US Army Corps of Engineers®
St. Paul District

Final Supplemental Environmental Assessment #3

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

U.S. Army Corps of Engineers

St. Paul District

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1 SUMMARY

The Red River basin in eastern North Dakota and western Minnesota has a long history of flooding due to the unique hydrology and topography of the area. The U.S. Army Corps of Engineers (USACE) completed the Final Feasibility Report and Environmental Impact Statement (FEIS) for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project (Project) in July 2011. The Project was later authorized by Congress in the Water Resources Reform and Development Act of 2014.

Detailed engineering and design studies conducted since the completion of the FEIS resulted in several modifications to the Project (described in Section 2.1). An initial round of modifications was addressed in a Supplemental Environmental Assessment (SEA), dated September 2013. Subsequent modifications to allow more flow through town and change the alignment of the Southern Embankment were addressed in a second SEA, dated February 2019. Information presented in the FEIS and the 2013 and 2019 SEAs is incorporated by reference.

This document focuses primarily on changes to designs and impacts associated with two structures being constructed along the Diversion Channel – the Sheyenne River Aqueduct and the Maple River Aqueduct, as well as changes to impacts associated with the Rush River Inlet. The previous assessments for the aqueduct structures were completed on preliminary designs. Updated design and hydraulic modeling efforts have revealed higher velocities upstream of the aqueduct structures than was anticipated during preparation in the FEIS or previous SEAs. Several alternatives to avoid and minimize impacts for the Sheyenne River Aqueduct and Maple River Aqueduct have been considered and are presented herein. Updated hydraulic modeling for the Rush River Inlet has also revealed higher velocities upstream of this structure. Additional impacts caused by the higher velocities are considered to be minor and are presented herein.

2 PURPOSE AND NEED FOR ACTION

2.1 Introduction and Background

The Fargo-Moorhead Metropolitan Area is a flood prone area located in Cass County, North Dakota and Clay County, Minnesota. The FEIS for the Project was completed in July 2011 to investigate flood issues, identify flood risk management measures, and recommend implementation of a federal project, if appropriate. The Locally Preferred Plan (LPP) from the FEIS consisted of a diversion channel system including, but not limited to: excavated channels; a diversion inlet structure; tieback embankments; gated 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. The LPP became the Federally Recommended Plan (FRP) after the analysis of alternatives in the FEIS and was authorized by Congress in the Water Resources Reform and Development Act of 2014. A Project Partnership Agreement for the Project was executed in July 2016 between USACE and the three non-Federal Sponsors, the City of Fargo, ND, the City of Moorhead, MN, and the Metro Flood Diversion Authority (MFDA).

Detailed engineering and design studies conducted after the completion of the FEIS resulted in several modifications to the Project. These modifications were analyzed in the first Supplemental Environmental Assessment (2013 SEA), which was completed in September 2013. Project modifications addressed in the 2013 SEA included: alignment shifts; diversion channel cross-section modifications; the addition of gates to the Diversion Inlet Structure; the addition of levees and floodwalls in downtown Fargo to accommodate a river stage (RS) of 35 feet during the 1-percent annual exceedance probability (AEP) event (100-year flood); and a ring levee around the communities of Oxbow, Hickson, and Bakke, ND (OHB).

In October 2016, the Minnesota Department of Natural Resources (MnDNR) denied a dam safety and public waters work permit for the project. A joint task force (Task Force) with members appointed by the North Dakota and Minnesota governors was created to propose a framework for flood risk management for the Fargo-Moorhead region. The Technical Advisory Group (TAG) was created to assess project components and alternatives and to provide technical guidance to the Task Force. The primary recommended changes resulting from Task Force and TAG meetings included a new alignment for the dam, or Southern Embankment, and a rise in allowable river stage through the Fargo and Moorhead Metro Area during project operation. A permit for the modified plan was issued by the MnDNR on December 27, 2018. An SEA evaluating the environmental impacts for the modified plan was completed by USACE in February 2019 (2019 SEA).

The project includes concrete aqueduct hydraulic structures that are needed to convey river flow across the Diversion Channel for both the Sheyenne River and Maple River. Considerations for design of the Sheyenne River and Maple River aqueducts have been analyzed in previous documents. With respect to velocity issues, Section 5.2.1.7.5.3 of the FEIS stated:

> "*The structures would be concrete channels with similar widths to the natural channel … Water depths through the structure would remain similar to existing conditions. Likewise,*

water velocities passing through the aqueducts would remain within the general range of what occurs under existing conditions. Water velocities would generally be less than 2 ft/s for discharges up to a 50-percent chance event flow, with lower velocities for lower discharges … Both aqueducts would include boulders or other hard-points strategically placed to provide flow complexity to aid in fish migration. Both aqueducts also will include a low-flow channel at its base, ensuring water depths to help migration even under low flows. The tributary flow structures would reduce flood flows on the Sheyenne and Maple rivers. Flood flows up to at least a 50-percent chance event would pass through these structures. Above that, additional flows would be diverted into the diversion channel. As such, flows through the structures would not exceed those levels identified for a 50-percent chance event."

After completion of the FEIS and 2013 SEA, the USACE completed a flume study. The purpose of this study was to test various types and configurations of roughness elements in a physical model to aid in a design that would provide flow currents and velocities to facilitate fish passage across the aqueducts. State and Federal natural resource agencies and other stakeholders participated in model planning and the review of the model results. Different sizes, shapes, and configurations of various roughness elements were added to the model and evaluated under a range of flows. While not ideal, the natural resource agencies were in general agreement that, based on available modeling results, the roughness elements would result in a diversity of flow conditions that could limit impacts to fish passage across the aqueduct flume for flows up to nearly 1,700 cubic feet per second (cfs). The modeled average cross-section velocity within the aqueduct flume at a flow of nearly 1,700 cfs, with the given roughness elements, was 3.6 feet per second (ft/s). The modeled average cross section velocity considers the velocity in the channel and the overbank areas and averages these areas. Channel velocity references the average velocity specifically in the conveyance area between the top of banks. Channel velocity generally results in higher values as compared to the average cross section velocity.

USACE completed a 30-percent level of design on the Maple River Aqueduct and a conceptual-level design for the Sheyenne River Aqueduct. A Developer selected through the non-Federal sponsors' public private partnership (P3) financing and delivery contracting mechanism was ultimately tasked with design of the aqueducts while meeting a series of technical requirements. Results from the Developer's initial hydraulic model analyses indicated that during high flow events, flow velocities upstream of the aqueduct engineered channels exceeded modeled existing condition velocities to levels that would likely cause erosion and limit fish passage. Velocities within the aqueduct structures exceeded levels that would limit fish passage.

Hydrologic flow-duration analyses were completed for both the Sheyenne and Maple Rivers to assess historic flows which typically occur in April. While fish passage success will ultimately be evaluated based on field observations, USACE and natural resource agencies determined that in order to minimize the potential for adversely affecting fish passage, velocities in the new and existing portions of the Sheyenne and Maple Rivers affected by the proposed aqueduct systems must be no greater than 3.6 ft/s (average cross section velocity) when flows are no greater than 3,850 cfs and 2,500 cfs along the Sheyenne and

Maple Rivers, respectively. The 3,850 cfs Sheyenne River flow and 2,500 cfs Maple River flow were determined to be the flows exceeded 5 percent of the time in April based on historical flow records.

2.2 Purpose for Action

Initial hydraulic modeling of conceptual designs near the Sheyenne River Aqueduct, Maple River Aqueduct, and Rush River Inlet during the FEIS and 2013 SEA showed velocities that were near existing conditions and erosion and fish passage were not a major concern. The conceptual designs and modeling were used until the MFDA initiated the final design and construction phases in 2021 for the Diversion Channel features, as summarized in Figure 1. Design of the Diversion Channel features were informed by an updated hydraulic model. The initial hydraulic model results of the final design indicated that during high flow events, velocities within the Sheyenne, Maple, and Rush Rivers in the vicinity of the Sheyenne River Aqueduct, Maple River Aqueduct, and Rush River Inlet (see Figure 1 and Figure 2) were likely to induce erosion and could adversely affect fish passage. USACE and the MFDA developed and evaluated a series of options to reduce velocities near the Sheyenne and Maple River Aqueducts. Velocity impacts at the Rush River Inlet are anticipated to be minor and practicable options were limited. Discussion of the proposed alternative for each of the three rivers is provided below.

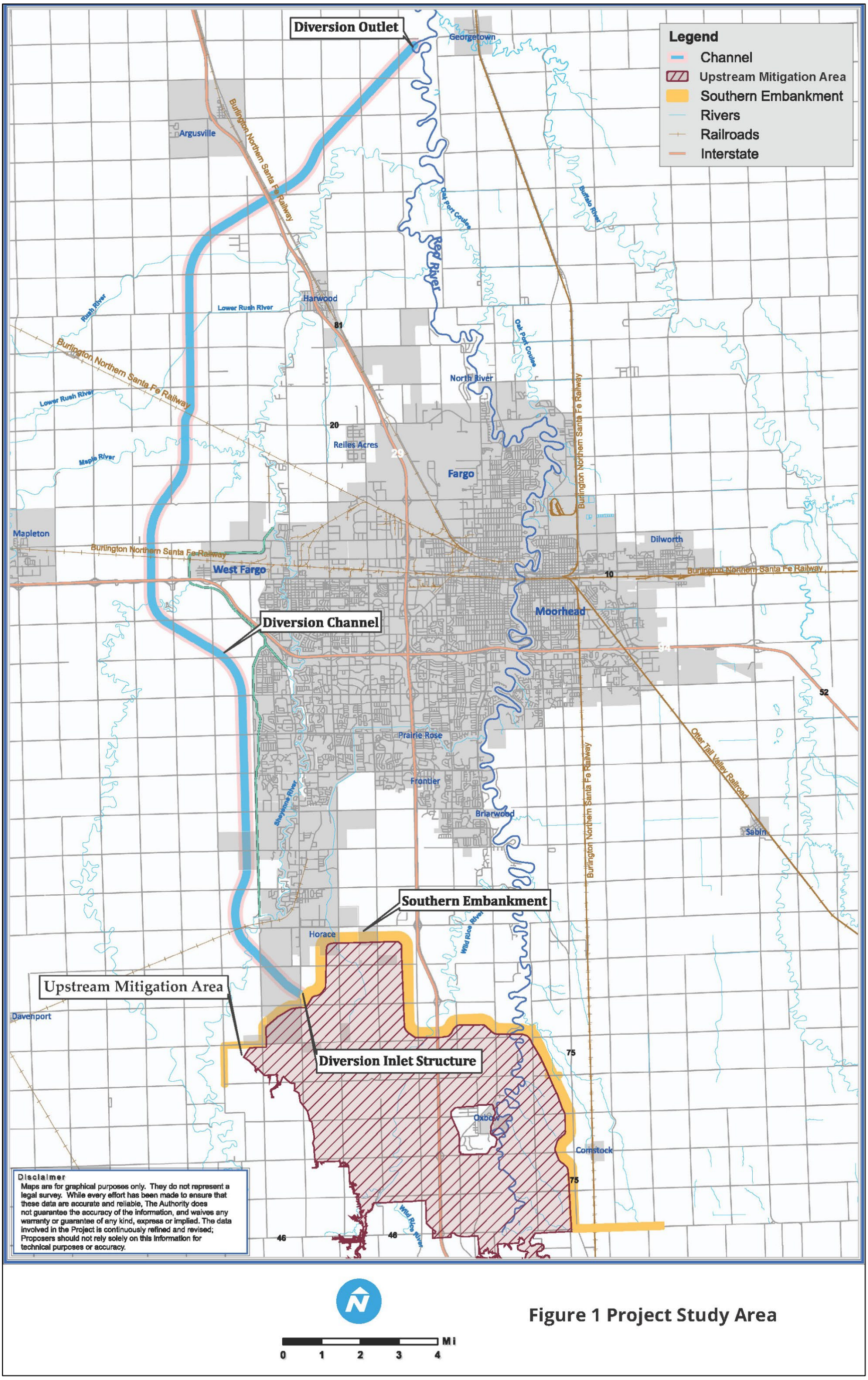

Figure 1. Project Area

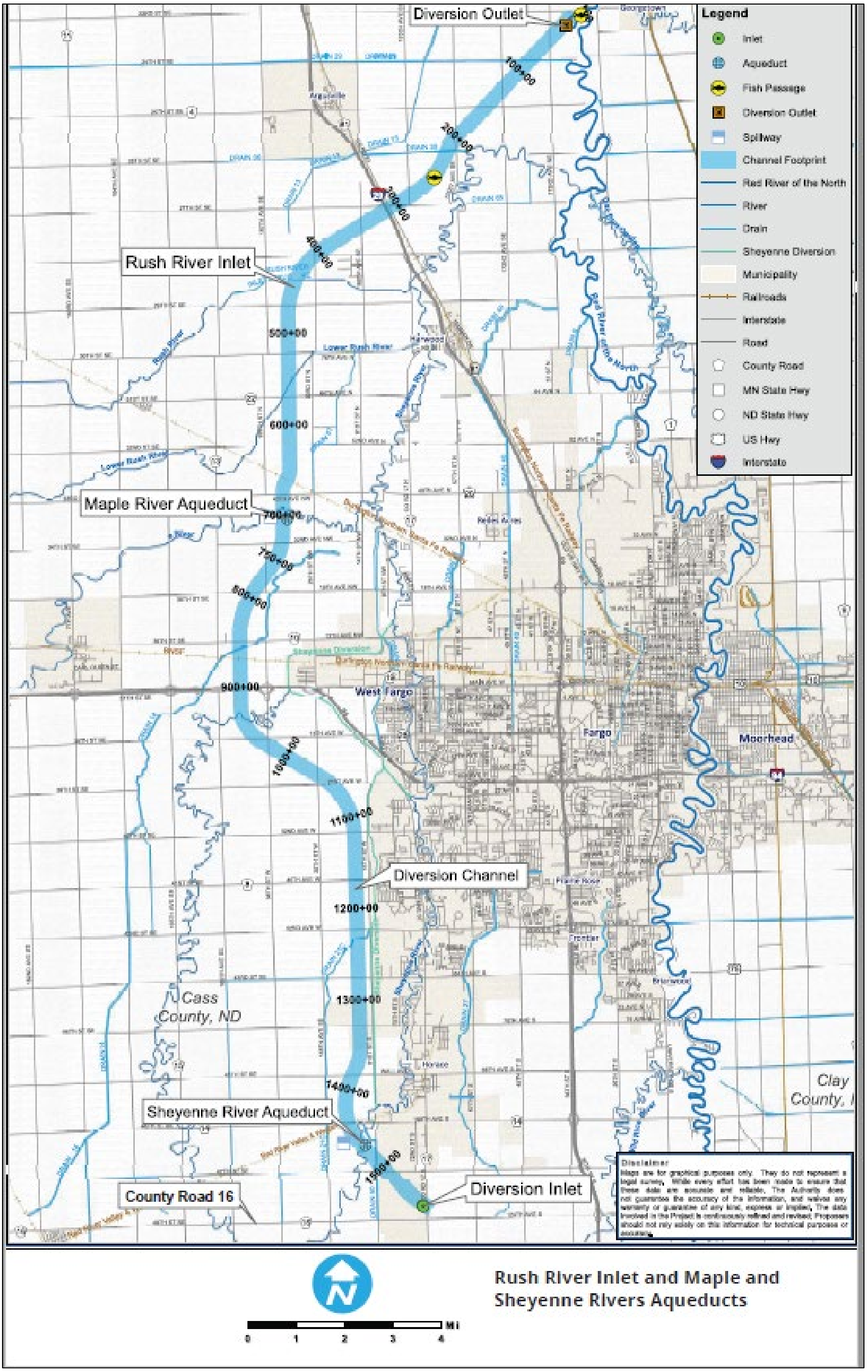

Figure 2. Rush River Inlet Structure, Maple River Aqueduct, and Sheyenne River Aqueduct Locations

3 ALTERNATIVES CONSIDERED

Alternatives for achieving flood risk management in the Fargo-Moorhead Metro Area were evaluated in Chapter 3 of the previous NEPA documents. This SEA addresses changes in the impacts described in previous NEPA documents as well as additional design alternatives considered at the Sheyenne River Aqueduct, Maple River Aqueduct, and the Rush River Inlet, as described below.

3.1 No Action Alternative

The No Action Alternative for this SEA is the proposed alternative from the 2013 SEA[1], with additional design details described below. This SEA, as well as the previous NEPA documents, are written as tiered NEPA documents. Tiered NEPA documents utilize the discussion and analysis presented in previously prepared NEPA documents to avoid duplication and to focus on changes from what has previously been discussed. Therefore, the proposed alternative from the 2013 SEA, with the refinements from further design described below, is used as the No Action Alternative in this document and is compared against the environmental effects of other alternatives considered. The alternative where USACE does not take affirmative flood risk management action is fully explained in the FEIS, which is incorporated by reference.

The previous NEPA documents describe the Sheyenne River Aqueduct and Maple River Aqueduct in general terms. Following the 2013 SEA, the Aqueducts were further defined to include the following features, and together those features are referred to as the Aqueduct System.

- Aqueduct Flume structure with an open-top flume conveying river flows to the top of and across the Diversion Channel. A heated low-flow channel with baffles would be included on the bottom portions of the Aqueduct Flume not in contact with soil to maintain flow across the aqueduct during cold conditions. Roughness elements made of naturally occurring materials or non-naturally occurring boulder-like materials would be included in the bottom of the Aqueduct Flume to improve fish passage conditions.
- Baffled chute spillway working with the Aqueduct Flume structure to convey excess flows into the Diversion Channel when activated. A variable elevation spillway crest, also referred to as an Obermeyer gate, would be provided at the top of the Spillway to meet the hydraulic design requirements and manage flow splits between the Spillway and Aqueduct Flume.
- Ice Retention Structure located in the natural channel upstream of flow split between the Spillway and Aqueduct Flume.
- Engineered Channels would be located upstream and downstream of the Aqueduct Flume. The interface between the Flume and the Channel is defined herein as the location where the Channel width widens beyond the Flume width (approximately 50 ft for the Maple River Flume and 35 ft

[1] The 2013 SEA addressed modifications to the diversion channel, including the Sheyenne River Aqueduct, Maple River Aqueduct, and the Rush River Inlet; the 2019 SEA only addressed the southern embankment.

for the Sheyenne River Flume). The engineered channels ultimately reconnect flow to the natural river above and below the aqueduct.

- Pedestrian walkways along the side of the Aqueduct Flume Structure.
- Maintenance roads and trails at the Aqueduct Systems.
- Vertical lift gate located at the upstream end of the aqueduct flumes. The vertical lift gate would be operated in extreme flood events to restrict flows by lowering from the top of the water column down. This would cause orifice flow through the gate and increase velocities when it is partially open, likely resulting in a complete barrier to fish passage during operation.

  Based on hydraulic modeling, the vertical lift gate on both the Maple River and Sheyenne River would not be operated during the 1 percent (1/100) Annual Exceedance Probability (AEP) flood event. The vertical lift gate would be operated during the 0.2 percent (1/500 AEP) and larger events on the Maple River. For other, larger events such as the probable maximum flood, the vertical lift gate would be operated on both the Maple River and Sheyenne River, as shown in Table 1 below.

Table 1. Aqueduct Vertical Lift Gate Operation

Flood Event	Aqueduct Vertical Lift Gate Operates?	
	Maple	Sheyenne
1/100 AEP (Peak on Red River)	no	no
1/100 AEP (Peak on Tributaries)	no	no
1/500 AEP (Peak on Red River)	yes	no
1/500 AEP (Peak on Tributaries)	yes	no
Probable Maximum Flood	yes	yes
Inflow Design Flood	yes	yes
Standard Project Flood	yes	yes

3.1.1 Sheyenne River No Action Alternative

Under the No Action Alternative, when flows in the Sheyenne River upstream of the Diversion Channel Right of Way are no greater than 1,200 cfs, an Obermeyer gate at the spillway would remain in a raised position, to prevent water from being diverted into the Diversion Channel. As the river flows become greater than 1,200 cfs, the Obermeyer gate at the spillway would be lowered to convey water into the Diversion Channel and concurrently manage flows across the aqueduct flume so that flows across the flume do not exceed 1,500 cfs. Allowing flows into the spillway lowers the water surface elevation and increases upstream flow velocity, including in the Sheyenne River for approximately 8 miles upstream of the Diversion Channel Right of Way until the effects are naturally attenuated. These conditions frequently occur in April and May, which is a period when fish passage is important. Layout of the Sheyenne River Aqueduct under the No Action Alternative is shown in Figure 3.

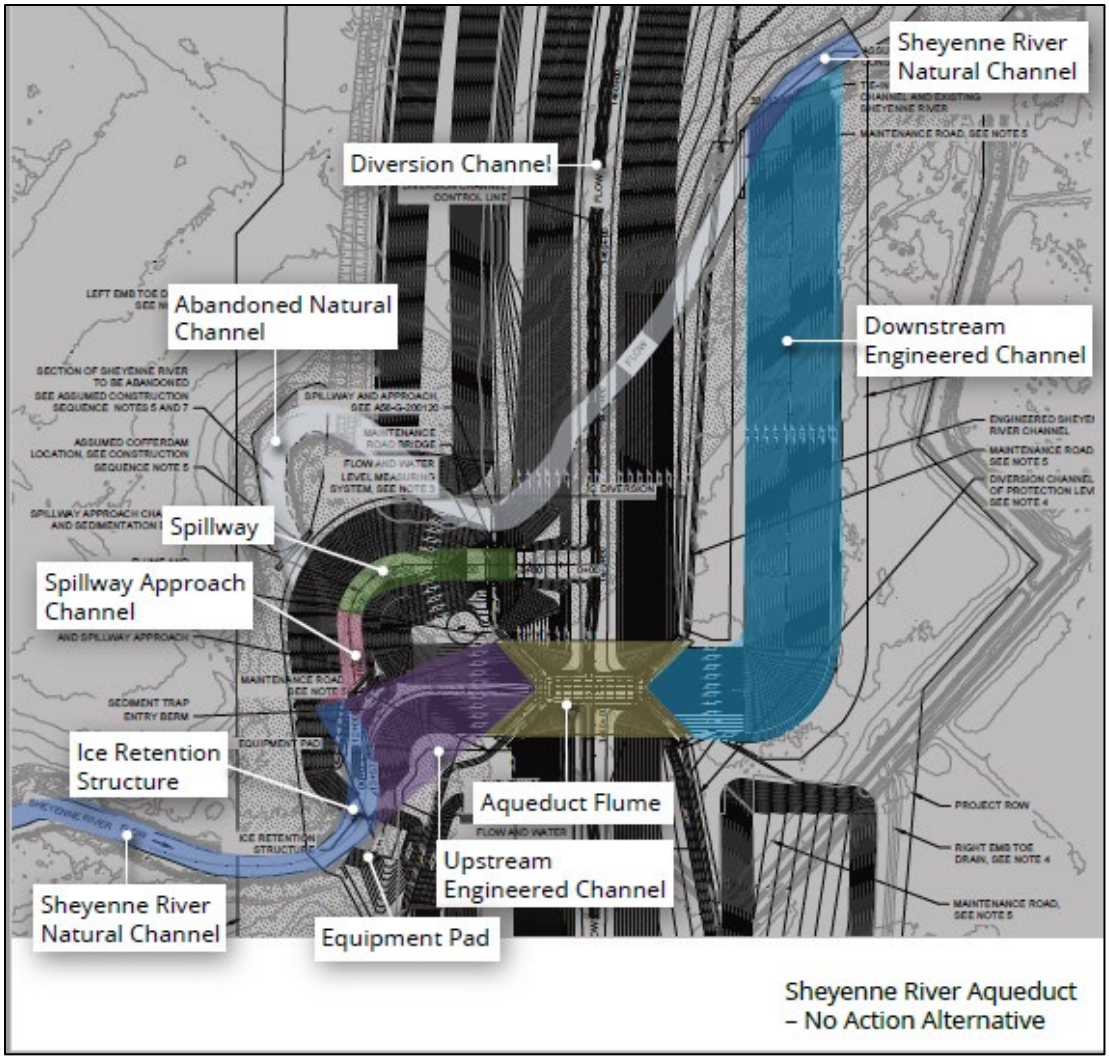

Figure 3. Sheyenne River Aqueduct under the No Action Alternative

3.1.2 Maple River No Action Alternative

Under the No Action Alternative, when flows in the Maple River upstream of the Diversion Channel Right of Way are no greater than 1,700 cfs, an Obermeyer gate at the spillway would remain in a raised position to prevent water from being diverted into the Diversion Channel. As the river flows become greater than 1,700 cfs, the Obermeyer gate would be lowered to convey water into the Diversion Channel and concurrently manage flows across the aqueduct flumes. When flows upstream of the Maple River Aqueduct System are no greater than 5,000 cfs, the Obermeyer gate would be operated such that flows across the Aqueduct Flume are approximately 1,700 cfs. When upstream Maple River flows exceed 5,000 cfs, the Obermeyer gate would be operated such that flows across the Aqueduct Flume do not exceed 3,500 cfs. Allowing flows into the spillway increases the flow velocity in the upstream Maple River natural channel for approximately 2.5 miles upstream of the Diversion Channel Right of Way until the effects are naturally attenuated. These conditions frequently occur in April and May, which is a period when fish passage is important. Layout of the Maple River Aqueduct under the No Action Alternative is shown in Figure 4.

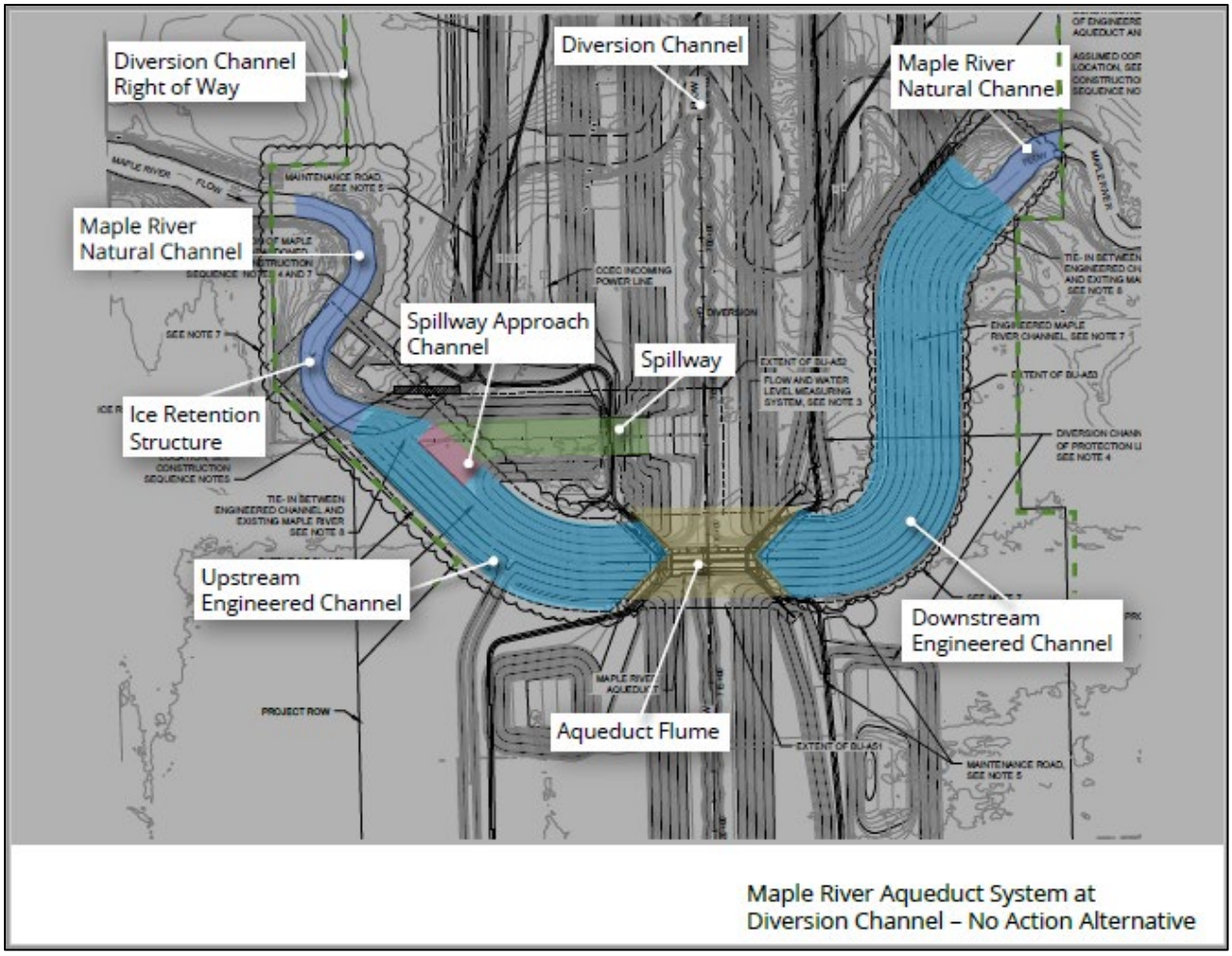

Figure 4. Maple River Aqueduct under the No Action Alternative

3.1.3 Rush River No Action Alternative

The previous NEPA documents described the Rush River Inlet, with its purpose being to convey flow from the Rush River into the Diversion Channel while providing fish passage between the Rush River and the Diversion Channel. As described in the previous NEPA documents, the Rush River Inlet would be constructed with rock arch rapids weirs, riprap armor, and boulders, and would be designed with a series of small drops and pools to support fish passage. The inlet would be designed to withstand ice and debris impacts without reduction in capacity or loss of function. Construction would occur in the same footprint as was described in previous NEPA documents.

The Rush River Inlet would include an engineered approach channel to convey flow from the Rush River natural channel to a rock arch rapids drop structure and downstream exit channel that would discharge into the Diversion Channel, as shown in Figure 5. The riprap-lined rock weir drop structure includes a series of rock (boulder) weirs with pools to convey flow to the downstream riprap-lined exit channel into the Diversion Channel. The drop structure would dissipate energy and the pools between the boulders would facilitate fish passage. Stone dikes included in the downstream end of the approach channel would lower velocities and increase the water levels in the approach channel. The approach channel would

expand from 20-feet at the Diversion Channel Right of Way to 150 feet at the rock weir drop structure into the Diversion Channel. The Rush River Inlet would be designed with a channel bottom invert elevation of 877.4 feet, channel bottom width of 20 feet, and minimum approach channel slopes of 6H:1V at the intersection with the Diversion Channel Right of Way.

