nearly \$19 million. Reduction in the number and severity of channel bends is advantageous for passing ice and debris down the channel and also reduces the chance for erosion and sedimentation within the channel. Additionally, fewer parcels of land and residences are affected by the modified alignment.

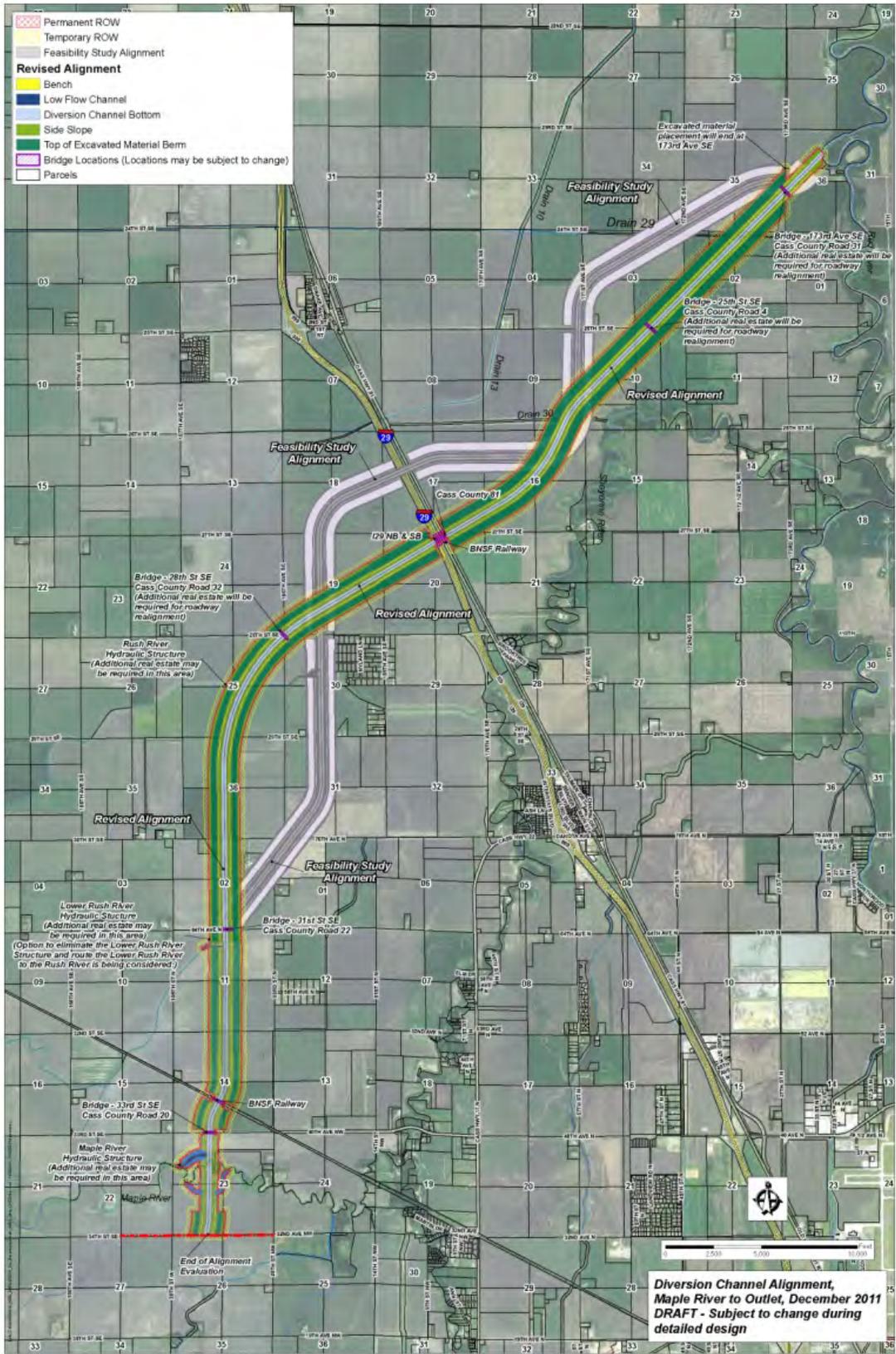


Figure 2: Proposed Northern Alignment Shift

### **3.1.1.2 Western Alignment**

During the design of the Project, three concerns were identified for the western alignment. North of I-94, the FEIS alignment closely follows the existing Drain 14 oxbows, increasing the risk of encountering sand lenses and cultural areas of concern during construction, and also impacting higher quality wetlands. In addition, the FEIS alignment is between the I-94 Raymond Interchange to the west and the existing West Fargo Diversion channel to the east; the temporary bypass of traffic during construction would require extended head to head traffic, including during the winter, which would pose a safety hazard to the travelling public. South of I-94, the FEIS alignment would incorporate the existing Horace to West Fargo diversion channel, which presents difficulties such as handling of water during construction.

When compared with the FEIS alignment, the proposed diversion channel alignment from the Sheyenne River to the Maple River would be west of existing oxbows north of I-94, west of the Raymond Interchange of I-94, slightly west of the Horace to West Fargo diversion, and replace several bends with a straighter alignment (Figure 3). The proposed alignment would resolve the concerns identified above, including allowing for less complicated construction and providing safer road and railroad bypasses.

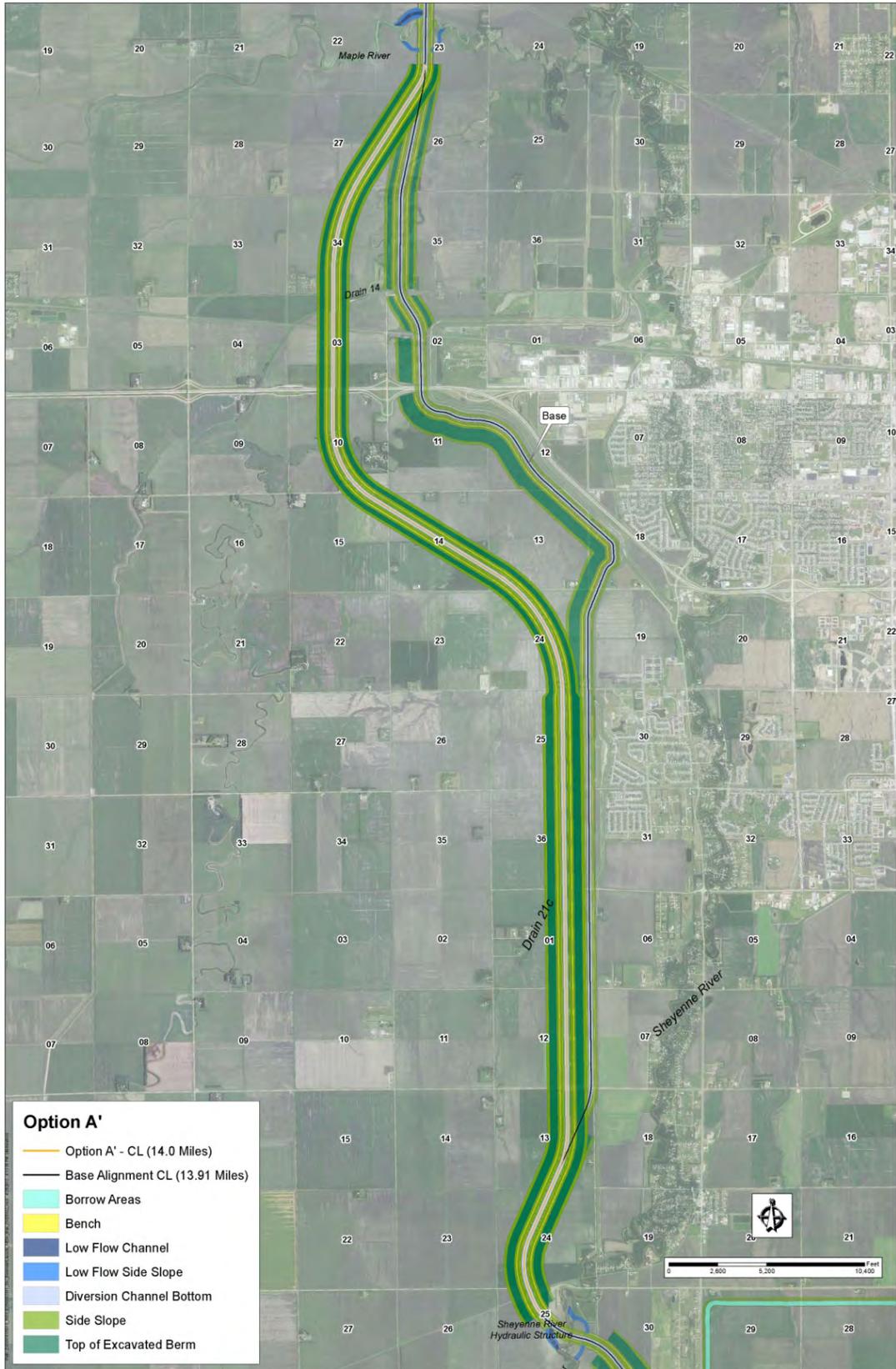


Figure 3: Proposed Western Alignment Shift

### 3.1.1.3 Southern Alignment

During a value engineering study for the Project, elimination of the Wolverton Creek structure and Storage Area 1 were identified as a possible improvement to the alignment. When compared with the FEIS alignment, the proposed modified diversion channel alignment from the diversion inlet structure to the Minnesota tieback embankment would be approximately 1 mile north and follow a line parallel to and just south of Country Road 16 (CR 16) (Figure 4). This alignment eliminates the need for Storage Area 1 and the Wolverton Creek structure, reduces the length of the diversion channel and tie-back embankments, and reduces costs. As part of the alignment modifications analysis, the inlet structure was changed from a fixed weir to a gated structure to improve operability and minimize potential downstream impacts.

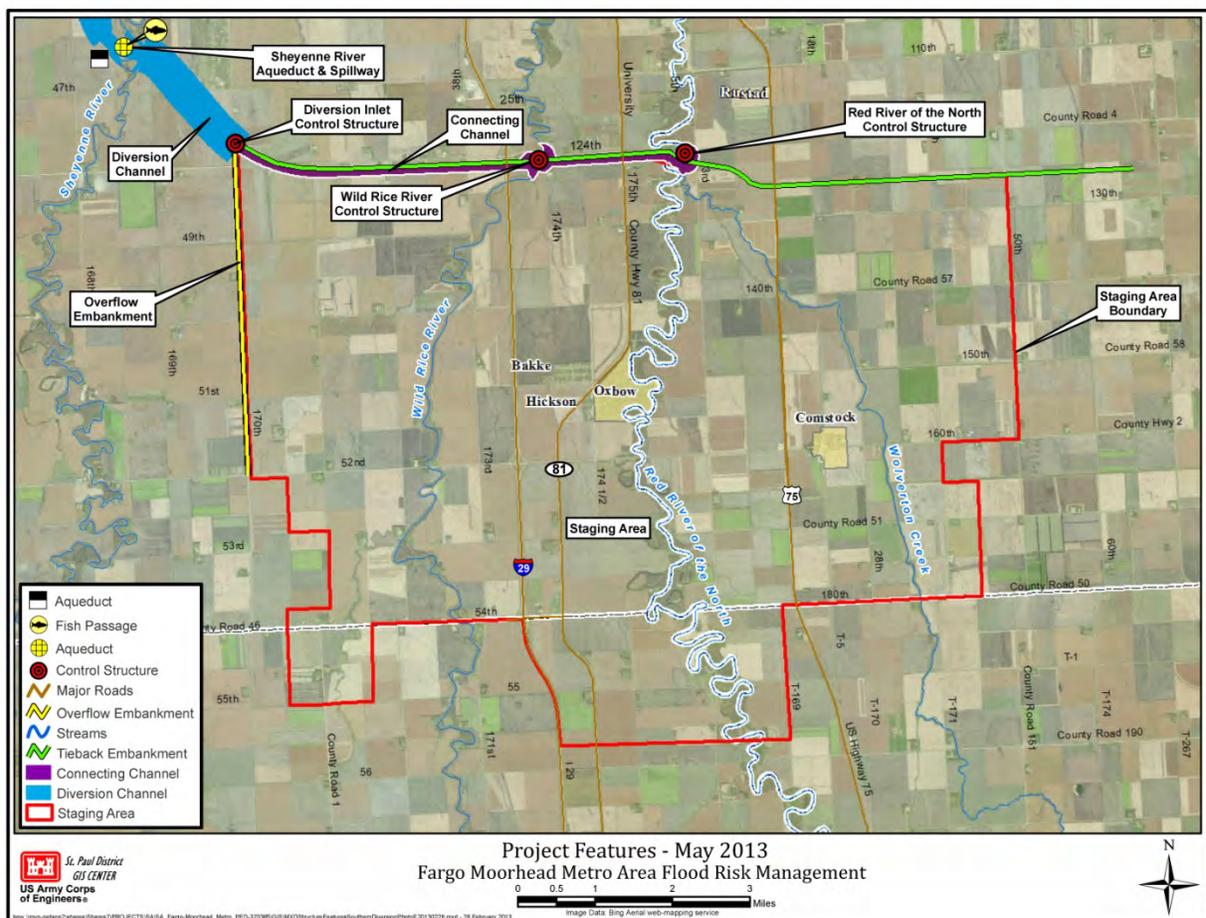


Figure 4: Proposed Sothern Alignment Shift

### 3.1.2 DIVERSION CHANNEL DESIGN CHANGES

Following completion of the FEIS, additional modeling and design determined that the diversion channel cross-section should be modified to address geotechnical, sediment transport, and constructability considerations. The cross-section modifications did not require the footprint to be expanded, however,

during the design phase, the extent of temporary and permanent easements required for the construction of the Project was better quantified. Adding the temporary and permanent easements would result in an additional 250 feet of impacted area on each side of the entire diversion channel, connecting channel, and tieback embankments.

In the FEIS the diversion channel generally consisted of a 250 ft wide channel bottom with 1V:7H side slopes. The depth of the main channel ranged from 15 to 30 ft deep and the channel was set at a longitudinal slope of 0.8 ft/mile. The side slopes included geotechnical “benches” of 15 to 40 ft wide, as needed, to provide additional stability to meet the required factors of safety. At the center of the flat 250 ft wide channel bottom was a small low-flow channel that was included to convey the runoff from small drains and streams, such as the Rush and Lower Rush Rivers. This low-flow channel for the entire diversion channel was sized to be 3 ft deep with a 10 ft bottom width and 1V:4H side slopes, giving a low-flow cross-sectional area of 66 sq ft.

### **3.1.2.1 Alternatives Evaluated**

**No Action:** The no action alternative for the diversion channel cross-section is to design and construct the diversion channel and all of the associated features as described for the LPP in the FEIS.

**Proposed Alternative:** Surfaces such as the bottom width and the geotechnical stability benches would now include a 1V:50H, or 2%, cross-slope towards the center of the channel to provide adequate drainage within the Project. As a result of the addition of the cross-slope to the bottom of the diversion channel, the overall bottom width would increase to 300 feet to retain approximately the same diversion channel top width and conveyance as in the FEIS. Figure 5 and Table 1 compare FEIS vs. the modified diversion channel features. There will be drainage ditches running along the exterior excavated material berm toe on both sides of the diversion channel. The left-bank (looking downstream) ditch will direct flow to the diversion inlets (e.g. Drain 30, Rush River, Reach 4 inlet, etc.). The right-bank ditch will direct flow into existing drainage features that will direct flow away from the diversion channel.

The original design of the low-flow channel assumed one size would be effective for all reaches of the diversion channel. It has been determined that the 3 feet deep low-flow channel was undersized for the majority of the project reaches to handle the existing drainage. The low-flow has been redesigned to accommodate drainage inflows all the way along the diversion channel. As a result, the low-flow channel increases in size and capacity as the diversion channel moves downstream. For constructability and design purposes, this gradually increasing low-flow channel was designated into four separate reaches. Details of the geometric configuration of these four low-flow channel sizes can be seen in Figure 6 and Table 3 of Appendix D.

