DEPARTMENT OF NATURAL RESOURCES

Fargo-Moorhead Flood Risk Management Project

Draft Supplemental Environmental Impact Statement

08/27/ 2018

Executive Summary

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Introduction

In May 2016 the Minnesota Department of Natural Resources (DNR) published a Final Environmental Impact Statement (Final EIS) for the Fargo-Moorhead Flood Risk Management Project (the Project). The dam that was proposed as part of the project that was evaluated in the 2016 Final EIS was denied a permit by DNR's Dam Safety permitting program in October 2016. The proposer has revised the Project with the development of a new design, called Plan B, which requires preparation of a Supplemental Environmental Impact Statement (SEIS).

Environmental Review Process

The DNR determined that the proposed changes to the design of the original Project, which resulted in the Plan B Project design, are substantial and could affect the potential significant adverse environmental effects of the project. Therefore, the DNR ordered preparation of a SEIS. These changes include the following:

- The relocation of the dam/Southern Embankment and associated change in locations of the Red River Structure (RRS) and Wild Rice River Control Structures (WRRS) would result in a different inundation area and construction footprints within the rivers than what was evaluated in the 2016 EIS.

- Relocation of the Eastern and Western Tieback levees also result in approximately 25 square miles of inundation area that were not part of the original inundation area and therefore were not evaluated in the 2016 EIS. These relocations also change approximately ten miles of embankment construction footprint area from what was evaluated in the 2016 EIS.

- The change in operations from 17,000 cfs to over 22,300 cfs would require additional in-town flood protection measures that were not evaluated in the 2016 EIS.

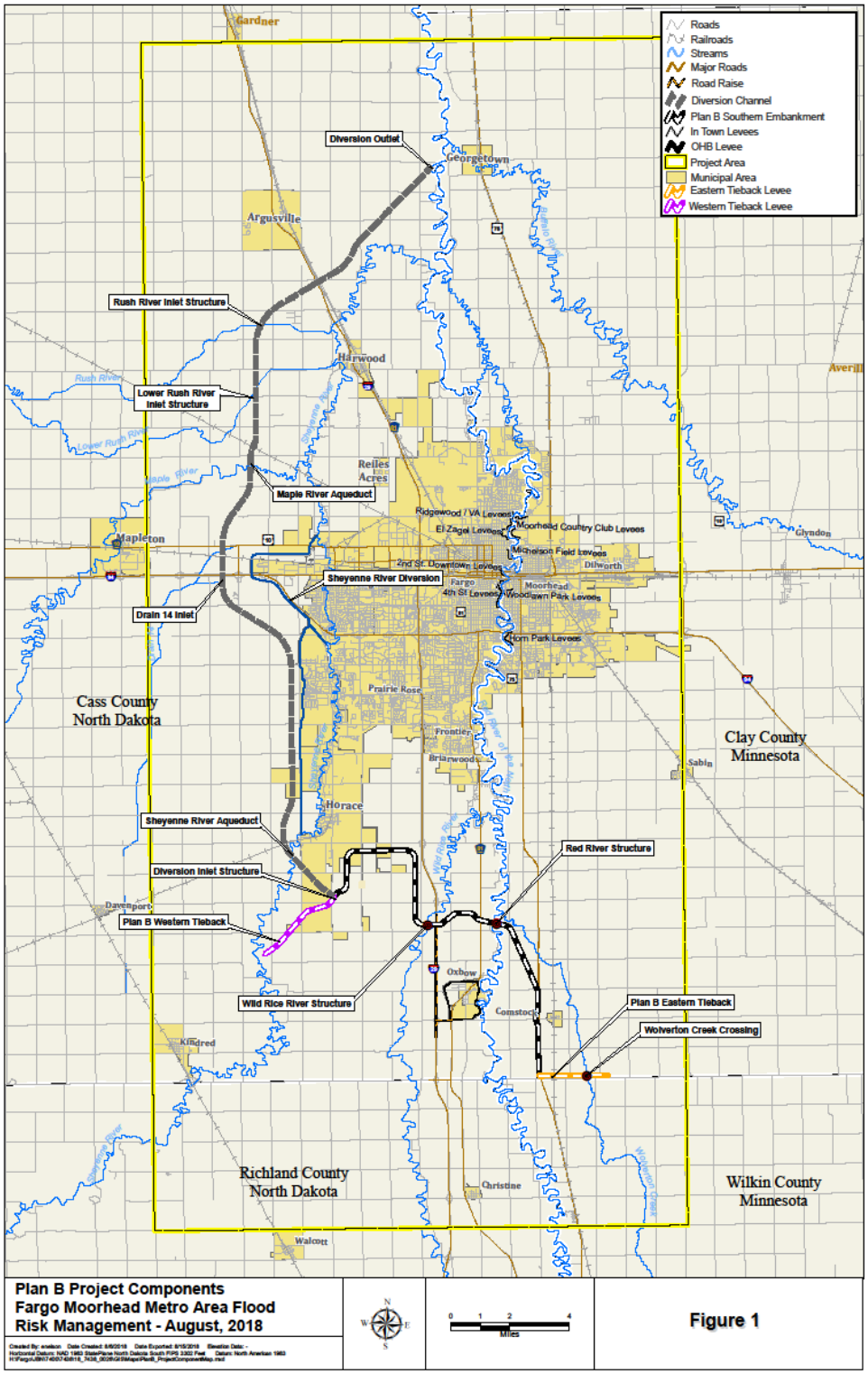
On May 21, 2018 the DNR issued a SEIS Preparation Notice for the Plan B Fargo-Moorhead Flood Risk Management Project (Plan B or Project). The notice included a proposed scope for the SEIS and identified the 20-day comment period for any person to object to the proposed scope. 46 comments were received and the DNR considered these comments as part of preparing this SEIS.