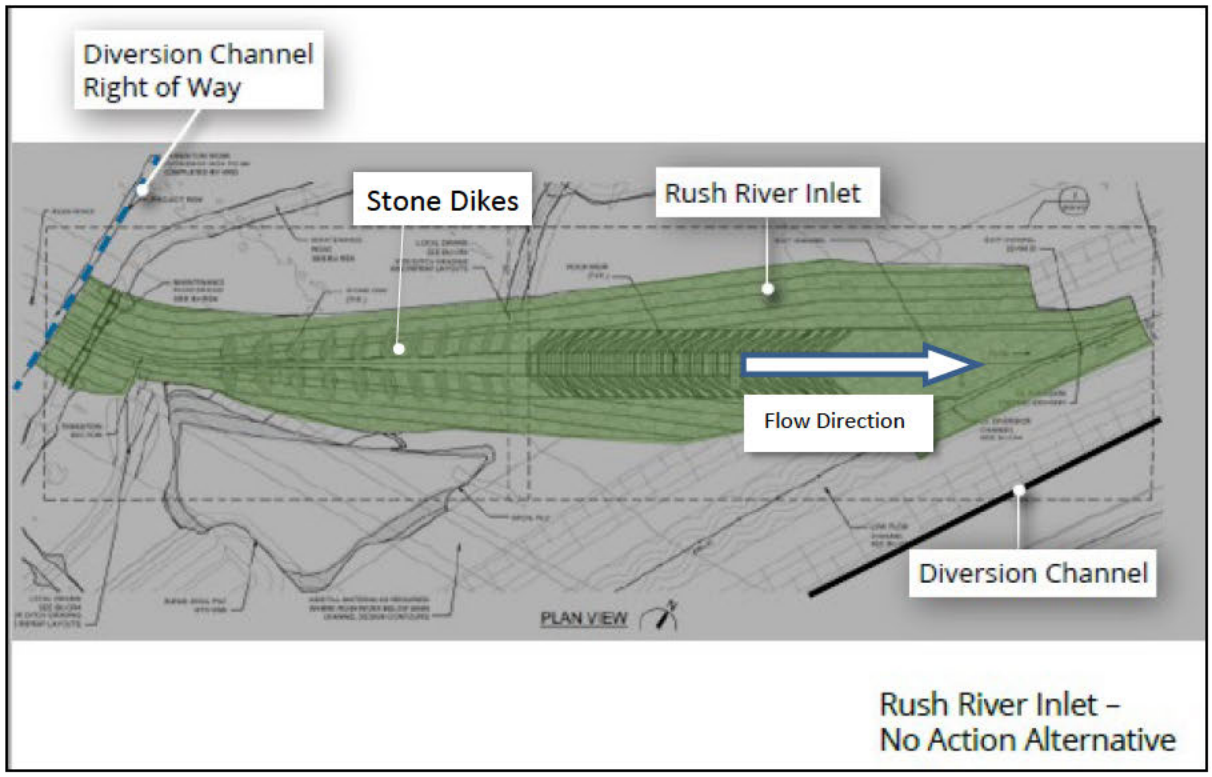

Figure 5. Rush River Inlet under the No Action Alternative (flow direction indicated by arrows)

3.2 Proposed Alternative

The USACE, MFDA, and natural resource agencies analyzed several design features that would reduce velocities to an acceptable level for the Sheyenne and Maple Rivers. The analysis included several iterations of feature design, hydraulic modeling, and impact assessment to select the best practicable alternative. The Rush River No Action Alternative was selected as the Rush River Proposed Alternative as the increases in velocity were determined to be on the upper edge of the acceptable range.

3.2.1 Sheyenne River Proposed Alternative

To address higher-than-anticipated velocities, lower water surface elevations, and decrease impacts to aquatic habitat in the Sheyenne River upstream of the aqueduct, a combination of riverbank benching, meandering of the Downstream Engineered Channel, and placement of toe wood-sod mats was developed. Some features of the Aqueduct System, including the Aqueduct Flume, Spillway and its approach channel, and Upstream Engineered Channel, would still be constructed similar to the No Action Alternative. Additional descriptions of the proposed features are included in the subsections that follow and are shown on Figure 6. In addition, fish passage and channel stability would be monitored and adaptive management would be used to implement measures as appropriate. The upstream extents of

both velocity impacts and associated potential channel stability impacts are the same as those described in Section 3.1.1.

The Aqueduct System was designed to limit average cross section velocities to no greater than 3.6 ft/s when flow rates in the Sheyenne River upstream of the Diversion Channel are up to 3,850 cfs, as determined by the hydraulic model.

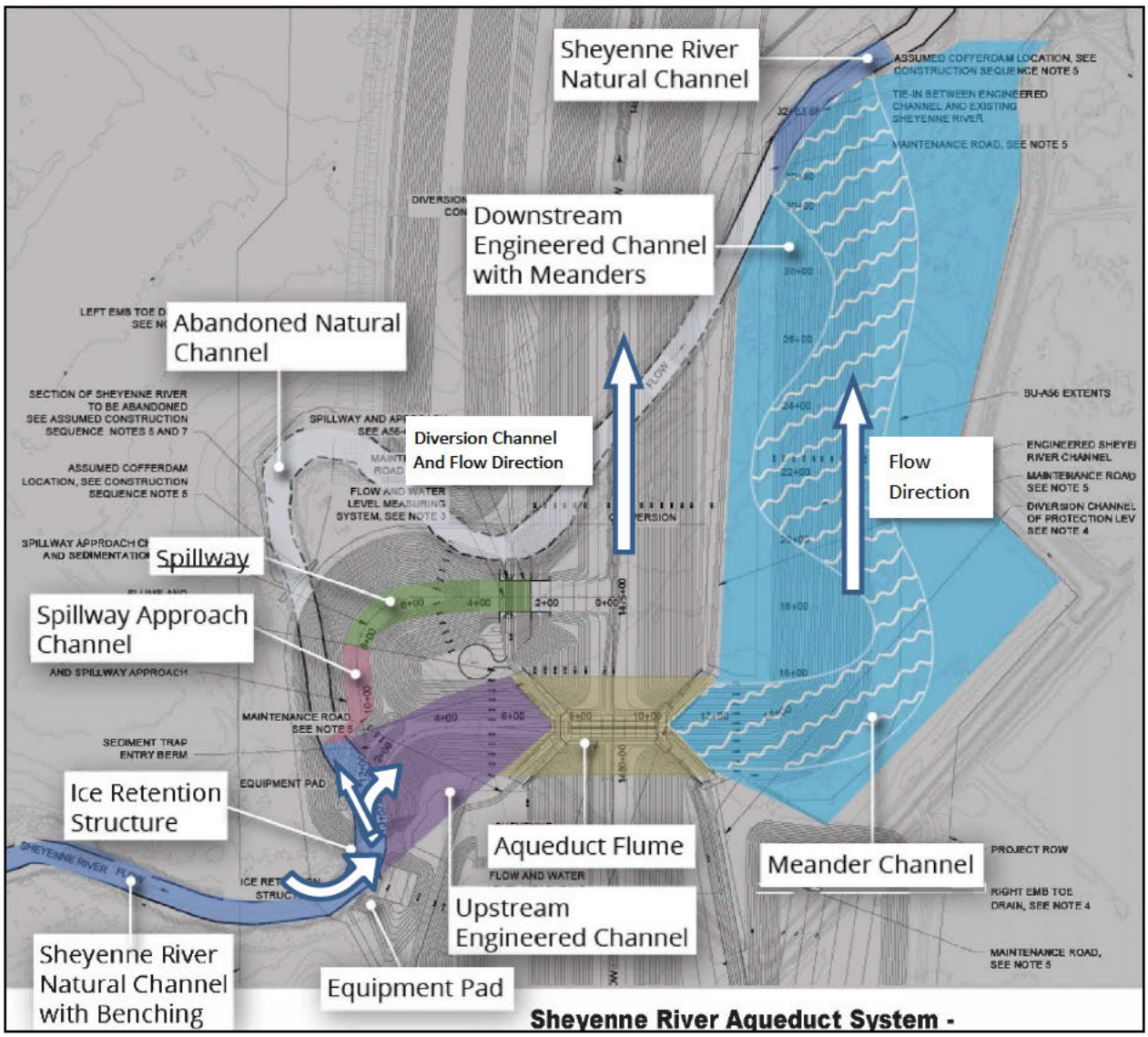

Figure 6. Sheyenne River Aqueduct System (flow direction shown by arrows)

3.2.1.1 Benches to Widen the Upstream Sheyenne River Natural Channel

Riverbank benching includes widening the river channel which provides more frequent overbank inundation and allows water to spread out over a larger area to reduce velocities. Benches would also stabilize the bank and provide riparian habitat.

In the Proposed Alternative for the Sheyenne River Aqueduct System, a series of benches extend along the natural Sheyenne River channel from the Equipment Pad upstream to the Cass County Road 16 bridge, as shown in Figure 7 through Figure 12. For the purposes of this SEA, the overbank area is generally defined as the area that will be excavated to increase inundation frequency, as represented by the purple and cyan linework in Figure 7. For the purposes of this SEA, the floodplain is generally defined as the area that would be inundated during a 1-percent AEP (100-year) event and includes the channel, overbank, and other inundated areas at higher elevations.

The placement and width of the benches were determined using the hydraulic model to limit average cross section velocities in this portion of the river to no greater than 3.6 ft/s for river flows up to 3,850 cfs. The benches have been set at an elevation profile associated with a 67 percent AEP (1.5-year) event, which has a flow of approximately 900 cfs. The banks of benches would transition with an Engineered Channel slope of approximately 6 horizontal:1 vertical (6H:1V) up to a smaller bench near the existing ground surface, as shown on Figure 7. The smaller bench near the existing ground surface would be graded into a berm designed to mimic the existing perched channel elevation. The berm would have a 4H:1V riverside slope.

Soil material removed during bench excavation would be placed on the adjacent agricultural fields. Prior to placement of this soil, the topsoil in the existing agricultural field would be removed and stockpiled. After the soil from the bench construction is spread, the topsoil would be spread over the newly placed soil. The area where the soil would be spread would have slopes ranging from the existing ground slope up to 20H:1V, which would be farmable. Prior to bench excavation, natural vegetation (sod mats with vegetation, willow, dogwoods, and other woody vegetation) would be extracted from the surface of the riverbank and stockpiled for use on the benches.

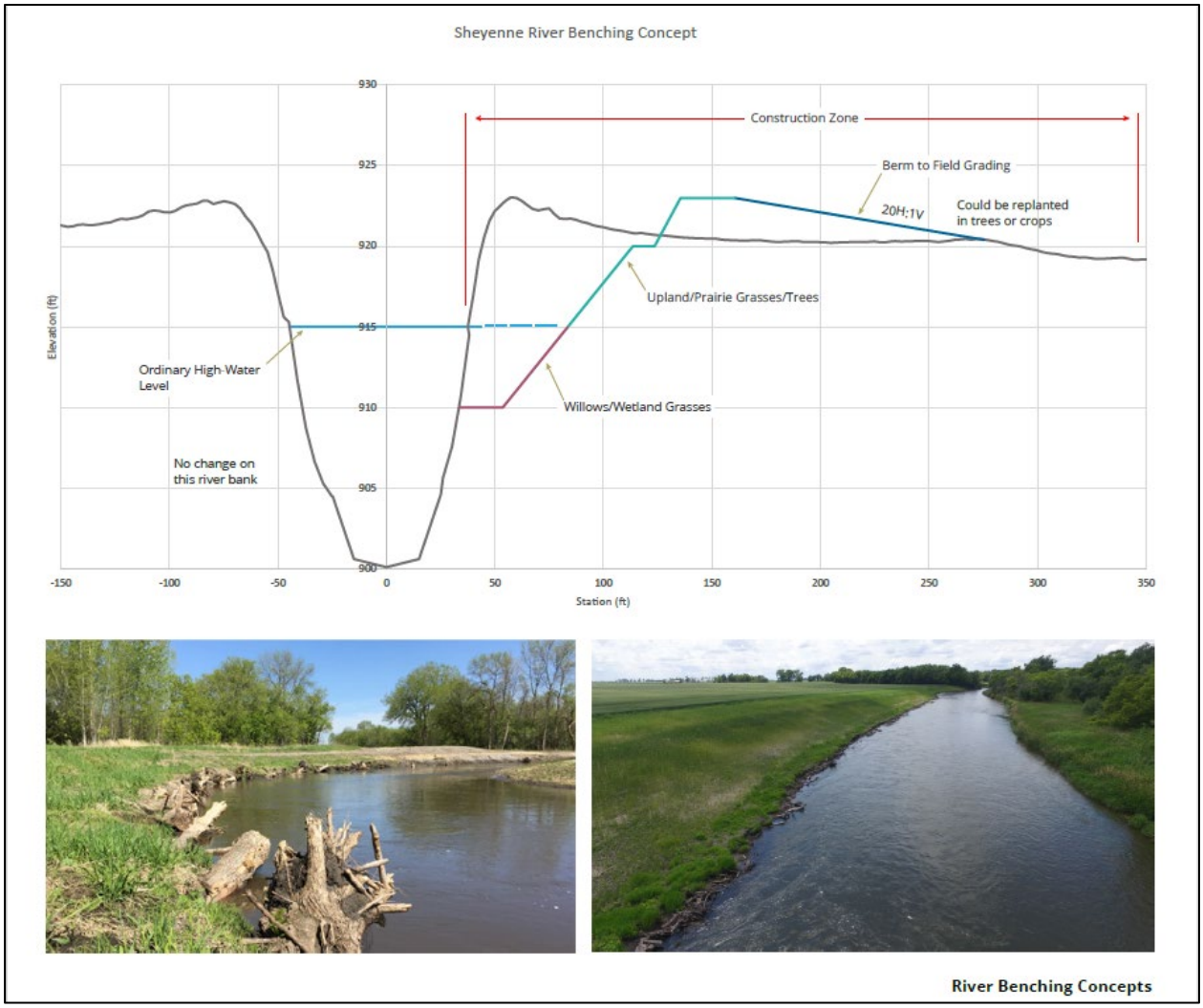

Figure 7. Sheyenne River benching concept

The bench widths are up to 165 feet for a few hundred feet upstream of the Equipment Pad and ice retention structure. Upstream of this location, bench widths are narrower and are generally on the order of 0 to 80 feet, with sizing for all benches based on hydraulic model results. The channel benches and the slope up to the Ordinary High Water Mark (OHWM) would be stabilized with sod mats, root wads, and the planting of willows, dogwood trees, and native grasses. Planting of the slopes below and above the OHWM with woody vegetation would also limit potential sediment accumulation on the benches and provide additional aquatic habitat. The OHWM established for the Sheyenne River in the vicinity of the benching project varies from an elevation of 915.4 near 46th Street to an elevation of 916.2 downstream of County Highway 16 (48th Street).

Toe wood-sod mats would be installed along the outside river bends to provide stability, habitat, and streambank protection where erosive potential is higher. Toe wood-sod mats consist of root wads, branches, brush, soil, other organic fill, and live cuttings. Installation of root wads requires live trees to be pushed over so intact root masses are still connected to the tree trunks. The tree trunks would be forced

into the riverbank using heavy equipment, such as an excavator, leaving the root wads exposed to protect the banks of the river. The trees to be used for root wads will range from approximately 12 to 18-inches in diameter with relatively straight trunks, resulting in a root ball with structurally sound roots that extend to about 6-feet in diameter. The root wads will be required to be placed adjacent to each other with some overlap of the root wad crowns to provide erosion protection along the riverbank, approximately 6 feet apart. Root wads would extend upstream and downstream of the outside bends by 50 feet to reduce erosion potential. Trees removed for the bench excavation activities and other locations would be used to provide the root wads, as described below.

The slope above the OHWM to the top of the berm would be planted with prairie grasses and other upland native species. On the landward side of the berm, the land could be planted with agricultural crops, trees, or other upland vegetation, depending on the applicable landowner preference.

The elevation of the toe of benches would range from 910 feet at the Equipment Pad to several feet higher at the most upstream bench, following the water surface profile at a flow rate of 900 cfs. This elevation would be lower than the approximate OHWM elevation in this portion of the Sheyenne River to allow for increased channel width during both low flow and high flow events.

No engineered meanders would be included in this portion of the natural channel. However, there would continue to be natural stream channel migration at some locations as under existing conditions.

Benches have been located on both sides of the river based upon geomorphic considerations, such as placing the benches on the inside of a river bend where a bench is typically formed naturally because of deposition, or on the outside of a river bend where the velocities are generally higher and more erosive and would benefit from additional toe wood. Bench locations were also designed to avoid conflicts with wetlands, forested areas, existing structures, access routes, and disposal of the excavated material on the adjacent land. Along the Sheyenne River between the Sheyenne River Aqueduct and County Road 16, all lands except the property along the southeastern bank adjacent to the Aqueduct are owned by private agricultural and residential owners. Therefore, easements would be acquired for the construction areas. The benching locations for the Proposed Alternative balanced environmental impacts with the willingness of private landowners to allow their property to be included in the project. The construction area would include areas for bench construction and areas for disposal of the excavated material on nearby land to minimize further land use disturbances due to hauling of the soil to an offsite disposal area.

A bench is anticipated to be constructed approximately 1,000 feet north of County Road 16 along a stretch of bank that is failing and slumping into the Sheyenne River (Figure 8). The bank failure is encroaching on a driveway running immediately adjacent to it. To reduce the potential for further bank failure along the driveway, the driveway would be moved farther to the east and a bench would be constructed along the riverbank (Figure 12) as part of the Proposed Alternative. The parcel with the driveway does not include adequate area for placement of soil excavated from the bench location. Therefore, that soil would be hauled for placement on the eastern parcel near the Diversion Channel.

The Proposed Alternative would include 8,530 linear feet of benching and 5,970 linear feet of root wads which would require 1,005 trees suitable for installation. Approximately 1,220 trees would be removed

from this area and it is estimated that 610 of these trees would meet the criteria to be suitable for use as root wads. The remaining 395 trees needed would be obtained from offsite locations, such as the Upstream Mitigation Area (UMA) as shown in Figure 1. In the event that a sufficient number of trees are not available in the UMA, selective tree removal in forest mitigation sites that need canopy thinning may be considered to acquire additional trees. The upstream benches would include approximately 148,000 cubic yards of excavation and placement of this material on site. The total disturbed area for the Proposed Alternative would be 86.1 acres.

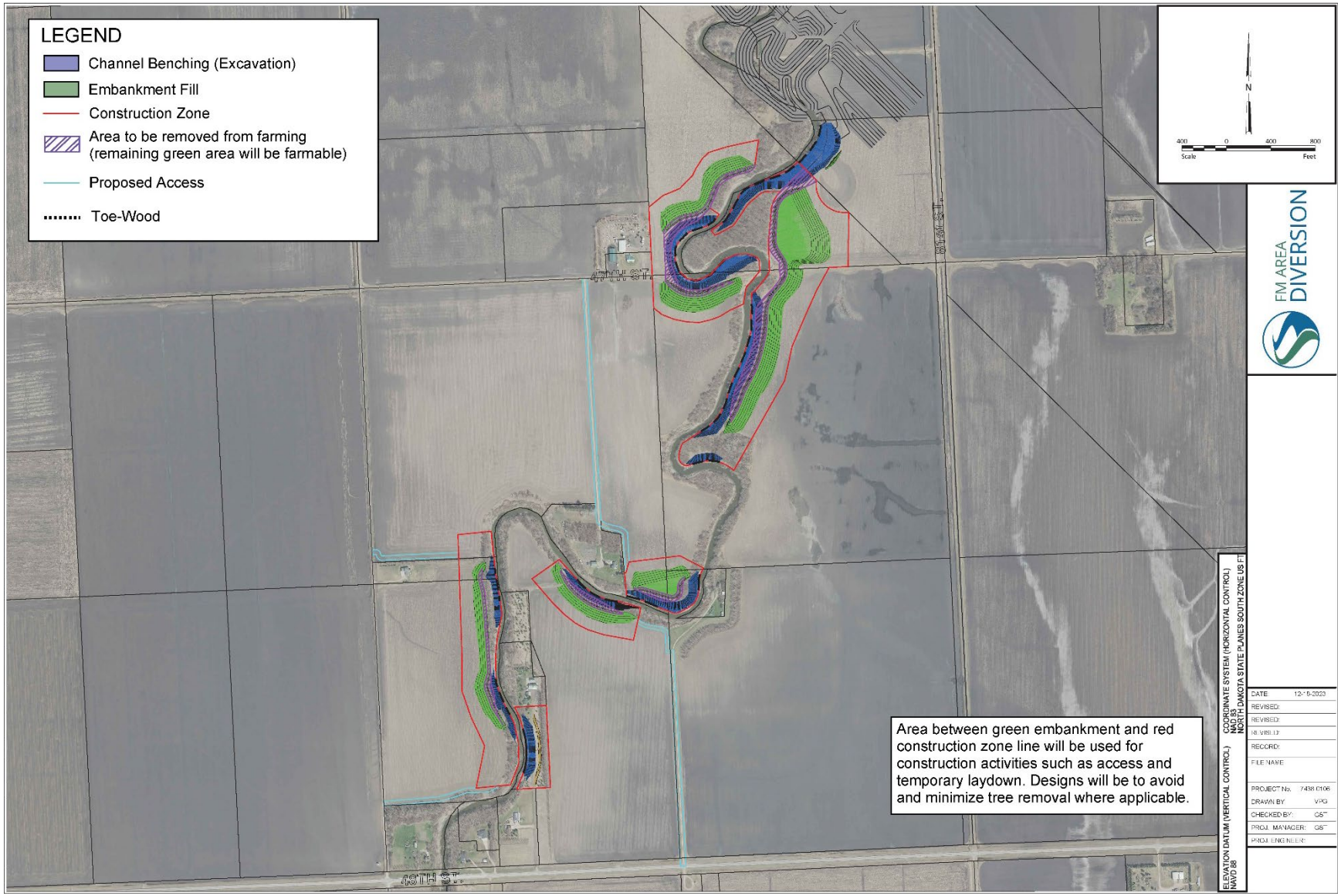

Figure 8. Sheyenne River Proposed Alternative Benching Overview

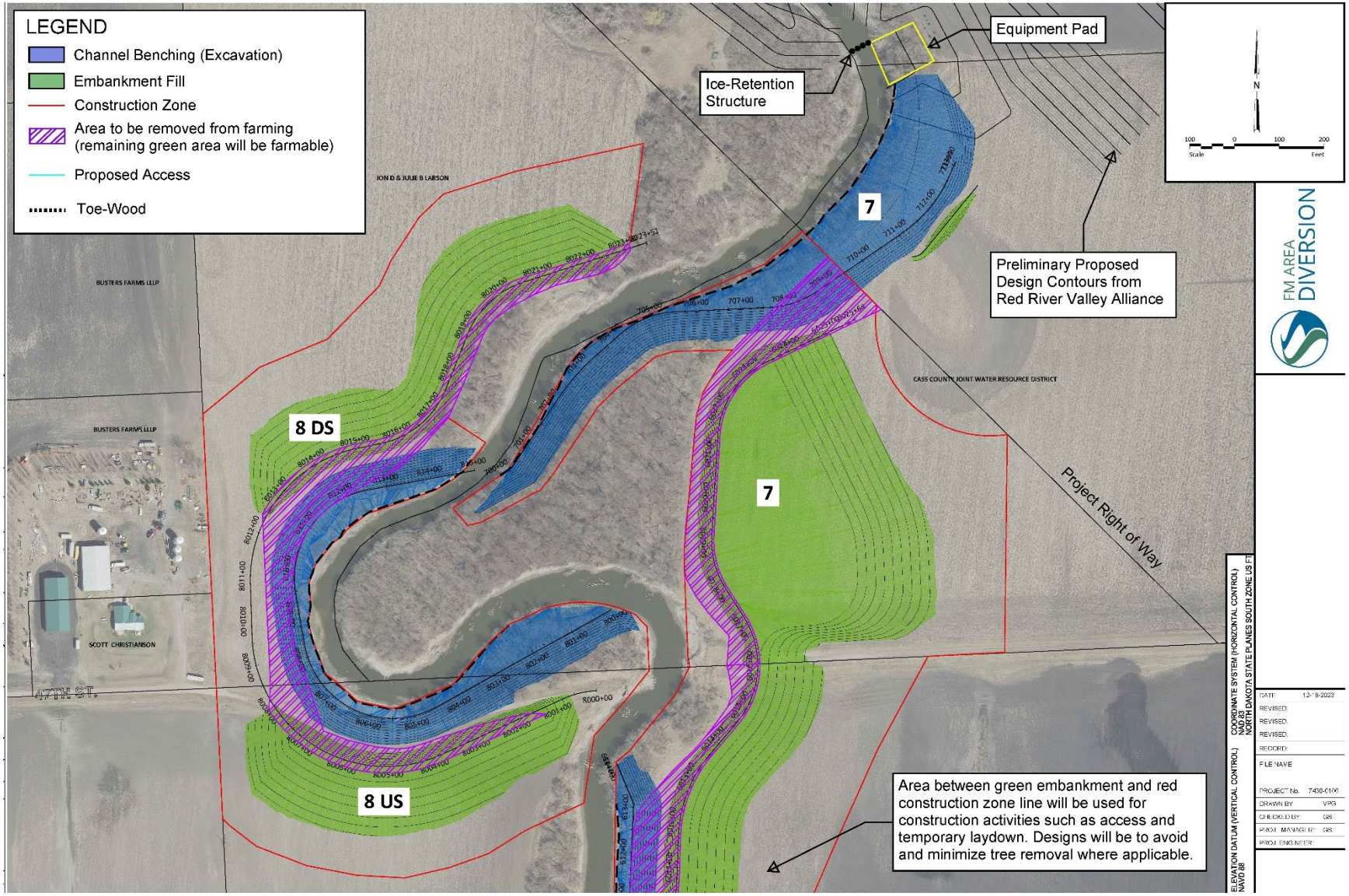

Figure 9. Sheyenne River Proposed Alternative Benching Detail (Figure 1 of 4)

Figure 10. Sheyenne River Proposed Alternative Benching Detail (Figure 2 of 4)

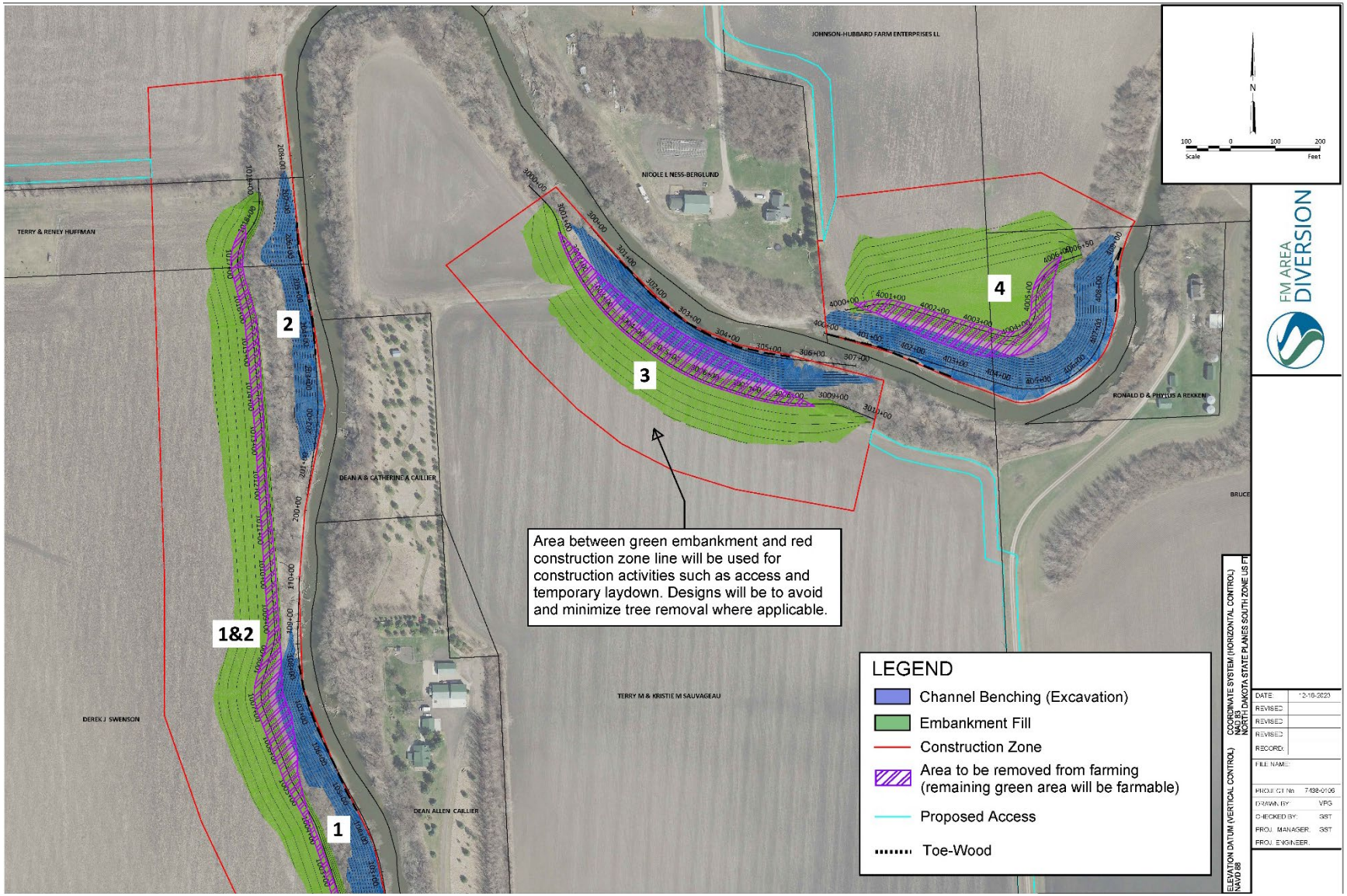

Figure 11. Sheyenne River Proposed Alternative Benching Detail (Figure 3 of 4)

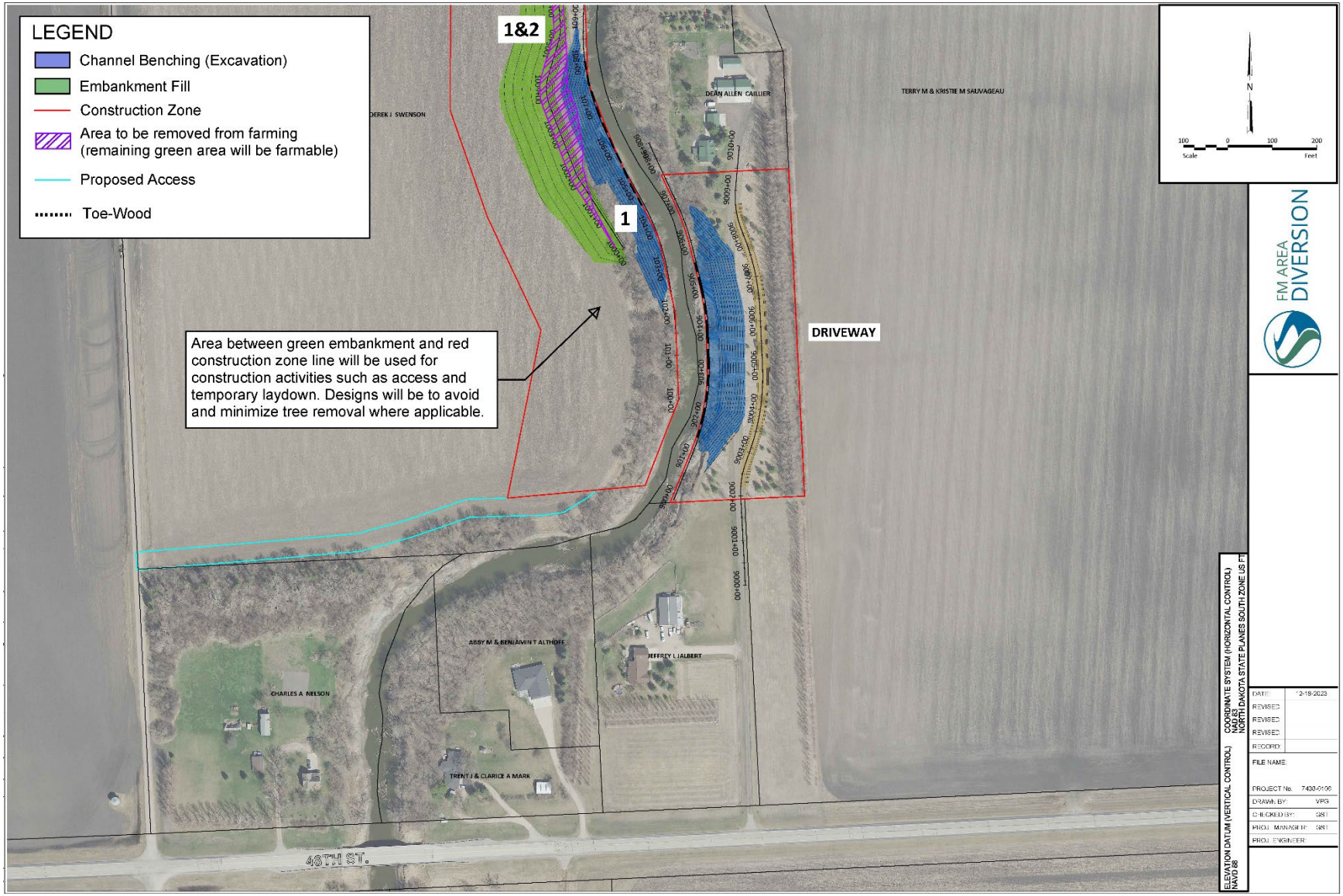

Figure 12. Sheyenne River Proposed Alternative Benching Detail (Figure 4 of 4)

3.2.1.2 Upstream Engineered Channel, Spillway Approach Channel, Spillway, and Aqueduct Flume

This reach extends from the upstream edge of the Equipment Pad to the downstream edge of the Aqueduct Flume and includes the Equipment Pad, ice retention structure, Spillway Approach Channel, Upstream Engineered Channel, and Spillway. No changes are proposed from the No Action Alternative for this reach.