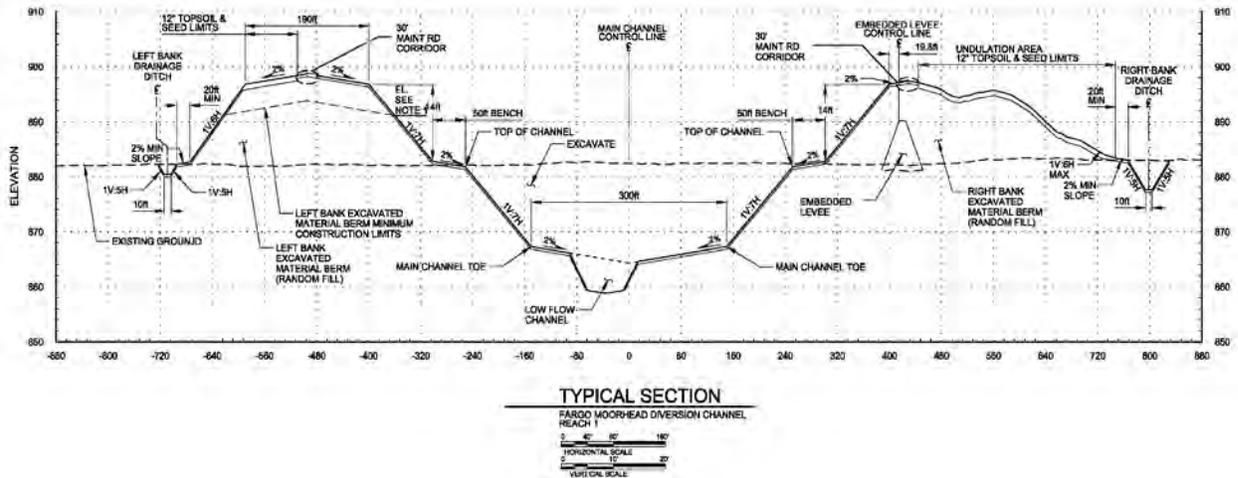


Figure 5: Typical Cross Section Near Downstream End of the Project

Table 1: Diversion Channel Geometry

Diversion Channel Feature	FEIS	Proposed
Bottom width	250 ft	300 ft
Cross-slope	0%	2%
Top width	450-750 ft	450-700 ft
Side slopes	1V:7H	1V:7H
Geotech stability benches	0-40 ft	0-30 ft
Excavation Material Berm Slope	1V:7H	1V:7H
Excavation Material Berm Offset	50 ft	50 ft

### 3.2 Alternatives for In-town Levees

Following completion of the FEIS, a study was conducted to evaluate options for increasing the flow down the mainstem of the Red River of the North. Allowing river stages through town that would exceed the stage of 31 feet contemplated with the LPP in the FEIS could serve as environmental mitigation because the Project would operate less frequently, thereby reducing the impacts to fish passage and eliminating the need for constructed fish passage features at the Red and Wild Rice River control structures. Inclusion of in-town levees would also reduce the frequency of staged floodwaters upstream of the tieback embankment. In-town levees would reduce the extent of temporary flood fight measures during more infrequent flood events. The study evaluated a range of potential target flood

stages at the USGS Fargo stream gage ranging from 30 feet to 37 feet during the 1-percent chance event. A residual stage of 31 feet was used for the LPP for the 1-percent chance event.

As a result of the study and input from the cities of Fargo and Moorhead and Cass County on past experience with flood fighting, a flood stage of 35 feet is proposed (see Appendix B).

### 3.2.1 Alternatives Evaluated

**No Action:** The no action alternative is to proceed as described for the LPP in the FEIS and operate the Project when combined flows of the Red River and the Wild Rice River reach 9,600 cubic feet per second (cfs).

**Flood Wall/Levee Alternative Considered:** The evaluation of alternatives to allow higher flows through town focused on completing a line of protection by tying into existing high ground or existing levees. Wherever practical, two conceptual alternatives for each flood stage from 30 feet to 37 feet were evaluated, one that focused more on structural protection (e.g. levees and floodwalls) and another that focused more on floodplain abandonment (e.g. acquisitions). Additional alternatives that incorporated minor changes were also considered. See Appendix B for detailed descriptions of the alternatives considered and an analysis of the alternatives.

**Proposed Alternative:** The proposed alternative for the in-town levees is shown on Figure 6 and is for a flood stage of 35 feet. It would extend the line of protection from NP Avenue to the BNSF Railroad Grade, maintain traffic on 2<sup>nd</sup> Street North, and provide the opportunity for additional flood protection on the Park East Apartment property. The proposed alternative includes the following features:

- Certification of the existing Ridgewood/VA levee
- Certification of the existing project area F1 levee
- Construction of the El Zagal Area levee
  - The El Zagal Area levee consists of an approximately 500-foot long levee connecting two existing levees near 3<sup>rd</sup> Street North between 14<sup>th</sup> Avenue North and 15<sup>th</sup> Avenue North. No structures would be removed for this feature.
- Certification of the Mickelson Field levee
  - The Mickelson Field levee consists of an approximately 150-foot long levee connecting an existing levee to high ground. Three structures would require removal for this feature.
- Construction of the 2<sup>nd</sup> Street North floodwall
  - The 2<sup>nd</sup> Street North floodwall includes realigning 2nd Street to the west to accommodate construction of a floodwall between the river and the roadway. However, the top elevation of the proposed floodwall is 39.5 feet +5.5 feet. This will help provide flood protection for events larger than a 1-percent chance (100-year) event after the diversion channel is complete. This feature would include the acquisition of property north of 1st Avenue North including the Feder Realty Company building and the Fargo Board of Public Education building, and partial acquisition of the Northland

Hospitality (Howard Johnson) structure. In order to provide minimum protection to 39.5 feet, this feature would extend protection through the Case Plaza parking lot using a removable floodwall constructed throughout the parking lot. This option also includes the acquisition of the Park East Apartments to remove that property from the floodplain at a river stage of 35 feet and higher and to allow for the construction of a levee across the property. An additional floodwall would then also be constructed to connect this levee to the north end of the existing 4th Street levee.

- Modification of the storm sewer lift station LS FC2
- Acquisition of the isolated urban property near Wood Lawn Park
- Certification of the existing Woodlawn Area levee
- Certification of the Belmont Area through acquisitions
  - Two structures would require removal.
- Certification of the existing Horn Park Area levee
- Construction of a levee on the Park East Apartment property

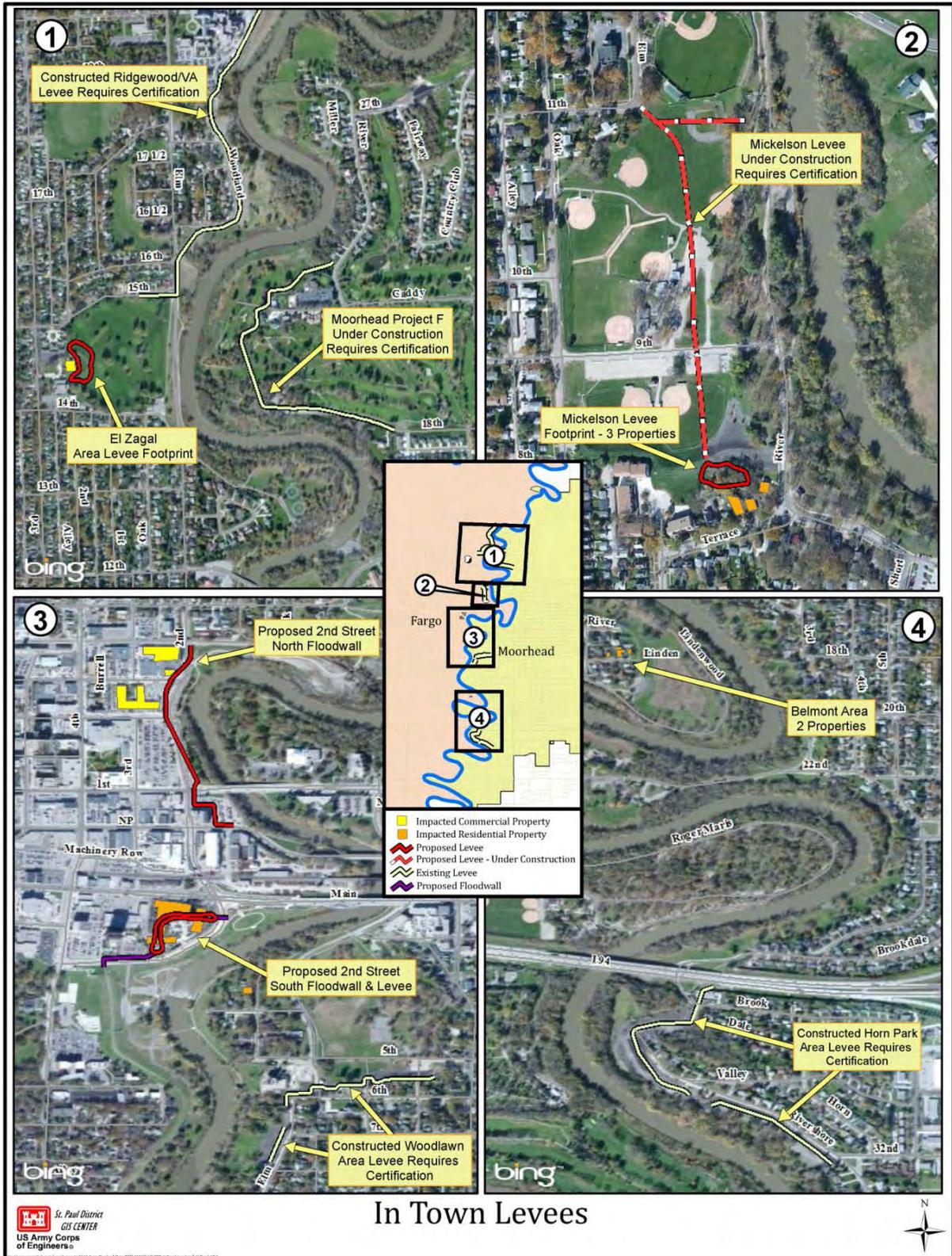


Figure 6: Proposed In-town Levee Alignment

### 3.3 Alternatives for the Oxbow/Hickson/Bakke Ring Levee

Operation of the Project would result in flood water being staged upstream of the cities of Fargo and Moorhead. Communities within the staging area include the city of Oxbow, the village of Hickson, and the Bakke subdivision. The FEIS includes complete fee acquisition of the Oxbow, Hickson, and Bakke area. However, following completion of the FEIS, the Corps determined that constructing a ring levee around the Oxbow/Hickson/Bakke area is a viable alternative to a complete fee acquisition if some residential structures were still acquired to facilitate the ring levee.

#### 3.3.1. Alternatives Evaluated

**No Action:** The no action alternative for the Oxbow/Hickson/Bakke ring levee is to acquire the area in fee, as described for the LPP in the FEIS, at an estimated cost of approximately \$74 million.

**Levee Alternatives Considered:** Three ring levee alignments were considered for the Oxbow/Hickson/Bakke area: (1) A full Oxbow/Hickson/Bakke ring levee alignment that would surround Hickson, Bakke, and a portion of Oxbow at an estimated cost of approximately \$65 million, (2) a ring levee for Hickson and a portion of Oxbow with a fee acquisition for Bakke residents at an estimated cost of \$85 million and (3) a ring levee for a portion of Oxbow only with fee acquisitions for Hickson and Bakke residents at an estimated cost of \$90 million. All three alternative alignments are shown in Figure 7. See Appendix C for a comparison of the costs and benefits of each alternative.

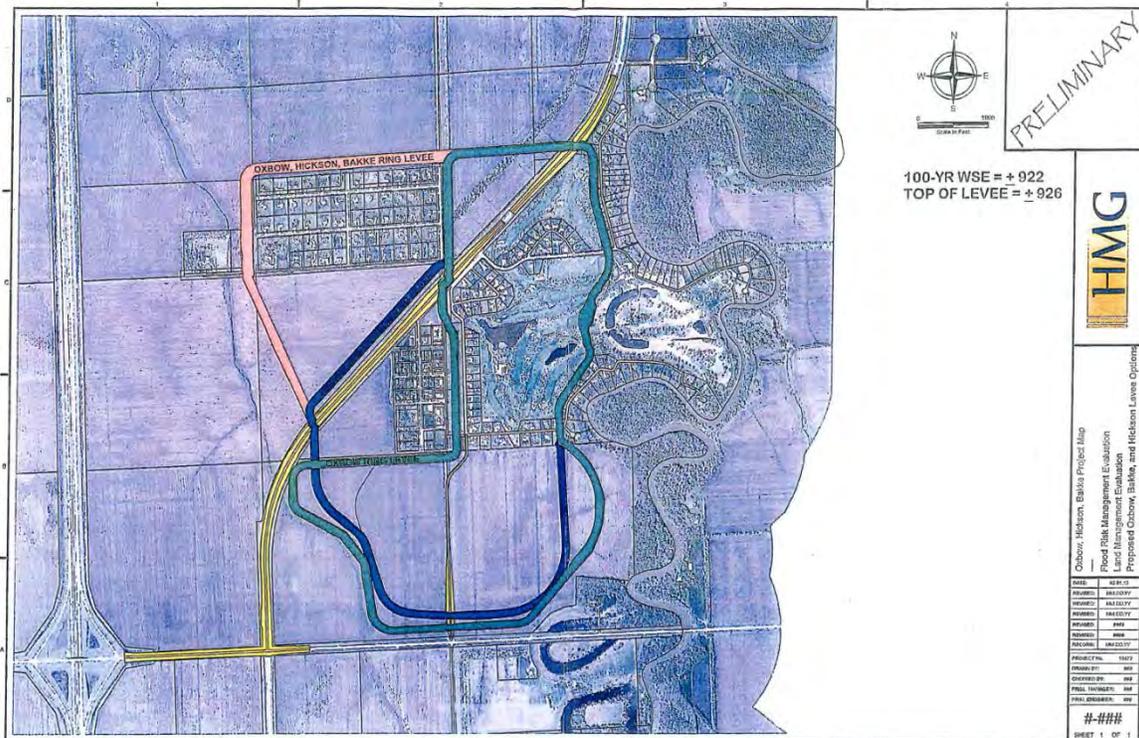


Figure 7: Oxbow/Hickson/Bakke Alternative Alignments

**Proposed Alternative:** The full Oxbow/Hickson/Bakke ring levee alignment would surround Hickson, Bakke, and a portion of Oxbow (Figure 8). Oxbow is located along the banks of the Red River and generally consists of residential lots surrounding the Oxbow Country Club. A number of residential lots as well as the country club would be impacted by the levee alignment. Approximately 40 residential structures would be removed. The alignment would generally parallel the Red River through residential areas in both the north and south portions of Oxbow and would cross directly through the Oxbow Country Club. The alignment would parallel the north edge of Bakke and run southward along the west edge of Bakke and Hickson. From the southeast edge of Oxbow and the southwest edge of Hickson, the levee would encompass a previously agricultural area and surround new residential lots and golf holes. The new residential lots and golf holes would be constructed to mitigate those lost due to the construction of the levee. Where it would be adjacent to existing residential lots, the embankment would be located a sufficient distance from the edge of residential lots to allow for clear space needed for levee maintenance, drainage features, and a vegetative buffer. The levee would be located a sufficient distance from the Red River to ensure geotechnical stability.

As more fully described in Appendix C, Cass County Highways 81, 18, and 25 would be raised where they would intersect the ring levee, and Interstate 29 would also be raised as described in the FEIS Section 5.2.3.1.4 Transportation. An additional area of the city of Oxbow would be created within the benefitted area that would include new roads, residential lots, golf holes, and a new clubhouse to replace structures and features lost due to construction of the ring levee. The existing sanitary sewer system, water main, and storm sewer system would be modified to accommodate the ring levee and new residential areas. Internal drainage features would be included, such as open channels, storm sewer, a stormwater ponding area, and a storm sewer pump station.

The alignment for the proposed alternative is a conceptual alignment that may be modified during detailed design studies; any changes in alignment will be evaluated for changes to impacts from what is being discussed in this Environmental Assessment. It is not anticipated at this time that there would be an appreciable change in scope or magnitude of impacts.

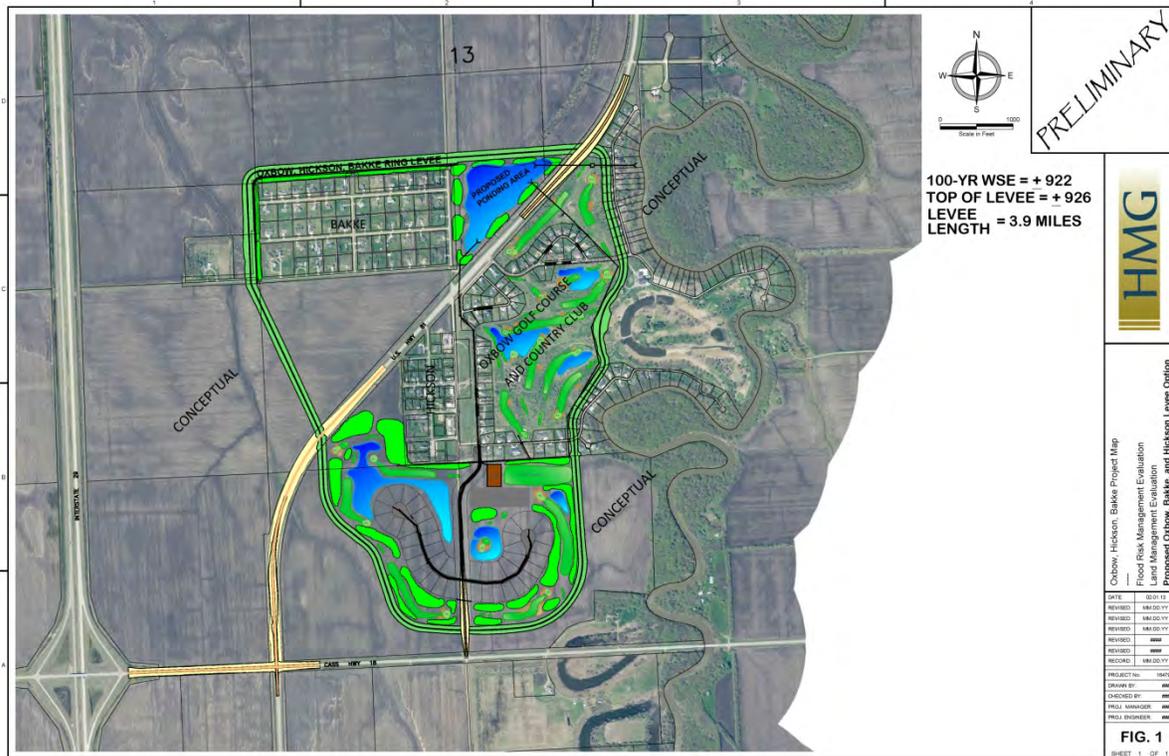


Figure 8: Proposed Oxbow/Hickson/Bakke Ring Levee

### 3.4 Project Description with Proposed Modifications

With the proposed modifications, the Project would consist of a 30-mile long diversion channel and a 6-mile long connecting channel that would be located west of the metropolitan area. The diversion channel would extend from the diversion inlet control structure near Cass County Road 17, just southeast of Horace, ND, downstream to its outlet near Georgetown, Minnesota. The path of the diversion channel would take it west of Horace, West Fargo, and Harwood. The diversion channel would have a maximum bottom width of 300 feet and a variable-width low-flow channel that would meander within a 200-foot belt width within the 300-foot bottom width. The maximum depth of the low-flow channel would be approximately 30 feet below existing ground. Soil excavated from the diversion channel would be placed into excavated material berms adjacent to the channel. The maximum width of the project footprint along the diversion channel is approximately one half mile including the diversion channel and excavated material berms. Where design stages in the diversion channel are expected to be higher than the existing ground, the right-bank berms (east side of diversion channel) would incorporate engineered levee sections. Drainage ditches adjacent to the berms would be necessary to intercept local drainage and direct it to the nearest downstream inlet structure.