The Draft SEIS was published on August 27, 2018 in the Environmental Quality Board (EQB) *Monitor*, which began the public comment period. During the public comment period, a public informational meeting will be held in the Fargo-Moorhead area. At the end of the public comment period, the DNR will consider all substantive comments received for potential revisions to the Final SEIS. The Final SEIS will include responses to all substantive comments received. The Final SEIS will be published in the *EQB Monitor,* beginning a 10-day comment period for persons to submit comments on the adequacy of the Final SEIS. Any comments received will be considered when determining the adequacy of the Final SEIS. Once the SEIS has been determined to be adequate, environmental review will be complete and the prohibitions on final governmental approvals which is currently in effect will be lifted.

Project Description

As proposed, Plan B would retain an approximately 30-mile long diversion channel on the North Dakota side of the F-M area. Plan B also includes about 20 miles of Dam/Southern Embankment and tieback levees. The Eastern Tieback levee ties into high ground in Minnesota along the Clay/Wilkin county line crossing Wolverton Creek, where box culverts would allow Wolverton Creek to pass through the levee. The Western Tieback begins at the Diversion Inlet Control Structure and head in a southwesterly direction along a high ridge. The Dam/Southern Embankment would extend from the Diversion Inlet Control Structure to the Eastern Tieback levee. The When operated, Plan B would divert a portion of the Red, Wild Rice, Sheyenne and Maple Rivers' flow upstream of the F-M urban area, intercept flow at the Lower Rush and Rush Rivers, and return it to the Red River downstream of the F-M urban area (see ES Figure 1).

ES Figure 1. Plan B Project Components



There are two zones of inundation upstream of the Southern Embankment that define the federal requirements for land mitigation. The United States Army Corps of Engineers (USACE) would impose use and development limitations on lands where Project impacts produce more than 1 foot of stage (inundation) for either the 100-year or the 500-year flood event. Zone 1 is a more restrictive inner area, while Zone 2 is a less restrictive outer area.

Operation of the Red and Wild Rice River inlet structures would occur when it becomes known that a stage of 37.0 feet would be exceeded at the United States (U.S.) Geological Survey (USGS) gage in Fargo (Fargo gage). At this stage, the flow through Fargo would be approximately 21,000 cubic feet per second (cfs). A flow of 21,000 cfs at the Fargo gage is approximately a five-percent chance flood (i.e., 20-year flood). Operation begins by partially closing the gates at the Red River and Wild Rice River control structures. Once the gates are partially closed, water would begin to accumulate in the inundation areas.

The Project would remove large portions of existing floodplain downstream of County Road 16 and within the F-M area downstream of the tieback embankment. This would reduce flood damages and flood risk in the F-M urban area, but it would not completely eliminate flood risk. The Project would reduce flood stages on the Red River in the cities of Fargo and Moorhead and would also reduce stages on the Wild Rice, Sheyenne, Maple, Rush and Lower Rush Rivers between the Red River and the diversion channel. When the Project is operational, the stage from a 100-year flood on the Red River would be reduced from approximately 41.4 feet, (assuming emergency levees confine the flow), to 37.0 feet at the Fargo gage.

Alternatives

The 2016 Final EIS alternative screening process considered 29 different alternatives. For this SEIS, the DNR reconsidered the 29 previously identified alternatives. In addition to the previously-screened 29 alternatives, during the Draft SEIS scoping period, DNR received three new alternatives. One of the three new alternatives was described in various ways by many commenters, and therefore was subsequently divided into two alternatives to ensure clarity of the analysis. In all, DNR considered for full analysis in the Draft SEIS the 29 previously-screened alternatives and 4 new alternatives for a total of 33 alternatives.

The SEIS alternative screening process verified the exclusion of the 29 previously-considered alternatives. One of the new alternatives was a variation of the Minnesota 35K Diversion that was evaluated in the USACE Final Feasibility Report Environmental Impact Statement (FFREIS), with the addition of an upstream staging area to prevent downstream flood increases. One of the primary reasons DNR denied the Dam Safety permit of the previously-proposed Project was due to the inequality of benefits and impacts between North Dakota and Minnesota. Construction of the diversion channel in Minnesota would have resulted in the majority of permanent impacts from the Project occurring within Minnesota, while Minnesota received limited flood-risk reduction benefits. As such, this alternative would be unable to be permitted and has been excluded from further consideration as unreasonable.

Another alternative identified in SEIS Scoping comments was often called the "JPA alignment" or "Charlie Anderson's alignment," and was part of the Governor's Task Force to develop a Plan B. This alternative had a more northerly location for the Southern Embankments and a revised alignment of the diversion channel in the northwest portion of the project area. The realignment of the diversion channel required a different crossing location of the Sheyenne River that would create additional impacts in that location and necessitate a wider diversion. These factors led the DNR to determine that this alternative did not have significant environmental benefits over Plan B, so it has been excluded from further evaluation.

The DNR evaluated a third alternative that consists of the "JPA alignment" or "Charlie Anderson's alignment" for the Southern Embankment, but maintains the Plan B diversion channel alignment. This alternative, called Alternative C, has many tradeoffs between multiple environmental effects as well as social impacts. Information was collected for Alternative C as part of SEIS preparation. The information collected enabled DNR to determine that Alternative C had similar environmental benefits as Plan B, but it also had greater socioeconomic impacts than Plan B. Based on this information, Alternative C has been excluded from further analysis.

The No-Action Alternative (with emergency measures) is addressed in the SEIS. This alternative has been updated from the 2016 Final EIS by using the Period of Record (POR) hydrology for predictive hydrology and hydraulic (H and H) modeling.

Environmental Effects

The scope of the Supplemental EIS (SEIS) must be limited to impacts, alternatives and mitigation measures not addressed or inadequately addressed in the 2016 Final EIS. The DNR has identified the following environmental consequences of Plan B that would be similar to what was analyzed in the 2016 Final EIS, and thus, were not evaluated in the SEIS:

- Cold Weather Impacts on Aqueduct Function and Biota
- Cover Types
- Potential Environmental Hazards
- State-listed and Special Status Species
- Invasive Species

This section summarizes the major findings of the affected environment and environmental consequences identified in Chapter 3 of the Draft SEIS.