3.2.1.3 Meanders in the Downstream Engineered Channel

Meanders would be constructed within the Downstream Engineered Channel to support riparian habitat and mimic more natural conditions (Figure 6). The Downstream Engineered Channel would extend from the downstream edge of the Aqueduct Flume to the natural Sheyenne River channel near the eastern boundary of the Diversion Channel Right of Way. The No Action Alternative includes a straight channel downstream of the aqueduct flume. For the Proposed Alternative, the Downstream Engineered Channel connecting the aqueduct to the natural channel would include meanders to provide more natural conditions. The width of the Diversion Channel Right of Way is limited along the Downstream Engineered Channel; therefore, design of the meanders balance criteria related to constructability, erosion, and maintenance. The spacing and sinuosity ratio of the meandered channel are limited by geographical limitations and geotechnical conditions.

The engineered slopes of the Downstream Engineered Channel would include woody vegetation to reduce erosion potential and sediment deposition as compared to grasses that would be planted in this channel under the No Action Alternative. Willows and dogwood trees and other upland woody vegetation would be allowed to naturally establish along the slopes and would not be removed during periodic maintenance. As the woody vegetation matures, minimal maintenance would occur along this reach. Meanders did not provide measurable hydraulic value in the Downstream Engineered Channel and were not included in the hydraulic analysis. However, meanders were included in the Sheyenne River Downstream Engineered Channel due to the habitat value provided.

3.2.2 Maple River Proposed Alternative

To address higher-than-anticipated velocities and lower water surface elevation in the Maple River, the USACE, MFDA, and natural resource agencies reviewed benches to be added along a portion of the Maple River natural channel from the Upstream Engineered Channel to the western boundary of the Diversion Channel Right of Way. Based upon the review comments, additional analyses were conducted using a hydraulic model to define the proposed alternative for the Maple River Aqueduct System, as shown on Figure 13. In addition, meanders would be constructed within the Downstream Engineered Channel to provide more natural channel characteristics as opposed to a straight channel. The Aqueduct Flume, Spillway and approach channel, and Upstream Engineered Channel would be constructed as under the No Action Alternative. The Maple River Aqueduct System would be designed for average cross section velocities not greater than 3.6 ft/s when flow rates in the Maple River upstream of the Diversion Channel are up to 2,500 cfs as determined by the hydraulic model. Adaptive management would be used to monitor fish passage and channel stability and implement measures as appropriate. The upstream extents of both velocity impacts and associated potential channel stability impacts are the same as those described in Section 3.1.2 for the No Action Alternative.

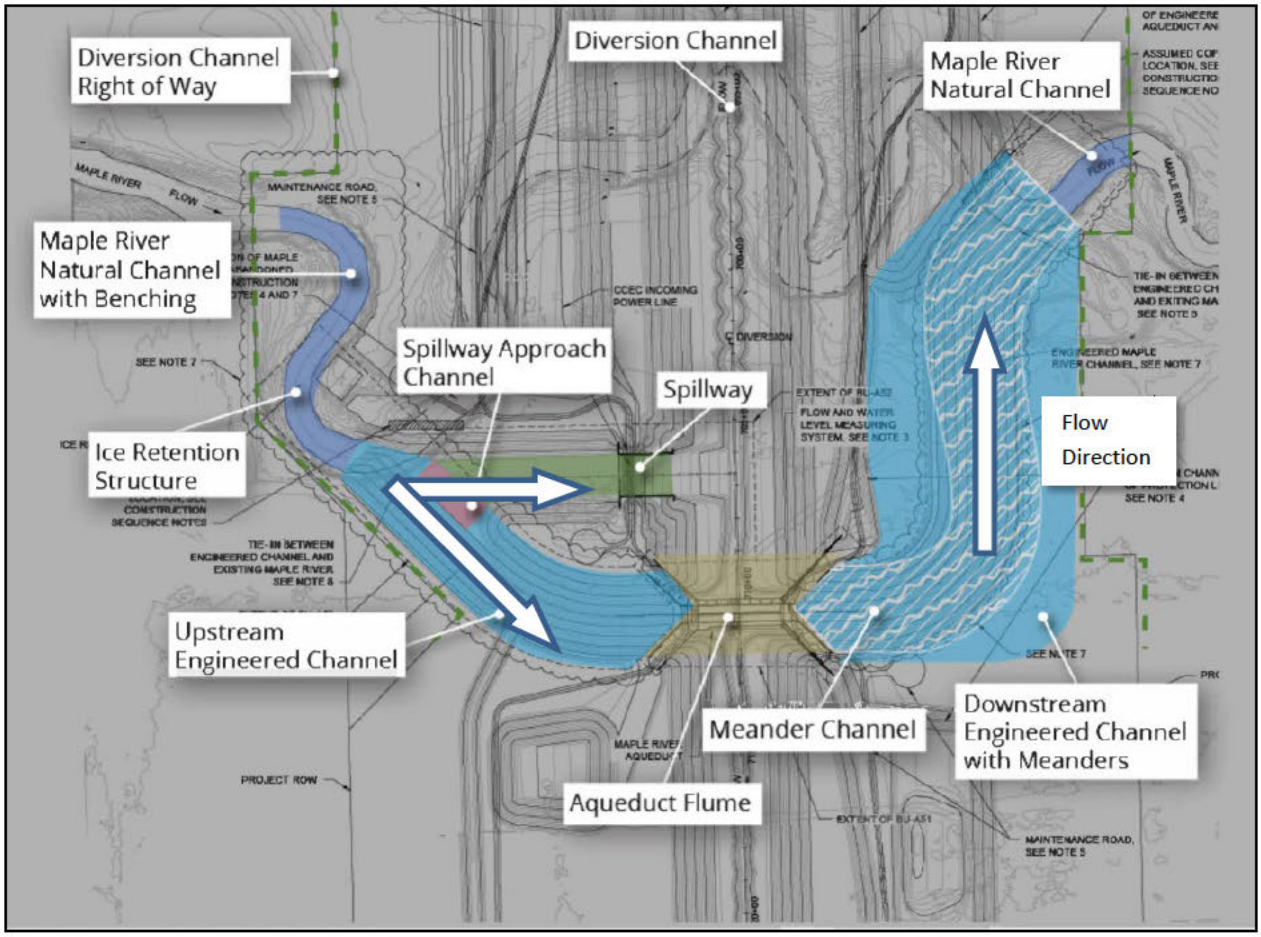

Figure 13. Maple River Proposed Alternative (flow direction shown by arrows)

3.2.2.1 Benches to Widen the Upstream Maple River Natural Channel

Benches would be added along the Maple River from Upstream of the Equipment Pad to the western boundary of the Diversion Channel Right of Way. The placement and width of the benches would be determined using the hydraulic model to limit average cross section velocities to no greater than 3.6 ft/s when the flow is up to 2,500 cfs and provide more frequent overbank inundation. The benches would be set at approximately the 67 percent AEP flood event, which is an elevation based on the water surface profile of approximately 900 cfs. The banks of the bench would transition with an engineered channel slope of approximately 6 horizontal:1 vertical (6H:1V) to a smaller bench near the existing ground surface. The smaller bench near the existing ground would be graded into a berm designed to mimic the existing perched channel elevation. The berm would have a 4H:1V riverside slope. Soil material removed during bench excavation would be placed within the Right of Way. The area where the soil would be spread would have slopes ranging from the existing ground slope up to 20H:1V. The bench width at each location would depend upon model results during the design phase. At this time, the specific locations and widths of the benches have not been determined; however, the bench widths are estimated to be 30 to 50 feet and total extent of grading between 40 and 120 feet. Prior to bench excavation, natural vegetation (sod

mats with vegetation, willow, dogwoods, and woody vegetation) would be extracted from the surface of the riverbank and stockpiled for use on the benches post construction.

The Maple River Proposed Alternative would include 600 linear feet of benching and result in 9,500 cubic yards of excavation. The channel benches and the channel bank up to the bench elevation would be stabilized with sod mats, root wads, and the planting of willow and dogwood trees and appropriate wetland grasses. Approximately 100 trees will be used for root wad installation along the benching area. The root wad below the benches, and planting of the slopes above the benches with woody vegetation would also reduce erosion and thereby limit potential sediment in downstream reaches while improving habitat for migrating fish. The slope above the bench to the top of the berm would be planted with prairie grasses and other upland native species. On the landward side of the berm, the land could be planted with agricultural crops, trees, or other upland vegetation. No engineered meanders would be included in this portion of the natural channel. However, there would continue to be natural stream channel migration at some locations as under existing conditions.

3.2.2.2 Upstream Engineered Channel, Spillway Approach Channel, Spillway, and Aqueduct Flume

Consistent with the No Action Alternative, this reach would extend from the Upstream Engineered Channel to the downstream edge of the Aqueduct Flume and includes the Equipment Pad, Ice retention structure, Spillway Approach Channel, and Spillway.

3.2.2.3 Narrowed Channel and Meanders in the Downstream Engineered Channel

The Downstream Engineered Channel would extend from the downstream edge of the Aqueduct Flume to the natural Maple River channel near the eastern boundary of the Diversion Channel Right of Way. For the purpose of the alternatives analysis, the Downstream Engineered Channel was assumed to have meander bends, an 8-foot bottom width and 3.5:1 side slopes, 10-foot bench at 67 percent AEP elevation, and 6:1 overbank side slopes. During final design, the final cross-sectional dimensions will incorporate geotechnical design considerations, which may result in slight changes to the cross-sectional dimensions while still maintaining the same level of impacts described in this SEA. The steep side slopes result in a narrower bankfull top width and reduced channel cross section as compared to the No Action Alternative. The No-Action Alternative does not include any benching or meanders downstream of the aqueduct flume. With the Proposed Alternative, the Downstream Engineered Channel would also include meanders to provide more natural conditions (Figure 13). The width of the Diversion Channel Right of Way is limited along the Downstream Engineered Channel; therefore, design of the meanders would need to balance criteria related to constructability, erosion, and maintenance. The spacing and sinuosity ratio of the meandered channel is limited by geographical limitations and geotechnical conditions. The meanders would be designed to be similar to the meanders in the existing Maple River natural channel in the vicinity of the Diversion Channel. The meanders would increase the channel length and the available habitat as compared to the No Action Alternative.

The engineered slopes of the Downstream Engineered Channel would include woody vegetation to reduce erosion potential and sediment deposition as compared to grasses that would be planted in this channel under the No Action Alternative. Willows and dogwood trees and other upland woody vegetation would be allowed to naturally seed along the slopes and would not be removed during periodic maintenance. As

the woody vegetation matures, minimal maintenance would occur along this reach unless vegetation growth or channel meandering reduces channel capacity.

Hydraulic model simulation results, using an inflow of 2,500 cfs, showed that a narrower downstream channel with channel meanders would increase the tailwater elevation of the Proposed Alternative (as compared to the No Action Alternative) and therefore decrease the velocity in the aqueduct. With this concept, the maximum average cross section velocity in the Maple River Aqueduct Flume is 3.4 ft/s, and the maximum average cross section velocity in the upstream natural channel, within the Project Right of Way, is 3.4 ft/s. Under the Red River of North Peak (RRN) flow event, as described in Section 2 of Appendix A, the average cross section velocity at the downstream face of the Maple River Aqueduct Flume is slightly higher at 3.49 ft/s.

3.2.3 Rush River Proposed Alternative

The design of the Rush River Inlet No Action Alternative has not changed from what was described in the previous NEPA documents. However, updated hydraulic modeling on the Rush River Inlet has indicated higher velocities than what was described in previous NEPA documents. The purpose of including the Rush River Inlet in this SEA is to describe the additional impacts caused by the higher velocities, as detailed in Section 5.3. The Rush River Inlet will be monitored, and adaptive management measures will be implemented, if necessary. Since the design has not changed, the Proposed Alternative and No Action Alternative are the same.

3.3 Other Alternatives Considered

3.3.1 Alternative Locations for Sheyenne River Benching

Two additional benching options to the Proposed Alternative, referred to as Option A and Option B, were considered along the Sheyenne River. Both options aimed to address higher-than-anticipated velocities in the Sheyenne River using a combination of riverbank benching, meandering of the Downstream Engineered Channel, and placement of toe wood-sod mats, similar to the Sheyenne River Proposed Alternative. Differences between the Proposed Alternative, Option A, and Option B are the specific benching locations between 47th Steet SE and the Equipment Pad upstream of the Sheyenne Aqueduct. Both Options A and B include benching on the east side of the river immediately upstream of the Equipment Pad to match contours in that area to protect the riverbanks from potential erosion. Both Options A and B also meet the hydraulic criteria of limiting average cross section velocities to no greater than 3.6 ft/s for river flows up to 3,850 cfs and were carried through detailed analysis for consideration with the Proposed Alternative. A comparison of the three options can be found in Table 2. Ultimately the Proposed Alternative was chosen over Options A and B for its balance of environmental impacts and willing participation from private landowners.

3.3.1.1 Option A

Option A maximized benching on lands already acquired for the FMM Project. For Option A, the bench and soil disposal were located on the eastern side of the river with a berm to maintain hydrology to an adjacent wetland area (Figure 14). A bench was located on the inside of the river bend where natural channel benching typically occurs in a river due to deposition. With Option A there would be a total of 8,340 linear feet of benching and 5,420 linear feet of toe wood. Installation of root wads would require

910 trees. Approximately 1,550 trees would be removed with Option A. Of those trees it is estimated that 775 would meet the criteria to be suitable for use as root wads. The remaining 135 trees would be obtained from the Upstream Mitigation Area or other areas locations within the Project Area as described above. Option A would result in approximately 148,000 cubic yards of excavation and placement of material on site. The total disturbed area for Option A is 73.2 acres.

3.3.1.2 Option B

Option B focused on minimizing impacts to existing mature forests as well as locating benching in areas where bank failures are present along the Sheyenne River (Figure 15). With Option B there would be a total of 8,620 linear feet of benching and 5,950 linear feet of toe wood. Installation of root wads would require 1,000 trees. Approximately 1,080 trees would be removed with Option B and it is estimated that 540 of these trees would meet the criteria to be suitable for use as root wads. The remaining 460 trees would be obtained from the Upstream Mitigation Area or other locations within the Project Area as described above. Option B would result in approximately 147,000 cubic yards of excavation and placement of material on site. The total disturbed area for Option B is 88.4 acres.

Table 2. Comparison of Benching Needed for Sheyenne River Alternatives

	Option A (Figure 14)	**Option B (Figure 15)**	**Proposed Alternative (Figure 9)**
Length of Bench (feet)	8,340	8,620	8,530
Length of Toe Wood (feet)	5,420	5,950	5,970
Total Excavation and Material Placement (cubic yards)	148,000	147,000	148,000
Total Disturbed Area (acres)	73.2	88.4	86.1
Number of Trees Needed for Root Wads	910	1,000	1,005
Number of Trees Removed during Benching	1,550	1,080	1,220
Number of Suitable Trees Removed during Benching	775	540	610
Number of Trees Needed Outside of Benching Area	135	460	395

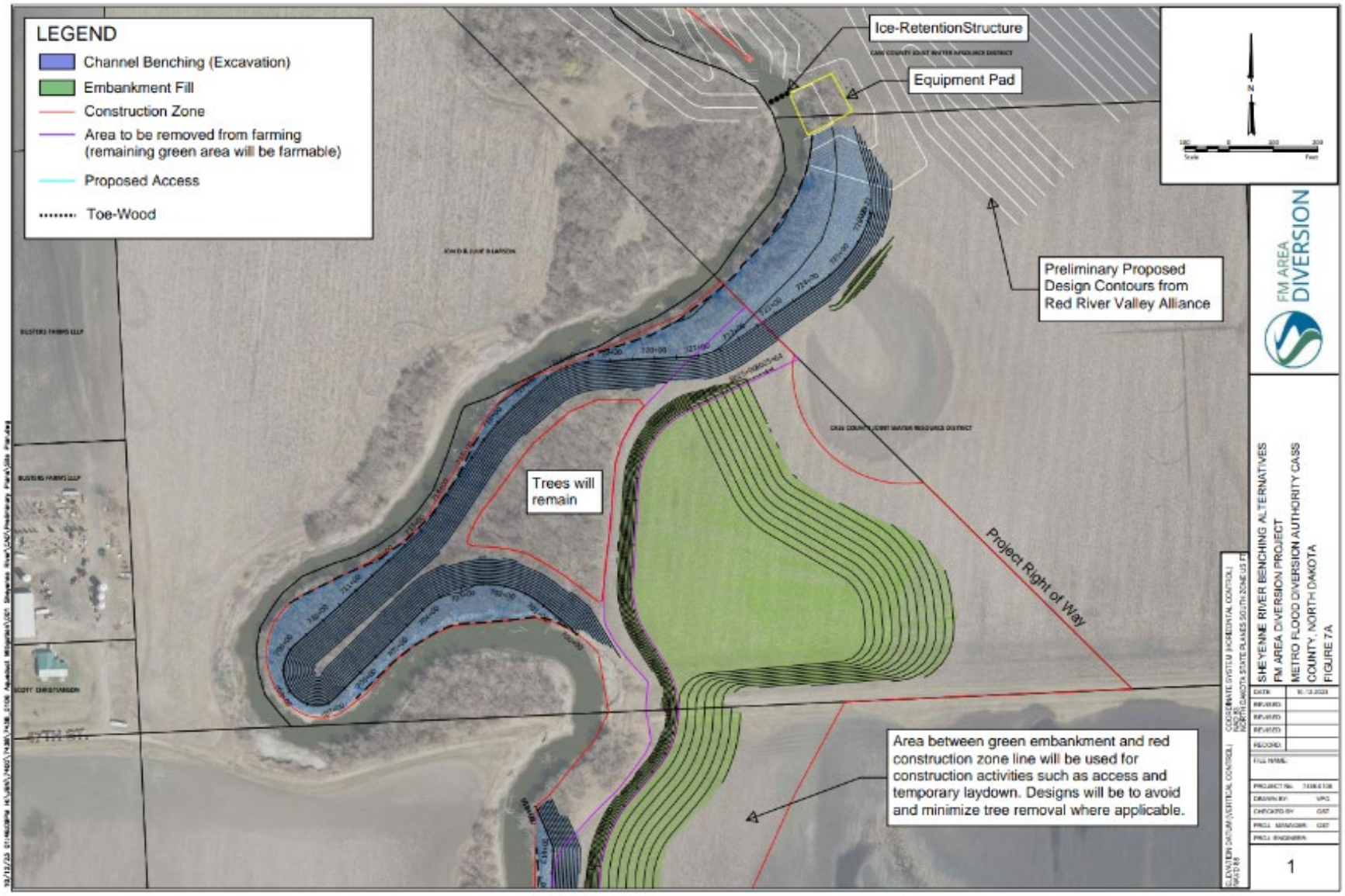

Figure 14. Sheyenne River Benching in the Downstream Portions of Option A

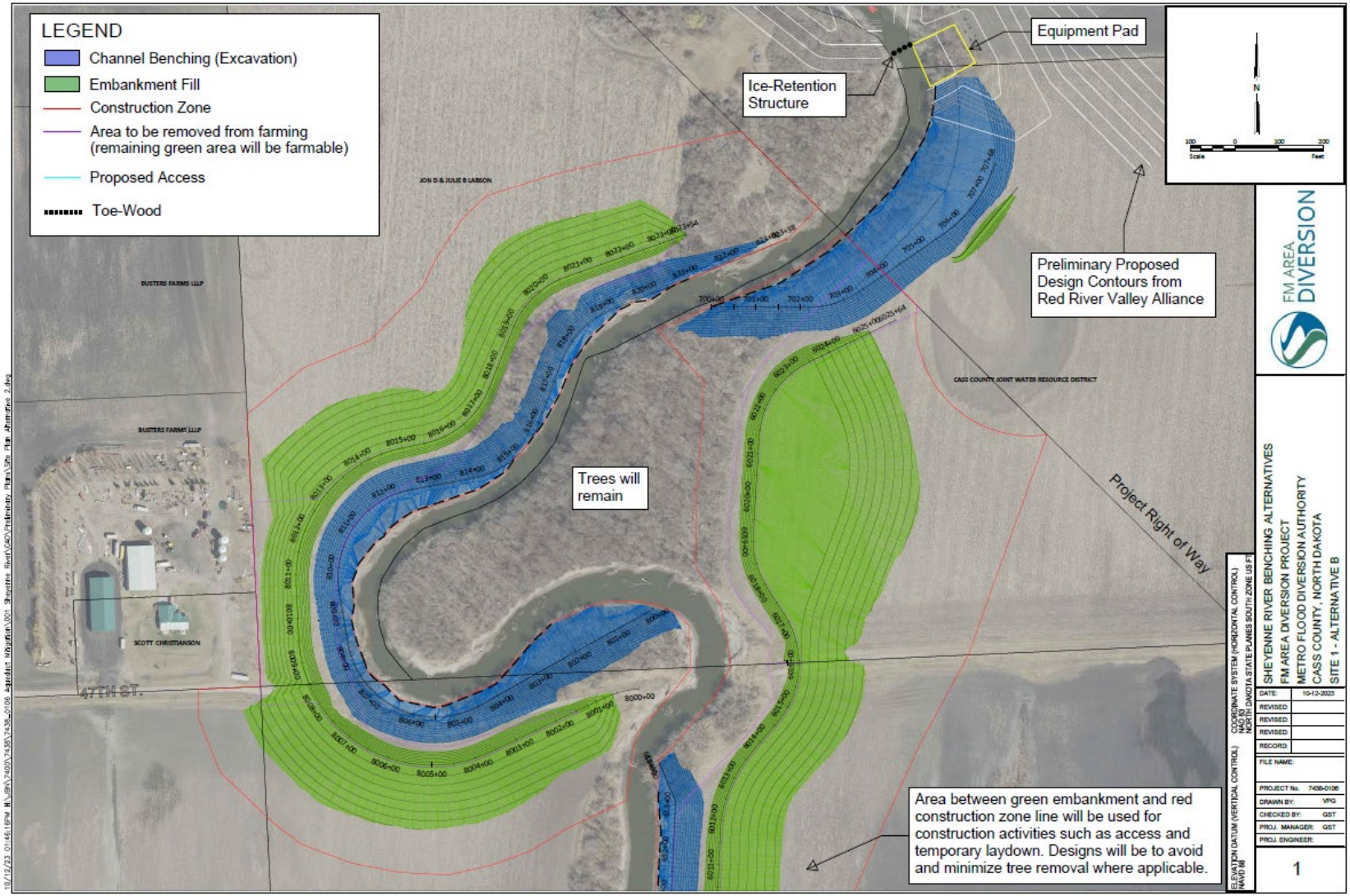

Figure 15. Sheyenne River Benching in the Downstream Portions of Option B

3.3.2 Alternative Designs Considered for Both the Sheyenne and Maple Rivers

3.3.2.1 Increase the Aqueduct Flume Width

Increasing aqueduct flume widths to decrease velocities through the flumes for a given flow were considered. However, increasing aqueduct width was shown to have a minimal impact. All practicable increases in width failed to reduce velocities sufficiently to reduce erosion and facilitate adequate fish passage. Changes to the aqueduct flume widths would also result in substantial additional costs for structural material needs (i.e. structural concrete, sheet pile, etc.). Other alternatives, such as the proposed alternatives for the Sheyenne River and Maple River, were less costly to incorporate and resulted in similar or better levels of velocity reduction. These alternatives were dropped from consideration.

3.3.2.2 Increase the Obermeyer Gate Length

Increasing the Obermeyer gate length at the spillway inlet to reduce water velocities when flows exceed 1,200 cfs for the Sheyenne River or 1,700 cfs for the Maple River was considered. Hydraulic model simulations were conducted with the weir length increased three times wider than the weir in the No Action Alternatives. For the Sheyenne River, the increased weir length did not change the water surface elevations (at 0.00 feet) and, therefore, did not reduce the velocities in the Aqueduct Flume or the adjacent Engineered Channel as compared to the No Action Alternative. For the Maple River, the increased weir length increased water surface elevation 0.07 feet upstream of the Aqueduct Flume, which resulted in 0.04 ft/s lower velocity in the natural channel upstream of the Spillway Approach Channel and 0.03 ft/s higher velocity in the Aqueduct Flume as compared to the No Action Alternative. These benefits would be minimal and would not justify the additional costs of constructing a wider weir. Therefore, this alternative was not carried forward for further evaluation.

3.3.2.3 Add a Fish Bypass Channel Upstream of the Aqueduct Flume

Addition of a fish bypass channel from the Aqueduct Flume to a location along the Sheyenne and Maple Rivers upstream of the Diversion Channel Right of Way was considered. The fish bypass channel would facilitate fish passage by conveying flows at a lower velocity than the natural channel. The fish bypass channel would only be used when average cross section velocities in the natural channel were greater than 3.6 ft/s and flows were no greater than 3,850 cfs for the Sheyenne River and 2,500 cfs for the Maple River. During flood events, a portion of the flows would be diverted into the fish bypass channel with flow and velocity conditions conducive to fish passage and the higher velocity flows would remain in the main natural channel. Based upon initial analysis of this concept, the fish bypass channel would increase the distance that fish would need to swim as compared to the upstream natural channel with higher velocities. The initial analysis also identified concerns about the effectiveness of methods to divert the fish into the fish bypass channel. For these reasons, this alternative was not carried forward for further evaluation.

3.3.2.4 Add Rock Arch Rapids Upstream and/or Downstream of the Aqueduct Flume

The addition of rock arch rapids upstream and/or downstream of the Aqueduct Flume in the Engineered Channels or natural channels was considered to reduce velocities. This type of structure is generally used for fish passage in areas where the river channel bottom elevation drops substantially. The rock arch rapid layouts would be similar to features for fish passage at the Project's Drayton Dam replacement feature

and at the Rush River Inlet. Flow regime patterns at those locations are primarily influenced by a substantial change in topographic elevations within the water body where the high velocities are to be reduced. Therefore, flows across the rock arch rapid structures can support fish passage at high and low flows. For the Sheyenne and Maple River Aqueduct Systems, the high velocities in the upstream Engineered Channel and natural channel are related to the change in water elevations when the flows would be conveyed through the Spillway and not due to change in elevation in the main fish passage corridor. Placement of rock arch rapids in the Upstream Engineered Channel and/or natural channel could impair fish passage at low flows. For these reasons, this alternative was not carried forward for further evaluation.

3.3.2.5 Add Riffles and Pools Upstream and/or Downstream of the Aqueduct Flume

The water surface elevation difference between the downstream natural channel and the Aqueduct Flume influences the water surface elevation at the Spillway Obermeyer gate. If the water surface elevation at the Aqueduct Flume and Obermeyer gate were increased, there would be less head loss and energy reduction at the Spillway which would reduce velocities in the upstream natural channel. To increase the water surface elevation at the Spillway and the Aqueduct Flume, the Engineered Channels could be modified to include more natural channel features, including riffles, pools, and meanders.

The riffles could reduce the cross-sectional area of the channel at multiple short-length locations to dissipate the energy in the water column and raise the water levels. Depending upon the cross-section of each riffle and the number of riffles, flow velocity could be increased for short periods of time and length along the channel. The riffles could be formed by rock placed in the channel or with sheet piles with or without rock cover. The riffles could be designed with low-flow channels to allow for fish passage during low flows. A meander channel to support low-flow habitat conditions could be developed along the bottom of the channel.

For the Sheyenne River, five riffles were incorporated into this concept, and each riffle would raise the channel bottom by approximately 0.5 feet, be approximately 20-feet long in-line with the river channel and be placed approximately 100 to 120 feet apart. Model simulations results showed that including the riffles increased water surface elevations upstream of the Aqueduct Flume by 0.3 feet, which reduced velocities by 0.1 ft/s within the Aqueduct Flume (3.5 ft/s to 3.4 ft/s).

Since the riffles only increased the water surface elevations 0.3 feet, this concept was not able to reduce velocities in the upstream natural channel to no greater than 3.6 ft/s for upstream Sheyenne River flows of up to 3,850 cfs as determined by the hydraulic model. Additionally, the riffles created concerns related to fish passage at low flows.

For the Maple River, each riffle would raise the channel bottom by approximately 0.5 feet, be approximately 20-feet long in-line with the river channel and be placed approximately 100 to 200 feet apart. Additionally, the cross section through the riffle would have an 8-foot bottom width and 3.5:1 side slopes, 10-foot bench (at 67 percent AEP event elevation), and 6:1 overbank side slopes. Channel benches would be required to lower the river velocities to approximately match existing conditions between the

flow split between the junction of the Upstream Engineered Channel/Spillway Approach Channel and the Diversion Channel Right of Way.