Road and highway relocations would include road crossings over the diversion channel spaced at approximately three mile intervals, primarily for county roads. Interstate 29, U.S. Highway 75, and the railroad near U.S. Highway 75 would be raised slightly above the 1-percent chance event flood elevation

within the staging area. Other roads intersected by the diversion channel would be terminated at the diversion channel or reconnected to the local road network.

A gated control structure would be constructed adjacent to the Red River in Holy Cross Township, Clay County, Minnesota. A similar control structure would be constructed adjacent to the Wild Rice River in Pleasant Township, Cass County, North Dakota. The structures would be constructed adjacent to the existing channels in order to keep the sites dry during construction. Once the control structures are built, the Red River and Wild Rice River would be re-routed through the control structures. When operated during flood events, these structures would limit flows downstream in the natural channels and cause the water to rise upstream into the 60 square mile staging area. At the Wild Rice River crossing there would be two weirs across the connecting channel to maintain flow in the Wild Rice River during non-flood conditions. The diversion inlet control structure would be located where the diversion channel alignment crosses Cass County Highway 17 in the southeast quarter of Section 31, Stanley Township, and Cass County, North Dakota. The diversion inlet control structure would consist of a 135-foot wide spillway with operable gates to control flows going into the diversion channel.

Additional hydraulic structures would be located along the diversion channel at each tributary crossing. At the Maple River and Sheyenne River crossings, there would be open aqueducts that cross over the top of the diversion channel to allow continuous connectivity of these two rivers and fixed-crest weir spillways that would direct flood flows into the diversion channel. These structures would also be built “in the dry” (construction off-channel, then diverting the river across the structure upon completion). At the Lower Rush River and Rush River, rock ramp spillways would be used to divert the entire flow into the diversion channel. The Lower Rush River and Rush River would be diverted into the diversion channel, thus preventing any water upstream of the diversion channel from entering the abandoned portions of these rivers. The low flow portion of the diversion channel is proposed to be constructed with sinuosity as a way of substituting for lost habitat in the Lower Rush and Rush River channels between the diversion channel and the Sheyenne River. The diversion channel outlet, located where the diversion channel returns to the Red River in Wisner Township, Cass County, North Dakota, would consist of a rock ramp spillway with a crest width of 300 feet.

Ditches and smaller hydraulic structures would be required along the diversion channel to handle existing drains and ditches cut off by the diversion channel. Ditches running outside and parallel to the diversion channel (Figure 5) would direct local drainage to a reasonable number of diversion inlet locations. Existing ditches, field swales, and drain tile would be directed into these parallel ditches. The larger inlets, such as Drain 14 (a drainage ditch which runs generally south to north from Davenport to the Maple River near its mouth), would be open inlets like the Lower Rush River and Rush River. These larger inlets would be either concrete drop structures or rock ramps. The smaller inlets would be culvert structures with flap gates and energy dissipation chambers at the outlet of the culvert in the diversion channel. The culvert flap gates would prevent water from backing up out of the diversion channel after the local peaks have passed. Uncontrolled inlets (inlets without flap gates) would be placed at rivers and drains that have either natural levees or spoil piles along them which would prevent widespread back-up flooding from the diversion channel for events up through the 1-percent chance event (100-

year). The project goal is to maintain the existing 1-percent chance (100-year) event floodplain outside the diversion channel.

With the inclusion of the proposed modifications described above, the Project would go into operation when it becomes necessary to lower the Red River and Wild Rice River control structure gates so that a stage of 35.0 is not exceeded at the USGS gage in Fargo. At this stage, the flow through Fargo will be approximately 17,000 cubic feet per second (cfs). A flow of 17,000 cfs at the Fargo gage is approximately a 10-percent chance (10-year) event. Once the gates are lowered, water would begin to inundate the upstream staging area and would begin to flow into the diversion channel. A maximum stage of 35.0 would be maintained at the Fargo gage until the upstream staging elevation reaches 922.2 NAVD 88 (the staging elevation would just reach elevation 922.2 for the 1-percent (100-year) event). Once the upstream staging elevation reaches 922.2, the Red and Wild Rice River control structures would be opened as necessary to maintain the upstream staging elevation of 922.2 while not exceeding a stage of 40.0 at the Fargo gage (a stage of 40.0 would occur for the 0.2-percent (500-yr) event). Once a stage of 40.0 is achieved at the Fargo gage, a stage of 40.0 would be maintained by first allowing more flow into the diversion channel through the diversion inlet gates and eventually allowing flow to exit the upstream staging area over the overflow embankment at elevation 923.0 until the upstream staging water surface rises to an elevation that provides a minimum acceptable height of freeboard for the tieback embankment. The expectation is that emergency measures would be employed within the risk management area to reduce flood damages when the stage is between 35.0 and 40.0. If the upstream staging water surface elevation is forecasted to reach the point of minimum acceptable freeboard, an evacuation order would be issued for the Fargo-Moorhead metro area. Once the upstream staging elevation reaches the point of minimum acceptable freeboard, the Red and Wild Rice River control structures would be opened further to maintain the minimum freeboard, and stages would rise above 40.0 at the Fargo gage.

## 4 AFFECTED ENVIRONMENT

The affected environment is described in detail in chapter 4 of the FEIS. This section will address studies that have been completed since completion of the FEIS and areas that would now be impacted by the Project that were not addressed before.

### 4.1 Social

There have been several homes purchased and removed since the FEIS was completed in order to support local flood risk management projects and/or to assist in the emergency flood fighting efforts.

### 4.2 Economic

No change from what is described in the FEIS.

### 4.3 Natural Resources

**Climate:** No change from what is described in the FEIS.

**Geomorphology:** General geomorphic conditions in the project area were discussed in section 4.2.1.2 of the FEIS. This information was based on a draft version of the geomorphology study for the Project. The final version of the geomorphology study is now available (WEST 2012). The findings presented in the final version support what was stated in the FEIS. The geomorphology study made use of detailed observations on sediment transport made during the floods of 2010 (USGS 2011a) and 2011 (USGS 2011b). Additional USGS observations have been made in 2012 and 2013, but a final report is not yet available.

**Air Quality:** No change from what is described in the FEIS.

**Water Quality:** No change from what is described in the FEIS.

**Water Quantity:** No change from what is described in the FEIS.

**Shallow Groundwater:** Over 340 soil borings have been conducted in the Fargo-Moorhead area to delineate the stratigraphy, and for conducting laboratory testing of the soils necessary to define the physical parameters of the subsurface geology. For the FEIS, vibrating wire piezometers with automated data-loggers were installed straddling the proposed alignments east of Dilworth, MN (NED and FCP) and west of Fargo, ND (ND35K and LPP). Many piezometers from the FEIS are still functional and continue to provide valuable data. Since the conclusion of the FEIS, an additional 36 piezometers have been installed along the alignment described in the FEIS for the LPP and along the proposed modified alignment.

Piezometers are used to record subsurface groundwater levels, and this information is used to better understand the groundwater regime in the vicinity of the diversion channel. The piezometers are typically nested together at one location and located in lower, middle and upper elevations and/or

sandy layers encountered to further understand the ground water regime. Additional nested piezometers with data-loggers may also be placed at proposed structure locations as the design phase progresses. Piezometers installed along the proposed modified alignment in August 2012 indicate varying degrees of downward flow towards the till and outwash deposits. Piezometers far from the Red River show significant decrease in the piezometric level with depth, while a set of piezometers near the proposed outlet indicates nearly hydrostatic conditions.

**Aquifers:** Throughout the Fargo-Moorhead area there are shallow pervious features that may act as small aquifers. A shallow channel-like formation has been identified crossing the proposed modified alignment and the FEIS alignment approximately 750 ft north of the Maple River. Based on current information the formation is about 500 ft wide and consists of clays and silts in the upper 15 ft and poorly graded sands below that to a depth of approximately 40 ft. The formation is underlain by lacustrine clays.

The West Fargo Aquifer described in detail in the section 4.2.1.7 of the FEIS is the primary water source of interest in the project area.

**Aquatic Habitat:** General aquatic habitat conditions in the project area were discussed in the section 4.2.1.8 of the FEIS. Additional observations on aquatic habitat quality, including fish and macroinvertebrate communities, were made in the project area in 2010, 2011 and 2012. Observations in 2012 for the Red River suggest habitat quality in the project area ranged from “fair” to “poor” according to the Qualitative Habitat Evaluation Index (QHEI) methodology (USACE 2013). The QHEI habitat grade for the footprint location of the Red River control structure at the site of LPP from the FEIS was poor. Observations by Yoder (2011) also were made throughout much of the Red River in 2010 using QHEI methods. Yoder’s habitat observations closest to the project area suggested habitat that tended to grade out as “fair” habitat.

Results from the USACE (2013) document also showed similar observations in 2012 for the lower Wild Rice River. Habitat in this area, including the vicinity of the Wild Rice Control Structure, was described as “poor” by the QHEI methodology. Habitat observations were not made directly in the footprint site of this proposed modified alignment. However, observations were made in close proximity. It is not believed that habitat quality at the site of the proposed new location of the Wild Rice control structure would be substantially different than the habitat nearby.

With the proposed modified alignment, the location of the control structures on both the Red and Wild Rice rivers has shifted downstream from what is described for the LPP in the FEIS. The new locations for these structures are provided at Figure 22. Habitat conditions are similar between the original and modified locations, so no appreciable change is expected.

**Fish Passage and Biological Connectivity:** No change from what is described in the FEIS.

**Riparian Habitat:** The proposed alignment shifts and construction of a ring levee around Oxbow, Hickson, and Bakke would change the location of some of the affected riparian habitat and add areas of

affected habitat, but overall there is no appreciable change in the type of riparian habitat from what is described in the FEIS.

**Wetlands:** Wetland delineations were completed for the entire area directly impacted. The off-site methodology used was the same as described in the July 13, 2011 wetland determination report in Appendix F of the FEIS. The general approach described by the NRCS "Mapping Conventions" to identify wetlands on agricultural fields was followed, with modifications based on the use of LiDAR and professional judgment. Aerial photography from 2011 showing areas holding water following that year's significant flood event was included in the analysis. This particular photography provided excellent images of those portions of the landscape that typically hold water early in the growing season but, due to the surface ditching prevalent in the area, are mostly drained by the time the Farm Service Agency aeriels are flown in late June or early July. These areas very likely have water long enough in the early growing season to meet wetland hydrology.

Furthermore, advancements in web-based aerial photography, such as those on Bing Maps, presented additional vantage points for the review of the landscape. These photos were flown during the 2012 growing season and show signatures of wetness correlating to those on other photographs.

With the updated information, as well as the inclusion of additional temporary and permanent easements for construction of the diversion channel, it was determined that more wetlands would be impacted for the Project than was reported for the LPP in the FEIS.

**Upland Habitat:** The proposed alignment shifts and construction of a ring levee around Oxbow, Hickson, and Bakke would change the location of some of the affected upland habitat and add areas of affected habitat. Overall there is no appreciable change in the type of upland habitat from what is described in the FEIS.

**Terrestrial Wildlife:** The proposed alignment shifts and construction of a ring levee around Oxbow, Hickson, and Bakke would change the location of some of the affected habitat and add areas of affected habitat, but no new types of wildlife will be impacted as a result of these modifications. Overall there is no appreciable change from what is described in the FEIS

**Endangered and Threatened Species:** The U.S. Fish and Wildlife Service has removed the gray wolf (*Canis Lupus*) from protection under the Endangered Species Act in the states of Minnesota, Wisconsin and Michigan.

Since completion of the FEIS, raptor nest surveys have been conducted along the proposed modified northern alignment of the diversion channel in 2012 and 2013. The 2013 report is still being completed. The Fish and Wildlife Service determined that there are no nests that would be impacted by construction of the Project with the proposed modified alignment. Surveys would be conducted in the spring each year leading up to construction of specific areas.

A survey was also conducted at the Oxbow, Hickson, and Bakke ring levee area to determine if there were any active nests in 2013. No nests were found; surveys would also be conducted in the spring prior to construction.

In the July 2011 Final Fish and Wildlife Coordination Act Report, the Fish and Wildlife Service recommended that a survey for blooming Western prairie fringed orchid be completed within the general area of the identified location. In November 2012, a field visit was made to the location where Western prairie fringed orchid had been identified within the staging area in Richland County, North Dakota. The area appears to be utilized for agricultural row cropping, and there is an area that has been planted with trees. At the time of the visit there was evidence of disturbance typical of agricultural plowing/discing and surface drainage, and there was agricultural crop residue present. Although this field visit was conducted outside of the normal growing season for Western prairie fringed orchid, based on the level of disturbance and present use of the area, the Fish and Wildlife Service does not believe the appropriate habitat to support Western prairie fringed orchids is present at this time. Based on this evaluation from the Fish and Wildlife Service, the Project will have no impact to Western Prairie fringed orchids.

**Prime and Unique Farmland:** The proposed alignment shifts and construction of a ring levee around Oxbow, Hickson, and Bakke would change the location of some of the prime and unique farmland to be affected and would add areas of affected farmland, however since the majority of the farmland in this region is considered to be prime and unique there is no appreciable change in the type of farmland affected from what is described in the FEIS.

**Hazardous, Toxic and Radioactive Waste (HTRW):** A Phase 1 Environmental Site Assessment (ESA) was completed to identify potential HTRW issues. An ESA is a non-intrusive investigation comprised of site visits, historic records searches, and interviews. The ESA identifies past or present HTRW issues that are called Recognized Environmental Conditions (RECs). RECs are defined as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.

The original Phase I ESA was completed between July and November 2010. A supplemental investigation was completed in 2012 to address areas not covered by the original investigation, including the shifted alignment on the north end of the Project, the extensions of the tie-back embankments, and the storage and staging areas. The alignment of the tie-back embankments and staging area have since been modified by the southern alignment shift, and the storage area would also be eliminated as part of that proposed modification. A Phase I ESA has not yet been completed for the western alignment shift, southern alignment shift, in-town levees, or any community ring levees (including the Oxbow/Hickson/Bakke ring levee).

The original Phase I ESA identified a limited number of RECs that included “junk vehicles” and railroad crossings. The 2012 supplemental Phase I ESA identified a number of additional RECs including the following:

- Aboveground storage tanks (ASTs) (propane, diesel, gasoline, heating oil)
- Underground storage tanks (USTs) (heating oil)
- Potential Asbestos Containing Materials (PACM) (asbestos roofing shingles)
- Polychlorinated Biphenyls (PCB transformers)
- Underground gas pipelines
- Underground utilities (wells, communications, power)
- Railroad crossings (PAHs, metals)

The majority of the RECs identified are common to small agriculture and rural residential settings. It was recommended that a limited Phase II ESA soil investigation be completed at these locations to determine if there was a presence of HTRW. If handled properly, the RECs should not pose a significant risk.

A phase 1 ESA for in town levees was completed and finalized in July 2013. Phase II ESAs were recommended for Case Plaza and the City Hall parking lot.

#### **4.4 Cultural Resources**

*Alignment Shifts* - Phase I cultural resources surveys were conducted for most of northern alignment in 2010 to 2012 (Tucker et al., 2012); the remainder of the northern alignment will be surveyed in the spring of 2013. Those portions of the modified diversion alignment overlapping the FEIS alignment from the Maple River to the diversion channel inlet at County Road 17 east of the Sheyenne River were also surveyed for cultural resources in 2010 to 2012. At least half of the alignment between the Maple River and the Sheyenne River remains to be surveyed. The majority of the connecting channel alignment from the inlet structure at County Road 17 to just west of I-29 was surveyed for cultural resources in 2010 to 2012 when it was part of Storage Area 1, which was eliminated when the diversion channel alignment was modified. The modified connecting channel from I-29 to the Red River needs to be surveyed for cultural resources, as does the modified tieback embankment alignment in Minnesota. The overflow embankment along County Road 17 was completely surveyed for cultural resources in 2012.

As of February 2013, 10 prehistoric archeological sites, 23 prehistoric isolated find spots, 9 historic archeological sites, 3 historic isolated find spots, 2 combination prehistoric/historic archeological sites, 9 farmsteads, 1 rural residence, 1 bridge, and 10 built-environment linear resource sites (3 railroad segments, 1 highway segment, and 6 drains/ditches/channelized river segments) have been recorded in the modified diversion channel alignment, the connecting channel alignment, and the overflow embankment alignment. The tieback embankment alignment in Minnesota crosses the Red River Trail historic oxcart trail (site lead 21CYr), but visible evidence of that trail near the modified alignment needs to be field verified. Finally, local lore has a “chief’s grave” (site lead 32CSX362) located at the Sheyenne

River crossing, which is scheduled for field verification testing in 2013 under North Dakota Administrative Code 40-02-03-06, Planned Disinterment--Notification.