Hydrology and Hydraulics

The USACE, along with the Diversion Authority and its consultants have completed Phase 9 H and H modeling for Plan B. The 2016 Final EIS used Phase 7 H and H modeling to analyze environmental consequences of the previously-proposed Project. The major differences between the Phase 7 and Phase 9 H and H modeling are as follows:

- Use of a calibrated HEC-HMS hydrologic model for the Red River watershed. This modeling method considers the runoff from the watershed during a specific rainfall event to help define flow into the hydraulic model.
- Use of the updated period of record (POR) for developing the hydrology (versus the Expert Opinion Elicitation Panel (EOEP) hydrology).
- Modification of the Phase 7 models based on the feedback from an Independent Technical Review and an Agency Technical Review of the hydrology and hydraulics to include: suggested modifications to bank station locations, storage and lateral structure connections, cross-section placement, reach lengths, and use of blocked obstruction. Suggestions were also made regarding completing a sensitivity analysis for weir coefficients, questioning the accuracy of culvert geometry in the storage area connections, and checking the overall storage in the model.
- Incorporation of the Plan B project changes such as locations of Project features and operations.

ES Table 1 provides the discharge rates and stage at the USGS Gage at Fargo for various flood events.

ES Table 1 Discharge Rates and Stage by Flood Event

Event	Discharge (cfs) at USGS Gage at Fargo, ND	Stage (feet (ft)) at USGS Gage at Fargo, ND[1]
10-year POR	13,865	32.5
50-year POR	26,000	39.5
100-year POR	33,000	41.3
500-year POR	66,000	46.5

ES Table 2 provides the discharge rates and stage at the USGS Gage at Fargo for historic flood events as a comparison to the POR modeled flood events.

ES Table 2 Historic Flood Event Discharges and Stages

Event	Discharge (cfs) at USGS Gage at Fargo, ND	Stage (ft) at USGS Gage at Fargo, ND
1997 Historic	28,000	39.7
2006 Historic	19,900	37.1
2009 Historic	29,500	40.8
2010 Historic	21,200	37.0
2011 Historic	27,200	38.8

The details of Project operation correlate with the specific flood event that occurs. ES Table 3 identifies how the Project would operate given different flood discharge rates.

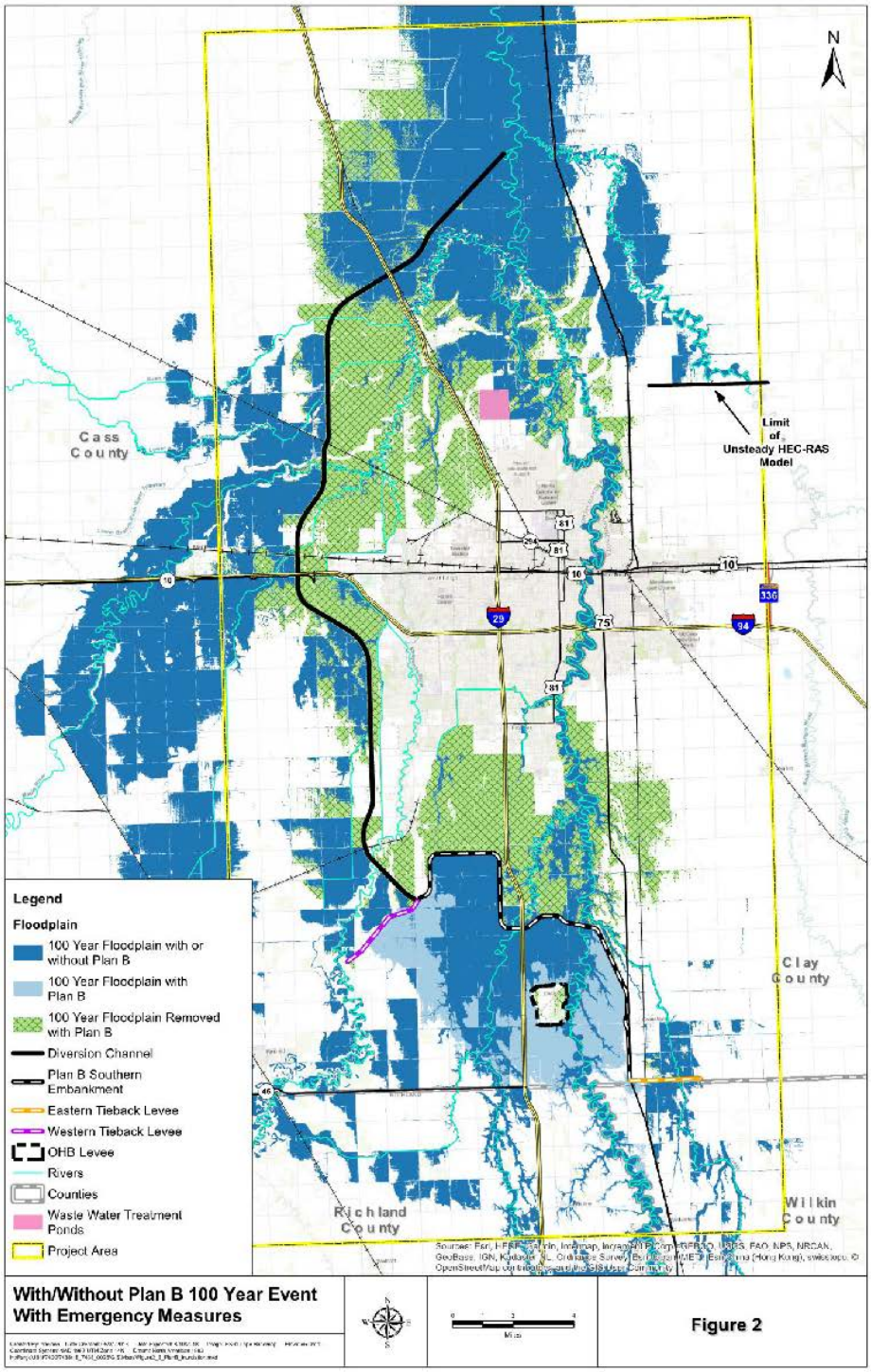
ES Table 3 Operation Summary by Discharge Rate Range