Hydraulic model simulations results, using an inflow of 2,500 cfs, showed that including natural channel features (i.e. riffles, native vegetation, and channel meanders) would increase the water surface elevation at the downstream face of the Maple River Aqueduct Flume by 0.5 feet, and increase the water surface elevation upstream of the flow split (between the Upstream Engineered Channel and the Spillway Approach Channel) by 0.5 feet. With this concept, the maximum velocity in the Maple River Aqueduct Flume matches the Proposed Alternative at 3.5 ft/s and is 0.2 ft/s lower than the No Action Alternative. The maximum velocity in the upstream natural channel, within the Project Right of Way is 3.0 ft/s which is approximately 0.4 ft/s and 0.9 ft/s lower than the Proposed and No Action Alternatives, respectively.

The proposed riffle features would produce isolated locations of higher velocity and low water depth during low flow conditions. These isolated locations would occur only at the riffles but would be a hinderance to fish passage during low flow conditions. The impacts to fish passage at the riffles did not justify the upstream benefits and this alternative was not carried forward for further evaluation.

3.3.2.6 Add Meanders Upstream and/or Downstream of the Aqueduct Flume

The addition of meanders to lengthen the Upstream and/or Downstream Engineered Channels was considered as a stand-alone method to increase surface water elevations and thereby reduce velocities and improve habitat in the engineered channels. The downstream meanders would be in the same location as those noted in previous sections, however the option of upstream meanders has not been previously discussed and would be included in both the natural and engineered channels. The concept was that the channel meanders would increase head-loss in the channel thereby raising the water surface elevation in the river, resulting in less head differential compared to existing conditions and lowered velocities. The Sheyenne River has relatively low velocities through the engineered channel, therefore it did not respond well to this induced head loss concept. Lengthening the channel through the meanders did not substantially reduce velocities based upon the initial hydraulic model. This concept resulted in a water surface elevation increase of 0.05 feet at the downstream face of the Aqueduct Flume, which resulted in a velocity reduction of 0.02 ft/s in the Aqueduct Flume. Meanders are not expected to measurably reduce velocities upstream of the Aqueduct System. Even though Downstream Engineered Channel meanders would not provide much value as measured in reduced velocities, they could provide a habitat benefit.

Lengthening of the channel through the meanders and providing a head loss component in the model to represent the channel meanders resulted in a water surface elevation increase of 0.1 feet at the downstream face of the Maple River Aqueduct Flume. This resulted in a maximum velocity reduction of 0.01 feet/second in the Maple River Aqueduct Flume. This concept did not provide substantial reduction in velocities. This alternative was not carried forward for further evaluation as it did not provide a

substantial reduction in velocities. However, meanders were included in the Downstream Engineered Channels for the purpose of providing more natural habitat.

3.3.2.7 Construction of an Upstream Storage Area

This alternative would involve excavating the riverbank to expand the river channel into an off channel "lake" or reservoir that would store water during high water events. A berm would be constructed around the excavated area to prevent the water from flowing to the southeast. Construction of an upstream storage area would require extensive grading and may not reduce velocities in the river upstream of the lake if the lake caused the river velocities to increase as the water moves from the river to the lake. Therefore, this alternative was not carried forward for further evaluation.

3.3.3 Rush River

Other alternatives for the Rush River were screened out in previously prepared NEPA documents. No additional alternatives were considered for the Rush River.

4 AFFECTED ENVIRONMENT

The affected environment is described in detail in chapter 4 of the previously prepared NEPA documents. This section will provide any additional information that has become available and describe any differences in the affected environment since the 2013 SEA.

4.1 Social

No change from what is described in previous NEPA documents.

4.2 Economic

No change from what is described in previous NEPA documents.

4.2.1 Environmental Justice

No change from what is described in previous NEPA documents.

4.3 Natural Resources

4.3.1 Climate

No change from what is described in previous NEPA documents.

4.3.2 Geomorphology

No change from what is described in previous NEPA documents.

4.3.3 Air Quality

No change from what is described in previous NEPA documents.

4.3.4 Water Quality

No change from what is described in previous NEPA documents.

4.3.5 Water Quantity

No change from what is described in previous NEPA documents.

4.3.6 Shallow Groundwater

No change from what is described in previous NEPA documents.

4.3.7 Aquifers

No change from what is described in previous NEPA documents.

4.3.8 Aquatic Habitat

No change from what is described in previous NEPA documents.

4.3.9 Fish Passage and Biological Connectivity

Conditions for fish passage and biological connectivity are generally described in the FEIS and the 2013 SEA. Note that connectivity on the Sheyenne River system will be improved in the near future as plans are underway to improve biological connectivity through the removal and modification of features included in the existing Sheyenne River Flood Protection Project. This cannot be implemented until the broader FMM Project has been constructed and is fully operational. However, as a mitigation measure for other lost habitat functions, features of the Sheyenne River Flood Protection Project will be removed and modified to improve conditions for fish passage and biological connectivity, relative to those described in the FEIS and 2013 SEA. The functionality of the Proposed Alternative for the Sheyenne River in this SEA is even more important given the proposed modification of the Sheyenne River Flood Protection Project. The value of mitigation actions at the Sheyenne River Flood Protection Project is reduced if adjacent hydraulic conditions result in reductions to biological connectivity.

4.3.10 Riparian Habitat

The proposed benching would change the location and extent of some of the affected riparian habitat, but overall, there is no appreciable change in the type or quality of riparian habitat from what is described in previous NEPA documents.

4.3.11 Wetlands

No change from what is described in previous NEPA documents.

4.3.12 Upland Habitat

The proposed benching would change the location and extent of some of the affected upland habitat, but overall, there is no appreciable change in the type or quality of upland habitat from what is described in previous NEPA documents. The upland areas in the project vicinity continue to be primarily composed of agricultural lands and urban development. While the majority of areas have not changed appreciably, slight changes have occurred. Forested windrows and fence lines have been removed in some locations to increase the number of tillable acreage and accommodate larger farm machinery. In addition, development in the project vicinity continues to occur. Overall, these changes are small but may reduce the amount of upland habitat, such as forested areas, affected by the Project.

4.3.13 Terrestrial Wildlife

Bank swallows (*Riparia riparia*) are present along the Sheyenne River and have not been discussed in previous NEPA documents. The bank swallow is a small songbird that builds nests in the steep, vertical soil surfaces along riverbanks (Figure 16). Bank swallows nest in groups as small as ten or as large as 2,000, and nesting can begin at a site as quickly as overnight if suitable vertical environments are available. Within the Project area, the nesting season for bank swallows typically occurs between June 5 and July 5 (Johnsgard, 2009).

Bank swallows place their nests mostly in the upper third of a bank to avoid ground predators. Their burrows can extend up to 25 inches into the side of the bank ending with a small chamber for the nest. The nest will commonly be constructed of grass, leaves, straw, or rootlets scavenged from the surrounding area. Male bank swallows will dig their burrows to attract a female, who will then construct the nest within the nesting chamber. Males who did not attract a female will abandon their burrows. Bank swallow eggs have a 13-15-day incubation period and nesting period of 18-21 days.

Figure 16. Bank swallow nests along the Sheyenne River

Bank swallows are protected under the Federal Migratory Bird Treaty Act (MBTA). The MBTA is enforced by the U.S. Fish and Wildlife Service as a 'strict liability' law, meaning that the offender assumes automatic

responsibility for the take of a protected migratory bird species, even if the destruction event was indirectly or unintentionally imposed by the offender. Additionally, there are no permitting options provided through the MBTA for the incidental taking of birds; this leaves the responsibility of implementing protective measures solely in the hands of the acting agency.

Bank swallows have not been identified on the Maple or Rush Rivers. However, if the presence of bank swallows is identified, measures to avoid take will be necessary to comply with the MBTA for the Proposed Alternative construction activities along the Sheyenne River, Maple River, and Rush River.

The presence and use of these areas by other terrestrial wildlife has not changed from what is described in previous NEPA documents.

4.3.14 Threatened and Endangered Species

On September 19, 2023, the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) tool was used to determine species protected by the Endangered Species Act that are known to or are believed to occur in Cass County, ND where the Sheyenne, Maple, and Rush River structures are located. A complete list of federally listed species in Cass County can be found in Table 3. No critical habitat was identified within Cass County, ND. The northern long-eared bat was listed as a threatened species in the project vicinity in 2019; however, it was reclassified to endangered in November 2022. Additional information on northern long-eared bat, Dakota skipper, and western prairie fringed orchid can be found in previous NEPA documents.

The monarch butterfly was listed as a candidate species in December 2020 and has not been addressed in previous NEPA documents. Monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The bright coloring of a monarch serves as a warning to predators that eating them can be toxic. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant, and larvae emerge after two to five days. Larvae develop over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals as a defense against predators. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks. Monarch butterflies live mainly in prairies, meadows, grasslands, and along roadsides.

Table 3. Federally-listed threatened and endangered species.

	Common Name	Scientific Name	Federal Status
Mammals	Northern Long-Eared Bat	*Myotis septentrionalis*	Endangered
Insects	Dakota Skipper	*Hesperia dacotae*	Threatened
	Monarch butterfly	*Danaus plexippus*	Candidate
Plants	Western Prairie Fringed Orchid	*Platanthera praeclara*	Threatened

4.3.15 State Listed Species

No change from what is described in previous NEPA documents.

4.3.16 Eagles

One eagle nest has been located approximately 200 feet from channel fill and excavation planned for all alternatives, including the No Action Alternative, on the Sheyenne River. Surveys to monitor and locate raptor nests will continue to be conducted in winter 2024 and subsequent years to determine the presence or absence of active eagle nests within the project areas. Eagle nests are active between December and August in North Dakota.

4.3.17 Prime and Unique Farmland

Prime farmland is a designation assigned by U.S. Department of Agriculture (USDA) defining land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these land uses. The Farmland Protection Policy Act is intended to minimize the impact Federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses.

Over 90-percent of the land in the FMM Project work limits are classified as either “prime farmland” or “prime farmland if drained”. Most undeveloped areas in the FM Area are in agricultural use due to the high percentage of rich, fertile soils. More prime and unique farmland continues to be developed as the Fargo-Moorhead metropolitan area continues to grow.

4.4 Hazardous, Toxic and Radioactive Waste (HTRW)

The majority of the area within the work limits upstream of the Sheyenne River Aqueduct has been surveyed for HTRW sites. The historic land use along the proposed project corridor is agricultural with some relatively recent residential development.

4.5 Cultural Resources

Cultural resources investigations for the Rush River and Maple River construction zones were completed between 2010 and 2019 and have been coordinated with the North Dakota State Historic Preservation Office (SHPO) and with Tribal Historic Preservation Offices (THPO). There has been no change from what is described in the FEIS and 2013 and 2019 SEAs at those locations. Further, those locations are subject to construction monitoring during all ground disturbing activities per the terms of the project’s cultural resources “Programmatic Agreement Among the U.S. Army Corps of Engineers, St. Paul District, the North Dakota State Historic Preservation Officer, and the Minnesota State Historic Preservation Officer Regarding the Fargo-Moorhead Metro Flood Risk Management Project, Cass County, North Dakota and Clay County, Minnesota,” (PA) executed in 2011 and amended in 2012.

The proposed benching along the Sheyenne River necessitated Class III intensive archaeological survey of all project-related construction zones, consistent with the PA. Field survey of project work zones for archaeological and architectural sites was performed in November 2023 and no significant resources were identified. The survey team is expected to submit their report in early 2024. Survey reports, North Dakota cultural resource survey site-recording forms (NDCRS Inventory Forms) for both archaeological and

architectural finds, along with relevant spatial data, will be submitted to the North Dakota State Historic Preservation Office (SHPO) for review and comment. Tribal Historic Preservation Offices (THPO) for the sixteen tribes with an interest in the Project will also receive notification/updates and survey reports for review and comment. SHPO and THPO comments would be considered and addressed, including any requests for additional information, per the terms of the PA, prior to commencement of work. It is anticipated that SHPO and interested tribes will concur with a finding of no historic properties affected.

5 ENVIRONMENTAL EFFECTS

Environmental effects from the Project are fully discussed in Chapter 5 of the previous NEPA documents. This section only describes the changes in effects associated with the additional design details for the No Action Alternatives and the Proposed Alternatives. No design changes are proposed for the Rush River Inlet Structure. However, updated hydraulic modeling provided additional information on impacts not available during previous environmental reviews. Changes in river velocities are relevant to discussions below on Geomorphology and Fish Passage. Because the No Action Alternative and Proposed Alternative are the same for the Rush River, the effects of both alternatives are the same. If no change in effects is discussed, the No Action Alternatives and/or the Proposed Alternatives do not alter the environmental effects for that category of impact from what was discussed in previous NEPA documents.

5.1 Social Effects

5.1.1 **Noise**

Impacts from noise would be dependent on proximity to the Project. In general, the location of the benching and other construction is remote and removed from large population areas. There would be additional noise impacts from construction of the Proposed Alternatives for the Sheyenne and Maple Rivers, as well as Options A and B for the Sheyenne River, because they include additional features that will take longer to construct than the No Action Alternative. These impacts would be minor and temporary in nature. No increase in noise is expected during project operation.

5.1.2 **Aesthetics**

During and immediately after construction some of the benching areas on the Sheyenne River and Maple River may be unsightly due to the disturbances near the river. However, plans to install toe-wood and root wads and planting of vegetation on the banks above the benches should result in a minor beneficial improvement to aesthetics once vegetation become established.

The degree of aesthetic impacts would vary by location due to benching on the Sheyenne River for the Proposed Alternative, as well as Options A and B. Areas affected by benching would experience more or less aesthetic impact, depending on the location.

Aesthetic impacts for the Rush River Proposed Alternative would not differ from what was disclosed in previous NEPA documents.

Analyzing viewshed impacts on historic properties is addressed in the Project's cultural resources PA (2011) and its amendment (2013). Adverse impacts for viewshed with respect to historic properties specifically requires that the setting play an integral part in the significance of the site. Historic farmsteads or other sites with visual obstructions, such as tree rings or other wind and snow guards, may not be adversely impacted by the benching if it is not visible.

5.1.3 Transportation

Increased traffic would result from construction the Proposed Alternative and Options A and B on the Sheyenne River due to the additional distance of benching. Impacts to transportation near the Sheyenne River would be minor and temporary in nature during construction as construction equipment moves in and out of the project area. The Maple River Proposed Alternative would occur within the same work limits as the No Action Alternative and additional traffic would be negligible.

5.1.4 Business and Home Relocation

No business or home relocations are anticipated. However, the Sheyenne River Proposed Alternative would require 71.5 acres of additional easements. Option A would require 49.7 acres of additional easements and Option B would require 71.1 additional acres. No additional easements are needed for the No Action Alternatives or the Proposed Alternatives for the Maple River or Rush River.

5.2 Economic Effects

5.2.1 Floodplain (Executive Order 11988)

Executive Order 11988 requires federal agencies to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, and then to minimize impacts to the floodplain. The inundation boundaries for the 1 percent AEP event generated by the hydraulic model used for this SEA were compared to the boundary generated by the hydraulic model used in the 2019 SEA along the Sheyenne, Maple, and Rush Rivers. Differences in inundation are minor for all alternatives analyzed and would not result in any appreciable changes to floodplain impacts.

5.3 Natural Resource Effects

5.3.1 Geomorphology

The proposed benching along the Sheyenne and Maple Rivers is designed to improve the frequency of overbank inundation by allowing earlier expansion of flow into overbank areas and results in lower velocities relative to the No Action Alternatives. The bench elevation was developed based on hydrologic analysis and field indicators of the river geomorphology. The Rush River Proposed Alternative was designed to limit the geomorphological change by including rock vanes in the structure approach. The effect of the No Action Alternatives and Proposed Action Alternatives on river geomorphology has been evaluated through the documentation of changes in stage, velocity, and shear stress in Appendix A. These results are summarized below.

The Sheyenne River Proposed Alternative lowers the peak average cross section velocities relative to the No Action Alternative for all modeled flow events. Peak average cross section velocities for the Proposed Alternative during the 5-percent exceedance April flow event are between 0.5 and 1 ft/s higher than for existing conditions. The No Action Alternative peak average cross section velocities for the same event

were 1 to 2.5 ft/s higher than existing conditions. The channel velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events (4,500 to 5,200 cfs) may exceed 5 and 6 ft/s, which will mobilize the bed material in ways that could introduce bed degradation and bank instabilities. The velocity impacts associated with the No Action Alternative, Proposed Alternative, Option A, and Option B extend approximately 8 miles upstream of the project right of way (ROW) as described in Section 3.1.1. The banks of the Sheyenne River can be characterized as steep and unstable and are often susceptible to sloughing under existing conditions. The benching, installation of sod mats, and placement of root wads will benefit the river geomorphology and improve upon the No Action Alternative by increasing the frequency of overbank inundation and providing improved resiliency to erosion. The improved erosion resiliency for the Proposed Alternative reduces the No Action Alternative velocity impacts and the increased frequency of overbank inundation reduces the impacts of the No Action Alternative lowered water surface elevation. Upstream of the Proposed Alternative there remains a 1.5 ft decrease in water surface elevation for all flow events (except for the 67% AEP event), however this decrease will not influence floodplain access as the channel is incised greater than 1.5 feet.

The Maple River Proposed Alternative effectively lowers velocities relative to the No Action Alternative for all modeled flow events. Peak average cross section velocities for the Proposed Alternative during the 5-percent exceedance April flow event are between 0.5 and 1 ft/s higher than for existing conditions and 1 to 2 ft/s higher for the No Action Alternative. Channel velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events (5,100 cfs to 7,100 cfs) can be as much as 4 ft/s higher than channel velocities under existing conditions. Channel velocities may exceed 10 ft/s for less frequent events (i.e., 1-percent AEP). Considering the alluvial silt composition of the Maple River this may result in increased bed mobilization, bed degradation, and bank instabilities within and upstream of the Project ROW. The velocity impacts associated with both the No Action Alternative and Proposed Alternative extend approximately 2.5 miles upstream of the Diversion Channel Right of Way as described in Section 3.1.2. The banks of the Maple River are also fairly steep and unstable under existing conditions. The benching, installation of sod mats, and placement of root wads will benefit the river geomorphology and improve upon the No Action Alternative by increasing the frequency of overbank inundation and providing improved resiliency to erosion. The improved erosion resiliency for the Proposed Alternative reduces the No Action Alternative velocity impacts and the increased frequency of overbank inundation reduces the impacts of the No Action Alternative lowered water surface elevation. Upstream of the Proposed Alternative (at the project right-of-way) there remains a 1-3 ft decrease in water surface elevation for all flow events, however this decrease will not influence overbank access for low flow events because of existing channel incision. For higher flow events, the frequency is very low and is not anticipated to result in geomorphological changes.

The Rush River Proposed Alternative has been shown to have higher than anticipated velocities through recent hydraulic modeling. However, the peak average cross section velocities within the inlet structure are not expected to generate erosion as this section is designed with rock revetment. For the natural channel upstream of the structure, the maximum peak average cross section velocity during the April 5-percent exceedance event is 4.1 ft/s. During the 10-percent AEP flow event peak velocities just upstream of the ROW are 5.5 ft/s which is an increase of almost 3.5 ft/s relative to the existing conditions. The

channel velocities for all modeled flow events are high enough to potentially mobilize the fine silts and clays that comprise the bed material in ways that could introduce bed degradation and bank instabilities. Rush River Proposed Alternative average cross section velocities for all modeled events drop to within 0.5 ft/s of existing conditions just upstream of the 167th Ave SE Low Water Crossing roughly 1,700 feet upstream of the Project ROW. Hydraulic modeling indicates that for the 10 percent AEP Tributary Peak Event, approximately 1 ft of erosion may occur immediately upstream of the Project ROW (RRVA, 2023). The 10-percent AEP Tributary Peak Event results in more critical velocities (and erosion potential) as compared to less frequent events. This is caused by additional tailwater influence in the less frequent events. Erosion is anticipated to be isolated to the reach between 167th Ave and the Project ROW.

Additional documentation regarding the stage, velocity, and shear stress hydraulic design results is included in Appendix A.

5.3.2 Water Quality

The No Action Alternatives, Proposed Alternatives, as well as Options A and B, would have temporary minor adverse impacts on water quality during construction. Adverse impacts would be localized and would cease upon the establishment of vegetation. Best Management Practices (BMPs) such as silt fences and silt curtains may be used to limit the extent of impact. The North Dakota Department of Environmental Quality (NDDEQ) provided a letter stating that a modification to the existing Section 401 Water Quality Certification for the Project is not required for the modifications discussed in this SEA.

5.3.3 Wetlands

Wetland impacts within the Diversion Channel ROW were disclosed in previous NEPA documents. No additional wetland impacts for any of the alternatives are anticipated. Alternatives involving river benching will likely result in the development of wetlands due to the increased hydraulic connectivity.

5.3.4 Aquatic Habitat

The Proposed Alternatives include river benching below the OHWM on the Sheyenne and Maple Rivers to reduce velocities to satisfactory levels. Benching would result in the removal of riverbank and debris. The addition of toe wood-sod mats would enhance the benching areas by providing erosion protection, refuge from high velocities during flooding, and aquatic habitat. The Proposed Alternative on the Sheyenne River would result in approximately 2.2 acres of benching below the OHWM along 8,530 linear feet of shoreline. Approximately 5,970 linear feet of toe wood-sod mats would be placed for bank stabilization. The Sheyenne and Maple Rivers do not have a lot of accessible river overbank due to steep banks and channel incision. Benching would provide habitat value by providing aquatic life additional accessibility to overbank areas.

Sheyenne River Options A and B would result in a total of approximately 1.7 and 2.5 acres of benching below the OHWM, respectively. Approximately 5,420 and 5,950 linear feet of toe wood-sod mats would be installed for Options A and B, respectively. A summary of the increased aquatic impacts on the Sheyenne River can be found in Table 4.

Table 4. Additional Sheyenne River aquatic habitat impacts in benching areas

Impact Location	Aquatic Habitat Impacts (ac)	Aquatic Habitat Impacts (Linear Feet)	Toe Wood-Sod Mat (Linear Feet)
Proposed Alternative	2.2	8,530	5,970
Option A	1.7	8,340	5,420
Option B	2.5	8,620	5,950

Excavation of the riverbanks during construction of the benches would result in removal of woody debris that provides habitat to aquatic organisms, resulting in minor temporary adverse impacts to the aquatic environment. However, there is little existing aquatic woody debris along the proposed benching areas, as a result of clearing and snagging practices. The placement of toe wood-sod mats would not only replace the lost habitat but would result in a substantial long term beneficial impact to aquatic habitat on the Sheyenne River.

The work limits used to calculate the spatial area of impact for the Proposed Alternatives on the Maple and Rush Rivers have not changed from what was evaluated in previous NEPA documents. Within the work limits on the Maple River, placement of approximately 600 feet of toe wood-sod mats would result in substantial long term beneficial impacts by providing additional aquatic structure.

Updated hydraulic modeling for the Rush River Proposed Alternative has revealed higher velocities than previously anticipated. The higher velocities are expected to result in minor changes to aquatic habitat. Changes in habitat will be subject to geomorphologic monitoring which will be used to inform potential adaptive management measures.

5.3.5 Fish Passage and Biological Connectivity

As discussed above, river benching on the Sheyenne and Maple Rivers for the Proposed Alternatives would reduce velocities and improves conditions for fish passage during high flow events relative to the No Action Alternative. Benching would involve the removal of riverbank to increase cross sectional area and reduce velocities at high flows (Figure 7). River benching would allow river flows to spread out during higher flow events. This would reduce velocities that could impede the movement of biota, particularly at more frequent flood events (e.g., 50-percent to 5-percent annual exceedance probability). The Proposed Alternatives provide inundated overbank areas that biota can effectively use to swim upstream during high flow periods. For the Sheyenne River, velocities in overbank areas would generally remain very near or below 1 ft/s during more frequent flood events and the average cross section velocity (average velocity for both the channel and overbank) would be no greater than 3.6 ft/s, as shown in Figure 17. For the Maple River, the average cross section velocity would also be no greater than 3.6 ft/s as shown in Figure 18, with the exception of one spike to approximately 4.2 ft/s at approximate river station 36,000, which is also present in existing conditions. The addition of toe wood-sod mats would enhance the benching areas by providing erosion protection, refuge from high velocities during flooding, and aquatic habitat. The Proposed Alternatives are not anticipated to have major adverse effects to fish passage and biological connectivity. The Sheyenne River alternatives would also work in concert with mitigation measures to

modify existing features of the Sheyenne River Flood Protection Project which have been designed to minimize potential adverse effects to impeded biological connectivity.

For the Maple River and Sheyenne River No Action Alternatives, river velocities would be elevated during high flow events. Average velocities during the 5-percent exceedance April flow event are projected to be at or above 4 ft/s near the Maple River Aqueduct and 5 ft/s near the Sheyenne River Aqueduct, which is 1-2 ft/s higher than existing conditions. These velocity differences would decrease with distance upstream. The existing channel is incised with limited physical structure that can provide current breaks and microhabitats that contribute to biotic organisms' abilities to move upstream. This would result in an elevated risk that high velocities could be a barrier to fish movement during high flow events.

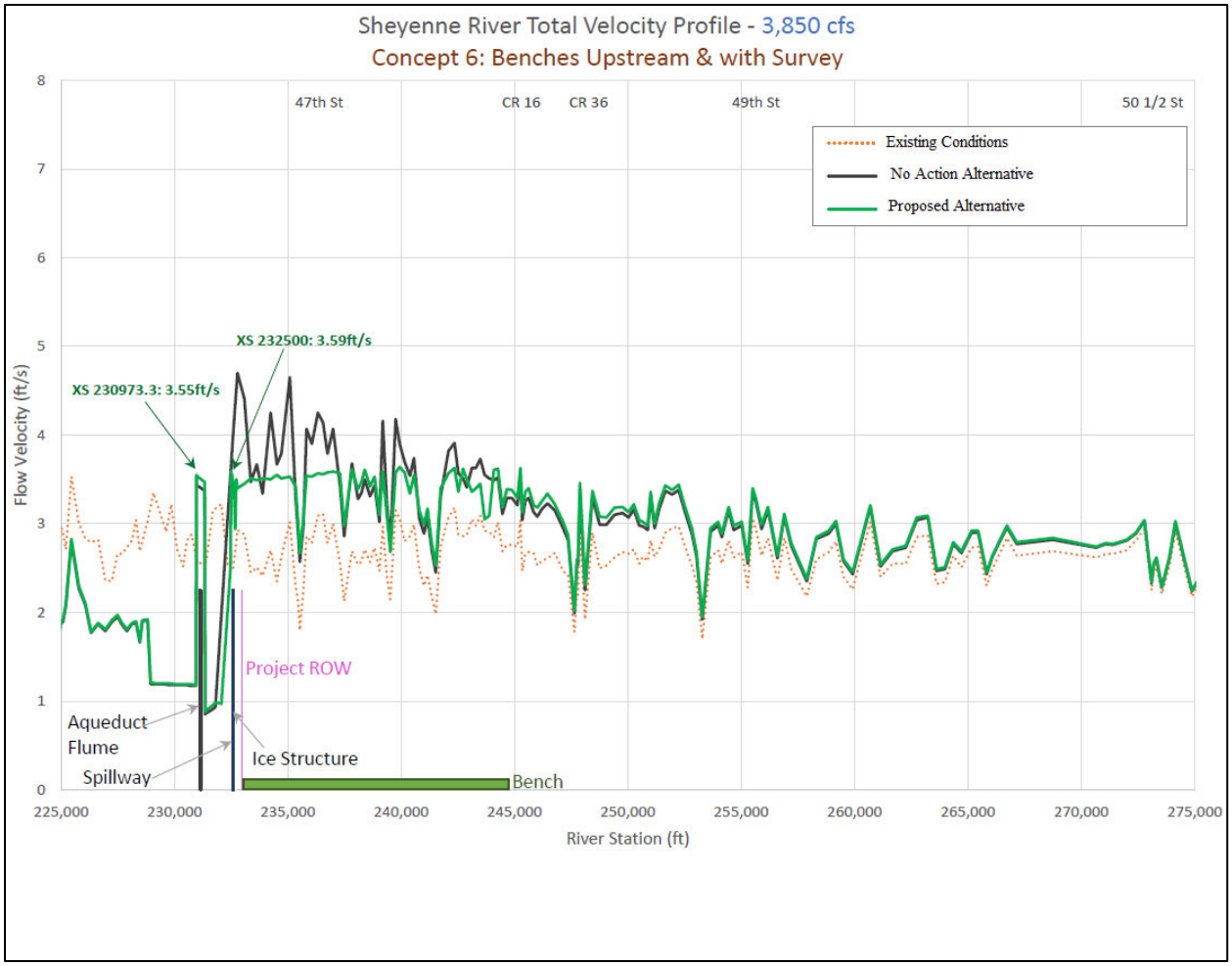

Figure 17. Sheyenne River velocity profile, existing conditions vs Proposed Alternative conditions

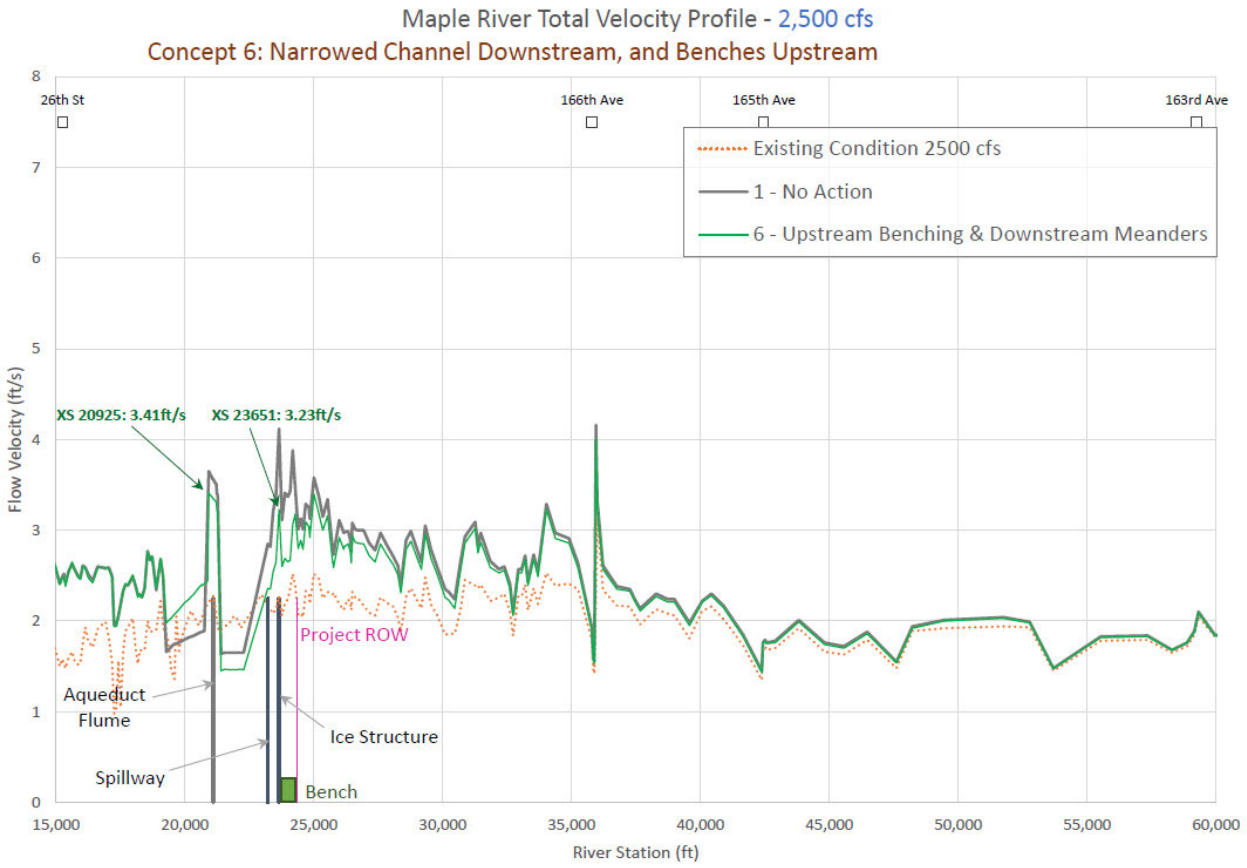

Figure 18. Maple River velocity profile, existing conditions vs Proposed Alternative conditions

With the Rush River Proposed Alternative, velocities within the Rush River immediately upstream of convergence with the diversion channel will be elevated during floods, relative to existing conditions. Modeled velocities show increases from 1 to 3 ft/s above the existing conditions. The increase depends on the Rush River discharge and the amount of flow and corresponding water level in the diversion channel. The increase in velocities will extend approximately 1,700 ft upstream, at which point the velocities would return to approximately existing conditions. Modeled velocities along the Rush River during the 5-percent April exceedance event, the 10-percent AEP event, and the 1-percent AEP event are shown in Figure 19 and are further discussed in Appendix A. While these velocity increases are a risk to fish passage, it is believed the extent, duration, and frequency of the increased velocities is small enough to avoid substantial changes to the fish community, relative to the same risks that would be present with existing conditions. The effectiveness of fish passage will be monitored at the Rush River. Thresholds will be developed with natural resource agencies through the FMM Project Adaptive Management and Mitigation Plan to determine triggers that would result in the implementation of adaptive management measures to reduce or alleviate fish passage impacts, if necessary.