Prehistoric occupation site 32CS201 near the diversion channel outlet and prehistoric cultural material scatter site 32CS5127 near the Maple River hydraulic structure were determined eligible to the National Register of Historic Places as a result of Phase II testing in 2012. Prehistoric isolated find spot site 32CSX384 near Rush River and faunal remains scatter find spot site 32CSX339 near the Maple River hydraulic structure were determined not eligible to the National Register based on Phase II testing in 2012. Phase II testing will be conducted at 7 prehistoric sites, 1 prehistoric/historic archeological site, and 3 prehistoric isolated find spots with undetermined National Register eligibility on the north side of the Maple River in the spring and fall of 2013. Prehistoric archeological site 32CS5135 along Drain 14 south of the Maple River also needs Phase II testing to determine its National Register eligibility.

The County Highway 16 bridge over the Wild Rice River (32CS4678) has undetermined eligibility to the National Register. Two farmsteads (32CS5153 and 32CS5168) and six segments of drainage ditches/channelized Rush River and Lower Rush River were recommended as eligible to the National Register (Tucker et al. 2012). The remaining 46 sites were recommended as not eligible based on what was observed at them during the 2010 to 2012 Phase I surveys (Tucker et al. 2012; Meier et al. 2013 draft).

*In-town Levees:* As of February 2013, there are no prehistoric or historic archeological sites recorded in the area of the proposed in-town levees along 2nd Street in Fargo. Most of the area is covered with parking lots and buildings, except for the actual bank of the Red River east of 2nd Street North. Those buildings in the area at or over 50 years of age need to have their eligibility to the National Register determined. The closest National Register-listed building to the 2nd Street in-town levees is the Pence Automobile Company Warehouse at 301 Northern Pacific Avenue, which is 1.5 blocks to the west. The listed Downtown Fargo Historic District starts one to two blocks away to the west of 4th Street North.

The El Zagal Shrine building at the El Zagal Area levee on the west side of the golf course is within the boundaries of the North Side Fargo Builder's Residential Historic District, which was listed on the National Register on April 7, 1987, for its architecture and its connections with community planning and development. There are no recorded cultural resources sites at either the proposed Mickelson Field Phase 2 levee location or the proposed Belmont Area location.

*Oxbow/Hickson/Bakke Ring Levee:* There are two historic archeological site leads and one architectural site in the Oxbow/Hickson/Bakke ring levee area. Site lead 32CSX4, the former Hickson Railroad site, is crossed by the proposed ring levee alignment. Site lead 32CSX200 is to the former Milwaukee Road station in Hickson. It and the Hickson Lutheran Church (32CS113) are inside the line of protection of the proposed ring levee. There are no National Register listed historic properties in or near this area. A Phase I cultural resources survey will be performed for the ring levee alignment.

## 5 ENVIRONMENTAL EFFECTS

The LPP described in the FEIS is the no action alternative for purposes of this Environmental Assessment; environmental effects from the LPP are fully discussed in Chapter 5 of the FEIS. This discussion addresses only the modifications to the LPP that were proposed following completion of the FEIS: the diversion channel modifications, including the three alignment shifts and the diversion channel cross-section modifications; the in-town levees; and the Oxbow/Bakke/Hickson ring levee. If no change in effects is discussed, the proposed modifications do not alter the environmental effects for that category of impact.

### 5.1 Social Effects

**Noise:** Additional areas would be subject to construction noise, namely the areas adjacent to the in-town levees and the Oxbow/Hickson/Bakke ring levee. Areas affected by the alignment shifts would also experience more or less noise, depending on the location. No increase in noise is expected during project operation.

**Aesthetics:** Additional areas would have aesthetic impacts, namely the areas adjacent to the in-town levees and Oxbow/Hickson/Bakke ring levee. Homes and businesses that currently have a view of the Red River may no longer be able to see the river. Areas affected by the alignment shifts would also experience more or less aesthetic impact, depending on the location.

**Transportation:**

*Alignment Shifts* - As described in the section 5.2.3.1.4 of the FEIS, bridges will be constructed approximately every three miles to cross the diversion channel. These bridges will provide access for emergency vehicles, school bus routes, and more. A list of the proposed bridges for the modified alignment can be found in Table 2; it includes 19 road bridges and 4 railroad bridges highlighted in red lettering. The number of bridges would not be changed due to the alignment shifts, although the exact locations of the bridges would be affected.

Table 2: List of Proposed Road and Railroad Bridges (in red)

1	Cass County Road 31
2	Cass County HWY 81
3	BNSF Railway
4	I29 North Bound
5	I29 South Bound
6	Cass County Road 32 (28 <sup>th</sup> St SE)
7	Cass County Road 22 (31 <sup>st</sup> St SE)
8	BNSF Railway
9	Cass County Road 20 (33 <sup>rd</sup> St SE)
10	Cass County Road 22 (31 <sup>st</sup> St SE)
11	BNSF KO Railway
12	I 94 West Bound
13	I 94 East Bound
14	38 <sup>th</sup> St W
15	Likely a bridge between 38 <sup>th</sup> St and 40 <sup>th</sup> Ave, but location has not been defined.
16	Cass County Road 8 (40 <sup>th</sup> Ave)
17	Cass County Road 6 (44 <sup>th</sup> St SE)
18	Red River Valley and Western Railway Crossing
19	Cass County Road 16 (46 <sup>th</sup> St SE)
20	Cass County HWY 17 (170 <sup>th</sup> Ave SE)
21	I 29 south Bound
22	I 29 North Bound
23	Cass County HWY 81

*In Town Levees* - Impacts to roadways resulting from the construction of in-town levees include the relocation of 2<sup>nd</sup> St. N to the west. 2<sup>nd</sup> St. N would remain open during flood events.

*Oxbow/Hickson/Bakke Ring Levee* - Impacts to roadways resulting from the Oxbow/Hickson/Bakke ring levee construction include reconstructing Cass County Highways 81, 18, and 25. Cass County Highway 81 will be gradually raised up and over the constructed ring levee at the north and south intersections. Cass County Highway 18 and Cass County Highway 25 will also be raised. The road raises will allow residents to access their homes and provide egress in a time of flood. See Appendix C.

**Community Cohesion (Sense of Unity):** There would be no appreciable changes to community cohesion due to the alignment shifts or the in-town levees. The Oxbow/Hickson/Bakke ring levee decision making process has impacted community cohesion between the communities of Oxbow, Hickson, and Bakke. The Project seems to have divided the communities of Oxbow, Hickson, and Bakke; the majority of the residents of Hickson and Bakke are opposed to a ring levee around their communities, while the city of

Oxbow is in favor of the ring levee around their community. This is discussed in more detail in section 5.6.

**Business and Home Relocations:** The Project would still require a substantial number of relocations for properties in the staging area as described in section 5.2.3.1.8 of the FEIS. Shifting the alignment, including eliminating Storage Area 1, and constructing a ring levee around Oxbow, Hickson, and Bakke would minimize the number of relocations necessary for the Project. The number of homes that would require relocation if all of the proposed modifications are made would be less than one hundred, which is substantially less than the several hundred described in the FEIS.

The construction of in town levees would require the full acquisition of the Park East Apartments, Feder Realty Company, Fargo Board of Education building, six residential properties, and partial acquisition of the Northland Hospitality (Howard Johnson) structure.

## 5.2 Economic Effects

**Flooding Effects:** As described in the section 5.2.3.2.8 of the FEIS, the Project would have significant beneficial impact on flooding effects in the metro area. As a result the proposed modifications described above, there will be fewer structures impacted by flooding than described in the upstream area.

There is no appreciable change in flooding effects for the northern and western alignment shifts; some properties that were described as affected in the FEIS would not be affected with the modified alignment, while others that were determined to not be affected in the FEIS would now be affected.

The southern alignment shift eliminates the need for Storage Area 1 and shifts the staging area north. Eliminating Storage Area 1 reduces the number of structures impacted from what was described in the FEIS. The shift in the staging area would have no appreciable impact on number of structures impacted, however the specific residences affected would change. Some residences that were not identified to be impacted in the FEIS would be affected with the proposed modifications, and some residences that were identified as impacted in the FEIS would not be affected with the proposed modifications. Shifting the staging area north would reduce the impacts to Richland and Wilkin Counties: land within the staging area would be decreased to 788 acres in Richland County and to 450 acres in Wilkin County, and the number of residential structures in the staging area would be reduced from 18 to 2 in Richland County and from 2 to 1 in Wilkin County.

By constructing the Oxbow/Hickson/Bakke ring levee the number of residential structures that would be impacted in the staging area would be reduced by approximately 200.

**Floodplain (Executive Order 11988):** The proposed alignment shifts, including the elimination of Storage Area 1 and shifting the staging area north, has changed the location of some of the land that would be taken out of the floodplain. The western alignment shift, elimination of Storage Area 1, and the Oxbow/Hickson/Bakke ring levee would increase the number of acres that would be removed from the floodplain, when compared to the FEIS alignment (an increase of approximately 4,000 acres).

Conversely, shifting the southern alignment of the diversion channel and tie back levee north and the northern alignment shift would reduce the number of acres removed from the floodplain when compared to the FEIS alignment (a reduction of approximately 3,000 acres). Overall, there would be no appreciable change to the quantity of land removed from the floodplain when compared to what was presented in the FEIS (a total of approximately 69 square miles for the 1-percent chance event).

**Public Facilities and Tax Revenue:** The full Oxbow/Hickson/Bakke alignment would benefit the church, community center, and businesses in Hickson and Oxbow. The full alignment would maintain this area's tax base for the Kindred School District, while the Oxbow/Hickson alternative alignment would reduce the tax base by \$21 million and the Oxbow-only alternative alignment would reduce the tax base by \$26 million.

### 5.3 Natural Resource Effects

**Geomorphology:** The FEIS discussed that the Project would be unlikely to cause substantial changes to upstream and downstream geomorphology or channel stability. This is largely due to the unique characteristics of sediment transport in the project area, combined with the frequency and duration of project operations (West 2012). However, the Minnesota Department of Natural Resources continued to be concerned that the Project could disrupt geomorphic process and cause bank instability.

The results from the geomorphic assessment of current and historical conditions indicate that the reaches in the study area saw very little geomorphic change over short to moderate periods of time. This is due, in part, to the erosion resistant nature of the cohesive glacial soils and the sediment supply to the system.

Future geomorphic impacts of the Project were assessed by evaluating each reach within the project area with respect to five geomorphic criteria: bank stability, channel migration rate, bank full depth, and riparian vegetation. Predictions were made for how the Project would impact the criteria and if the combined impacts would result in a discernible change to geomorphology. For reaches within the staging area, the report predicted that bank stability and riparian vegetation would be affected; however, these impacts would only lead to minor changes to geomorphology relative to the system as a whole. Potential morphologic changes are discussed in Section 9.3 of the geomorphology report, which is included as a reference document to this EA.

The in-town levees would allow the Project to operate even less frequently than what was outlined in the FEIS. With the in-town levees, the Project would operate for floods with peaks in excess of approximately 17,000 cfs. This relates to approximately a 10-percent chance event. This means less frequent project operation, shorter durations of water staging, and less risk for geomorphic effects. In addition, project operation would likely be limited to periods when riparian tree cover remains dormant. Historically, floods of this magnitude (e.g., peaks of 17,000 cfs or greater) have only occurred during the late winter or early spring. Project operation would typically occur during periods prior to leaf-on. This helps minimize stress to riparian trees that may be caused by increased water elevations in the staging

area. The in-town levees thus help to minimize tree stress and mortality, reducing any loss of root structures that are important for bank stability.

**Water Quantity:** The modifications to the Project described above affect the modeled stage increases along the Red River of the North. The updated stage increase tables are provided below (Tables 3 – 6). These tables show stage increases in inches at 14 locations downstream of the diversion channel outlet, 5 locations within the risk management area, and 5 locations upstream of the tieback embankments. Locations have been added in the risk management area and upstream of the Project to provide additional information. In general, the downstream impacts are essentially zero and no worse than what was reported in the FEIS, except that the slight stage reduction necessary to get to essentially zero impacts downstream of Grand Forks in the FEIS is no longer necessary due to the addition of gates at the diversion inlet structure (see Appendix D). The HEC-RAS model does report water surface elevations to the nearest 0.01 foot, and with a less complicated model it might be possible to determine impacts to the sub-inch level. However, it has become increasingly clear that the complex flow conditions in combination with the complex model result in model accuracy that is on the order of 0.1 to 0.2 feet (approximately 1 to 2 inches). Therefore a reported stage increase within 1 to 2 inches of what was reported in the FEIS is essentially the same as what was reported in the FEIS.

Figures 9-16 show the extent of flooding without and with Project, as modified, and how flow will be distributed by the Project. The difference in existing conditions versus with project flow and stage for the 10-percent chance event at the USGS gage in Fargo is minor and within the accuracy of the models. The upstream control gates would not be in operation for the 10-percent chance event. However the presence of the diversion channel does affect the amount of flow entering the risk management area through the Sheyenne River and Maple River aqueducts and therefore affects inundation along these rivers. The additional inundation in the staging area and the inundation reduction within the risk management area are readily apparent for the 2-percent, 1-percent, and 0.2-percent chance events. The inundation differences along the west side of the diversion channel require some explanation: There are a few areas of additional inundation that will be addressed as more detailed design efforts of the inlets occur. Every effort will be made to not increase inundation for events equal to and smaller than the 1-percent chance event. In addition, as discussed in the FEIS, inundation west of the diversion channel and downstream and north/northeast of the Rush River is reduced with the Project due to the elimination of overland flow.

Table 3: 10-percent Chance (10-Year) Event

Proposed Modified Alignment (VE13A-Bundled), 10-Percent Chance (10-yr) Event		
Location	Stage Increase (Inches)	Stage Increase (Inches) As Described in FEIS for LPP
<b><u>Downstream Locations</u></b>		
Drayton Gage	0.1	0.1
ND SH#17/ MN SH317	0.1	0.2
Co. Hwy 15	0.2	0.1
Oslo Gage	0.0	0.5
Minimum DS Impact Location	0.0	0.1*
DS Grand Forks Levees	0.5	1.0
Grand Forks Gage	0.5	1.3
32nd Ave, Grand Forks	0.7	1.3
Thompson Gage	1.3	0.5
Co. Hwy 25/ Co. Rd 221	1.6	0.5
DS Sandhill River/ Climax	1.7	0.4
Nielsville	1.7	0.4
DS Marsh River	1.9	0.5
US Goose River/ Shelly	1.9	0.4
Maximum DS Impact Location	2.0	1.4*
Halstad Gage	1.8	-1.4
Hendrum	1.4	-3.0
Perley	0.8	-6.5
Georgetown	1.0	-5.2
<b><u>Risk Management Area Locations</u></b>		
North River/ Clay Co. Hwy 93	-4.0	-65.9
19th Ave N Fargo/ 28th Ave N Moorhead	-2.9	-64.3
Fargo Gage (13th Ave S, 12th Ave S)	-2.2	-65.6
52nd Ave S Fargo/ 60th Ave S Moorhead	-1.9	-65.9
US ND Wild Rice River	-1.7	-61.8
<b><u>Upstream Locations</u></b>		
US Diversion	1.4	98.8*
Oxbow	1.1	
Hickson Gage	-0.6	79.1
Cass/Richland County Line	-0.5	
Abercrombie	-0.1	1.3

\* Location different for LPP

Table 4: 2-percent Chance (50-Year) Event

Proposed Modified Alignment (VE13A-Bundled), 2-Percent Chance (50-yr) Event		
Location	Stage Increase (Inches)	Stage Increase (Inches) As Described in FEIS for LPP
<b><u>Downstream Locations</u></b>		
Drayton Gage	0.5	1.0
ND SH#17/ MN SH317	0.5	0.8
Co. Hwy 15	0.5	0.6
Oslo Gage	0.2	0.5
DS Grand Forks Levees	0.7	1.3
Grand Forks Gage	1.1	2.2
32nd Ave, Grand Forks	1.3	3.4
Thompson Gage	1.3	2.9
Co. Hwy 25/ Co. Rd 221	1.8	2.5
DS Sandhill River/ Climax	1.9	2.5
Nielsville	2.3	2.2
Maximum DS Impact Location	2.3	4.6*
DS Marsh River	2.0	1.9
US Goose River/ Shelly	1.8	1.4
Halstad Gage	0.0	0.0
Hendrum	-0.4	-1.4
Perley	-0.4	-3.8
Minimum DS Impact Location	-0.5	-3.8*
Georgetown	1.2	-2.8
<b><u>Risk Management Area Locations</u></b>		
North River/ Clay Co. Hwy 93	-42.1	-81.0
19th Ave N Fargo/ 28th Ave N Moorhead	-52.1	-100.2
Fargo Gage (13th Ave S, 12th Ave S)	-60.6	-118.6
52nd Ave S Fargo/ 60th Ave S Moorhead	-52.8	-122.5
US ND Wild Rice River	-49.2	-112.9
<b><u>Upstream Locations</u></b>		
US Diversion	89.8	85.2*
Oxbow	72.7	
Hickson Gage	62.3	55.0
Cass/Richland County Line	44.4	
Abercrombie	1.6	1.7