Discharge Rate	Project Operations
<21,000 cfs	No operations
21,000 cfs to 39,000 cfs	• 21,000 cfs flow in the Red River through town • Maximum 20,000 cfs into diversion channel • Flow increases into diversion channel limited to 2,000 cfs per hour • Maximum surface water elevation of 921.0 feet.
39,000 cfs to 64,000 cfs	• Target flows in the Red River through town of 21,000 cfs to 27,000 cfs • Flow into diversion channel between 20,000 cfs and 25,000 cfs (unsually high water volumes would require higher flows into the diversion channel) • Maximum surface water elevation of 922.5 feet
>64,000 cfs	• Flow in the Red River through town would be limited to 40.0 feet at the USGS Gage at Fargo • Over 25,000 cfs would flow into diversion channel • Maintain 923.5 feet water surface elevation • Evacuation order would be issued
After flood peak	• RRS and WRRS gates would be operated to limit stage reduction in the staging area below 2 feet/day

Project operations for the 100-year flood event would result in the following changes to flood inundation (see (ES Figure 2):

- 123,954 acres of total inundation in project area.
- 56,882 acres of existing 100-year floodplain would no longer be removed from flooding.
- 12,049 acres area outside the existing 100 -year floodplain that would be newly inundated.
- Downstream stage increases of 0.14 feet at Georgetown, Minnesota.

ES Figure 2. Plan B, 100-Year Flood Event Inundation



FEMA

Plan B would change the flood risk within the Project area such that a revision to the Flood Insurance Rate Maps (FIRM) would be needed. The USACE has coordinated with FEMA and developed a FEMA/USACE Coordination Plan (Coordination Plan) that outlines floodplain management requirements for Plan B, including Conditional Letter of Map Revisions (CLOMR) requirements for floodplain map revisions and FEMA-related Project mitigation.

After completion of a Project, local sponsors would submit a Letter of Map Revision (LOMR) request for Plan B based on the Project as-built and supporting technical data including updated H and H analysis and delineation including new floodplain boundaries and floodways.

The FEMA revision reach is defined by the Red River profile and limited to where Plan B would alter the river profile flood elevation by more than 0.5 feet. The current upstream and downstream limits of the FEMA revision reach is near model station 2673320, about one mile south of Wolverton and the outlet of the diversion channel, respectively. The actual FEMA revision reach would be determined once the Project design is finalized and updated H and H modeling becomes available; however, it isn't anticipated that the limits would change from where they currently are mapped.

The potentially impacted structures have been classified into five categories according to the mitigation processes that will be applicable to them. These structures are identified by category and color and listed in ES Table 4.

ES Table 4. Proposed Upstream Mitigation by Impact Category and Location

Upstream Structure Mitigation Area	Mitigation Category 1 (Structures in Floodway)	Mitigation Category 2 (Total depth greater than 2-foot)	Mitigation Category 3 (Total depth between 2-feet and 0.5-feet)	Mitigation Category 4 (Total depth less than 0.5-feet)	Mitigation Category 5 (Outside Revision Reach)
USACE Zone 1	Structure Acquisition and Removal	Not Applicable	Not Applicable	Not Applicable	Not Applicable
USACE Zone 2	Not Applicable	Structure Acquisition and Removal	Mitigation via Non-structural Measures or Acquisition and Removal	Mitigation via Non-structural Measures or Acquisition and Removal	Not Applicable

Upstream Structure Mitigation Area	Mitigation Category 1 (Structures in Floodway)	Mitigation Category 2 (Total depth greater than 2-foot)	Mitigation Category 3 (Total depth between 2-feet and 0.5-feet)	Mitigation Category 4 (Total depth less than 0.5-feet)	Mitigation Category 5 (Outside Revision Reach)
Outside of USACE Zones	Not Applicable	• FMDA: Structure Acquisition and Removal • USACE: Not Applicable	• FMDA: Non-structural Measures or Acquisition and Removal • USACE: Not Applicable	• FMDA: Non-structural Measures or Acquisition and Removal • USACE: Not Applicable	• FMDA: To be determined by USACE Takings Analysis • USACE: Takings Analysis

Wetlands

Plan B would result in direct wetland impacts from construction of Project features. ES Table 5 provides the estimates of the types and acreage of wetlands impacted.

ES Table 5. Direct Wetland Impacts

Wetland Type (Eggers and Reed)	Total project (acres)	Southern Embankment (acres)
Open water	<1	0.0
Seasonally flooded basin	1,426	155.6
Wet Meadow	155	71.4
Shallow Marsh	84	17.0
Shrub-Carr	0	0.0
Total Acres	**1,666**	**244.0**

Wetland impacts due to construction of the diversion channel and OHB levee would be addressed under Army Permit No. NWO-2013-1723-BIS and NWO-2014-0236-BIS respectively. Construction of the water control structures and the Southern Embankment for Plan B would require 244 acres of wetland to be mitigated.

Project operation may increase inundation of some wetlands in the Project area compared to flood events occurring under existing conditions. In some areas, floodwater depths during Project operation are estimated to be over five feet. Flood duration, depth, and associated drainage or infiltration rate changes within the wetland basins could cause changes in wetland type over time through repeated killing of vegetation, sediment deposition, and in some locations, scour. It is estimated that there are 253 acres of wetlands within the inundation area that could have indirect impacts from project operation.

The greatest potential for sediment to cumulatively fill shallow wetlands would be near the Southern Embankment, where flood inundation would be the greatest and most frequent. Wetland types could change over time in the inundation area due to sediment deposition during Project operation. Wetlands downstream of structures may also be affected through increased velocities and resulting scour due to the structures. The project proposers have not identified any mitigation for indirect wetland impacts.

Aquatic and Terrestrial Resources

Construction of the entire Project would impact 41.1 acres of aquatic habitat including 19.1 acres of impact from the Sheyenne River Aqueduct and the Maple River Aqueduct. For the Rush River and Lower Rush River, 2.1 and 3.4 miles, respectively, of river channel would be abandoned due to Project construction, as the flows from each river would be directed out of the existing channel and into the diversion channel. The RRS would remove 13 acres of aquatic habitat and the WRRS would remove 8 acres of aquatic habitat. The Wolverton Creek structure would remove one acre of aquatic habitat from the stream.