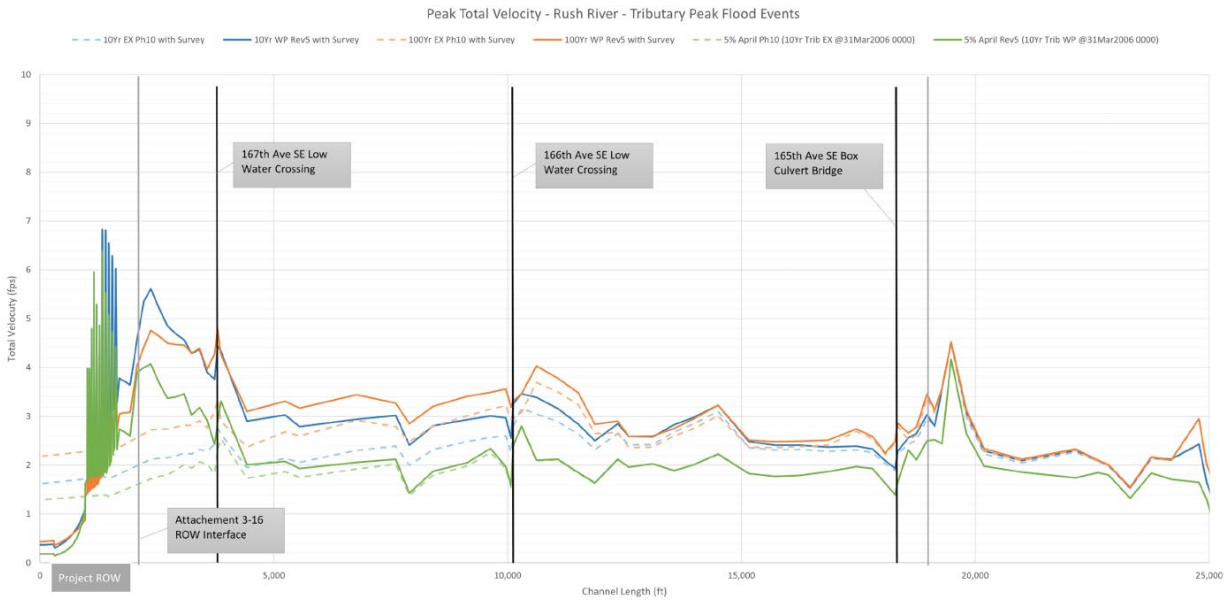

Figure 19. Rush River velocity profile, existing conditions vs Proposed Alternative conditions

5.3.6 Upland Habitat/Riparian Habitat

Effects of the Rush River Proposed Alternative are the same as described in previous NEPA documentation. Effects of the Maple River Proposed Alternative are within the same footprint described in previous NEPA documents. The additional benching would occur along 600 linear feet of riverbank and produce 9,500 cubic yards of material. Approximately 100 root wads would be installed along the benching area. The benching would slightly increase the riparian areas affected, but would ultimately improve riparian areas through the revegetation and environmental enhancement features previously described.

This section will focus on upland and riparian habitat impacts for the Sheyenne River benching alternatives, which would include the Proposed Alternative, Option A and Option B.

Work limits were used to calculate areas with potential temporary or permanent impacts. Work limits are areas where contractors are allowed to access the sites, drive, and stage construction equipment, and complete the construction activities. Impacts to work limit areas outside of benching and fill areas would be minor and temporary as they would return to similar use after construction concludes. Benching and fill areas would experience permanent changes to surface elevations; however, benching areas would be enhanced to provide improved functions compared to existing conditions and much of the fill areas would be returned to similar land use (farming).

In addition to the placement of root wads, benching areas would include the placement of sod mats and plantings of woody vegetation and native herbaceous species. Material excavated from the benching areas would be placed in adjacent areas. A berm would be constructed along the benching areas to mimic the existing perched channel elevation. The remaining material would be spread in adjacent farm fields. The topsoil of the fields would be stripped prior to the placement of material and would be respread to allow farming practices to continue, to the extent possible.

The Proposed Alternative on the Sheyenne River includes 86.1 acres of land within the work limits. Approximately 14.0 acres would be included in the excavation areas required for benching and 28.6 acres would be included in the fill areas.

Options A and B would include 73.2 and 88.4 acres of land within the work limits, respectively. Excavation areas would equal 13.6 and 14.2 acres and fill areas would equal 23.7 and 28.5 acres (Table 5).

Table 5. Comparison of Sheyenne River Alternative Upland Disturbances

Sheyenne River Alternatives	Work Limit Area (ac)	Temporary Impact Area (ac)	Permanent Land Alteration	
			Bench Excavation Area (ac)	Fill Area (ac)
Proposed Alternative	86.1	43.5	14.0	28.6
Option A	73.2	35.9	13.6	23.7
Option B	88.4	45.7	14.2	28.5

Upland areas of resource significance include forested areas and farmland. A description of forest impacts along the Sheyenne River can be found below. The majority of the fill area would be returned to conditions that may continue to be farmed, as discussed in Section 5.3.11. A detailed description of impacts to farmland can be found in Section 5.3.11.

On the Sheyenne River, 7.4 acres of forested areas would be cleared for the Proposed Alternative, 8.8 acres for Option A, and 7.2 acres for Option B. A summary of forest clearing acreages are displayed below in Table 6. Impacts to forest are no different on the Maple River and Rush River than what was described in the 2013 SEA.

Table 6. Comparison of Sheyenne River Alternative Impacts to Forests

Sheyenne River Alternatives	Area of Forest Clearing (ac)
Proposed Alternative	7.4
Option A	8.8
Option B	7.2

The loss of wooded acres would be off-set through the placement of woody vegetation via the toe wood-sod mats along the benching areas. The toe wood-sod mats would produce willow and dogwood species soon after placement. Over time, boxelder, cottonwood, and other tree species are expected to establish via natural regeneration in the benching areas, replacing forest habitat lost from tree removal.

Root wads would be included in the toe wood on the outside riverbanks where higher velocities would be expected. Root wads would be obtained from trees harvested in the benching areas, to the extent possible. The quantity of root wads needed to armor outside bends would be greater than what can be supplied from trees cleared in the benching areas. Additional root wads would be harvested from offsite

locations, including sites in the upstream staging area. These sites consist of building site groves and wind rows that would be likely to be removed in the foreseeable future for construction of the FMM Project and/or sites that would be cleared to convert building sites to land usable for agricultural purposes. Trees used for root wads are those that would be cleared regardless of the benching project.

Permanent impacts to upland and riparian habitats are considered minor due to the restorative actions being taken in the forested and farmland areas.

5.3.7 Terrestrial Wildlife

Riparian areas in this region are key travel corridors for wildlife. Wildlife likely to utilize riparian habitat would be adversely affected during project construction due to the disturbances described above. However, for the Proposed Actions, enhancement to the benching areas provided by the toe wood-sod mats and planting of native vegetation, would eventually provide the benefits of food, shelter, and a concealed transportation corridor.

The Proposed Alternative, Option A, and Option B for the Sheyenne River may have adverse impacts to species that utilize steep banks, which are typical of the Sheyenne River. Bank swallows are one species in particular. Nesting cavities in vertical sand and dirt banks have been observed on the Sheyenne River. To avoid and minimize impacts to bank swallows, surveys would be conducted prior to and during construction. Bank swallows feed on airborne insects and a mated pair will remain close to the nest throughout the 13-15-day incubation period and 18-21-day nesting period. Once bank swallow nests have been identified at a site, disturbing either the birds or the nests would be avoided. This includes destruction of nests or the collapse of burrows caused by the vibration of heavy machinery. Bank swallows can nest quickly overnight. If detected during construction, work would stop and a 165-foot buffer placed around the nesting site. Once nesting is complete, construction could resume in the area.

Temporary adverse impacts to terrestrial wildlife are expected during project construction for all alternatives. However, restoration measures along the riparian corridor are expected to result in a permanent benefit to terrestrial wildlife by providing additional habitat and an enlarged travel corridor along the Sheyenne and Maple Rivers. Species requiring steep banks, such as the bank swallow, would be able to relocate to many other areas along the rivers with suitable habitat.

5.3.8 Endangered and Threatened Species

The northern long-eared bat (NLEB) is a federally-listed endangered species that has been identified by the USFWS as a species potentially affected by activities in the Project area. The NLEB utilizes trees for shelter and raising young. Tree clearing would be required for all alternatives. However, no known records of the NLEB have been recorded in the Project area. Actions to avoid and minimize impacts to the species would be followed. This includes no tree cutting during the active season (April 15 to October 1).

On March 22, 2024 the USFWS provided concurrence with the USACE determination that the Project may affect but are not likely to adversely affect the NLEB (Attachment II). No changes in impacts to other federally listed species would be expected.

The monarch butterfly was identified as a candidate species in December of 2020 but it is not yet listed or proposed for listing. Most areas that would be affected by the Proposed Alternatives do not have ideal habitat for the species; however, potential effects to the butterfly would be evaluated and addressed in the future if the butterfly is listed.

5.3.9 State Listed Species

Species and resources included on the North Dakota Key Species of Conservation Priority would be impacted similarly with the Proposed Alternatives or the No Action Alternatives. All fish species, mammal species, bird species, and insects listed are highly mobile and would likely avoid work areas during construction. Tree clearing would take place during winter months to minimize impacts to bird and bat species during their nesting and rearing periods.

5.3.10 Eagles

A bald eagle nest has been identified approximately 200 feet from planned channel fill and excavation associated with construction of the engineered channel upstream of the Sheyenne River Aqueduct. The manner and proximity of construction in the vicinity of the eagle nest is similar for all alternatives considered along the Sheyenne River. Through coordination with the USFWS and the North Dakota Game and Fish (NDGF) it was determined that avoidance and minimization measures could likely be taken to prevent any unnecessary impacts to eagles in this area.

The Diversion Authority is required to follow the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines to minimize the likelihood that the FMM Project will affect any bald eagles nesting in the Fargo-Moorhead Project Area. Preparation of an eagle nest avoidance and minimization plan is being coordinated with USACE, USFWS, and the NDGF. Surveys to monitor and locate raptor nests will continue to be conducted to determine the presence or absence of active eagle nests within the project areas.

5.3.11 Farmland

The Sheyenne River benching alternatives, to include the Proposed Alternative, Option A, and Option B, would result in the loss of some agricultural land, to varying degrees. Loss of agricultural land on the Maple River and Rush River would be no different than what has been disclosed in previous NEPA documentation. The focus of this section is limited to farmland lost due to the construction of the Sheyenne River benching alternatives.

Excavated material from the Sheyenne River benching would be placed on adjacent lands to replace the natural levee and dispose of excess material. The topsoil of the fields would be stripped prior to the placement of material and would be respread to allow farming practices to continue, to the extent possible. The total area affected by placement of fill and/or cut off from farming practices by the reconstruction of the natural levee is 33.7, 27.6, and 34.0 acres for the Proposed Alternative, Option A, and Option B, respectively. Of those areas, it is expected that 23.8, 20.5, and 22.9 acres would be able to be farmed upon completion of construction, resulting in a net loss of 9.9, 7.1, and 11.1 acres, respectively. A summary of impacts to farmland is provided below in Table 7.

Table 7. Comparison of Sheyenne River Alternative Impacts to Farmland

Sheyenne River Alternatives	Existing Farmland Impacted (ac)	Restored Farmable Areas (ac)	Net Loss of Farmland (ac)
Proposed Alternative	33.7	23.8	9.9
Option A	27.6	20.5	7.1
Option B	34.0	22.9	11.1

Prime farmland, as defined in section 4.3.17, was also evaluated for the Sheyenne River benching alternatives. Areas no longer able to be used as farmland (net loss farmland from Table 7) were considered impacted. Lands that are not currently in agricultural production (e.g., roads, yards, building sites, etc.) were identified and removed from the analysis.

For the Proposed Alternative, 5.8 acres were considered "prime farmland" and 0.2 acres were considered "prime farmland if drained". For Options A and B, acreages of 3.8 and 6.8 were considered "prime farmland" and 0.2 and 0.2 acres were considered "prime farmland if drained", respectively. Over 90 percent of all farmland is considered prime and unique in this region. Impacts to Prime and Unique Farmland resulting from the Proposed Alternative have been documented and are being coordinated with Natural Resources Conservation Service using form NRCS-CPA-106. A summary of impacts to prime farmland can be found below in Table 8.

Table 8. Comparison of Sheyenne River Alternative Impacts on Prime and Unique Farmland

Sheyenne River Alternatives	Prime Farmland (ac)	Prime Farmland if Drained (ac)
Proposed Alternative	5.8	0.2
Option A	3.8	0.2
Option B	6.8	0.2

Both temporary and permanent impacts to farmland would result from the Proposed Alternative for the Sheyenne River, including impacts to prime and unique farmland. However, impacts would be mitigated through actions that would allow the majority of impacted farmland to remain in agricultural production after construction is complete. Therefore, adverse impacts to farmland are considered minor.

5.3.12 Hazardous, Toxic and Radioactive Waste (HTRW)

Information on the 2010 comprehensive Phase 1 Environmental Site Assessment and a 2012 supplemental investigation was provided in the FEIS and the 2013 SEA. An additional supplemental Phase 1 Environmental Site Assessment was completed in 2015 to identify HTRW concerns along subtle alignment modifications being considered, including areas within 0.5 miles of the Sheyenne River Aqueduct crossing of the Diversion Channel. The 2015 HTRW study considered five of the seven parcels that would be disturbed for the Sheyenne River Proposed Alternative. The vast majority of this area has been in agricultural production since settlement. No HTRW concerns of major significance were revealed in the investigation for the five properties including a property with remnants of collapsed storage structures. Based upon initial studies, it is anticipated that the two remaining properties (located at the southern end

of this alignment) would have similar HTRW conditions as those studied in 2015. However, an additional Phase 1 Environmental Site Assessment will ultimately be necessary to evaluate the two parcels along this new alignment not covered in prior Environmental Site Assessments.

5.4 Greenhouse Gases

Greenhouse gases were not discussed in previous NEPA documents.

On January 9, 2023, the Council on Environmental Quality (CEQ) released National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change. This guidance provides details for how federal agencies can incorporate GHG and climate change considerations into the NEPA process, including assessing and reducing impacts from GHG emissions or incorporating climate resiliency considerations into alternatives. While the Climate Change Guidance is considered "interim," it is effective immediately, while CEQ seeks public comment on the guidance.

As discussed in this guidance, when conducting climate change analyses in NEPA reviews, agencies are recommended to consider the potential effects of a proposed action on climate change, including by assessing both direct and indirect GHG emissions and reductions from the proposed action, quantifying the baseline (no-action) emissions, and evaluating the effects of climate change on a proposed action and its environmental impacts. The guidance further recommends that greenhouse gas emissions should be quantified for the gross and net emissions for each chemical species (i.e., methane, nitrous oxide, etc.) and summarized as carbon dioxide equivalent (CO2e) and social cost of greenhouse gases. The guidance also emphasizes the "rule of reason" which states that the depth of the GHG analysis should be commensurate to the amount of greenhouse gases emitted.

The operation of heavy equipment such as backhoes, excavators, and dump trucks during construction would generate GHG emissions. The most notable difference between the No Action and Proposed Alternatives from a construction perspective is the construction of benches to widen the upstream Sheyenne River natural channel. However, this construction timeframe is only approximately 13 months for the benching portion of the Sheyenne River Proposed Alternative and would be undertaken concurrent with the rest of the Proposed Alternative construction activities. Both the No Action and Proposed Alternatives would have a minor impact on GHG emissions, and the "rule of reason" supports not performing a more in-depth, quantitative analysis.

5.5 Cultural Resources Effects

For the Rush River and Maple River construction zones there is no change from what is described in the FEIS and 2013 and 2019 SEA at those locations. The Proposed Alternative at the Sheyenne River crossing may impact historic properties, if any are determined to be present. Based on cultural resources investigations along the Sheyenne River, prehistoric and historic sites are situated along the margins of uplands overlooking the river, and within one-quarter mile of riverbanks. Previous archaeological surveys in proximity to the top of bank, within the diversion channel footprint, identified four sites. Sites 32CS5178, 32CSx362, 32CS5108, and 32CS5180—located north to south along both banks—were all determined to be ineligible and/or isolated finds. To avoid and minimize adverse impacts on historic

properties, surveys will be conducted prior to construction, and archaeological monitoring of all ground disturbing activities during construction will take place.

5.6 Cumulative Impacts

The FMM Area has experienced rapid growth over the past several decades and infrastructure, such as bridges, ditches, and water control features, have been constructed to accommodate growth and development. These structures have contributed to habitat fragmentation, reduced water quality, and limited connectivity in area rivers and streams, to varying degrees. The No Action Alternatives would result in higher velocities that would add to the adverse cumulative impacts listed. The Proposed Alternatives on the Sheyenne and Maple Rivers would reduce the long-term cumulative impacts by lowering the velocities resulting from the Project and by providing stabilization and habitat to steep banks susceptible to sloughing.

Aquatic impacts caused by the FMM Project will also be mitigated through the Sheyenne River Mitigation Project which includes the removal and alteration of several structures built as part of the Sheyenne River Flood Protection Project. The alterations will increase aquatic connectivity to allow fish to access upstream portions of the Sheyenne River more frequently. These benefits would be reduced by the Sheyenne River No Action Alternative as high velocities upstream of the Sheyenne River Aqueduct would limit the ability of many fish to pass through the area during frequent flood events. The Sheyenne River Proposed Alternative provides velocities likely to allow upstream migration during flood events, maximizing the benefits provided by the Sheyenne River Mitigation Project.

5.7 Controversy

The FMM Project continues to be somewhat controversial due to the large geographic extents of the project and the land required to implement the project. The areas impacted by the Sheyenne River Benching Alternatives are rural and residents living in this area have expressed their desire to maintain the natural appearance and feel provided by the wooded corridors. Extensive coordination with landowners near the Sheyenne River has led to the evaluation of numerous alternatives and the eventual selection of the Proposed Alternative that balances project function, environmental impacts, and landowner input.

6 COORDINATION

6.1 Resource Agency Meetings

The resource agency team that was developed during the FEIS process has continued to meet in order to discuss the Project. The higher velocities anticipated upstream of the Sheyenne River Aqueduct, Maple River Aqueduct, and the Rush River Inlet have been discussed extensively with representatives from the natural resource agencies. Those discussions have contributed to the selection of the Proposed Alternatives.

6.2 Landowner Meetings

The Metro Flood Diversion Authority held two meetings in Horace, North Dakota on May 10, 2023 and September 13, 2023. All landowners with properties along the Sheyenne River from the Diversion Channel Right of Way to County Road 16 bridge were invited to these meetings. Representatives from USACE and the NDGF also were invited and attended the meeting with landowners on September 13, 2023.

The purpose of these meetings was to discuss: (1) reasons for benching to be constructed as part of the Fargo-Moorhead Flood Risk Management Project, (2) potential options for constructing benches along this reach of the river, and (3) need for temporary Rights of Entry to allow the Metro Flood Diversion Authority to conduct geotechnical, cultural resources, and tree surveys on properties along the river to better define potential construction actions. Following each of the meetings, several landowners requested individual visits by the Metro Flood Diversion Authority in order to better understand the potential actions and provide suggestions unique to their property.

All work along the Maple River and Rush River for those Proposed Alternatives will be conducted on property previously acquired for the project. Therefore, because no additional landowners are impacted, no additional coordination was conducted for those Proposed Alternatives.

6.3 Cultural Resources

Section 106 coordination with tribes and State Historic Preservation Offices has continued, consistent with the information provided in the FEIS and 2013 and 2019 SEAs. Formal consultation was initiated beginning in 2009 with eight tribes; additional tribes were consulted in 2010 and 2011. At the time the PA for cultural resources management was executed in 2011, sixteen tribes were invited to sign as concurring parties. A traditional cultural property survey was conducted for the Project in 2011 in accordance with the PA and in consultation with tribes. SHPO and THPO consultation is ongoing and will continue to the end of Project construction. Inadvertent discoveries or other events that trigger consultation will be responded to in accordance with Section 106 requirements.

6.4 Comments

This Environmental Assessment was made available for public review and comment from February 13, 2024 to March 15, 2024. Comments were received from the NDGF, NDDWR, and MnDNR. All comments received are included in Appendix B and responses to comments are provided in Appendix C.

7 REFERENCES

Johnsgard, Paul A., "Birds of the Great Plains: Family Hirundinidae (Swallows)" (2009). Birds of the Great Plains (Revised edition 2009) by Paul Johnsgard. 40.

Red River Valley Alliance (RRVA). 2023. *E09-S09 - Rush River Inlet Construction Documents Submittal*, September 2023.

United States Army Corps of Engineers (USACE). 2011. *Final Feasibility Report and Environmental Impact Statement Fargo Moorhead Metropolitan Area Flood Risk Management*. USACE, Mississippi Valley Division, St. Paul District.

United States Army Corps of Engineers (USACE). 2013. *Supplemental Environmental Assessment Design Modifications to the Fargo Moorhead Metropolitan Area Flood Risk Management Project*. USACE, Mississippi Valley Division, St. Paul District.

United States Army Corps of Engineers (USACE). 2019. *Supplemental Environmental Assessment Design Modifications to the Fargo Moorhead Metropolitan Area Flood Risk Management Project*. USACE, Mississippi Valley Division, St. Paul District.

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Appendix A
Hydraulics and Hydrology

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

U.S. Army Corps of Engineers

St. Paul District

May 2024

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Appendix A
Hydraulics and Hydrology

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1 OVERVIEW

The Fargo-Moorhead Metropolitan Area is a flood prone area located in Cass County, North Dakota and Clay County, Minnesota. The Fargo-Moorhead Metropolitan Area Flood Risk Management Project (FMM Project) is designed to reduce the risk of flooding. The FMM Project consists of two main hydraulic components: 1) an upstream staging area and earthen embankment and 2) a Diversion Channel and associated structures that convey flood flows around the community. This Supplemental Environmental Assessment (SEA) and Appendix focus on proposed engineered channels, aqueducts, spillways, and/or inlets along the Sheyenne, Maple, and Rush Rivers and their impacts to the existing upstream natural channels.

Hydraulic modeling indicates that velocities upstream of the Sheyenne River and Maple River Aqueducts exceed existing conditions levels for the with-project condition. For some flow events, these velocities may induce erosion and adversely impact fish passage. The US Army Corps of Engineers (USACE) St. Paul District and the Metro Flood Diversion Authority (MFDA) developed and evaluated a series of options to reduce velocities at and upstream of the Sheyenne and Maple River Aqueducts. Updated hydraulic modeling conducted as part of the design for the Rush River Inlet indicated higher velocities than what was described in previous NEPA documents. The increased velocities at the Rush River may cause increased erosion, but are anticipated to result in an acceptable level of impacts. Erosion will be monitored and adaptive management measures will be implemented, if necessary. The various alternatives are discussed in Section 3.2 and 3.3 of this Appendix and Section 3 of the Supplemental Environmental Assessment (SEA).

1.1 Objective

The objective of this appendix is to identify the hydraulic characteristics and trends associated with existing conditions, No Action Alternatives, and the Proposed Alternatives. Additionally, a review of the erosion risks outside of the respective project area right of way (ROW) is included.

2 HYDROLOGIC DATA

The hydrologic assessment that informed the hydraulic model boundary conditions for this study was developed as a part of the 2019 SEA and is referred to as the Period of Record (POR) Hydrology for Plan B (Houston-Moore Group (HMG), 2018 and USACE, 2019). The hydraulic model unsteady flow file uses the return period interval naming convention for these flow events, representing the 10-, 5-, 2-, 1-, and 0.2-percent Annual Exceedance Probability (AEP) flood events, respectively. The details of this hydrology can be found in Attachment 1 of Appendix D to the 2019 SEA (HMG, 2018).

A modified version of the 10-percent AEP flow event centered on the tributaries (TribPeak) along the Sheyenne and Maple Rivers was used to assess velocity impacts associated with fish passage and erosion under peak flow conditions of 3,850 cfs and 2,500 cfs, respectively. These peak flows correspond to the

5% exceedance flows in April and are important for migratory fish passage (USACE, 2020a and USACE, 2022).

An additional modified version of the 5-percent AEP flow event with a storm centering on the Red River of the North (RRN event) was used on the Maple River as this event was identified as generating the highest velocities within the Maple River Aqueduct system. The RRN event did not produce similar higher-velocity results on the Sheyenne or Rush Rivers and is therefore not discussed in this document.

The Rush River modeling used the 10-percent AEP TribPeak flow event boundary conditions and extracted velocity and water surface elevation (WSE) data at a specific time step when velocities approximately match the 5% exceedance flow in April (USACE, 2023).

2.1 Sheyenne River 5% Flow

The 5% exceedance flow in April for the Sheyenne River is identified in Addendum 1 to the Sheyenne River Flow Duration Curve Update document (USACE, 2020b and USACE, 2020a). The peak flow of 3,850 cfs was identified as the 5% exceedance flow for the month of April using mean daily flow data for a time period of 1952 – 2020.

2.2 Maple River 5% Flow

The 5% exceedance flow in April for the Maple River is identified in a memo from USACE titled "Flow Duration Curves at Maple River below and near Mapleton, North Dakota" (USACE, 2022). The peak flow of 2,500 cfs was identified as the 5% exceedance flow for the month of April using a Hydrologic Engineering Center (HEC)-1 hydrologic model developed by USACE in 2011 with flow data from USGS gage 05060000 Near Mapleton from 1945-2009. More information related to the development of this flow data can be found in the memo.

2.3 Rush River 5% Flow

The 5% exceedance flow in April for the Rush River is identified in a memo from USACE titled "Flow Duration Curves on Rush River Just Upstream of FMM Diversion Channel" (USACE, 2023). The peak flow of 533 cfs was identified as the 5% exceedance flow for the month of April using modified mean daily data from USGS gage 05060500 Rush River at Amenia, ND for the full period of record from 1947-2023. More information related to the development of this flow data can be found in the memo. The unsteady flow boundary condition for the Rush River was not modified to reflect a peak of 533 cfs; instead, the velocity data from the 10-percent AEP TribPeak data was recorded at time step 31MAR2006 0000 as the flow at this time step is 527 cfs.

3 HYDRAULIC MODELS

The Hydrologic Engineering Center – River Analysis System (HEC-RAS v.5.0.6) models used to assess velocities along the Maple and Sheyenne use the FMM Phase 11.2 model (Metro Flood Diversion Authority, 2023). The hydraulic modeling for the Rush River was developed by the Metro Flood Diversion

Authority by incorporating the bathymetric survey data into the RRVA-Rev05 model. The existing conditions geometry is described in section 3.1 below. Separate geometries were developed for the No Action and Proposed Alternative conditions for the Sheyenne and Maple Rivers and are described in sections 3.2 and 3.3 below. The Rush River No Action Alternative and Proposed Alternative are the same as no changes in the design are proposed for the Rush River Inlet.

3.1 Existing Conditions

The existing conditions model used to establish baseline velocity and shear stress data for the Sheyenne, Maple, and Rush Rivers was the FMM Project Phase 11.2 HEC-RAS model.

3.1.1 Sheyenne River

The portion of the Sheyenne River impacted by the Diversion Channel is located within a roughly 33-mile reach (Gol to Horace), with an upstream extent at station 397,223 and the downstream confluence with the Sheyenne Diversion channel at station 222,482.

Cross sections are, on average, spaced approximately 350 feet from each other.

Manning's n values were assigned as outlined in Table 1.

Table 1. Sheyenne River Manning's n Values.

Cross Section Location	Manning's n value
LOB	0.15
Channel	0.040 – 0.045
ROB	0.15

The channel Manning's n value changes from 0.045 to 0.040 at River Station 273,102, approximately 7.5 miles upstream of where the Sheyenne River intersects with the Diversion Channel alignment.

3.1.2 Maple River

The portion of the Maple River impacted by the Diversion Channel is located in a roughly 29-mile reach with an upstream extent at River Station 170,400 and the downstream confluence with Drain 14 at River Station 8,435. Cross sections are, on average, spaced approximately 450 feet.

Manning's n values were assigned as outlined in Table 2.

Table 2. Maple River Manning's n Values.

Cross Section Location	Manning's n value
LOB	0.060
Channel	0.035
ROB	0.060

3.1.3 Rush River

The Rush River is represented by a roughly 30-mile reach with an upstream extent at River Station 158,968 and the downstream confluence with the Sheyenne River at River Station 129.

Cross sections are, on average, spaced approximately 650 feet.

Manning's n values were assigned as outlined in Table 3.

Table 3. Rush River Manning's n Values.

Cross Section Location	Manning's n value
LOB	0.060
Channel	0.035 – 0.040
ROB	0.060

The channel Manning's n value changes from 0.040 to 0.035 at River Station 40,200, approximately 4.5 miles upstream of where the Rush River intersects with the Diversion Channel alignment.