\* Location different for LPP

Table 5: 1-percent Chance (100-Year) Event

Proposed Modified Alignment (VE13A-Bundled), 1-Percent Chance (100-yr) Event		
Location	Stage Increase (Inches)	Stage Increase (Inches) As Described in FEIS for LPP
<b><u>Downstream Locations</u></b>		
Drayton Gage	0.4	1.0
ND SH#17/ MN SH317	0.4	0.8
Co. Hwy 15	0.4	0.6
Oslo Gage	0.2	0.7
DS Grand Forks Levees	1.0	1.8
Grand Forks Gage	1.6	2.9
32nd Ave, Grand Forks	1.9	3.4
Maximum DS Impact Location	3.4	3.5*
Thompson Gage	2.0	0.5
Co. Hwy 25/ Co. Rd 221	2.0	-0.2
DS Sandhill River/ Climax	2.0	-0.5
Nielsville	1.6	-0.5
DS Marsh River	1.3	-0.4
US Goose River/ Shelly	1.1	-0.5
Halstad Gage	-0.5	-0.7
Hendrum	-1.0	-0.7
Perley	-1.0	-3.4
Minimum DS Impact Location	-1.1	-3.4*
Georgetown	0.8	-3.0
<b><u>Risk Management Area Locations</u></b>		
North River/ Clay Co. Hwy 93	-48.0	-87.0
19th Ave N Fargo/ 28th Ave N Moorhead	-58.4	-103.0
Fargo Gage (13th Ave S, 12th Ave S)	-69.8	-123.8
52nd Ave S Fargo/ 60th Ave S Moorhead	-57.5	-120.6
US ND Wild Rice River	-54.1	-107.9
<b><u>Upstream Locations</u></b>		
US Diversion	89.6	98.8*
Oxbow	70.1	
Hickson Gage	58.1	64.6
Cass/Richland County Line	35.9	
Abercrombie	0.5	1.3

\* Location different for LPP

Table 6: 0.2-percent Chance (500-Year) Event

Proposed Modified Alignment (VE13A-Bundled), 0.2-Percent Chance (500-yr) Event		
Location	Stage Increase (Inches)	Stage Increase (Inches) As Described in FEIS for LPP
<b><u>Downstream Locations</u></b>		
Drayton Gage	1.0	1.3
ND SH#17/ MN SH317	0.7	0.8
Co. Hwy 15	0.6	1.1
Oslo Gage	0.4	0.6
DS Grand Forks Levees	1.0	1.4
Grand Forks Gage	1.9	2.6
32nd Ave, Grand Forks	2.2	2.8
Thompson Gage	0.8	-0.6
Co. Hwy 25/ Co. Rd 221	0.7	-1.4
DS Sandhill River/ Climax	0.7	-1.8
Nielsville	0.5	-1.9
DS Marsh River	0.2	-1.7
US Goose River/ Shelly	0.1	-1.6
Halstad Gage	-0.4	-2.6
Minimum DS Impact Location	-1.2	-4.3*
Hendrum	-0.7	-3.6
Perley	-0.6	-4.3
Georgetown	2.6	-4.0
Maximum DS Impact Location	3.6	3.2*
<b><u>Risk Management Area Locations</u></b>		
North River/ Clay Co. Hwy 93	-15.0	-28.7
19th Ave N Fargo/ 28th Ave N Moorhead	-19.4	-23.9
Fargo Gage (13th Ave S, 12th Ave S)	-30.8	-36.4
52nd Ave S Fargo/ 60th Ave S Moorhead	-16.0	-24.6
US ND Wild Rice River	-13.2	-15.7
<b><u>Upstream Locations</u></b>		
US Diversion	75.5	78.0
Oxbow	49.8	
Hickson Gage	34.9	34.2
Cass/Richland County Line	6.6	
Abercrombie	0.0	0.1