Construction of these Project features would also directly impact riparian vegetation that serves as both aquatic and terrestrial habitat for various plant and animal species at different life stages. Floodplain forest impacts from construction of the entire Project would result in the loss of 124 acres of floodplain forest.

Fish passage and biological connectivity, or the ability to migrate upstream or downstream, on rivers and tributaries, is important to the overall health of an aquatic community. The Project has the potential to disrupt aquatic organism passage through the construction of the diversion channel, associated control structures, and tieback embankment, as well as through modification of the natural hydrology of the project area by controlling water flow and staging water during flood events.

The Project is proposed to operate only when flood discharges exceed 21,000 cfs, which would limit potential impacts to biological connectivity but not eliminate them. Biological connectivity and fish passage could be impacted by the presence of the RRS, WRRS and Wolverton Creek box culverts, regardless of whether or not the Project is operating.

Within the Red River Basin water velocities above 2 feet per second can create difficulties for fish to migrate upstream. At the 10-year flood event, water velocity through the WRRS is estimated at 3 feet per second and water velocity through the RRS is estimated at less than 2 feet per second. The Wolverton Creek box culverts would have an estimated water velocity of 3.4 feet per second at a 10-year flood event. Based on this information, the WRRS and the Wolverton Creek box culverts could result in additional impediments to fish passage under certain conditions when the Project is not operating.

An Adaptive Management and Mitigation Plan (AMMP) developed by the USACE proposes mitigation for the direct impacts to aquatic habitat and the floodplain forest impacts. Also, the AMMP proposes to monitor for potential impacts to steam stability and fish passage and biological connectivity. However, the AMMP does not propose mitigation for impacts to fish passage or biological connectivity, because the USACE determined that Plan B will not impact fish passage or biological connectivity. The DNR does not agree that mitigation of potential impacts to fish passage and biological connectivity are not

warranted. In the 2016 Final EIS, the USACE had previously proposed to construct a fish passage structure on Drayton Dam to mitigate fish passage and biological connectivity impacts. The change in operation would reduce the impact but not eliminate it. For this reason DNR believes that constructing a fish passage on Drayton Dam is still needed. The USACE is concerned that the cost of the Drayton Dam fish passage and the permanent fish passage benefits that it would provide are more mitigation than is warranted for the Project.

DNR has identified the following concerns with the proposed mitigation for aquatic and terrestrial resources:

- Use of Index of Biological Integrity (IBI) as sole source of habitat quality assessment in mitigation calculations. IBI is utilized as an indicator of watershed habitat, not specific locations within a river reach.
- Proposed use of engineered channels that connect the river to the control structure as mitigation for aquatic habitat impacts. This habitat will likely have limited natural stream design and function.
- No proposed mitigation for biological connectivity and fish passage.
- Lack of identified triggers when monitoring results would indicate when an adaptation is needed and lack of potential actions that could be taken to adapt to monitoring results.

Cultural

Nearly 33,400 acres within the Project area have been subject to Phase I cultural surveys. Additional Phase I surveys for Plan B would be needed in the following areas:

1. The newly-aligned western tieback.
2. Transportation corridors.
3. The newly-aligned eastern tieback, including the Wolverton Creek crossing.
4. The majority of the new staging area.
5. The Area of Potential Effect (APE) for direct and indirect effects for the increased river stage to 37 feet through town.

The previous surveys identified the following cultural resources that would potentially be impacted by Plan B.

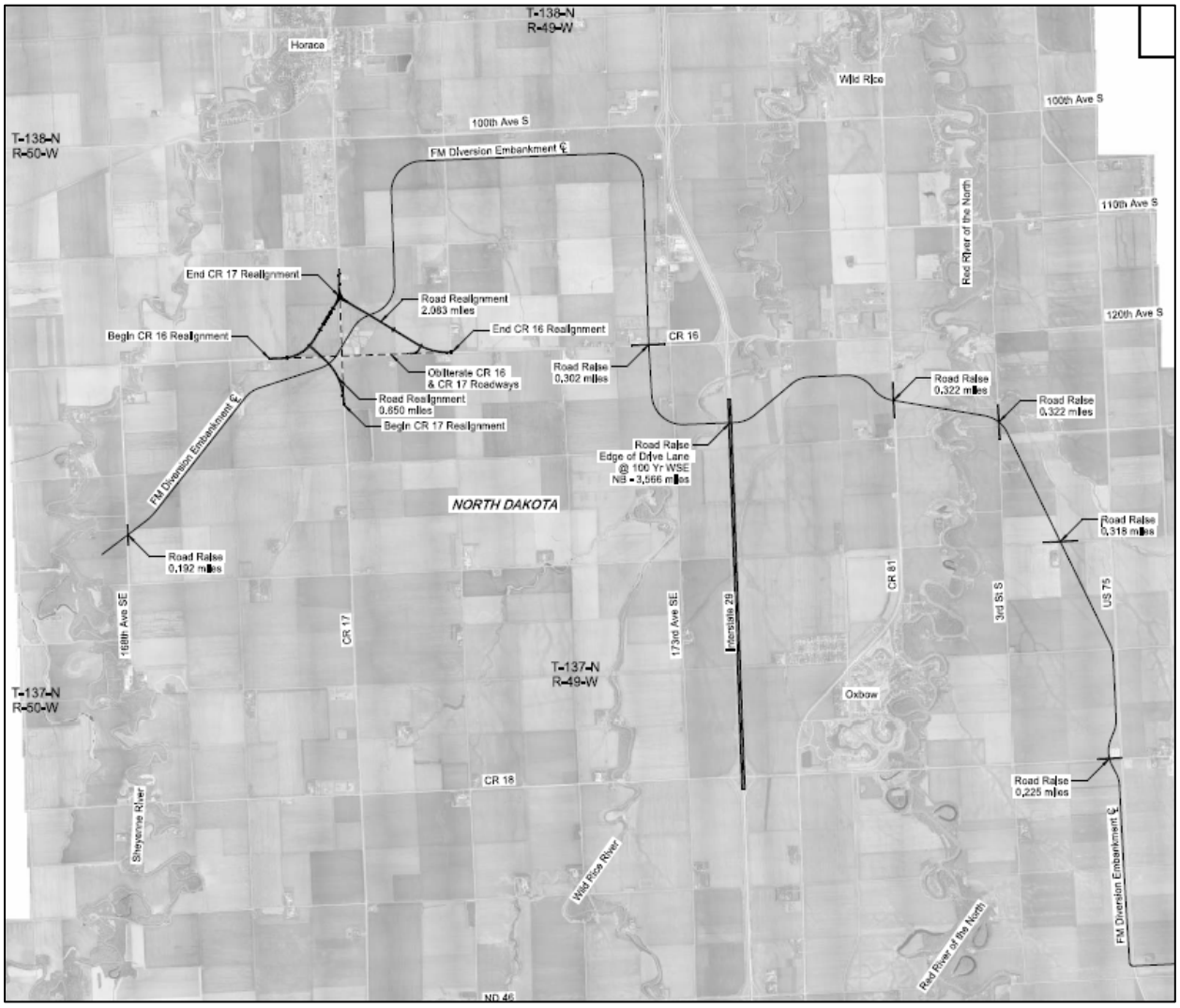
- Three National Register-eligible farmsteads
- Viewshed impacts to St. Benedicts cemetery, Wild Rice and Red River Cemetery, 1953 concrete bridge and Freeman farmstead
- Clara Cemetery
- Hemnes Cemetery
- Ramstad farmstead
- Former log cabin site