3.2 No Action Alternative

The No Action Alternatives for both the Sheyenne and Maple River are the previously proposed Diversion Channel aqueduct and inlet structure designs from the 2013 SEA, with design refinements described in the 2024 SEA. The Phase 11.2 model used to evaluate the No Action Alternatives includes the Southern Embankment design features as of May 2023 and the RRVA's Rev05 hydraulic model. The designs for the Sheyenne, Maple, and Rush Rivers are described in the sections below.

3.2.1 Sheyenne River

Under the No Action Alternative, when flows in the Sheyenne River upstream of the Diversion Channel Right of Way are no greater than 1,200 cfs, an Obermeyer gate at the spillway would remain in a raised position, to prevent water from being diverted into the Diversion Channel. As the river flows become greater than 1,200 cfs, the Obermeyer gate at the spillway would be lowered to convey water into the Diversion Channel and concurrently manage flows across the aqueduct flume. Flow through the aqueduct is limited by the Project to no greater than 1,500 cfs. Allowing flows into the spillway lowers the water surface elevation and increases upstream flow velocity in the Sheyenne River for approximately 5 miles upstream of the Diversion Channel Right of Way until the effects are naturally attenuated. These conditions occur during high flow events, generally in April and May, which is the period when most of the fish passage occurs. Layout of the Sheyenne River aqueduct under the No Action Alternative is shown in Figure 1 and Figure 2.

The No Action Alternative for the Sheyenne River includes the following:

- A natural river channel entering the Diversion Channel Right of Way from the west
- An Ice Retention Structure upstream of the Upstream Engineered Channel

- An Upstream Engineered Channel to convey normal flows to an Aqueduct Flume
- An Aqueduct Flume which would convey water across the Diversion Channel to a Downstream Engineered Channel
- A Downstream Engineered Channel which would convey water from the Aqueduct Flume to the natural river channel at the east edge of the Diversion Channel Right of Way
- A Spillway Approach Channel and Spillway branching off the Upstream Engineered Channel which would direct flow into the Diversion Channel during high flow events
    - The Spillway Approach Channel and Spillway connects the Upstream Engineered Channel to the Diversion Channel through a spillway structure and is not designed for fish passage

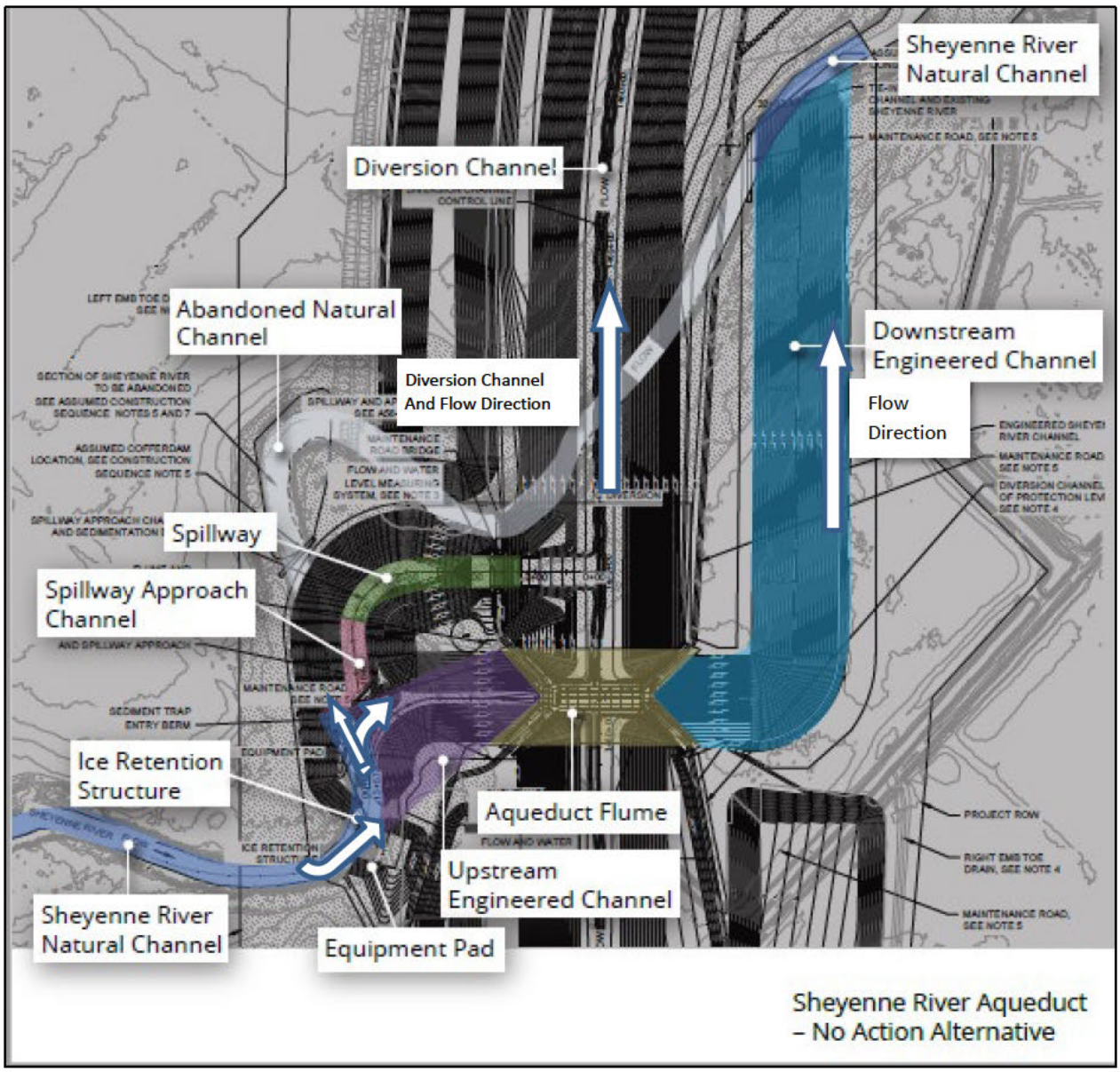

Figure 1. Sheyenne River Aqueduct under the No Action Alternative

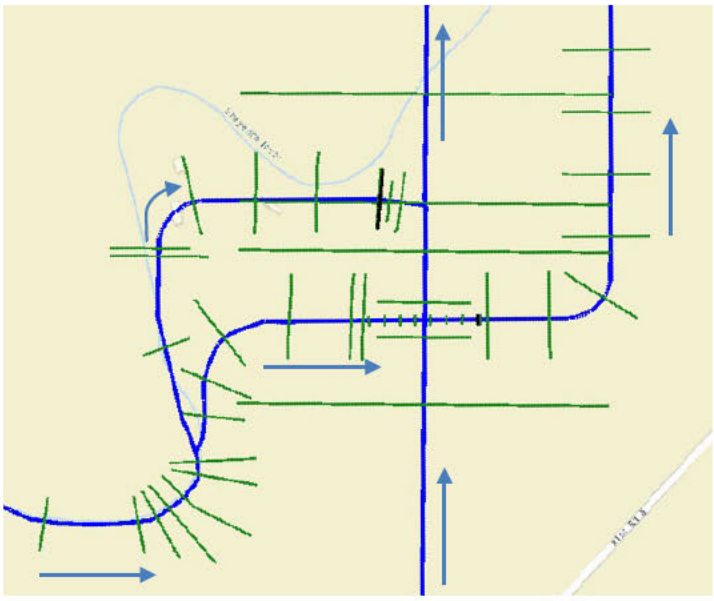

Figure 2. HEC-RAS geometry representation of the Sheyenne River No Action Alternative (flow direction shown by blue arrows)

The Ice Retention Structure within the Sheyenne River is included within the No Action Alternative hydraulic model geometry at River Sta: 232,579 (Figure 3).

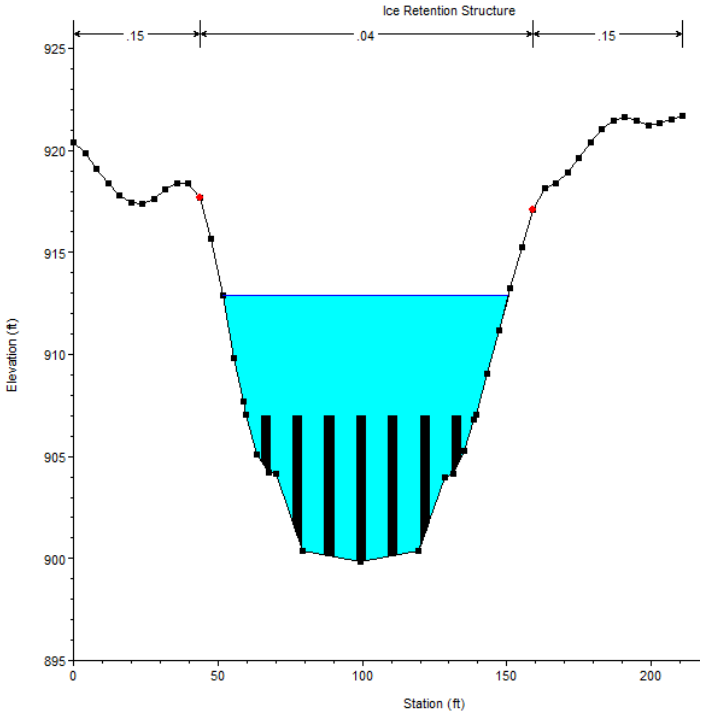

Figure 3. Ice retention structure represented with Blocked Obstructions within HEC-RAS cross section 232579

The Upstream Engineered Channel and Downstream Engineered Channels are represented via a roughly trapezoidal channel in the hydraulic model as shown in Figure 4:

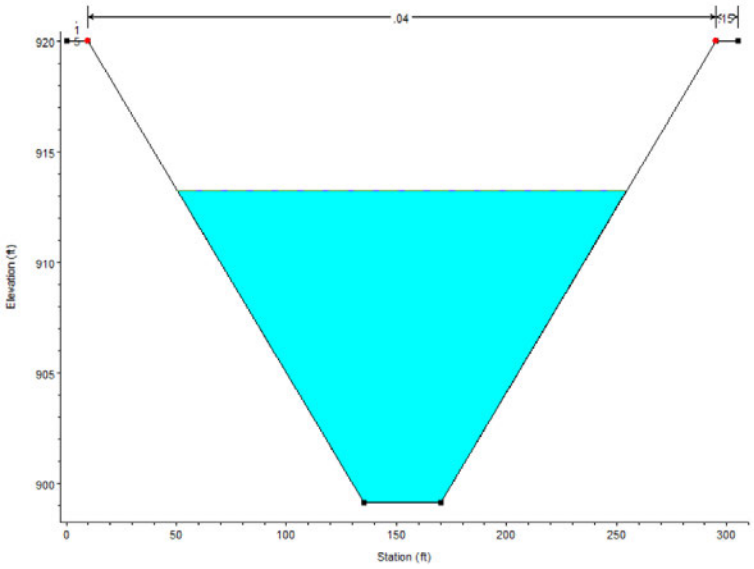

Figure 4. Upstream/Downstream Engineered Channel representative cross section

The Aqueduct Flume is represented as a generally rectangular channel with a trapezoidal low-flow channel in the hydraulic model as shown in Figure 5:

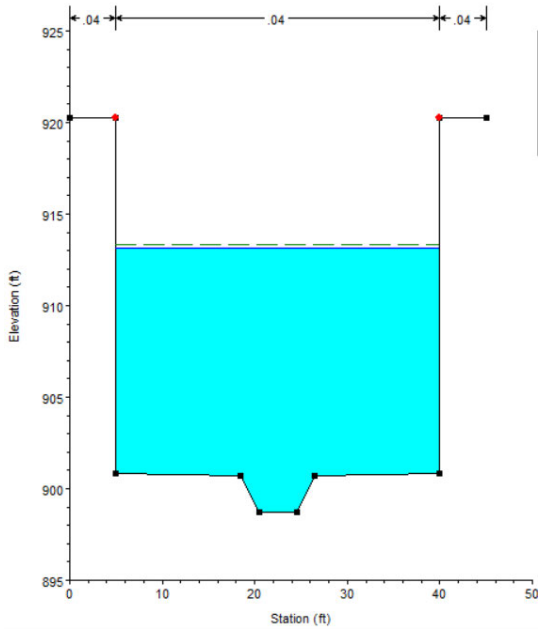

Figure 5. Aqueduct Flume representative cross section

The Spillway is represented as a generally trapezoidal channel as shown in Figure 6. The small triangular channel at the base of the trapezoidal channel is not a design feature and was included in the hydraulic model for stability purposes:

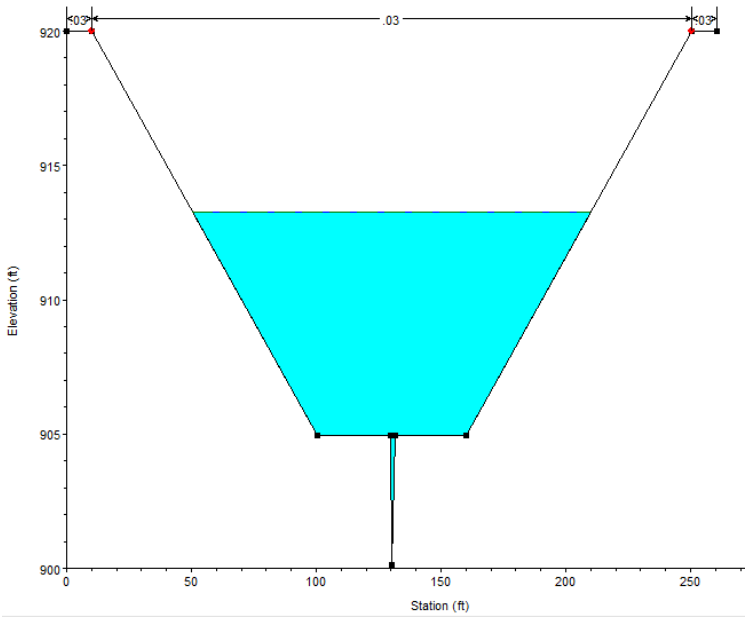

Figure 6. Sheyenne Spillway representative cross section

No changes were made to the Manning's n values of the natural river channel upstream or downstream of the Diversion Channel as compared to the existing conditions model. The Manning's n values for the No-Action Alternative are described in Table 4:

Table 4. Manning's n values of Sheyenne River No Action Alternative project features. *Spillway Manning's n values at three downstream cross section deviate from those listed in the table to promote model stability and do not impact model results

Project Feature	LOB	Channel	ROB
Upstream Engineered Channel	0.150	0.040	0.150
Spillway Approach Channel	0.030	0.030	0.030
Spillway*	0.030	0.030	0.030
Aqueduct Flume	0.040	0.040	0.040
Downstream Engineered Channel	0.150	0.040	0.150

3.2.2 Maple River

Under the No Action Alternative, when flows in the Maple River upstream of the Diversion Channel Right of Way are no greater than 1,700 cfs, an Obermeyer gate at the spillway would remain in a raised position to prevent water from being diverted into the Diversion Channel. As the river flows become greater than 1,700 cfs, the Obermeyer gate would be lowered to convey water into the Diversion Channel and concurrently manage flows across the aqueduct flumes. When flows upstream of the Maple River Aqueduct System are no greater than 5,000 cfs, the Obermeyer gate would be operated such that flows across the Aqueduct Flume are approximately 1,700 cfs. When upstream Maple River flows exceed 5,000 cfs, the Obermeyer gate would be operated such that flows across the Aqueduct Flume do not exceed 3,500 cfs. Allowing flows into the spillway increases the flow velocity in the upstream Maple River natural channel for approximately 2.5 miles upstream of the Diversion Channel Right of Way until the effects are naturally attenuated. These conditions frequently occur in April and May, which is a period when fish passage is important. Layout of the Maple River Aqueduct under the No Action Alternative is shown in Figure 7.

The No Action Alternative for the Maple River include the following:

- A natural river channel entering the Diversion Channel Right of Way from the west
- An Ice Retention Structure upstream of the Upstream Engineered Channel
- An Upstream Engineered Channel to convey normal flows to an Aqueduct Flume
- An Aqueduct Flume which would convey water across the Diversion Channel to a Downstream Engineered Channel
- A Downstream Engineered Channel which would convey water from the Aqueduct Flume to the natural river channel at the east edge of the Diversion Channel Right of Way
- A Spillway Approach Channel During branching off of the Upstream Engineered Channel which would direct flow into the Diversion Channel during high flow events
    - The Spillway Approach Channel connects the Upstream Engineered Channel to the Diversion Channel and is not designed for fish passage

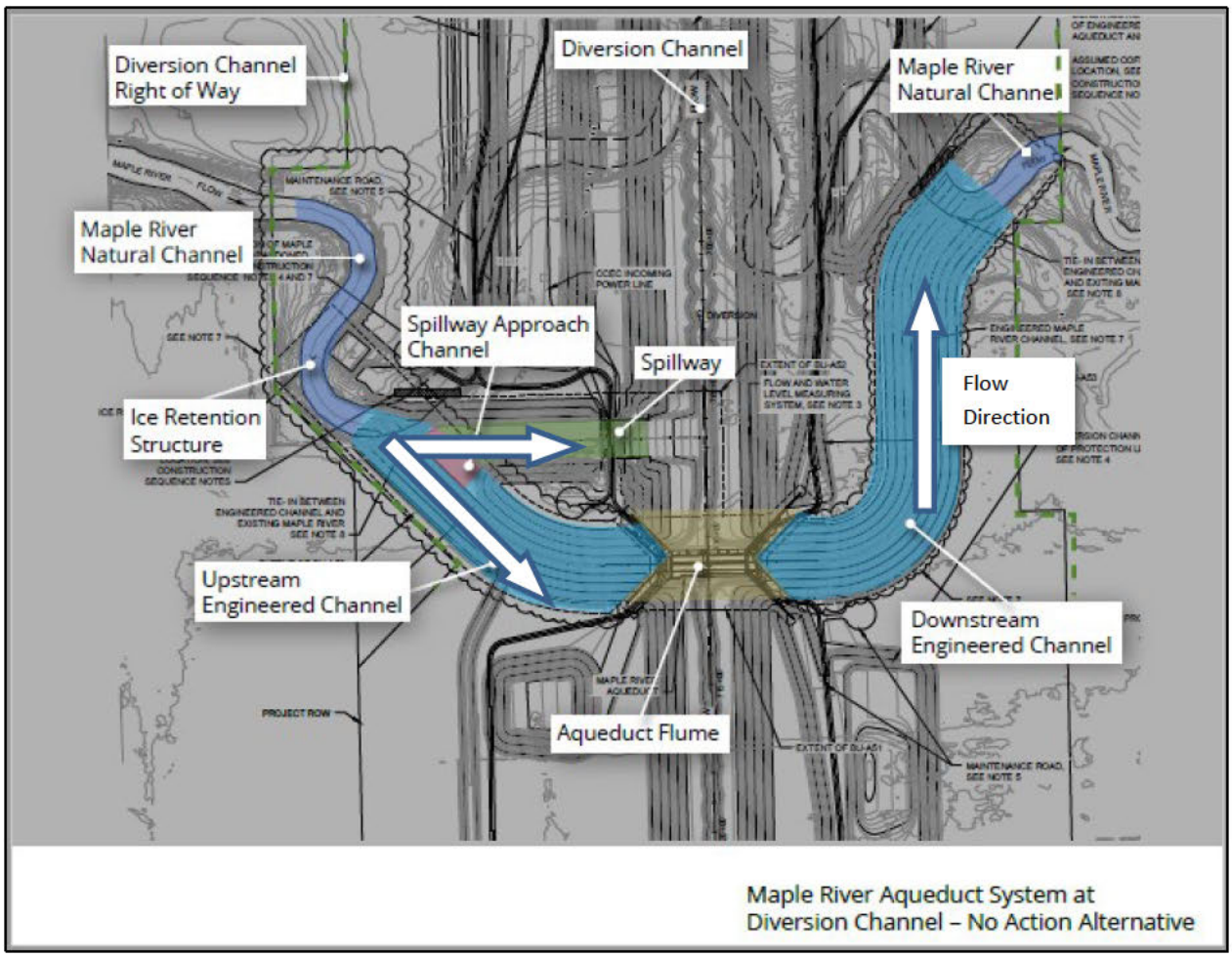

Figure 7. Maple River Aqueduct under the No Action Alternative

The HEC-RAS model geometry representing the Maple River No Action Alternative is shown in Figure 8 below.

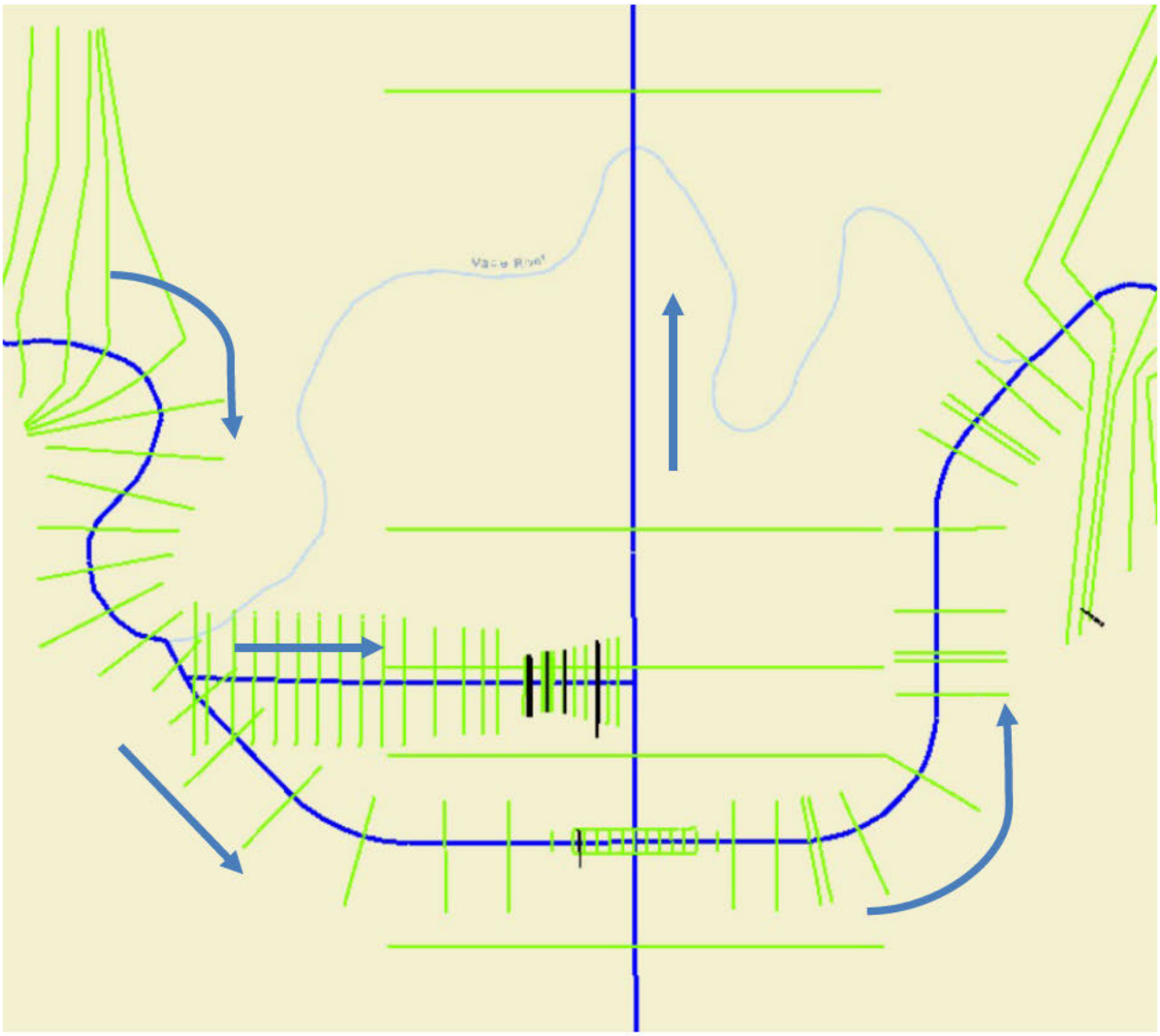

Figure 8: HEC-RAS geometry representation of the Maple River No Action Alternative (flow direction indicated by blue arrows)

The Ice Retention Structure within the Maple River is represented with blocked obstructions within the No Action Alternative hydraulic model geometry at River Sta: 23651 as shown in Figure 9:

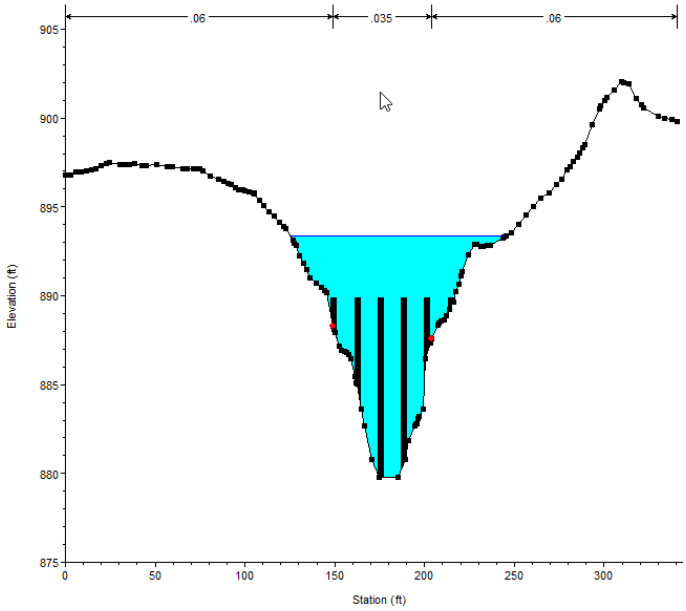

Figure 9. Ice retention structure upstream of the Maple River No-Action Alternative project features (River Sta: 23651)

The Upstream Engineered Channel and Downstream Engineered Channels are represented via a roughly trapezoidal channel in the hydraulic model as shown in Figure 10:

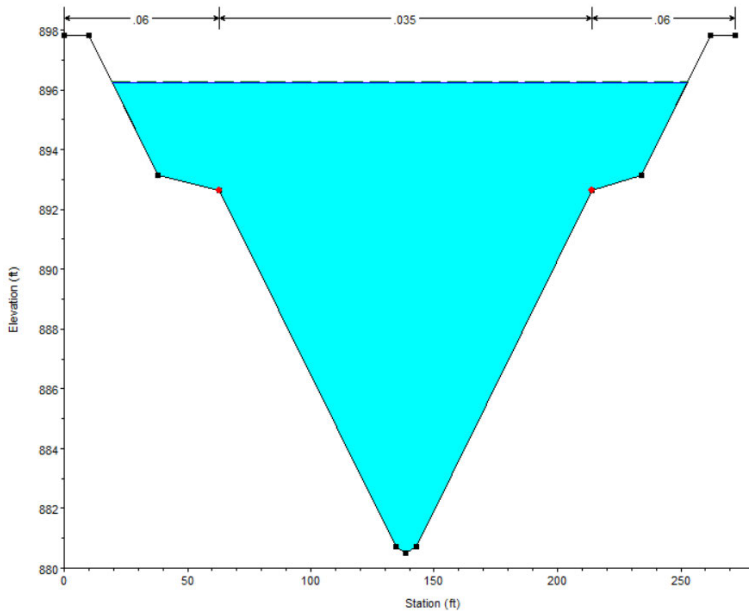

Figure 10. Upstream/Downstream Engineered Channel representative cross section

The Aqueduct Flume is represented as a generally rectangular channel with a trapezoidal low-flow channel in the hydraulic model as shown in Figure 11:

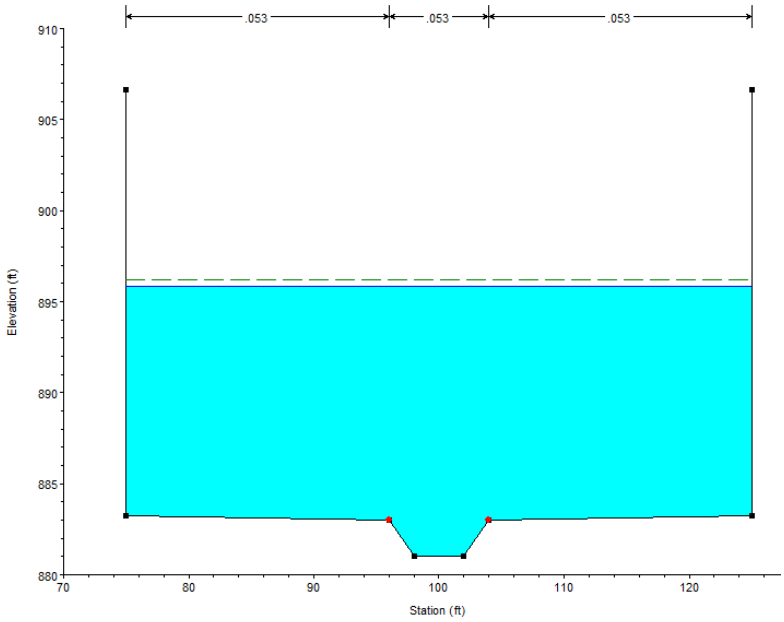

Figure 11. Aqueduct Flume representative cross section

The Spillway is characterized by three different cross section configurations. At the upstream end of the Spillway (River Sta: 988 – 300) the cross section is generally trapezoidal with a triangular low-flow channel as shown in Figure 12:

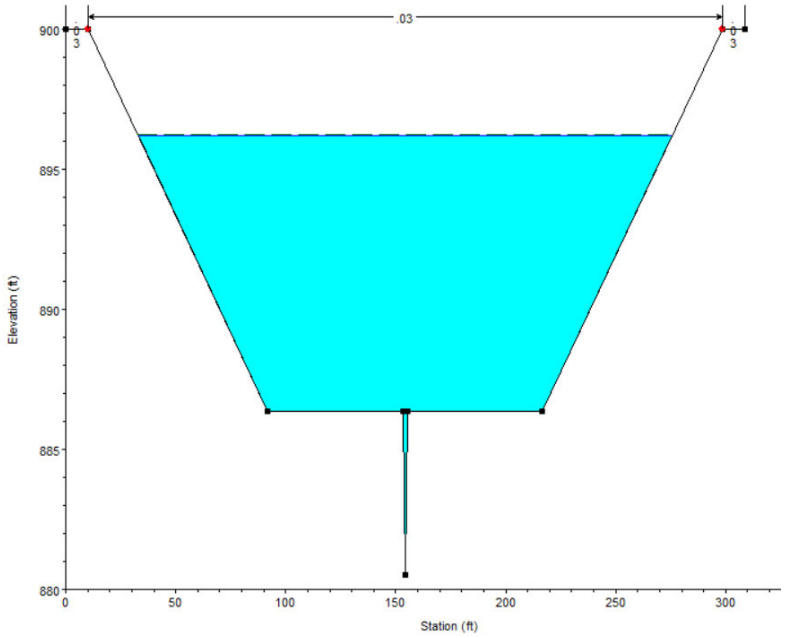

Figure 12. Spillway representative upstream cross sections from River Sta: 988 - 300

The second cross-section configuration is generally rectangular with a triangular low-flow channel as shown in Figure 13. The Manning's n values are reduced from 0.030 to 0.013.