\* Location different for LPP



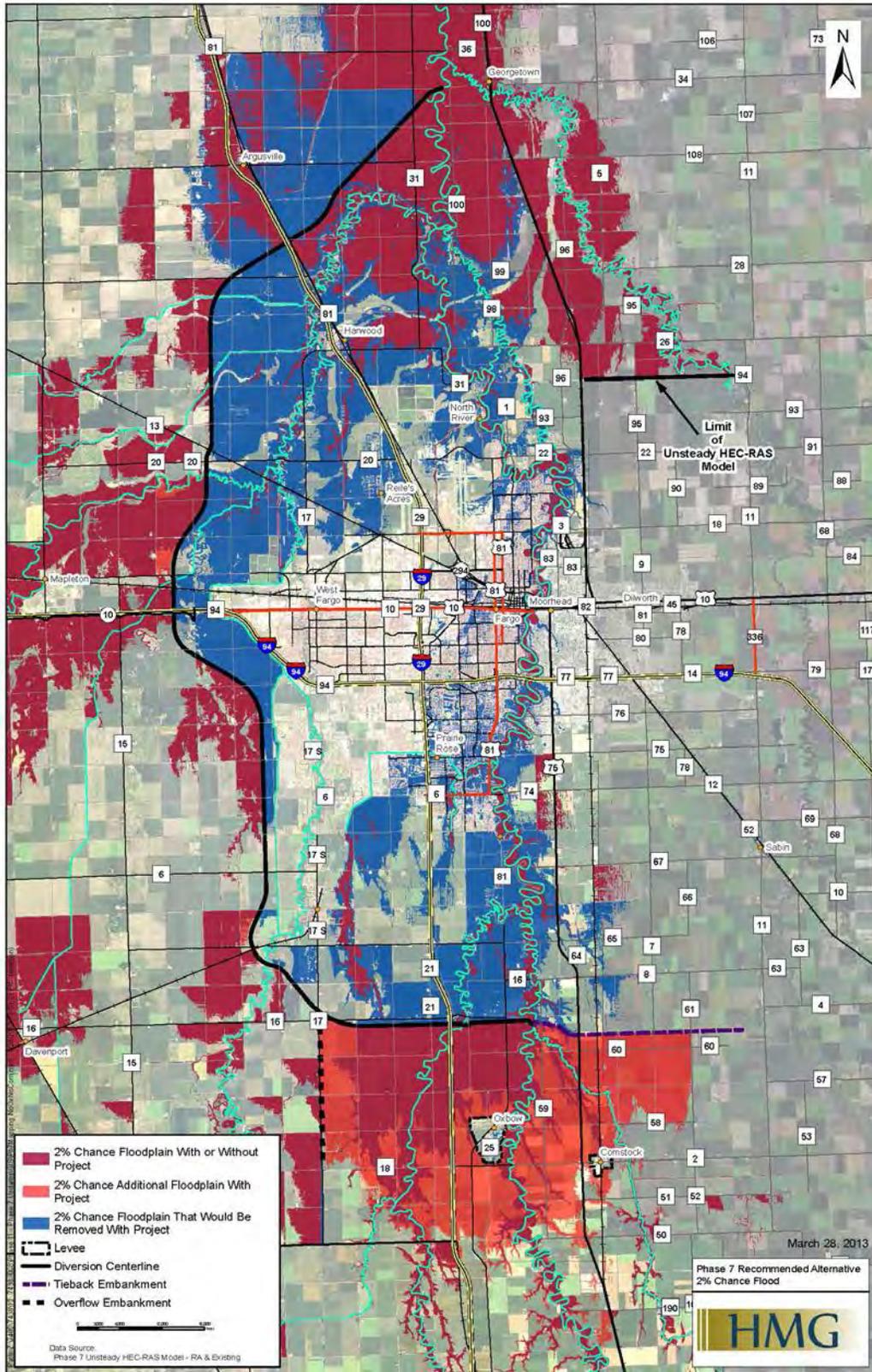


Figure 10: 2-percent Chance Event Showing With and Without Project Conditions

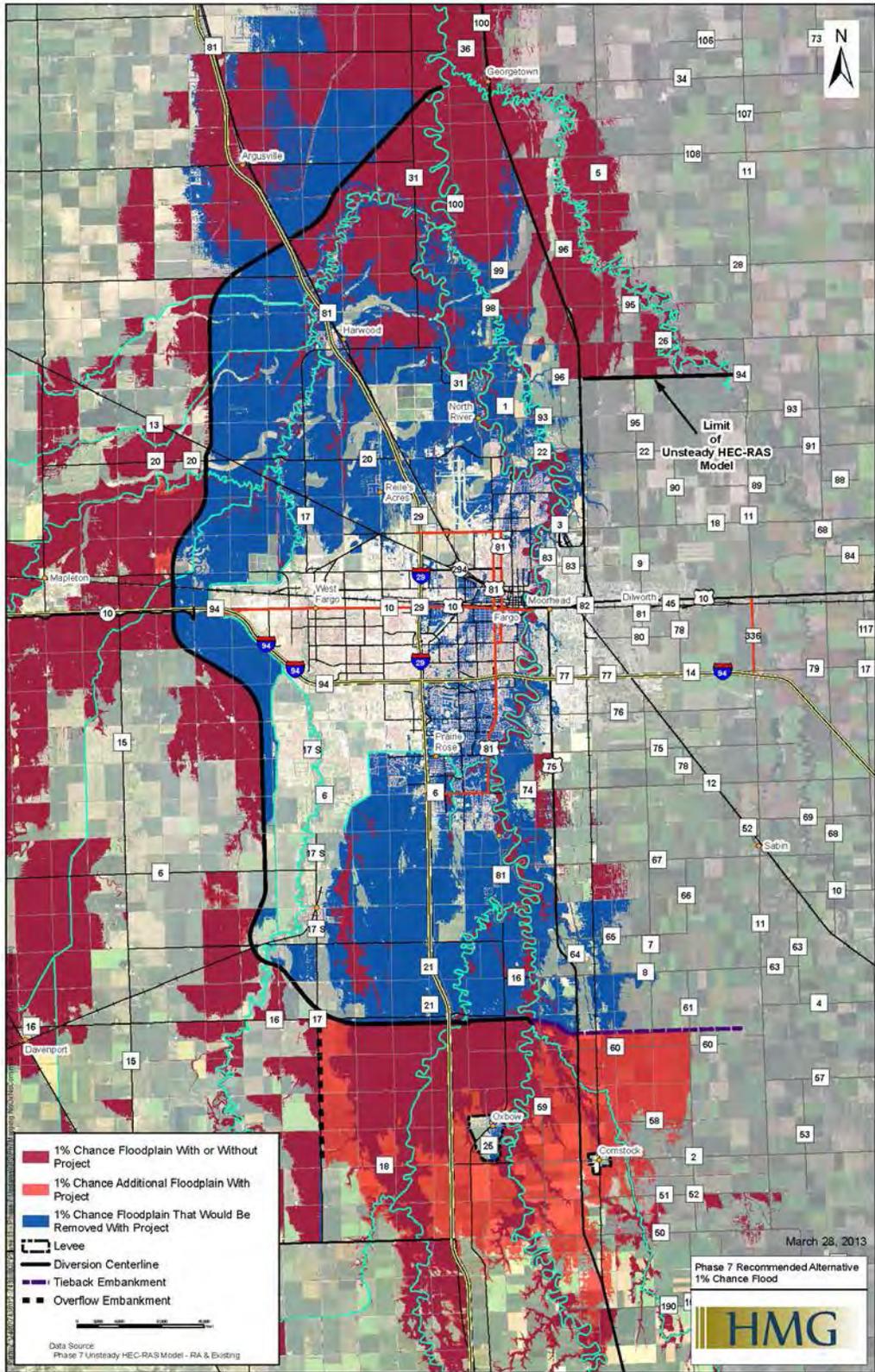


Figure 11: 1-percent Chance Event Showing With and Without Project Conditions

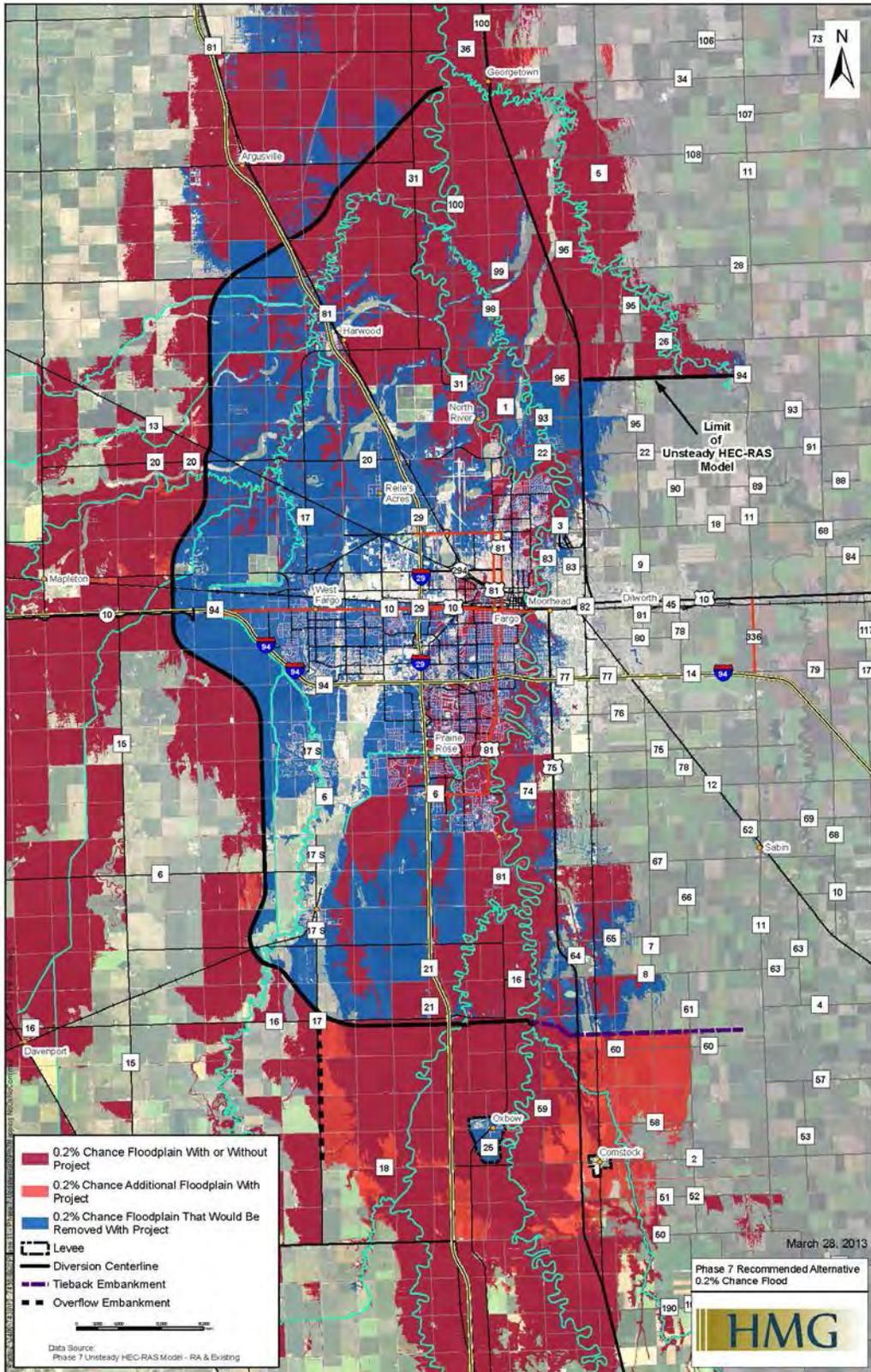


Figure 12: 0.2-percent Chance Event Showing With and Without Project Conditions

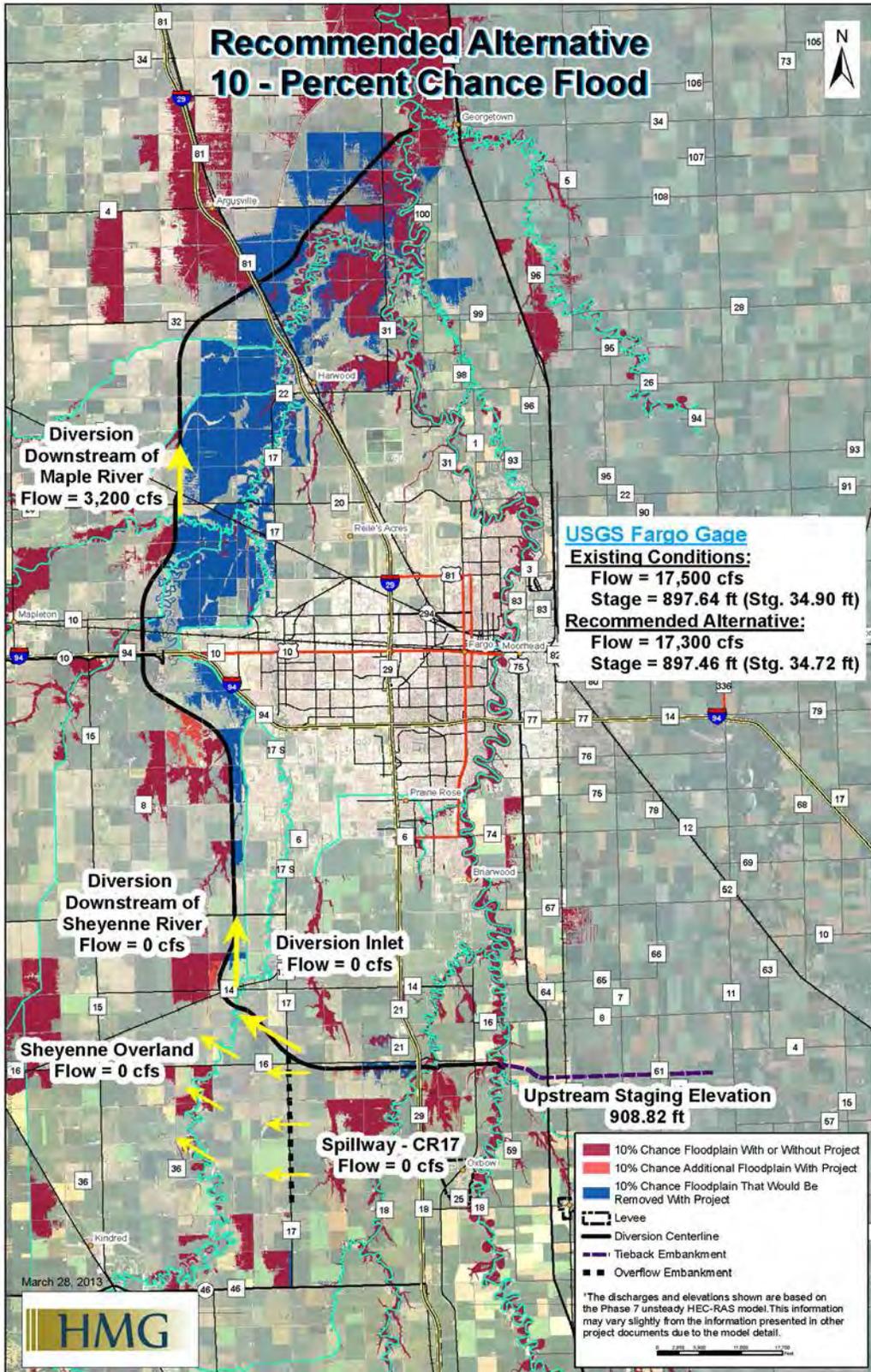


Figure 13: 10-percent Chance Event Floodplain and Flow Impacts

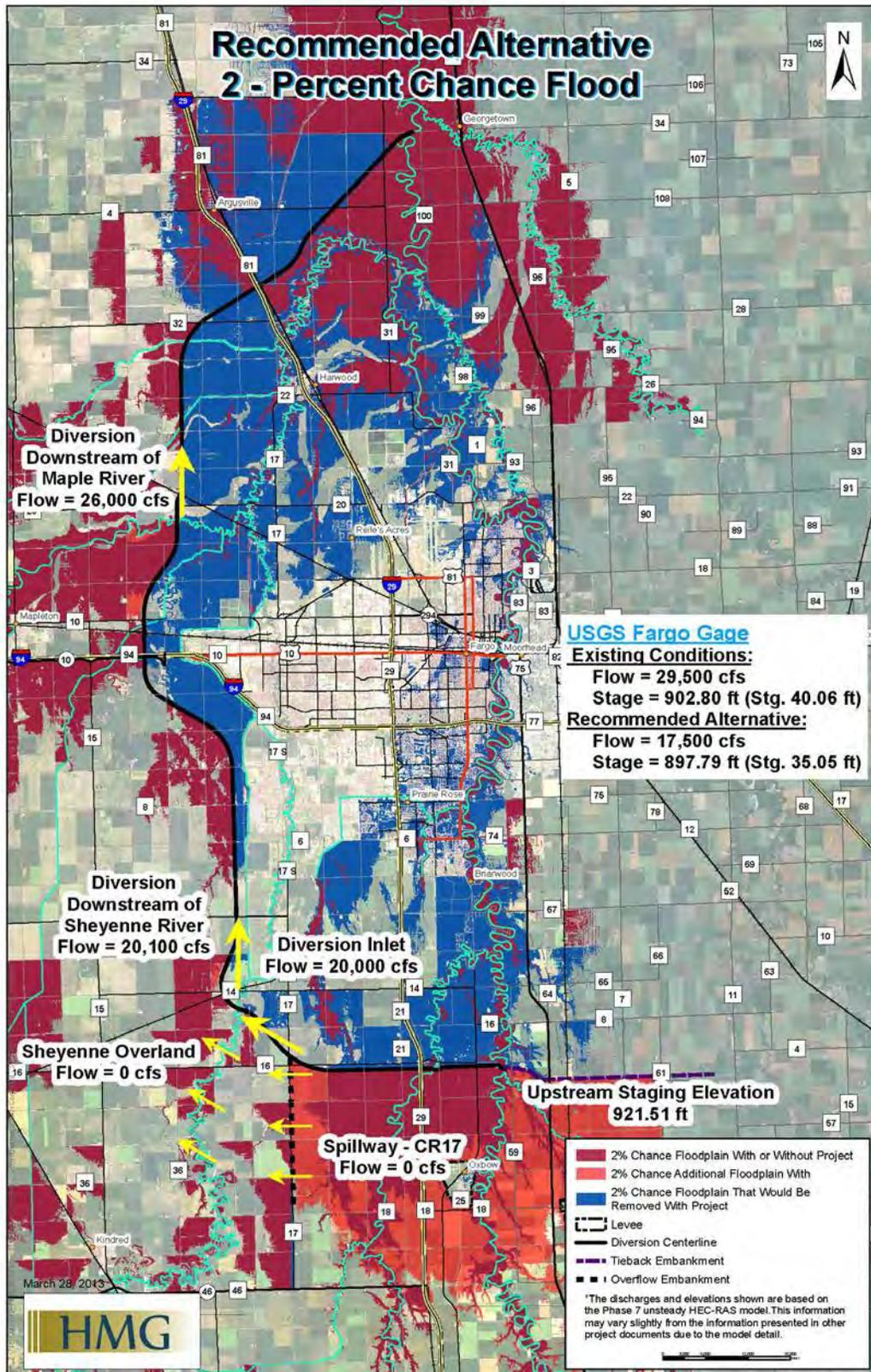


Figure 14: 2-percent Chance Event Floodplain and Flow Impacts

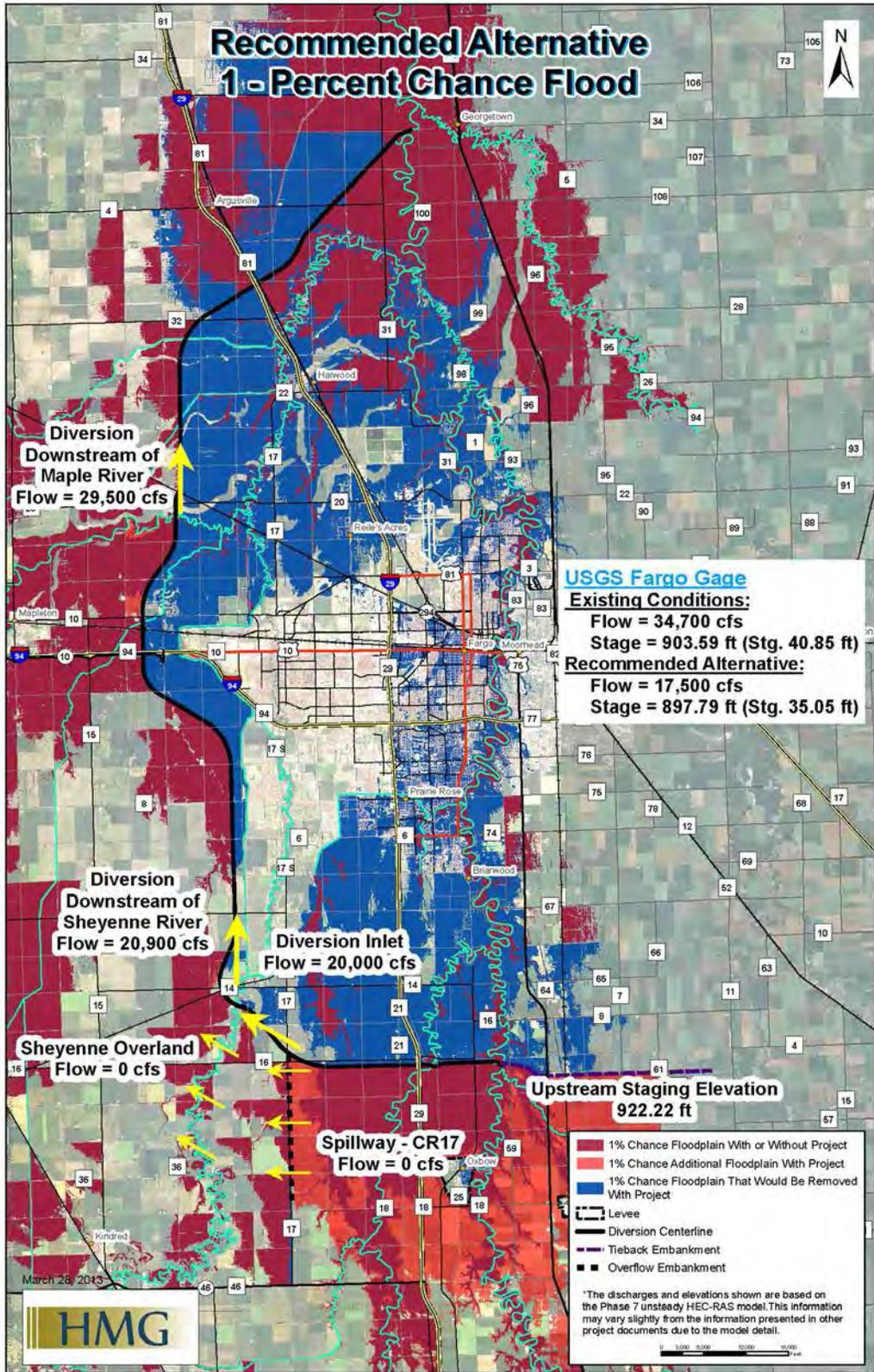


Figure 15: 1-percent chance Event Floodplain and Flow Impacts

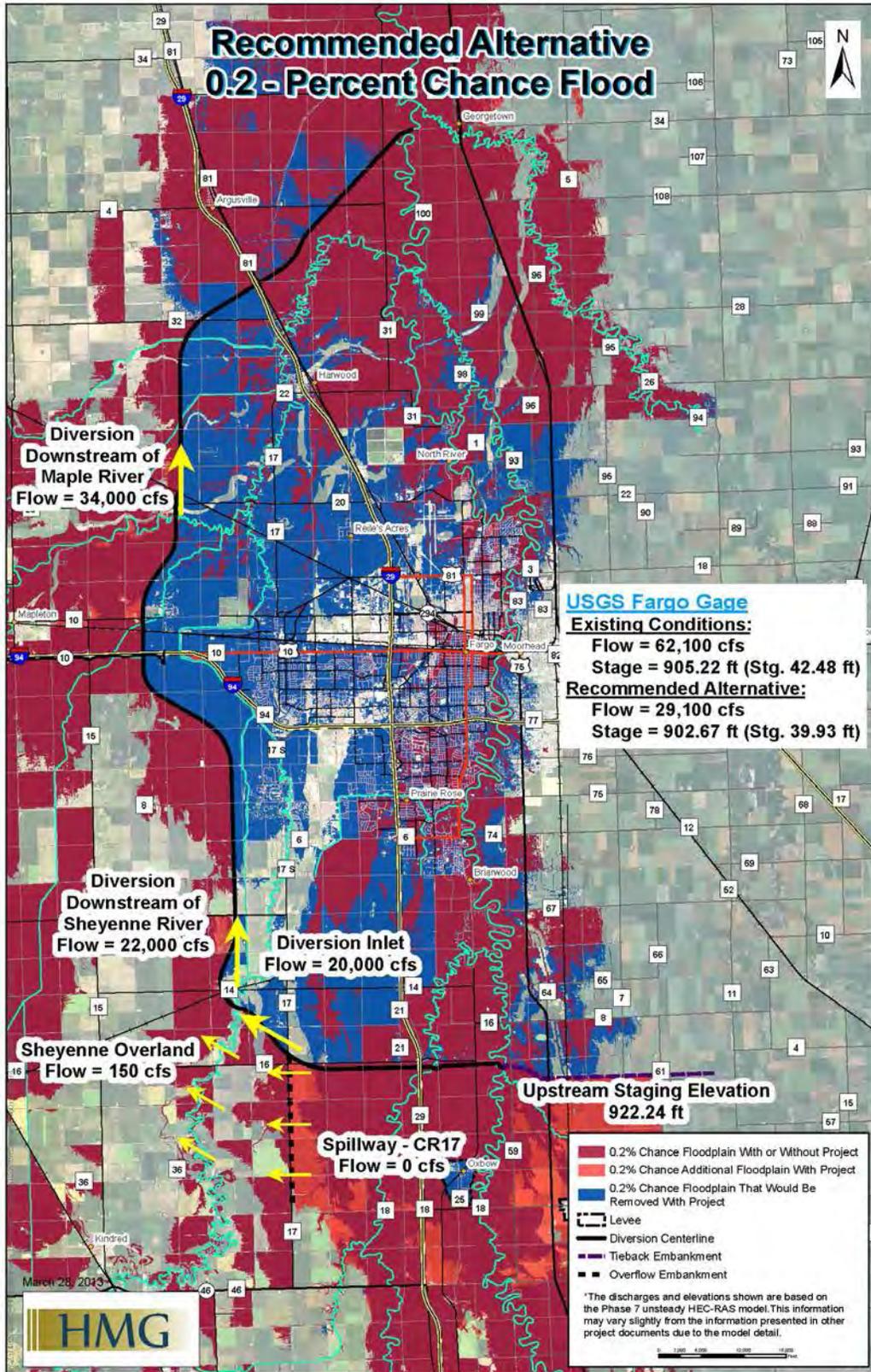


Figure 16: 0.2-percent Chance Event Floodplain and Flow Impact

**Wetlands:** Changes to impacts to wetlands since the FEIS include additional wetlands impacted because of alignment shifts, additional temporary and permanent easements required for construction of the diversion channel, and the Oxbow/Hickson/Bakke ring levee. In-town levees would have no impact on wetlands.

*Alignment Shifts:* Total acreages of wetlands impacted include: farmed seasonally flooded basin (Type 1): 1477 acres compared to 790 acres as reported in the FEIS; shallow marsh (Type 3): 106 acres as compared to 50 as reported in the FEIS; shrub-carr (Type 6): 1 acre as compared to 0; and wet meadow (Type 2): 120 acres as compared to 140 acres as reported in the FEIS (Table 7). Again, much of the change is due to the additional aerial photographs and LiDAR data that is now available, and not due to the proposed modifications to the Project described herein. The wetland impacts will be compensated for with the creation of wetlands in the diversion channel.

**Table 7: Fargo-Moorhead Wetland Delineation – Complete Alignment Summary**

<b>Wetland Type</b>	<b>Acres in FEIS</b>	<b>Acres with modifications</b>
Open Water	10	1
Farmed Seasonally Flooded Basin	790	1,477
Shallow Marsh	50	106
Shrub-Carr	0	1
Wet Meadow	140	120
<b>Total Acres</b>	<b>990</b>	<b>1,705</b>