The description of the USACE's compliance with Section 106 of the National Historic Preservation Act and the Programmatic Agreement has not changed and is described in the 2016 Final EIS. Proposed cemetery mitigation has changed since the 2016 Final EIS and is discussed in detail in Socioeconomics section.

Infrastructure

Plan B would require modifications to roads and bridges due to the new Dam/Southern Embankment and tieback levee locations.

ES Figure 3. Plan B Required Road and Bridge Modifications



In-town levees would need modification to accommodate the additional flows through town. A total of seventeen (17) specific locations would require modification.

New drain channels would need to be constructed on the upstream and downstream length of the embankment and tieback levees. Some large existing drains may need modification. Drain 51woudl be rerouted to the Wild Rice River. Extensive modifications would be needed to Drain 27.

Land Use Plans and Regulations

The DNR contacted, via email, those cities, counties and water resource districts that have identified land use concerns in the past. The goal of the communication was to collect information about how Plan B would interact differently with those land use plans and regulations.

Cass County, Cass County Joint Water Resource District, the City of Fargo, and the City of Moorhead responded that they did not have concerns about Plan B's compatibility with their land use plans and regulations.

The Buffalo Red Watershed District identified a concern that controversial projects (such as Plan B) need to be, "…thoroughly reviewed/vetted with all affected parties, including landowners. Project design/designers have to be flexible to incorporate other's concerns/ideas."

Richland County and Pleasant Township did not reply to the email request. Wilkin County answered by indicating that the County Zoning and Land Use Ordinances contain the answers to the questions posed in the email request. Public comment received from Wilkin County and Pleasant Township during the SEIS scoping comment period indicates that the Project may have difficulty complying with portions of their existing land use ordinances.

Along with any mitigation required by permitting, the Diversion Authority has prepared a Property Rights Acquisition and Mitigation Plan (PRAM). The PRAM includes a section on compensation for damages through an operations and maintenance (O&M) funding program. The program will be funded using sales tax revenues and/or a maintenance district.

Minnesota Dam Safety and Public Water Works

Plan B would require both a Minnesota Dam Safety and Public Water Works permit. Minnesota Rules, Chapter 6115 contain the details of application requirements and criteria for issuance or denial of a permit. Other considerations for permit approval or denial include Minnesota Statutes § 116D.04 Subdivision 6, and Minnesota Statutes §§ 103G.245 and 103G.315. Minnesota Statute §103G.315 states "if the commissioner concludes that the plans of the applicant are reasonable, practical, and will adequately protect public safety and promote the public welfare, the commissioner shall grant the permit".

The Southern Embankment of Plan B would be classified as a high hazard dam. An important consideration for any high hazard dam application is the risk that it poses in the case of a dam breach. A dam breach analysis for Plan B had the following findings:

- A dam breach of Plan B during the PMF (90,000 cfs) creates no additional risk than the risk of No Action with Emergency Measures during the same flood event.
- A dam breach of Plan B during 100-year event would create additional risk than the risk of No Action with Emergency Measures during the same flood event.
- The risk of a breach for the Southern Embankment is less than the risk of an in-town levee breach during project operation.

- The estimated time of response to a dam breach is between 10-100 hours, so the risk could be managed with appropriate emergency response planning and implementation.
- The depth of water behind the dam west of Comstock during the 90,000 cfs Event (with breach) would range from 2-6 feet. A breach at this location is not likely to impact Comstock, which is approximately ½-mile east of the dam.

Socioeconomic

Plan B does not significantly change the major socioeconomic trends (demographics, employment and income, housing, and fiscal resources) for the four counties that comprise the Project area: Cass and Richland County, North Dakota; and Clay and Wilkin County, Minnesota.