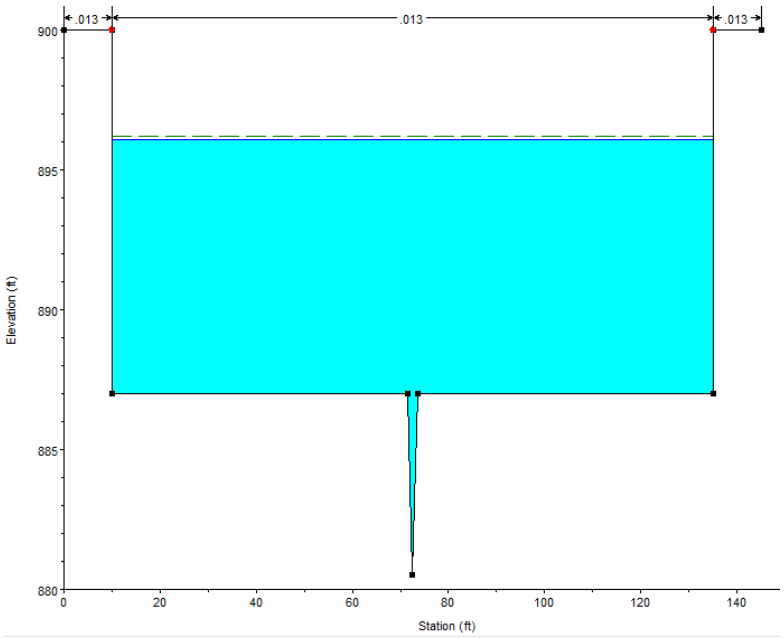

Figure 13. Spillway representative cross section from River Sta: 244 – 235

The third Spillway cross-section configuration is included only to route flow from the Spillway structure into the Diversion Channel (Figure 14).

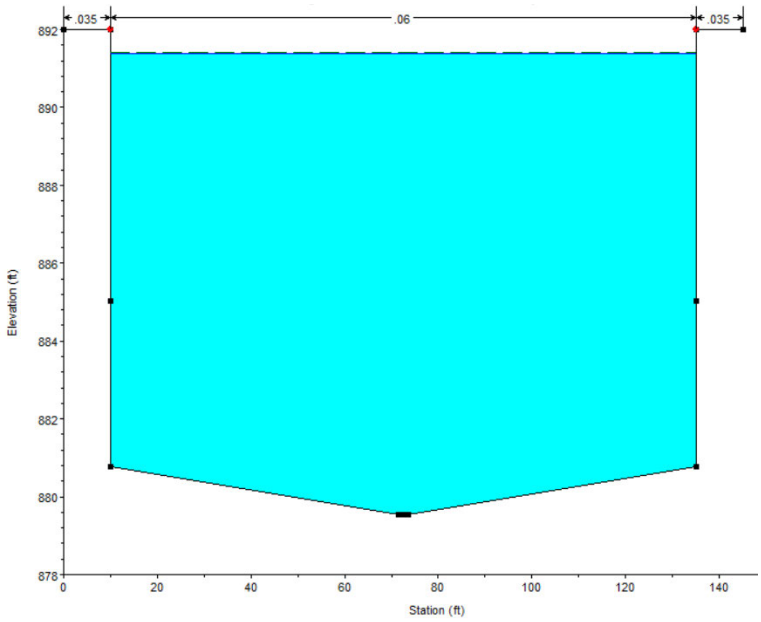

Figure 14. Spillway representative cross section conveying flow into the Diversion Channel

No changes were made to the Manning's n values of the natural river channel upstream or downstream of the Diversion Channel and No Action Alternative project features. The Manning's n values for the No-Action Alternative are described in Table 5:

Table 5. Manning's n values of Maple River No Action Alternative project features. *Spillway Manning's n values at two downstream cross section deviate from those listed in the table to promote model stability and do not impact model results

Project Feature	LOB	Channel	ROB
Upstream Engineered Channel	0.060	0.035	0.060
Spillway Approach Channel	0.030	0.030	0.030
Spillway*	0.030	0.030	0.030
Aqueduct Flume	0.053	0.053	0.053
Downstream Engineered Channel	0.060	0.035	0.060

3.2.3 Rush River

The No Action Alternative for the Rush River includes the Rush River Inlet structure and diverts all of the flow from the Rush River into the Diversion Channel via an engineered approach channel, rock arch rapids drop structure, and downstream exit channel as shown in Figure 15 and Figure 16. Table 6 provides the Rush River Inlet Structure Manning's n values for the No Action Alternative.

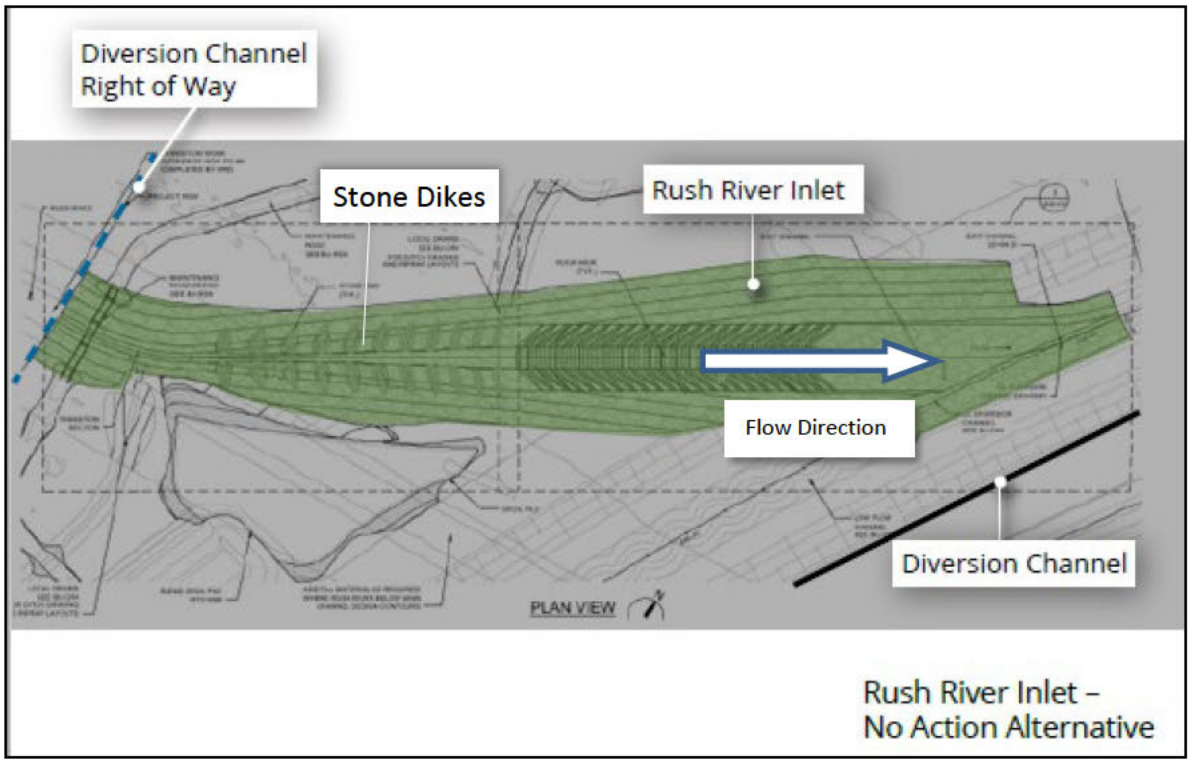

Figure 15. Rush River Inlet under the No Action Alternative

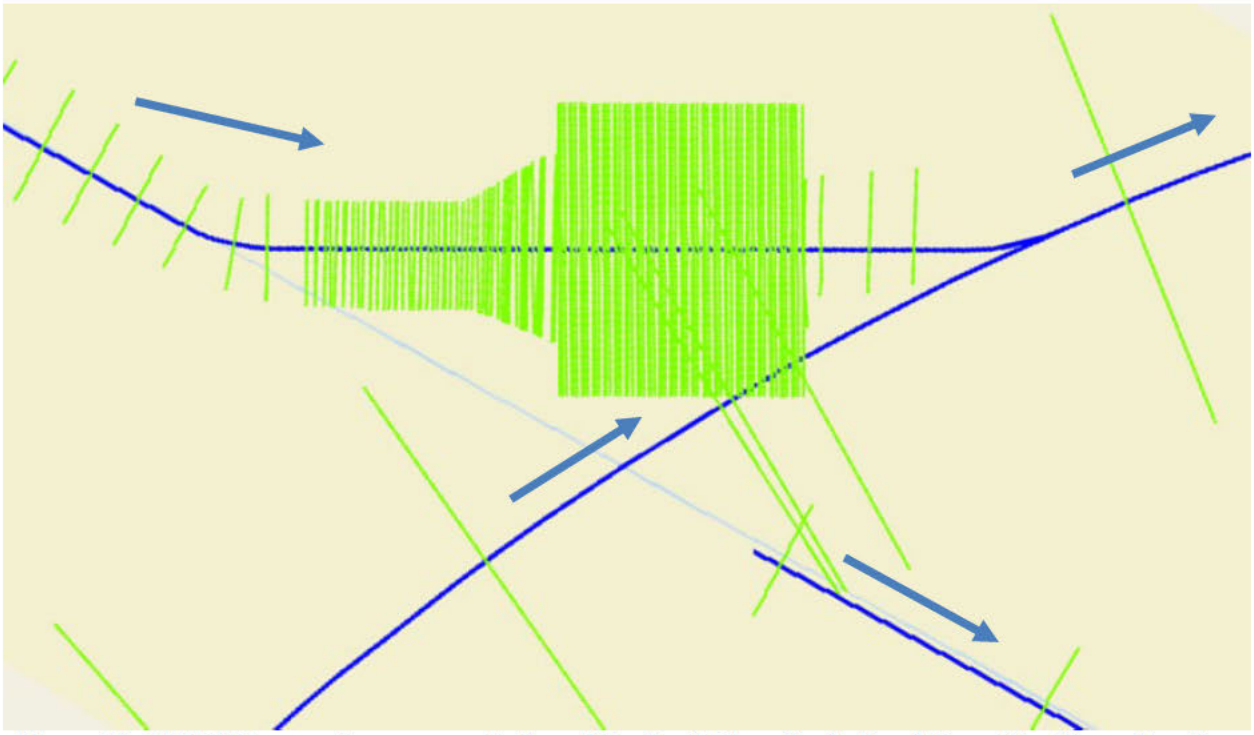

Figure 16. HEC-RAS geometry representation of the Rush River No Action Alternative (flow direction indicated by blue arrows)

Table 6. Manning's n values of Rush River No Action Alternative project features.

Project Feature	LOB	Channel	ROB
Rush River Inlet Structure	0.050	0.050	0.050

Stone dikes to provide fish passage are spaced every 40 feet from River Station 1487 to 2099 and represented as high ground within the hydraulic model cross section geometry (Figure 17 and Figure 18).The height of the stone dikes decreases from an initial height of 9 feet at River Station 2099 to approximately 3 feet high at River Station 1487.

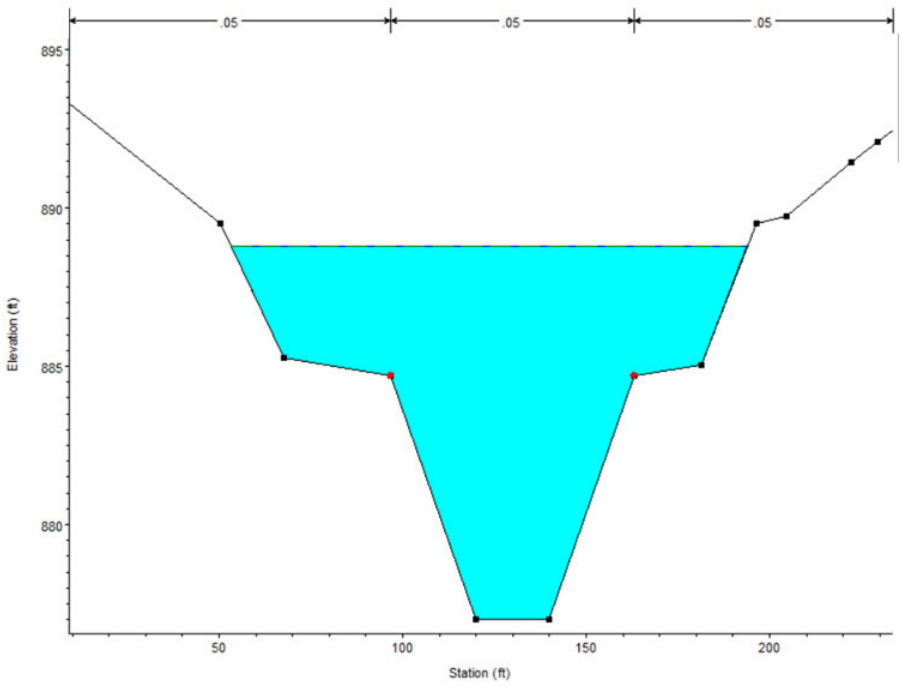

Figure 17. Spillway stone dike representative cross section

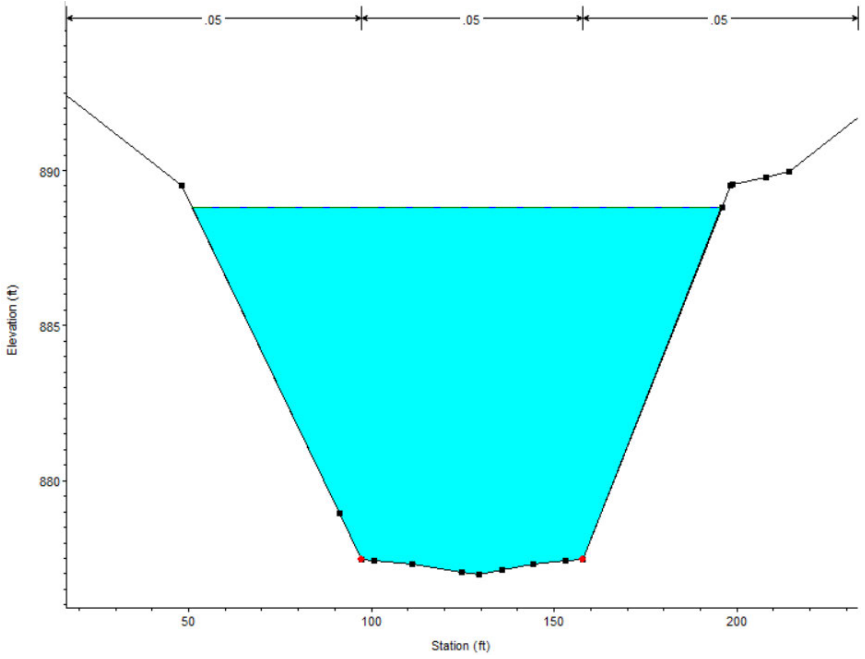

Figure 18. Spillway representative cross section between stone dikes

The spillway configuration downstream of the stone dikes are represented by a roughly trapezoidal channel (Figure 19).

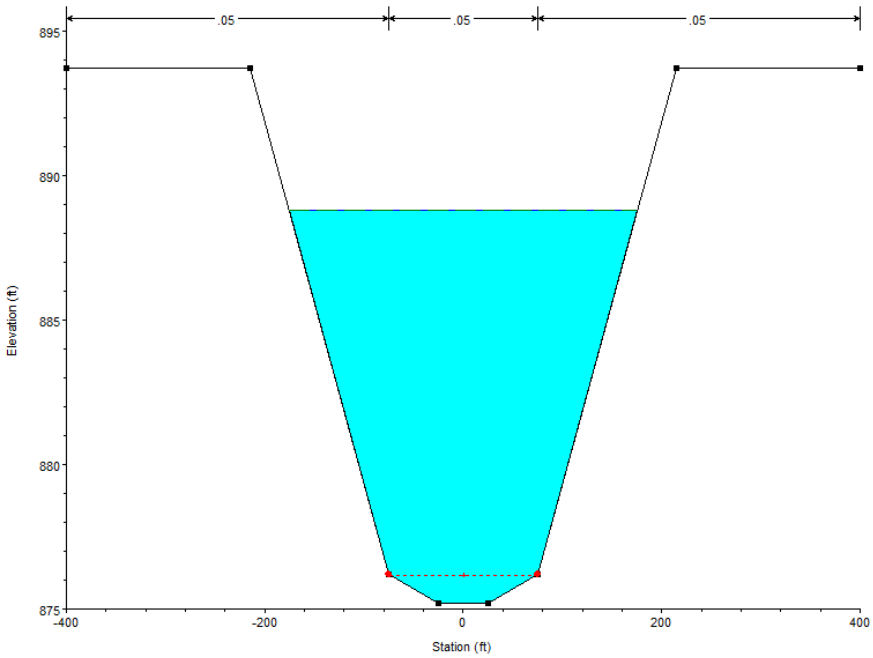

Figure 19. Spillway representative cross section downstream of stone dike features

3.3 Proposed Alternatives

The Proposed Alternatives for both the Sheyenne and Maple Rivers include all of the design features from the No Action Alternatives in addition to benching along the left and right banks upstream of the aqueducts and diversion channel to reduce velocities. Bench elevations generally fall between the normal water level (NWL) and the ordinary high water mark (OHWM) along the Sheyenne River (HMG, 2023) and between the OHWM and the bankfull elevation along the Maple River (USACE, 2016 and WEST, 2021). The OHWM for the Sheyenne and Maple Rivers were identified as 915.4-916.2 ft (NAVD88) and 884.9-887.7 ft (NAVD88), respectively.

The Proposed Alternative is the same as the No Action Alternative for the Rush River Inlet.

3.3.1 Sheyenne River

The addition of benches to widen the natural channel upstream of its intersection with the Engineered Channel to reduce the velocities in the upstream natural channel was reviewed by the MFDA, USACE, and natural resource agencies. The benches allow water during flood events additional access to the overbank and will reduce the average velocities within the flow cross section. The benches will be set at an elevation profile generally associated with a 67 percent AEP (1.5-year) event, which is equivalent to an elevation of 910.0 feet (NAVD88). This elevation is roughly 5 feet below the observed OHWM elevations of 915.4 feet and 916.2 feet (NAVD88) (HMG, 2023). The benches along the natural channel upstream of the Equipment Pad were proposed and modeled from the Equipment Pad upstream to the Cass County Road 16 bridge

over the Sheyenne River, as shown on Figure 20 and Figure 21 below. In addition, meanders would be constructed within the Downstream Engineered Channel to support riparian habitat by providing additional flow diversity. The Aqueduct Flume, Spillway and its approach channel, and Upstream Engineered Channel would be constructed as under the No Action Alternative. Section 3.2.1.1 of the SEA provides additional description of the Sheyenne River benching features.

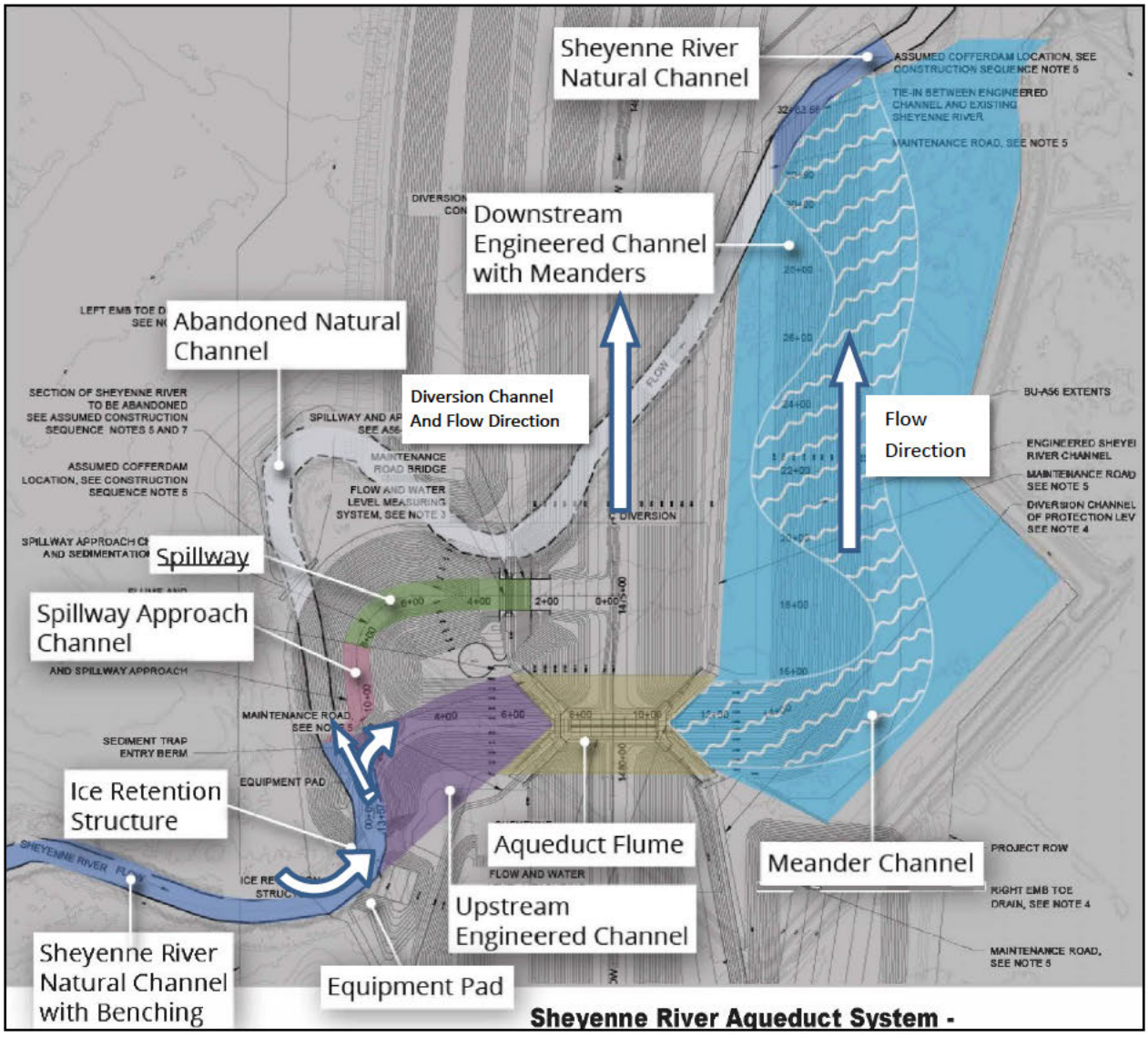

Figure 20. Sheyenne River Aqueduct System

RAS model cross sections show proposed benching of the left and right banks extending approximately 2 miles upstream of the Upstream Engineered Channel (Figure 21).

Figure 21. HEC-RAS geometry representation of the Sheyenne River Proposed Alternative with benching represented by black rectangles

Cross section station/elevation data have been developed to reflect proposed benching along the left or right bank. No changes are made to the Manning's n value for the areas of proposed benching (i.e. roughness in the channel and overbanks is anticipated to match existing and No Action Alternative conditions).

3.3.2 Maple River

The Proposed Alternative to reduce the velocities in the upstream natural channel along the Maple River includes benches along the Maple River natural channel from the Upstream Engineered Channel to the western boundary of the Diversion Channel Right of Way (Figure 22 and Figure 23). The benches will be set at an elevation profile generally associated with a 67 percent AEP (1.5-year) event, which is equivalent to an elevation of 890.0 feet (NAVD88). This elevation is roughly 4 feet above the observed OHWM elevations of 884.9 feet and 887.7 feet (NAVD88) (USACE, 2016). In addition, meanders would be constructed within the Downstream Engineered Channel to provide more natural channel characteristics as opposed to a straight channel. The Aqueduct Flume, Spillway and approach channel, and Upstream Engineered Channel would be constructed as under the No Action Alternative.

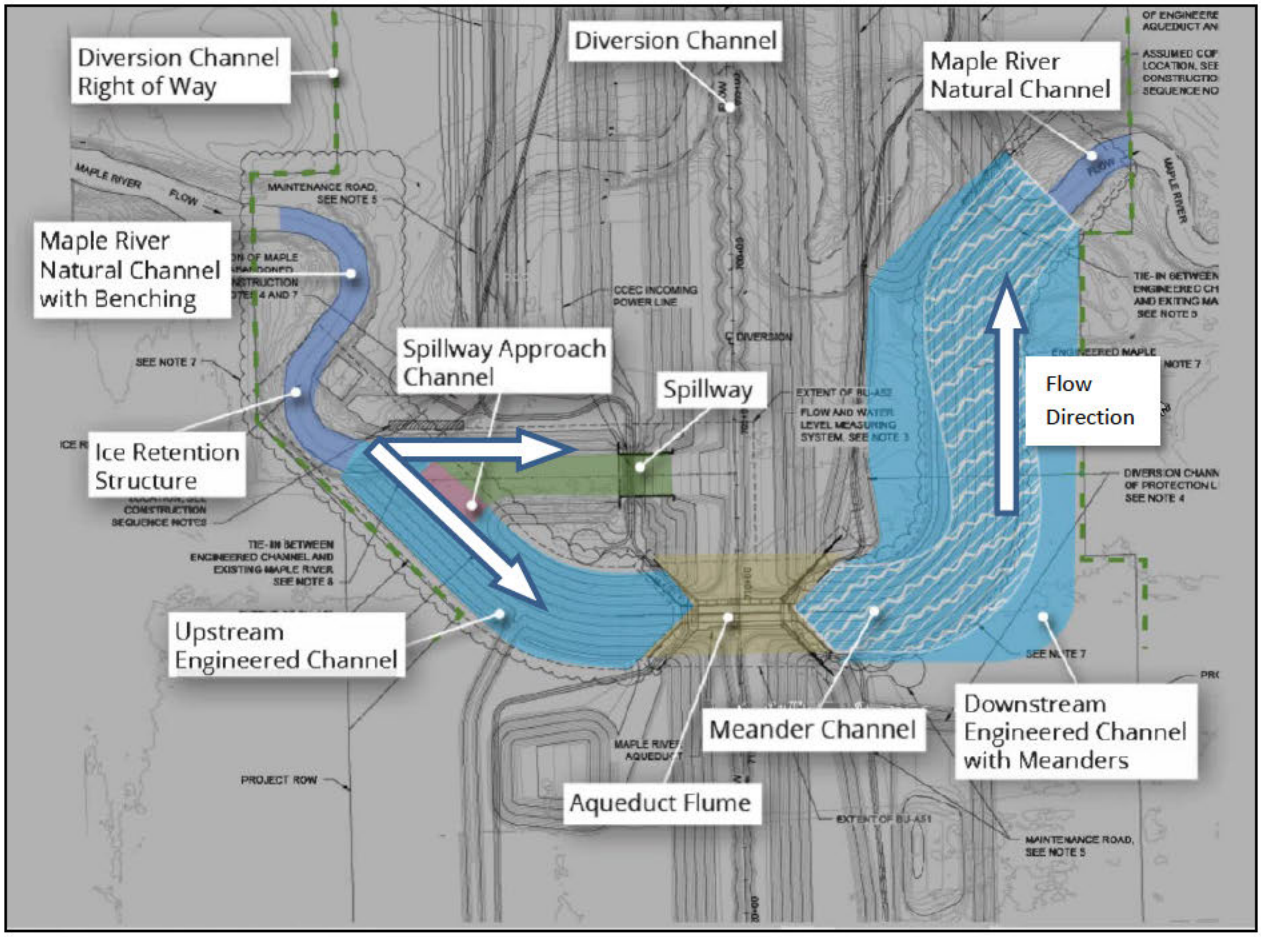

Figure 22. Maple River Aqueduct System

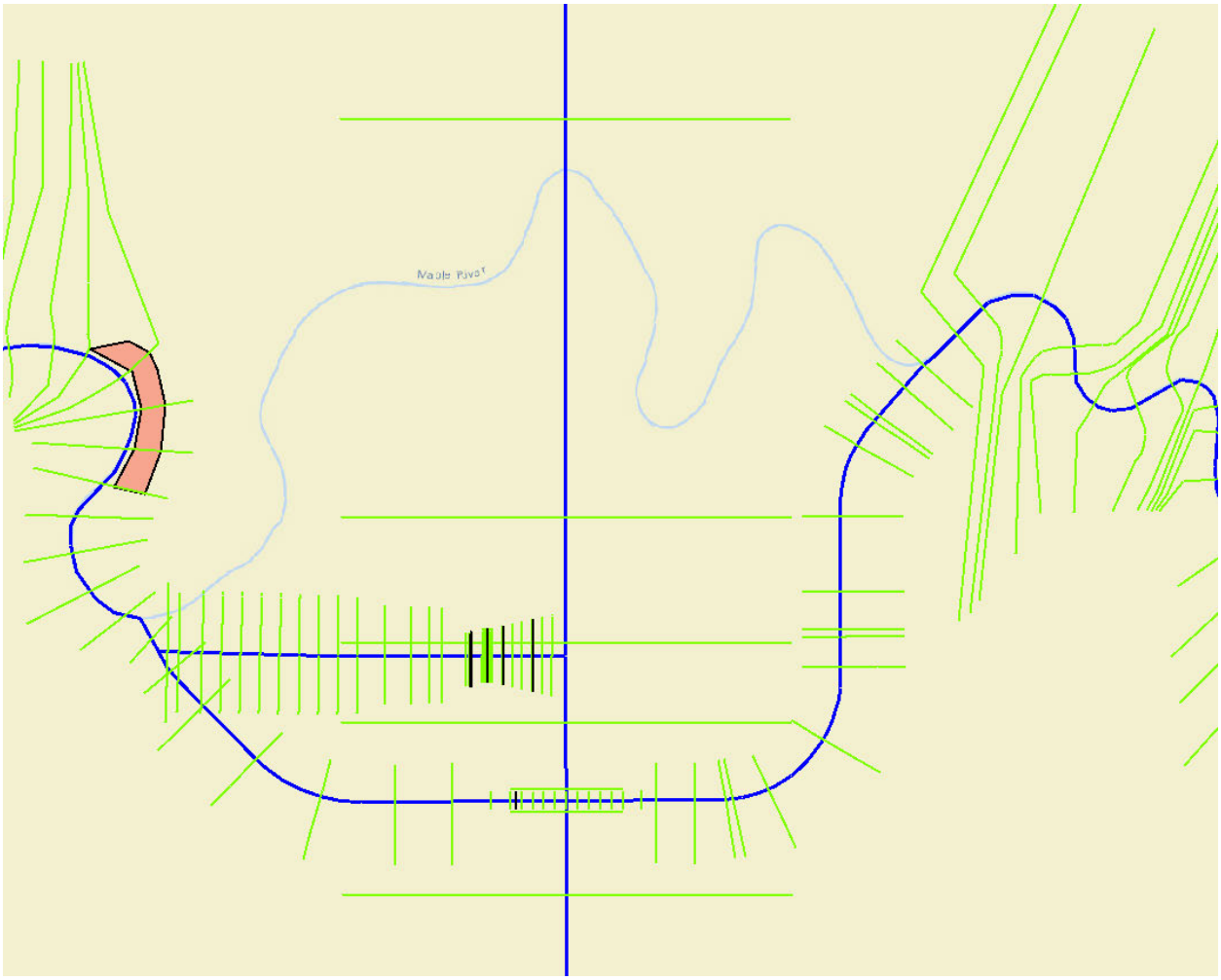

Figure 23. HEC-RAS geometry representation of the Maple River Proposed Alternative with approximate benching represented by the red polygon.