# Fargo Moorhead Flood Risk Management Project

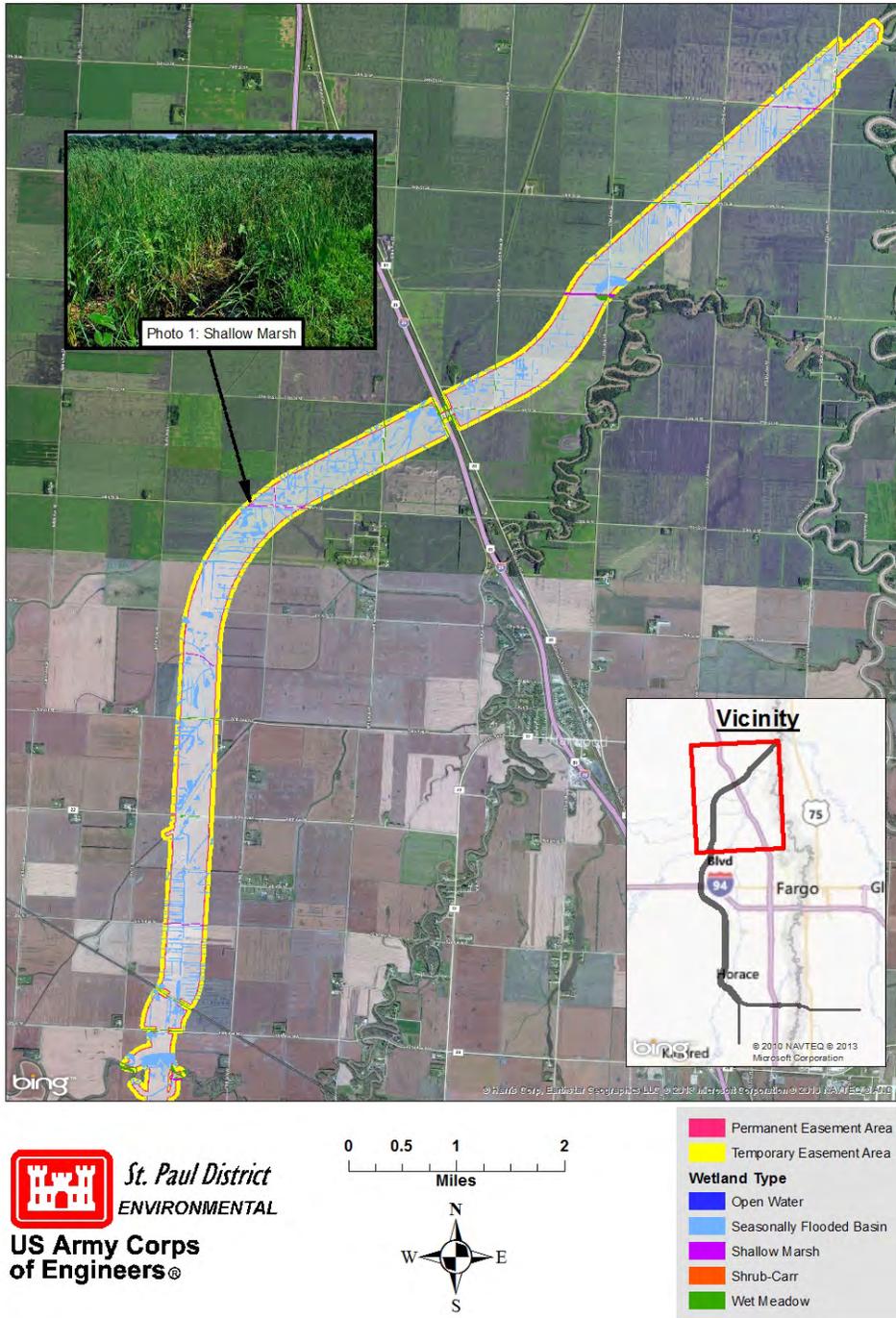
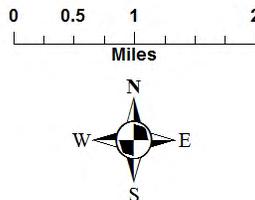
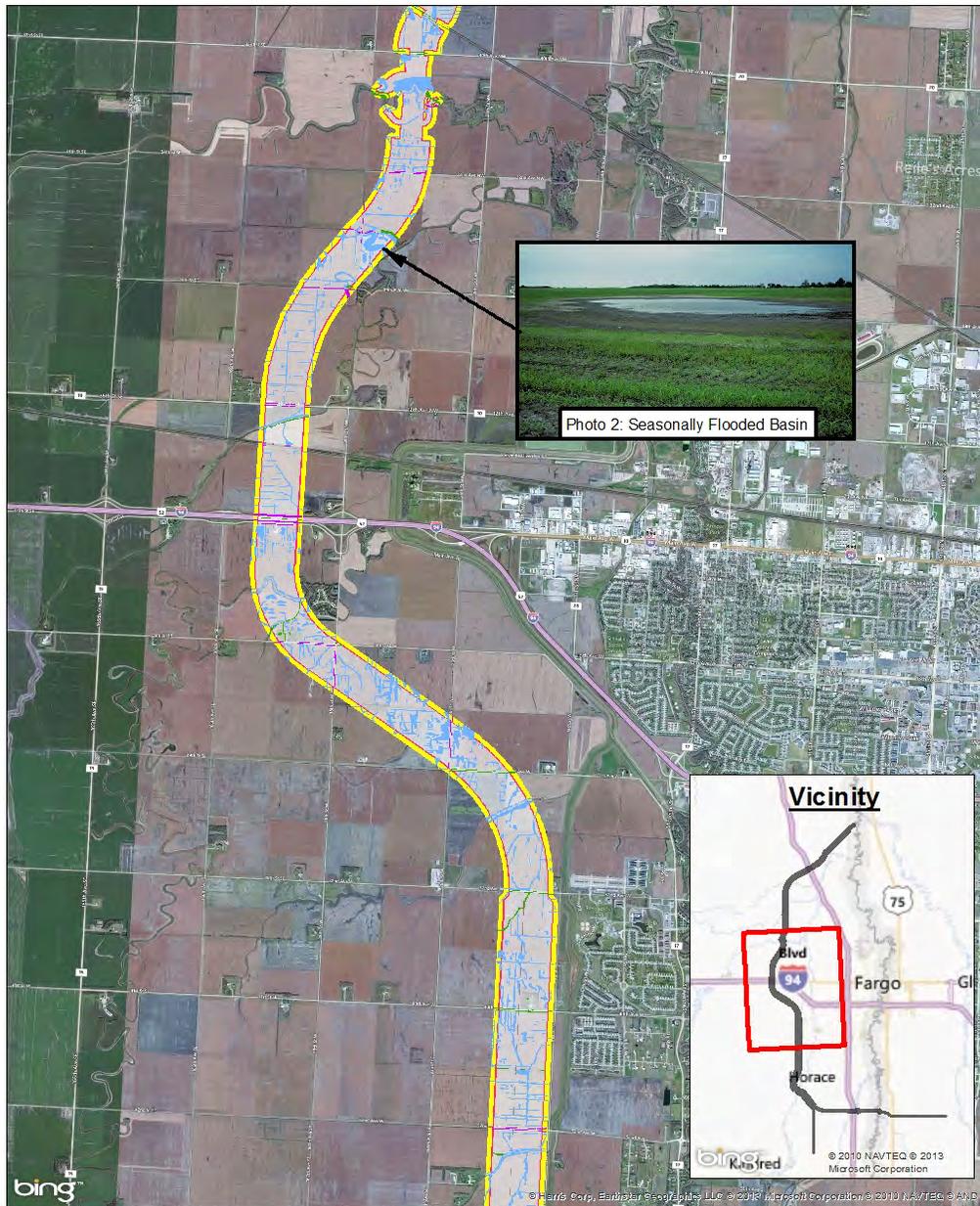


Figure 17: Wetland Impacts in Northern Alignment



# Fargo Moorhead Flood Risk Management Project



<span style="display:inline-block; width:15px; height:10px; background-color:yellow; border:1px solid black;"></span>	Permanent Easement Area
<span style="display:inline-block; width:15px; height:10px; background-color:yellow; border:1px solid black;"></span>	Temporary Easement Area
<b>Wetland Type</b>	
<span style="display:inline-block; width:15px; height:10px; background-color:blue;"></span>	Open Water
<span style="display:inline-block; width:15px; height:10px; background-color:lightblue;"></span>	Seasonally Flooded Basin
<span style="display:inline-block; width:15px; height:10px; background-color:purple;"></span>	Shallow Marsh
<span style="display:inline-block; width:15px; height:10px; background-color:orange;"></span>	Shrub-Carr
<span style="display:inline-block; width:15px; height:10px; background-color:green;"></span>	Wet Meadow

Figure 18: Wetland Impacts in Western Alignment

# Fargo Moorhead Flood Risk Management Project

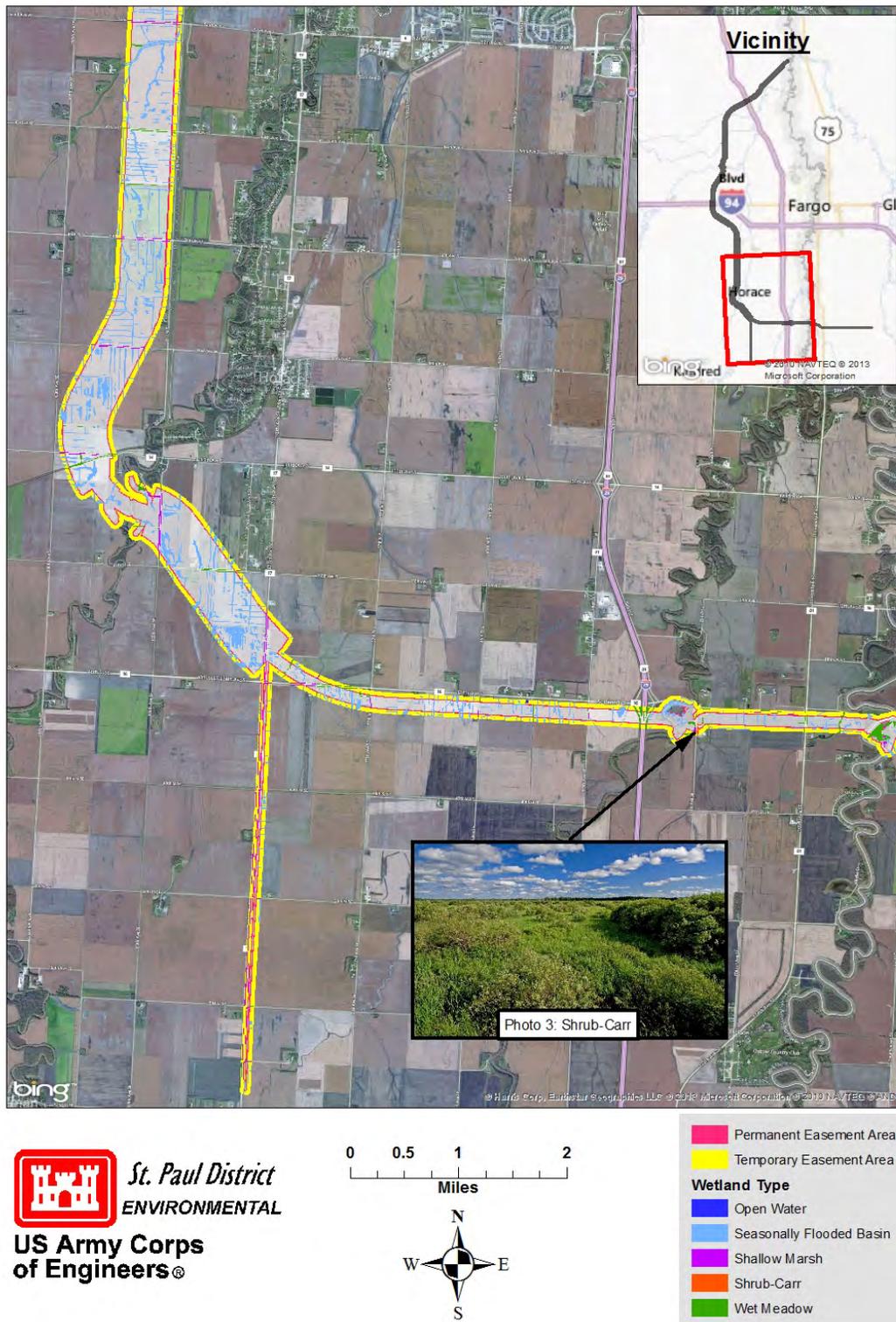


Figure 19: Wetland Impacts in Western and Southern Alignment

# Fargo Moorhead Flood Risk Management Project

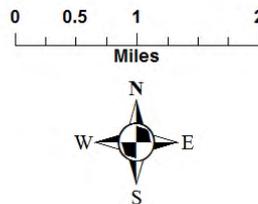
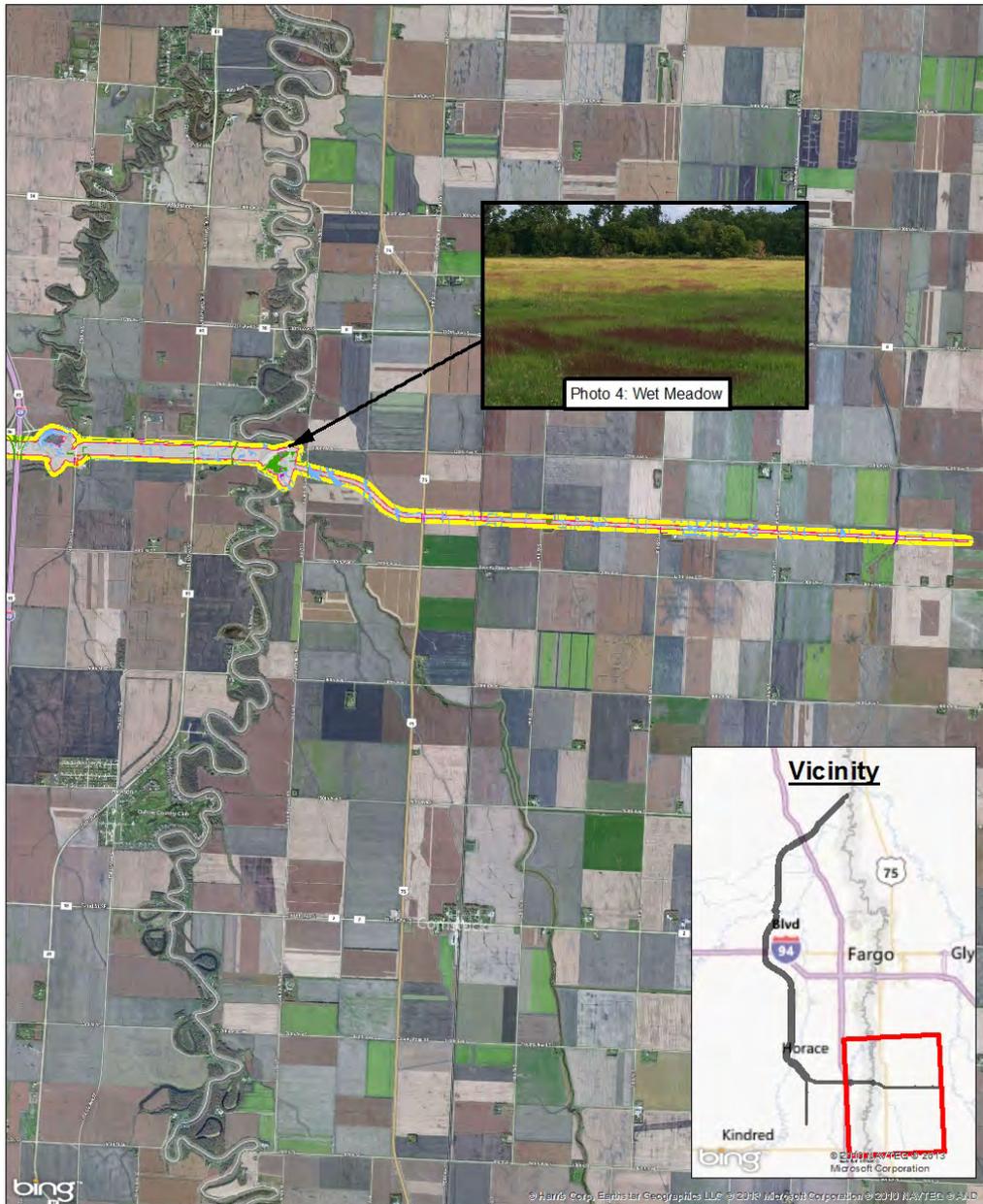


Figure 20: Wetland Impacts in Southern Alignment

*Oxbow/Hickson/Bakke Ring Levee*: There would be approximately 14 acres of wetlands impacted by the ring levee around Oxbow, Hickson, and Bakke and the associated road raises (Figure 21). Seven acres of wetlands are higher functioning wetlands, while the remaining seven acres are seasonally flooded wetlands considered to be very low functioning. The wetland impacts will be compensated for with the creation of wetlands in the diversion channel.

### Oxbow, Hickson, Bakke Ring Levee



Figure 21: Oxbow/Hickson/Bakke Ring Levee Impacted Wetlands

**Aquatic Habitat:** The FEIS described project footprint areas and the amount of aquatic habitat that would be lost or altered from the Project. The alignment shift includes site locations for the Red River and Wild Rice River control structures that are slightly different than those outlined in the FEIS (Figure 22). The site locations have been shifted slightly downstream as the whole southern alignment shifted north. Although the locations differ, the relative impacts to aquatic habitat are not appreciably different from what is described in the FEIS. The approximate area impacted for the Red River is 14 acres, which has not changed from the FEIS. The approximate area for the Wild Rice is 11 acres, compared to 12 acres as described in the FEIS.

The FEIS alignment required a tie back levee and associated box culvert to be constructed within Wolverton Creek. The estimated footprint was 0.3 acres of aquatic habitat. The proposed modified alignment would not require these structural features, thus this footprint impact would be avoided.

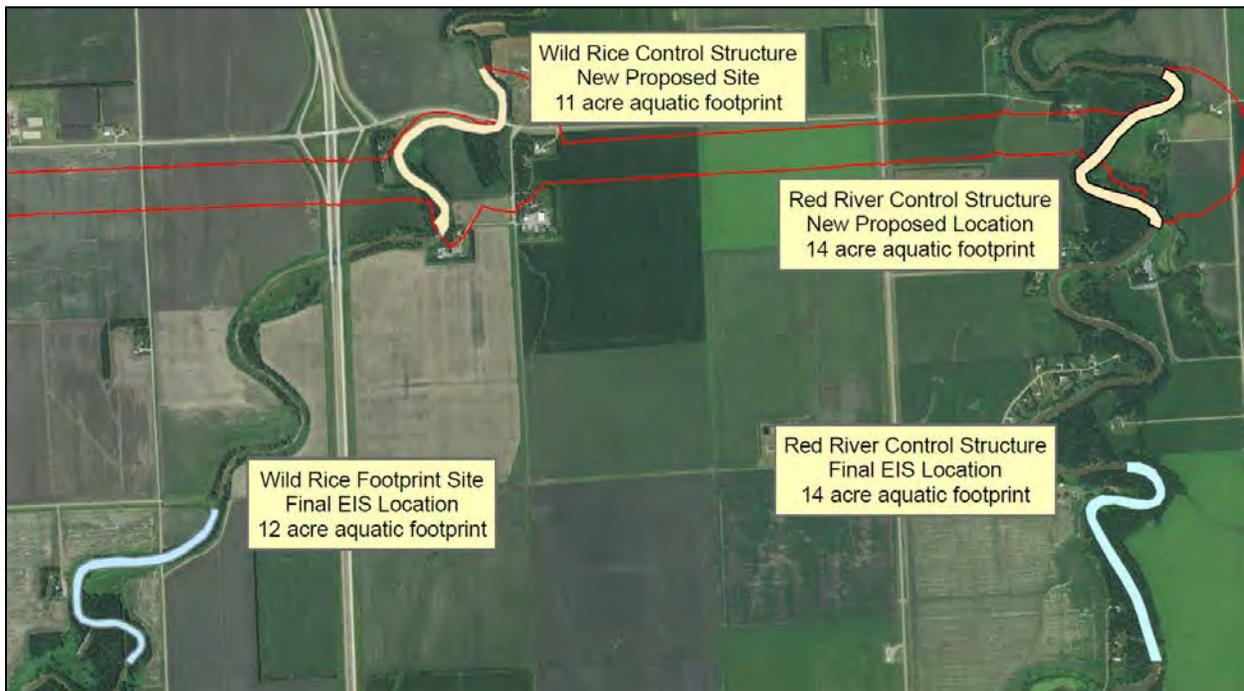


Figure 22: Locations of Proposed Control Structures for the Red and Wild Rice Rivers, Compared to the Locations Previously Described in the FEIS

**Shallow Groundwater:** There are no appreciable changes to ground water due to the proposed modifications to the Project, however new information available since the FEIS is presented here.