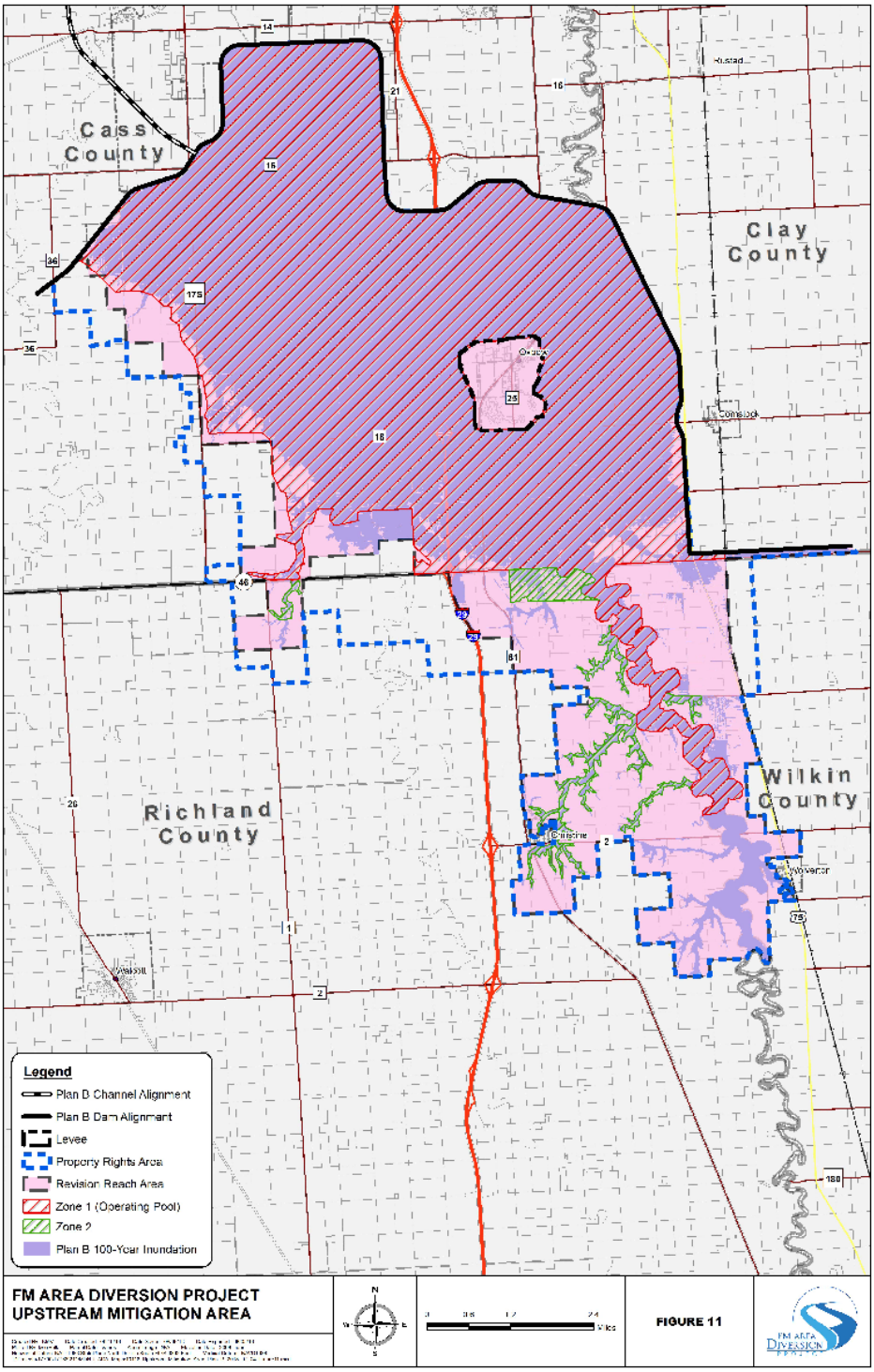
Changes to the Southern Embankment and the eastern and western tieback would change the number and extent of impacted structures, parcels and cemeteries near those features, as well as the geographic extent of impacts between Minnesota and North Dakota and the upstream mitigation area.

During a 100-year flood event Plan B would impact 159 more structures than the No Action with Emergency Measures. Forty-two (42) of these are residential structures and 117 are non-residential structures. The No Action with Emergency Measures would impact 6 more parcels compared to Plan B during the 100-year flood event.

Plan B would create inundation impacts to five of the eleven cemeteries in the project area: Clara, Eagle Valley, North Pleasant, Roen Family and Wolverton Cemeteries.

St. Benedict's Cemetery and the Lower Wild Rice and Red River Cemetery would likely experience viewshed impacts due to their proximity to the Southern Embankment. The 2018 Plan extends flowage easements to cemeteries outside the staging area and within the property rights area (see ES Figure 4)

ES Figure 4. Upstream Mitigation Area Boundaries, Plan B



Inundation of organic farms by Project operations has been identified as a potentially significant impact to these agricultural producers. ES Table 6 identifies how organic farms in the Project area are affected by the No Action Alternative (with Emergency Measures) and Plan B.

ES Table 6. Organic Farm Impacted Acreage for 100-Year Flood Event

Farm		Acres within No Action (with Emergency Measures)	Acres Removed from Impact with Plan B	Acres Impacted with or without Plan B	Acres newly-impacted with Plan B
Farm 1: 998 acres	*Flooded*	78		62	55
	Non-flooded	920	16		
Farm 2: 1,330 acres	*Flooded*	387		368	0
	Non-flooded	943	19		
Farm 3: 835 acres	*Flooded*	29		29	0
	Non-flooded	806	0		
Farm 4: 1,208 acres	*Flooded*	22		15	16
	Non-flooded	1186	7		
TOTAL: 4,371 acres	*Flooded*	516		474	71
	Non-flooded	3855	43		

Plan B does better job than the previously proposed project of providing an equal geographic distribution of inundation during Project operation with respect to equality between Minnesota and North Dakota. Minnesota would have slightly more inundation impacts than flood risk reduction benefits. ES Table 7 provides the total inundated acres under Plan B during a 100-year flood event. This table includes total inundation and does not account for acres that may be newly-inundated or have current flooding

ES Table 7. Plan B, 100-year flood, Total Acres Impacted and/or Protected in Project Area

Area Inundated or Benefited	*Number of Acres*
Total Inundated Acres in Project Area	**123,954 acres**
Minnesota Total Inundation	33,545 acres (27%)
Wilkin County Total Inundation	3,599 acres
Clay County Inundation Impacts	29,946 acres
North Dakota Total Inundation	90,409 acres (73%)
Richland County Inundation Impacts	8,697 acres
Cass County Inundation Impacts	81,712 acres
Total Acres Removed from Flooding in Project Area	**56,882 acres**
Minnesota Removed from Flooding	9,635 acres (17%)
Wilkin County Removed from Flooding	5 acres
Clay County Removed from Flooding	9,630 acres
North Dakota Removed from Flooding	47,247 acres (83%)
Richland County Removed from Flooding	4 acres
Cass County Removed from Flooding	47,243 acres

Source: HMG, 2018

Note:

- Total inundation includes new inundation, existing inundation and removed inundation

Cumulative Potential Effects

Cumulative potential effects (CPE) are environmental or social effects that result from the proposed project in conjunction with other projects in a given area. The effects from any one project may be small; however, the aggregated effects from all the projects together may be significant.