Under the conditions reasonably anticipated, the flow of the shallow groundwater should be “downhill” or toward the area of lower hydraulic potential. Existing examples of this type of feature are the Red River of the North and its local tributaries, the Maple River and the Sheyenne River. After the excavation of the diversion channel is completed, the diversion would act as another area of low hydraulic potential. This may lower the groundwater table near the diversion channel, but not below the depth of the channel bottom. The lateral extent of the lowered groundwater table would likely be confined to areas immediately adjacent to the diversion channel including the excavated material berms

(EMBs). Areas outside the project limits would likely see very little to no change. Considering the expected vertical permeabilities of the lacustrine soils (between  $3 \times 10^{-3}$  ft/day and  $3 \times 10^{-4}$  ft/day), the natural groundwater flow through these soils is expected to be very small.

A lowered shallow groundwater table could potentially reduce the capacity of shallow local wells that are recharged by the groundwater table. The risk to the shallow groundwater table as related to the diversion channel is low because the anticipated area affected would be concentrated adjacent to the diversion channel. One possible exception to this generalization is where the alignment crosses a shallow channel-like sand formation north of the Maple River. Here, water levels within the sandy formation could be reduced some greater distance away from the diversion channel due to the relatively pervious nature of the sandy soils.

The lowering of the shallow groundwater table may cause consolidation of the surrounding soils and settlement of structures within the affected area. Only structures immediately adjacent to the diversion channel would have the potential to settle. Since the area affected is not expected to extend beyond the channel and EMBs it is unlikely that any structures remaining after construction would be impacted. If local shallow wells experience reduction in capacity, the depth of the well could be increased or an additional well could be installed to mitigate for the reduced capacity. Wells and structures that are within the footprint of the diversion channel would be removed or abandoned, while those immediately adjacent would be identified and monitored to quantify any impacts. Any impacts identified as the result of the construction and/or operation of the Project can be mitigated for.

The construction of the ring levee around Oxbow, Hickson, and Bakke will not have a measurable effect on the regional groundwater table. During flood events when there is water on the levee, the groundwater table may increase adjacent to the dryside of the ring levee, but seepage should be relatively small due to the impervious nature of the levee and foundation materials. The Oxbow/Hickson/Bakke ring levee situation is similar to other flood risk management projects that have been constructed within the Red River Valley.

**Aquifers:** There are no appreciable changes to the effects on aquifers due to the proposed modifications to the Project. There are some smaller scale sand and gravel beds that could be considered localized aquifers if the beds are extensive enough to provide potable water for a residence or farmstead. The existence of these smaller localized aquifers will be investigated and a mitigation plan will be developed, if needed, on a case by case basis.

**Fish Passage:** Fish movement and biological connectivity would be interrupted during periods when the Project is in operation. With the in-town levees, the Project would operate less frequently, and for a shorter duration, compared to what was described in the FEIS. This difference in operation would further minimize any limitations on fish movement and biotic connectivity on the Red River and Wild Rice River. Modifications to the project alignment also would avoid temporary closures on Wolverton Creek, thus eliminating independent connectivity concerns on Wolverton Creek.

**Upland Habitat/Riparian Habitat:** Areas impacted by the Project has been updated since the FEIS to include the proposed alignment shifts, the addition of temporary and permanent construction

easements, and the addition of a ring levee around Oxbow, Hickson, and Bakke. The construction of in-town levees will not have an impact on upland forest or riparian forest. Total acreage that would be impacted by the diversion channel and associated features is approximately 8,200 acres, which is slightly higher than what was identified in the FEIS. The size of the staging area for the Project is approximately 38,400 acres and has been shifted north approximately one mile. The increase in total acres along the diversion channel is a result of construction modification to include all lands required for temporary and permanent easements. Areas where upland forest and riparian forested would be cleared have also changed because of the alignment shifts and additional acreage required for construction easements. Sixty acres of riparian forest and 71 acres of upland forest would be impacted with the modified alignment compared to 117 riparian forest and 82 upland acres as described in the FEIS. The reduction of impacts to upland forest and riparian forest is largely a result of the elimination of Storage Area 1. The loss of these wooded acres would be permanent but would be mitigated for by converting farmed wetland along one of the rivers into floodplain forest at a 2:1 ratio. There is no appreciable change to impacts described in the FEIS for the staging area other than the shift north for the entire staging area.

Constructing a ring-levee around Oxbow, Hickson, and Bakke would impact approximately 100 acres, including 12 acres of forested land. The loss of these wooded acres would be permanent but would be mitigated for by converting farmed wetland along one of the rivers into floodplain forest at a 2:1 ratio.

**Endangered and Threatened Species:** The proposed modifications to the Project have not changed the impacts to endangered and threatened species that were reported in the FEIS.

**Prime and Unique Farmland:** With the proposed modifications, the acreage of farmland impacted by the Project increases from approximately 7,000 acres to 8,000 acres. This increase is largely a result of including the construction easements along the entire diversion channel, tieback embankments, overflow embankments, and connecting channel. Therefore, the increase is a worst-case-scenario, as not all of the farmland within the temporary construction easements may be impacted, and farming could resume following construction. Based on the analysis in the FEIS, 90% of the farmland is prime and unique, which indicates that approximately 7,200 acres of prime and unique farmland would be impacted by the Project as modified. No prime and unique farmland would be impacted by constructing in town levees. An additional approximately 100 acres of prime and unique farmland would be impacted by the construction of the Oxbow/Hickson/Bakke ring levee.

## 5.4 Cultural Resources Effects

*Alignment Shifts:* All alignment shifts considered the probability of cultural sites as a criterion during the alternatives analysis. Extra surveys were conducted along the Maple River east and west of the proposed hydraulic structure location in an effort to minimize the impact to cultural sites. Phase I cultural resources surveys in the project area in 2010 to 2012 have recorded 68 cultural resources sites, with two unverified site leads (reported burial and oxcart trail). All 70 sites and site leads would be directly affected by construction of the diversion channel and related features.

Prehistoric occupation site 32CS201 and prehistoric cultural material scatter site 32CS5127 will need data recovery mitigation prior to construction of the northern alignment. Based on Phase II testing in 2013, there may be additional archeological sites at the Maple River crossing which will need to be mitigated prior to construction. Prehistoric archeological site 32CS5135 along Drain No. 14 south of the Maple River will need Phase II testing to determine its eligibility to the National Register. The County Highway 16 bridge (site 32CS4678) over the Wild Rice River will also need to be evaluated for eligibility to the National Register. Farmstead sites 32CS5153 and 32CS5168, located between the Sheyenne River and the Wild Rice River, have been recommended eligible to the National Register and will need mitigation in the form of Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation prior to removing their buildings from the project area.

Six segments of the channelized Rush River, channelized Lower Rush River, Drain No. 12, and Osgood Drain No. 21 (between I-94 and the Sheyenne River crossing), were recommended as eligible to the National Register under criterion A due to their connections with the settlement and development of agriculture in the Red River Valley. A site or structure is determined eligible to the National Register of Historic Places under criterion A if it is "associated with events that have made a significant contribution to the broad patterns of our history", i.e., it is associated with significant historic events. The Corps does not concur with this recommendation at the present time, but a historic context on drainage systems in the North Dakota portion of the Red River Valley will be prepared to decide this eligibility issue.

*In-town Levees* : At present, no National Register listed or eligible historic properties would be directly affected by the proposed 2nd Street levee construction. However, Phase II evaluations of the National Register eligibility of the buildings in the in-town levee areas along 2nd Street have not yet been conducted. The potential for visual impacts to listed historic properties one to five blocks to the west of the in-town levee areas have also not been evaluated.

The El Zagal Shrine building at the El Zagal Area levee is within the boundaries of the North Side Fargo Builder's Residential Historic District, which was listed on the National Register on April 7, 1987. Levee construction or upgrade in this area may have adverse effects on the Shrine building. There are no known National Register eligible properties in the proposed Mickelson Field Phase 2 levee location or the proposed Belmont Area location. The National Register eligibility of the houses to be bought out at the proposed Mickelson Field Phase 2 levee location and Belmont Area location needs to be determined.

*Oxbow/Hickson/Bakke Ring Levee*: As of February 2013, there are no National Register listed or eligible historic properties within one mile of the proposed ring levee alignment. A Phase I cultural resources survey of the alignment needs to be conducted. There is moderate to high potential for archeological sites due to the close proximity to the Red River of the North on the east and to an unnamed intermittent tributary on the west.

## 5.5 Cumulative Impacts

**Alignment Shifts:** The proposed modifications described herein do not appreciably change the cumulative impacts from what was described in the FEIS.

**In-Town Levees:** The in-town levees that are proposed for inclusion in the Project provide flood risk management to a stage of 35 feet in town, which would provide benefits up to a 10-percent chance event. The non-Federal sponsors intend to pursue a higher level of flood risk management while they have the opportunity by constructing features above a stage of 35 feet. This Environmental Assessment identifies the removal of a large apartment complex as an impact associated with levees being constructed to a stage of 35 feet. However, additional floodwalls and a levee would be constructed at this and possibly other locations to address higher flood stages. These floodwalls and the levee are displayed in Figure 6.

**Cumulative Effects on Historic Properties:** Project features may have indirect visual impacts on any National Register eligible or listed historic properties located within one-half mile of the features. Conversely, once constructed, project features would have a beneficial effect for historic properties in the cities of Fargo and Moorhead and some smaller communities in Cass and Clay counties as they would reduce the risk that the historic properties would be subject to future flood related damages.

Based on cultural resources investigations along other stretches of the Red, Sheyenne, and Maple rivers, prehistoric archeological sites tend to occur on the edge of uplands overlooking the river valley and within one-quarter mile of riverbanks, with older, buried sites likely on river terraces. Any archeological sites lost as a result of project construction would be in addition to those lost to past urban and/or agricultural development in the Fargo-Moorhead portion of the Red River Basin.

## 5.6 Controversy

In the FEIS, the communities of Oxbow, Hickson, and Bakke are identified as being located within the Staging Area. The city of Oxbow asked that either all residential structures be protected, or be acquired in fee. Through analysis during the feasibility phase it was determined that all residential structures could not be benefited. Due to their proximity to the riverbank and geotechnical stability issues, several homes would need to be removed to construct a ring levee to provide protection for the remainder of the communities. After the determination that all residential structures could not be benefited with a ring levee, the communities asked that they all be acquired in fee.

After the FEIS was completed, the non-Federal sponsors asked the Corps to look at a ring levee option to benefit the three communities, with the understanding that several homes would need to be removed.

A conceptual alignment was developed and formally presented to the communities and general public at a meeting on January 8, 2013 in Fargo, North Dakota. Individual meetings were also held for residents of Oxbow, Hickson, and Bakke after the public meeting and the following two days in Hickson, North Dakota. The meetings were held to provide information on the proposed ring levee concept, to meet with impacted residents, and to address concerns about the proposed ring levee. Residents

impacted by the ring levee were invited, via letter, to attend the public meeting and to sign up for a one-to-one meeting.

Over 150 people attended the public meeting and 76 individual meetings were held in person or over the phone. An anonymous, informal survey was also provided to residents to gain additional information from impacted residents. The survey results indicate a clear split between the Oxbow residents and residents of Bakke and Hickson. In general, Oxbow residents favor the ring levee, while the Bakke and Hickson residents do not support it.

On January 23, 2013, the city of Oxbow City Council carried a motion to remove from the record a previous resolution as it related to any opposition against the Project. In addition, it also carried a motion to rescind a previous resolution which supported the Richland Wilkin JPA (Joint-Powers Agreement) formed to oppose the Project. On January 10, 2013, Pleasant Township passed a Resolution of Opposition to Fargo-Moorhead Metropolitan Area Flood Risk Management Project. The resolution is in opposition of the diversion project as well as the proposed ring levee for the communities of Oxbow, Hickson, and Bakke.

Reasons given in favor of the ring levee include that it provides permanent protection for the communities. In addition, the ring levee would maintain the Oxbow Country Club and the tax base for the communities. Reasons given by those not in favor of the ring levee include that Bakke and Hickson residents feel they were not fairly represented in the process; that they do not support the Project as a whole; and that they feel as though the information provided did not allow residents to make an informed decision at the time of the public meeting.

General comments and concerns from residents impacted by the proposed ring levee included:

- Home/property values
- Safety: how safe is it to live behind a levee
- Operation and maintenance: residents do not want to be responsible for any future operation and maintenance of the ring levee or associated features
- Fair appraisals and compensation for homes and property
- Time frame is unclear and uncertain: many residents would like to know sooner what the final decision and plan is for their communities
- Other concerns particular to Bakke residents included that the levee may create more drifting snow; local stormwater drainage; septic systems functioning when water is stored on the other side of the levee; the reliability of the levees and FEMA certification; and the safety of children when the staging area is in use.

## 6 COORDINATION

**Agency Meetings:** The resource agency team that was developed during the FEIS process has continued to meet in order to effectively transfer information through face to face meetings. The resource agencies identified in the FEIS have continued to work diligently on this Project. Resource agency team meetings since completion of the FEIS were held on the following dates: July 18, November 1, and December 12 of 2011, May 30, July 18, and November 9 of 2012, and March 27 of 2013.

**Public Meetings Hosted by the Corps :** December 12-14, 2011, Landowner Meetings, Maple to the Outlet: Conducted an open house and formal presentation with public questions and answers to present project design information between the outlet and the Maple River to affected landowners and the public. In addition, individual landowner meetings were conducted to gain information for incorporation into progressing designs. The meetings were held at the Harwood Community Center.

March 19, 2012, Richland and Wilkin Counties: Met with Richland and Wilkin County Commissions in Wahpeton, ND to present county-specific impact information. This meeting was open to the public.

September 13, 2012 Public Meeting, Post Feasibility Analysis: The purpose of this open house and public meeting was to present information on the Project, status of ongoing work, proposed revisions, and the path forward. This meeting presented proposed modifications to the Project, including in-town levees, gates on the inlet and the southern alignment options. The meeting was held at the Moorhead Marriott.

January 8-10, 2013, Oxbow, Hickson and Bakke Levee Concept Public Meeting: The purpose of this open house and public meeting was to present the potential ring levee concept to the residents of these three communities as an alternative to acquiring the communities in fee. Individual landowner meetings were also held to seek local input on whether a ring levee would be the preferred course of action and to compile lists of questions and concerns. The public meeting was held at Bennett Elementary School in Fargo. Individual landowner meetings were held at the Hickson Community Center.

April 10-11, 2013, Bakke, Hickson and Upstream Residential Property Owner meetings: These individual meetings were conducted by the non-Federal sponsors with Corps support. The purpose of the meetings was to hear individual concerns and provide information on mitigation for the upstream impacts caused by the Project. Those invited included residents of Bakke and Hickson and other residential landowners located upstream of the Project. The meetings were held at the Hickson Community Center and Moore Engineering offices in Fargo.

June 25, 2013, Draft Supplemental Environmental Assessment Open House and Public Meeting: The Corps of Engineers, in cooperation with the non-Federal sponsors, hosted a meeting to discuss the Draft Supplemental Environmental Assessment. The meeting was held at the Fargo Civic Center, Centennial Hall.

Additional public meetings were held by the non-Federal sponsors.

**Cultural Resources:** The original Programmatic Agreement for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project was signed in June and July 2011. The Programmatic Agreement states that the Project's Area of Potential Effects (APE) includes "project-related floodproofing locations", which would include the proposed Oxbow/Hickson/Bakke ring levee. Amendment No. 1 to the Programmatic Agreement (in Attachment 2) adds environmental mitigation areas and in-town levee areas to the Project's APE. In addition, the Amendment changes the distance at which visual impacts are included in the APE from 1/8th mile to 1/2th mile to cover those segments of excavated material berms and tieback embankments which need to be over 20 feet tall for engineering or geotechnical reasons.

On February 7, 2013, a letter was sent to the Tribal Historic Preservation Officers (THPOs) or cultural resources points-of-contact of 15 tribes summarizing all cultural resources work conducted in calendar year 2012 and listing potential cultural resources work scheduled for 2013. On March 20, 2013, a copy of the Amendment to the Programmatic Agreement was sent to these same THPOs and cultural resources points of contact for their information.

**Comments:** The Draft Supplemental Environmental Assessment was available for public review and comment from June 14, 2013 to July 15, 2013. The review period generated a number of questions and comments and covered a wide range of topics. Many comments were unique and many were reiterated by multiple individuals. In an attempt to provide more clear and understandable responses, comments have been condensed, paraphrased, and addressed once (Appendix F).

## 7 REFERENCES

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