ES Table 8 identifies the reasonably foreseeable projects that could interact with Plan B as well as the relevant environmental impact categories.

ES Table 8. Reasonably Foreseeable Projects

Reasonably Foreseeable Project	Project Location	Applicable Environmental Impact Category
Wolverton Creek Restoration and Sediment Reduction Project	Holy Cross Township, Clay County; and Wolverton Township, Roberts Township, and Mitchell Township, Wilkin County	Hydrology Stream Stability Wetlands Fish Passage Wildlife Resources Cultural Resources
J.D. No. 1 Improvements	Holy Cross and Alliance Townships, Clay County	Hydrology Stream Stability Wetlands Socioeconomic

The size, scale and magnitude of Plan B is such that environmental impacts from other reasonably foreseeable projects are minor in comparison. The environmental effects from other projects combininged with Plan B's anticipated effects would result in minor potential increases in environmental effects to the resources in the relevant geographic area. No potentially affected resources were identified as being particularly susceptible to the minor additional environmental effects from the other identified projects when combined with Plan B's potential environmental effects.

Although the combined effects of Plan B with those of thereasonably foreseeable projects did not identify any significant environmentalimpacts, impacts to hydrology and fish passage from the WRRS and the Wolverton Creek box culverts would combine with existing road culverts that also having a negative impact on hydrology and fish passage. These combined effects would result in a cumulative negative impact on fisheries and aquatic resources.

Comparison of Alternatives

For the purposes of the pending 2018 Dam Safety permit application decision, DNR would only compare Plan B to other reasonable alternatives, which would be the No Action Alternative (with Emergency Measures). The previously-proposed Project is not evaluated in this SEIS buy is included here for informational purposes.

Chapter 5 of the SEIS provides detailed comparison of the Plan B Project to the previously-proposed Project and the No Action with Emergency Measures. Some of the more relevant comparisons are provided below in ES Table 9.

ES Table 9. Relevant Comparisons of Plan B, the Previously-Proposed Project, and the No Action Alternative (with Emergency Measures), 100-year

Topic	Previously Proposed Project	Plan B	No Action with Emergency Measures
Total inundation (100-year event)	118,513 acres	123,954 acres	168,786 acres
Newly inundated area (100-year event)	20,461 acres	12,049 acres	0 acres
Geographic distribution of benefits and impacts (100-year)	Minnesota experiences about 40% of the inundation and North Dakota experiences about 60%.	Minnesota experiences 27% of the inundation and North Dakota experiences 73%.	Minnesota experiences 23% of the inundation and North Dakota experiences 76%.
Impacted structures (100-year event)	828	698	539
Organic Farms impacted (100-year event)	2,200 acres	474 acres	516 acres

Mitigation

Chapter 6 includes a description of major differences between the 2016 and 2018 Mitigation and Monitoring plans and proposals, and an evaluation of updated mitigation and monitoring sufficiency. Some of the more significant changes to proposed mitigation.

- The Diversion Authority proposes to obtain property rights up to the maximum pool elevation of 923.5 ft (i.e., above the 100-year).
- The 2018 Plan includes a supplemental crop insurance plan, provides for private land debris clean-up assistance, and includes early buy-out options.
- The 2018 Plan extends flowage easements to cemeteries outside the staging area and within the property rights area. The Diversion Authority will also provide post-operation clean-up assistance for cemeteries.
- The 2018 Plan identified potential mitigation options including restoration of Bois de Sioux River, Lower Otter Tail River, or Sheyenne River. Various fish passage project and habitat features in constructed channels.
- The 2018 Plan removes all of the previous-proposed mitigation for biological connectivity, including the Drayton dam fish passage project (due to Project operations being limited to flood discharges over 21,000 cfs).
- The Diversion Authority proposes a Debris Clean-up and Repair program for public lands, which allows for reimbursement of clean-up costs. Private land clean-up would include pick-up, but not reimbursement.

The DNR has identified six mitigation areas where the Diversion Authority and the USACE need to consider additional measures or mitigation.

- Rights or interest in potentially impacted land or structures need to be acquired prior to impactful Project activities.
- Feasibility of monitoring to capture project-related indirect wetland impacts.
- Proposed use of engineered channels that connect the river to the control structure as mitigation for aquatic habitat impacts. This habitat will likely have limited natural stream design and function.
- Lack of identified triggers when monitoring results would indicate when an adaptation is needed and lack of potential actions that could be taken to adapt to monitoring results.

- The assessment of habitat quality of the aquatic habitat impact areas is insufficient and proposed use of the water control structure connecting channels as mitigation is unlikely to provide much mitigation value. The loss of the natural meander channels has not been fully addressed in the mitigation proposals.
- Plan B would create impacts to fish passage and biological connectivity during operations and in situations prior to operation. These impacts are not accounted for in the proposed mitigation.

Issues and Areas of Controversy

DNR's denial of the previously-proposed Project was largely due to the following factors:

- Lack of equitable geographical impacts in comparison to benefits.
- Proposed flood protection for large sparsely developed area.
- In compatibility with land and water resource plans and ordinances.
- Insufficient mitigation.

Comparison of Plan B for these topics provides the following:

- Provides a more proportional balance of impacts to benefits between Minnesota and North Dakota.
- Less sparsely-developed area would be protected.
- The plan still appears incompatible with several local ordinances.
- Mitigation is better, but is still significantly lacking for fish passage and biological connectivity and there is uncertainty about the ability to properly mitigate for direct impacts to aquatic habitat.