The HEC-RAS model cross sections show proposed benching of the left bank extending approximately 1,000 feet upstream of the Upstream Engineered Channel. The HEC-RAS model representing the Proposed Alternative benching does not include any additional cross sections; instead, the existing cross sections within the No Action Alternative were modified to reflect benching station/elevation. No changes to Manning's n values were made.

The meanders in the Downstream Engineered Channel were incorporated through the addition of cross sections between River Station 20757 and 19279. Minor Losses coefficients of 0.2 were added to these cross sections to account for energy loss associated with meanders. The added cross sections had Manning's n values in the overbank increased from 0.060 to 0.100 for approximately 40 feet on either side of the left and right bank points (Figure 24). This increased roughness represents the proposed plantings and natural channel roughness elements associated with a forested overbank, more natural maintenance practices, and habitat improvement within the channel.

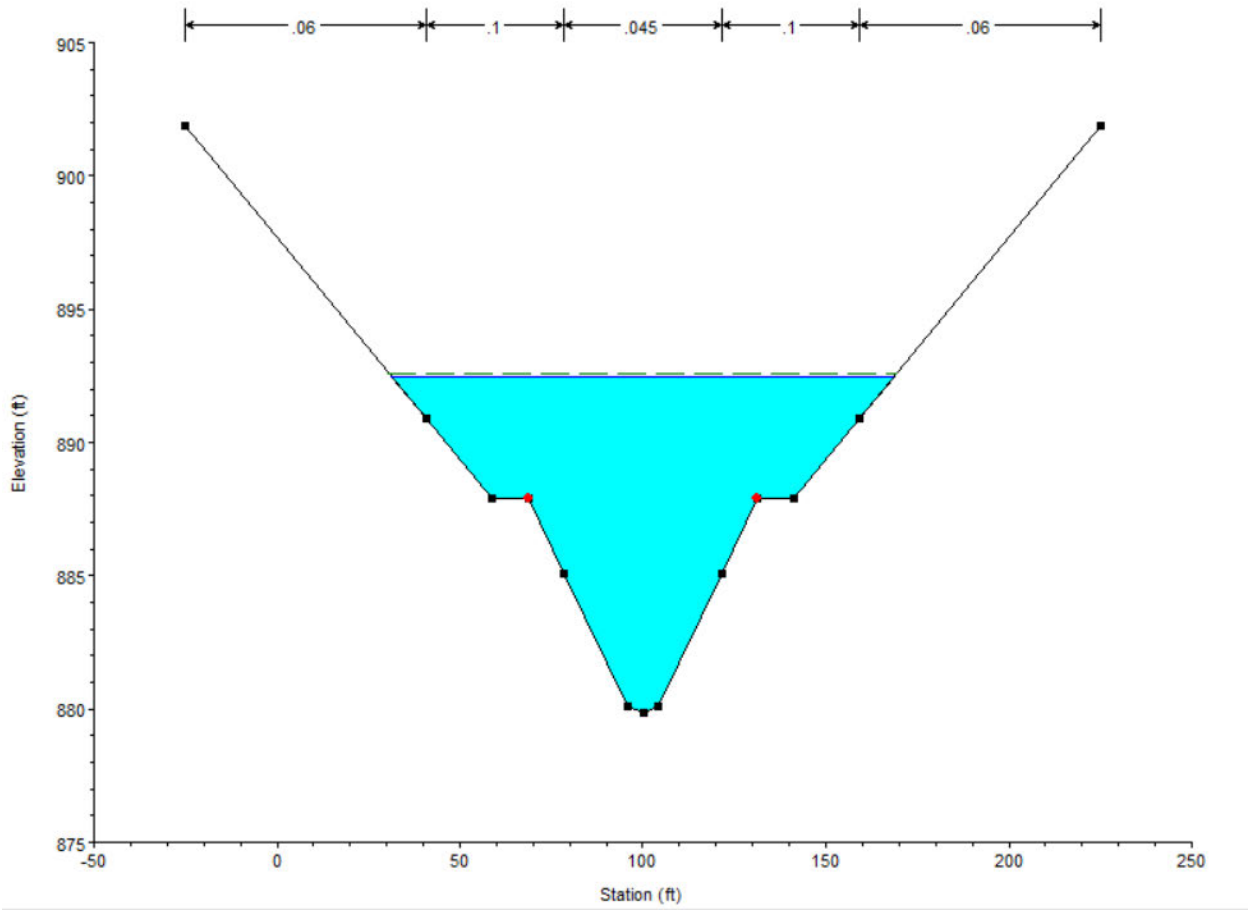

Figure 24. Maple River Downstream Meander cross section 20077.0 with modified overbank Manning's n values

3.3.3 Rush River

The Rush River Proposed Alternative is the same as the Rush River No Action Alternative as the velocity, stage, and erosion impacts from the design provide sufficient confidence in bank stability under this design scenario. See results discussion in Section 4.4.

4 MODEL RESULTS

Hydraulic analysis related to inundation, velocity, shear stress, and erosion potential are included in the sections below. These analysis results are presented for the existing conditions, No Action Alternatives, and Proposed Alternatives for the Sheyenne and Maple Rivers. Model results for the existing conditions and the Proposed Alternative (referred to as the Rush River Inlet) are discussed for the Rush River. The Proposed Alternative and the No Action Alternative are the same for the Rush River. As previously stated, the Maple River was modeled with both the TribPeak and RRN events as the RRN was identified as the critical event generating the highest total velocities.

4.1 Inundation Boundaries

The inundation boundaries for the 1-percent AEP event generated by the hydraulic model used for the 2024 SEA were compared to the boundary generated by the hydraulic model used in the 2019 SEA along the Sheyenne, Maple, and Rush Rivers. Differences in inundation extents are minor, or show a slight reduction in some locations, and do not constitute a deviation from the impacts identified in the 2019 SEA.

4.2 Sheyenne River

The No Action Alternative hydraulic model results for the Sheyenne River indicate that peak total velocities during flows of 3,850 cfs exceed 4.5 ft/s (Figure 25) at and just upstream of the project Right of Way (ROW) (cross section (XS) 232,579 ft). Total velocities oscillate upstream of the ROW for approximately 10,000 feet before dropping below 3.5 ft/s near the Cass County Road 16 bridge. At the Sheyenne River the Tributary Peak and Red River Peak events produce results with negligible difference. Therefore, only the Tributary Peak events are evaluated in this section.

The benching associated with the Proposed Alternative lowers the total velocities relative to the No Action Alternative. Figure 25 below shows the change in velocity relative to existing conditions for both the No Action Alternative and the Proposed Alternative along the Sheyenne River at the 3,850 cfs flow event (5% exceedance flow in April). Both the No Action and Proposed Alternatives show increased velocities relative to the existing conditions starting at the Aqueduct Flume and extending approximately 8 miles upstream of the project ROW. A maximum peak total velocity of 3.5 ft/s occurs under existing conditions approximately 5,000 feet downstream (approximately station 226,000 in Figure 25) of the Sheyenne River Aqueduct Flume system. Existing condition peak total velocities both within and upstream of the project area oscillate between 2 and 3 ft/s. Peak total velocities with the Proposed Alternative are between 0.5 and 1 ft/s higher than under existing conditions with velocities converging upstream of the project area. Velocity differences between the two conditions drop below 0.1 ft/s approximately 7.5 miles upstream of the Project ROW. Velocities in overbank areas are below 1 ft/s during the 3,850 cfs flow event.

Figure 26 shows the total velocity of both existing conditions (Existing Conditions – EX) and Proposed Alternative (With-Project Conditions – WP) for return events from 67- to 0.2-percent AEP. Total velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events range from 3 to 4.5 ft/s. These velocities are 1 to 1.5 ft/s higher than existing conditions. Based upon velocity threshold values of 4-6 ft/s for long native grasses as described in Fischenich (2001) the modeled velocities caused by the Proposed Alternative are unlikely to induce erosion in the existing overbank vegetation.

Figure 27 shows the channel velocity of both existing (EX) and proposed (WP) conditions for 67- to 0.2-percent AEP events. Channel velocities for the Proposed Alternative for the same events can be as much as 2.5 ft/s higher than the existing conditions with proposed conditions channel velocities exceeding 5 to 6 ft/s for less frequent events (i.e., 1-percent AEP). These channel velocities are high enough above threshold values of 1.5 to 2.5 ft/s for sandy soils similar to those observed in the Sheyenne River (Fischenich, 2001) to potentially mobilize the bed material in ways that could introduce bed degradation and upstream bank instabilities. Total and channel velocity differences between the Proposed Alternative

and existing conditions converge upstream of the project ROW with both converging with the existing conditions approximately 8 miles upstream of the project ROW (station 275,000).

Channel shear stress profiles for all return period flow events are provided in Figure 28. During the 3,850 cfs flow event the channel shear stress values are approximately 0.3 pounds per square foot (psf) higher with the Proposed Alternative than for existing conditions. The channel shear stress with the Proposed Alternative is approximately 0.5 psf. Channel shear stress value differences drop to less than 0.1 psf between existing conditions and the Proposed Alternative approximately 3 miles upstream of the project ROW (station 250,000). As with the channel velocities, the channel shear stresses may result in increased mobilization potential of the channel bed material or bank vegetation based upon the shear stress threshold data described in Fischenich (2001).

Water surface profiles for existing conditions (EX) and the Proposed Alternative (WP) are shown in Figure 29. The 67-percent AEP flow event is minimally impacted by the Diversion Channel and the Proposed Alternative as the spillway is not operating, but all other flow event water profiles show decreases in water surface elevation relative to existing conditions. A water surface elevation decrease of approximately 1.5 ft is observable roughly 17,000 feet upstream of the project ROW for all flow events. These lowered water surface profiles are not expected to introduce any additional potential erosion concerns outside of what is described in the paragraphs above based on review of the velocity potential. The channel is incised in this location greater than 1.5 ft, so frequency of floodplain inundation will not be affected upstream of the benching.

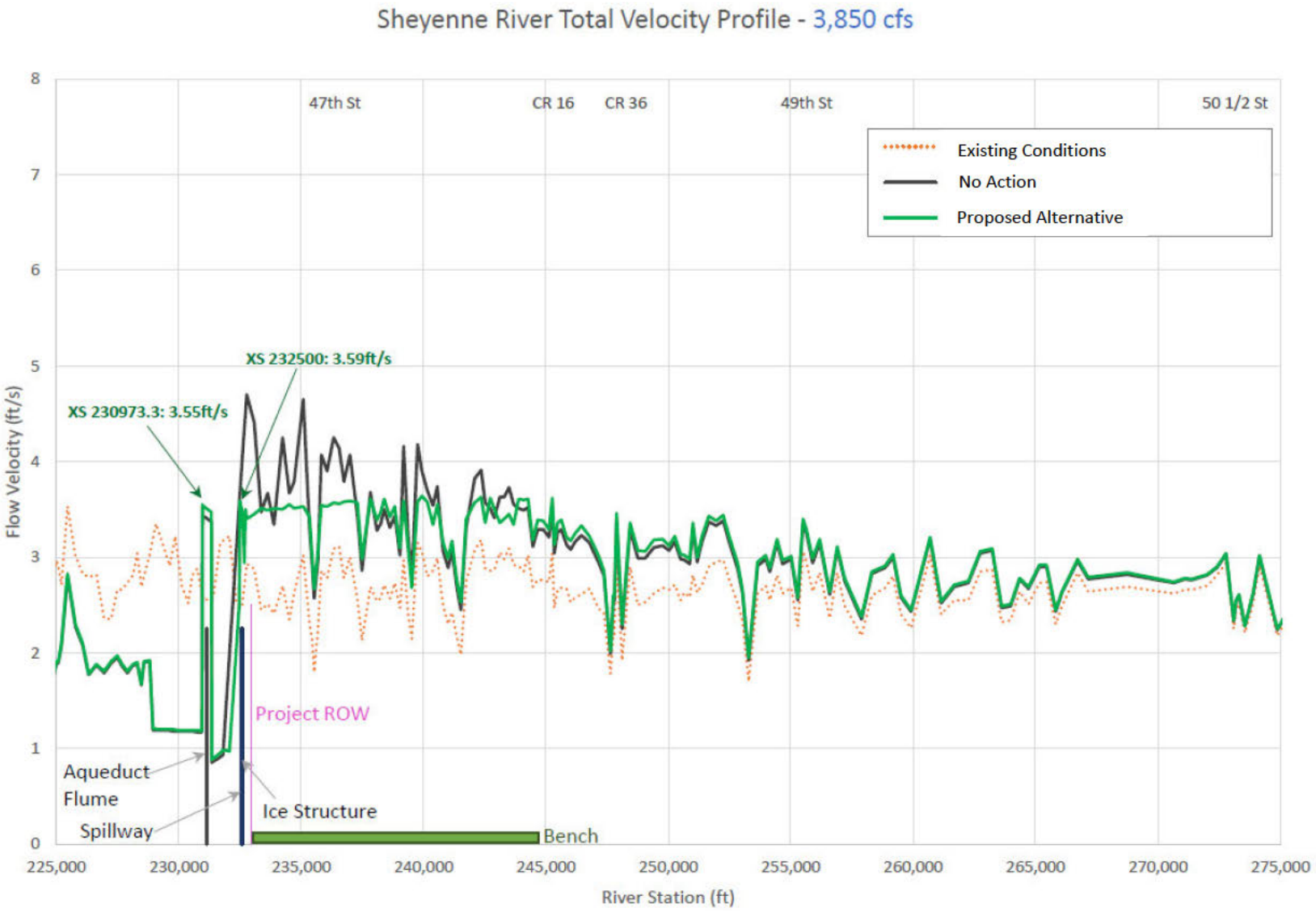

Figure 25. Velocity comparison plot along the Sheyenne River of existing, No Action Alternative, and Proposed Alternative

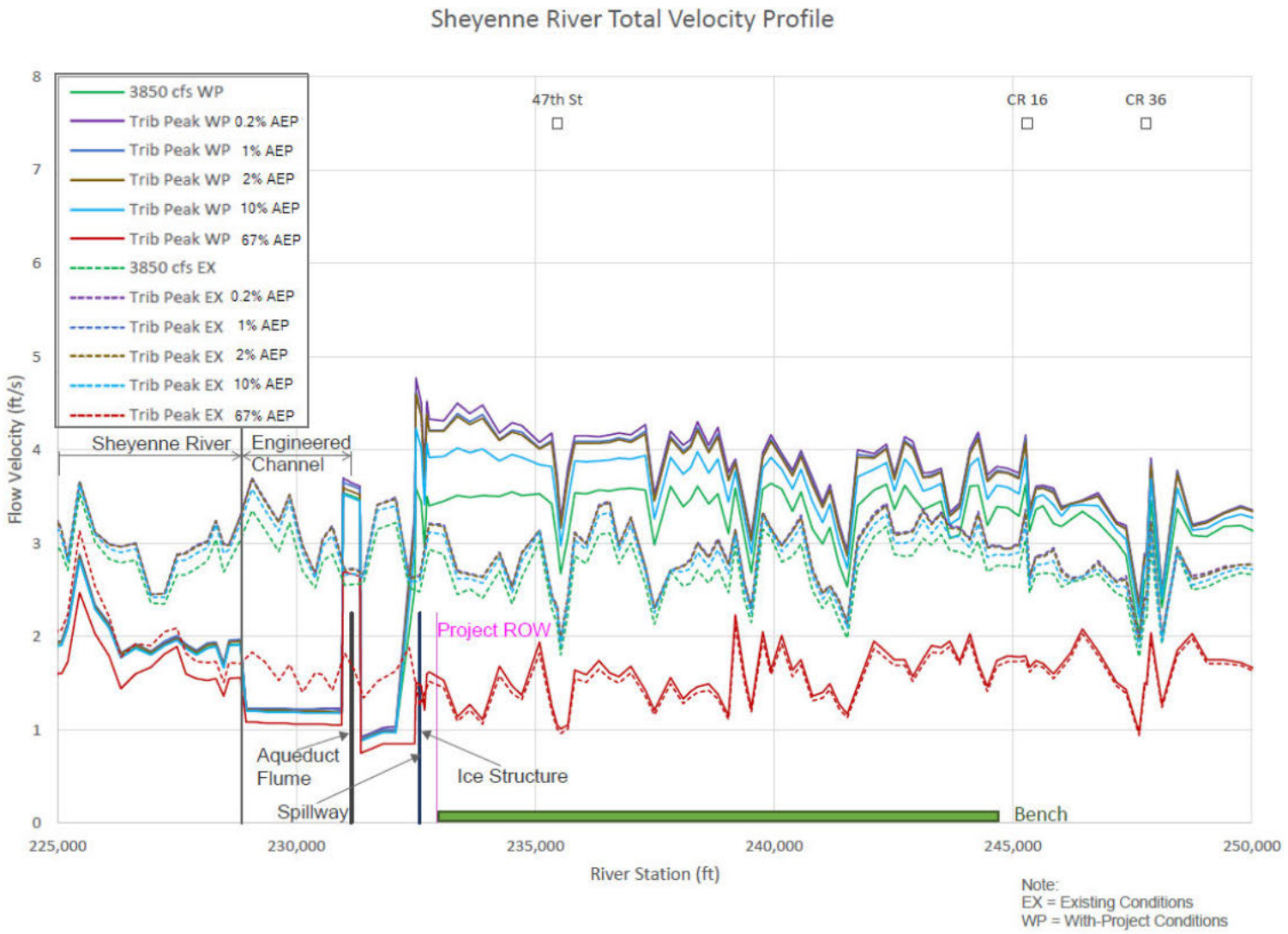

Figure 26. Total velocity profiles along the Sheyenne River of existing conditions and proposed conditions Proposed Alternative for all return-period flow events

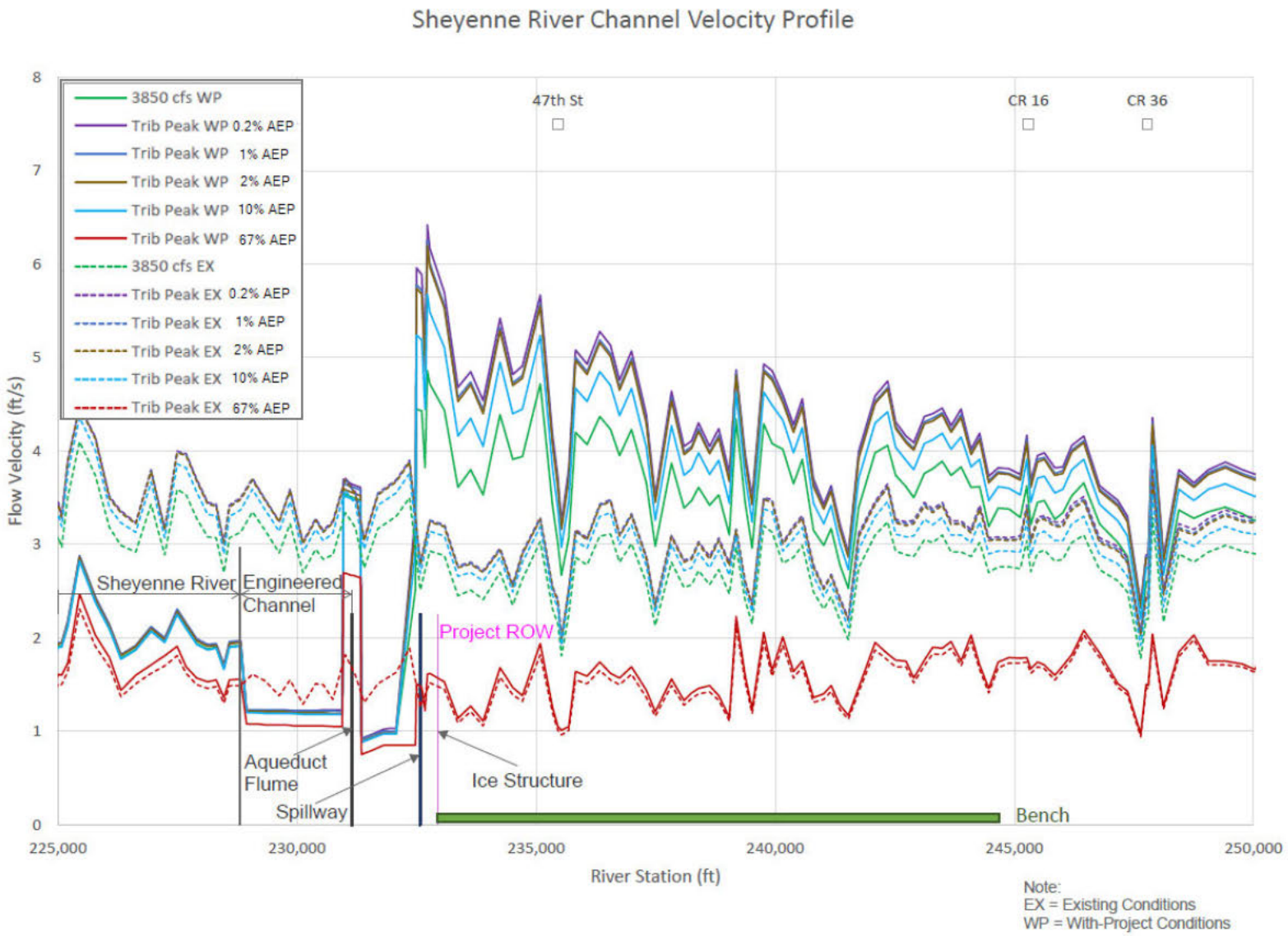

Figure 27. Channel velocity profiles along the Sheyenne River of existing conditions and Proposed Alternative for all return-period flow events

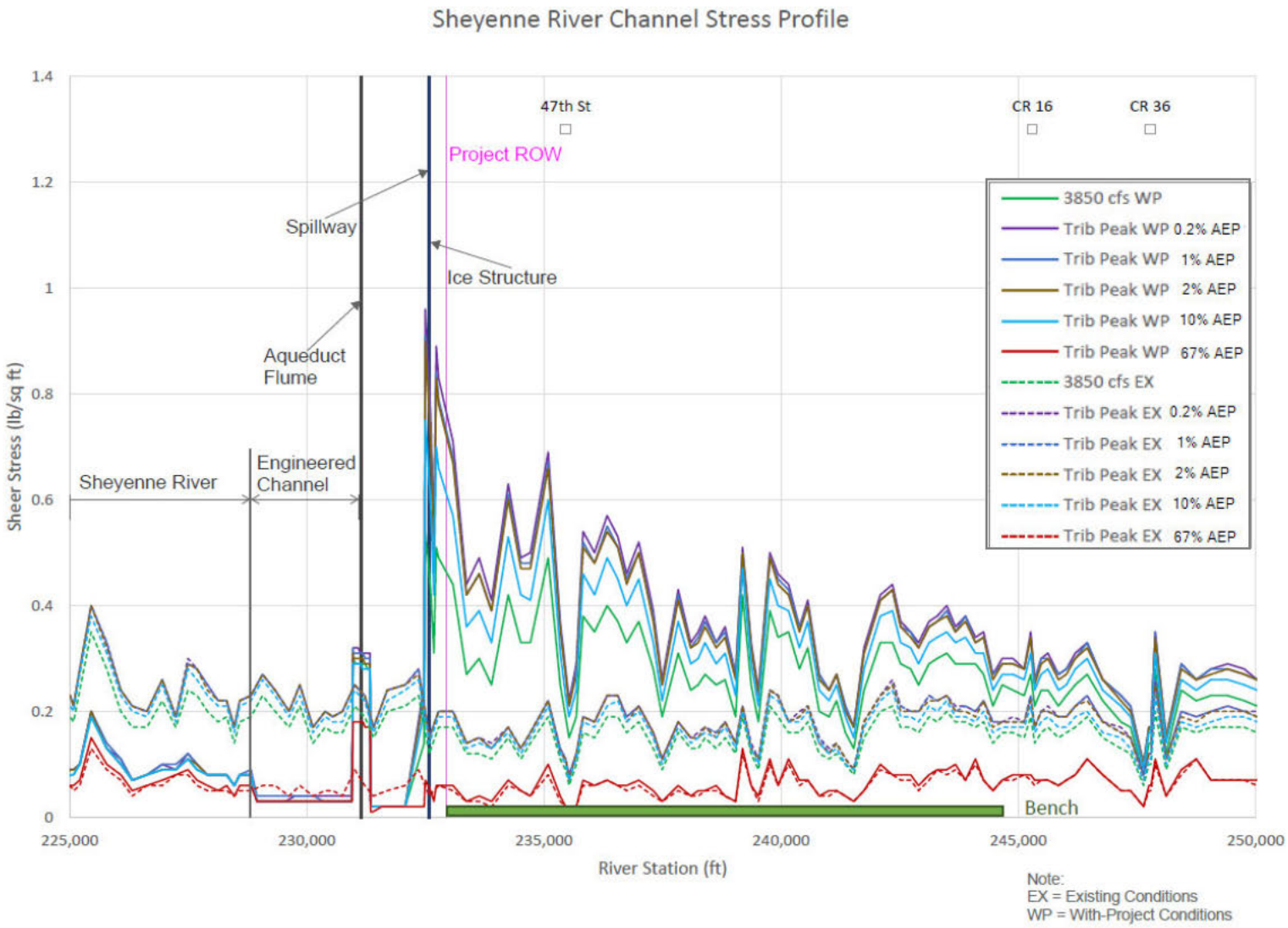

Figure 28. Channel shear stress profile along the Sheyenne River for Proposed Alternative

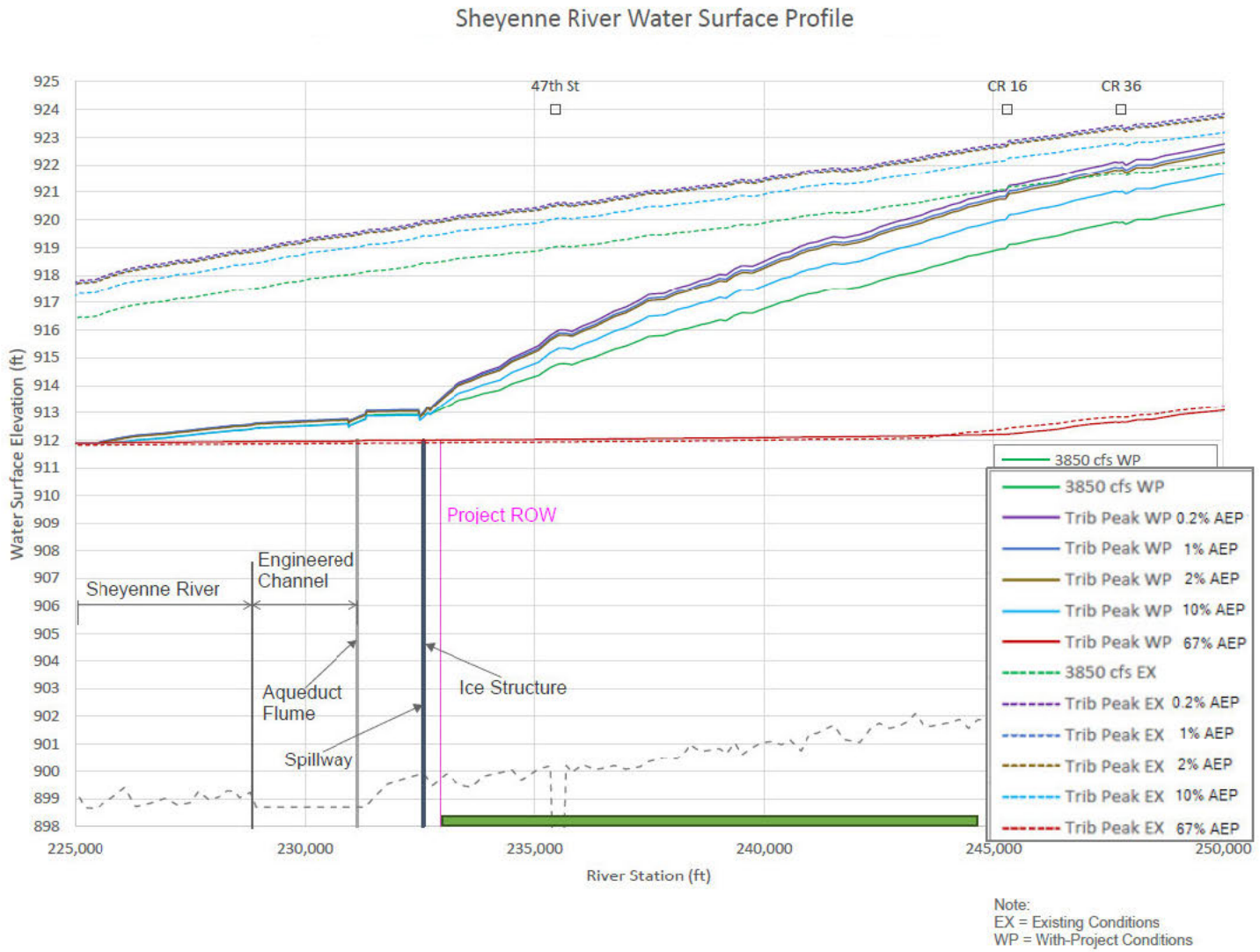

Figure 29. Water surface profiles along the Sheyenne River for the 67- through 0.2-percent AEP flow event for existing conditions and Proposed Alternative

4.3 Maple River

The No Action Alternative hydraulic model results for the Maple River using the TribPeak flow event indicate that peak total velocities during flows of 2,500 cfs exceed 4 ft/s (Figure 30) upstream of the ice retention structure. Total velocities oscillate upstream of the ROW for approximately 15,000 feet before dropping below 2.0 ft/s. At the Maple River, critical velocity conditions at the aqueduct occur when the peak occurs on the Red River. This scenario produces a lower downstream tailwater as compared to the peak occurring on the Tributary. For the No Action alternative, velocity at the downstream end of the aqueduct can exceeds 3.7 fps during the Red River Peak event with 1,700 cfs conveyed through the aqueduct (Figure 31).

The benching associated with the Proposed Alternative successfully lowers velocities relative to the No Action Alternative along the Maple River. Figure 30 below shows the change in velocity relative to existing conditions for both the No Action Alternative and the Proposed Alternative along the Maple River at the 2,500 cfs flow event (5% exceedance flow in April). Under the TribPeak flood event the Proposed Alternative produced a maximum total velocity of 3.4 ft/s at the downstream end of the Aqueduct Flume (XS 20925). The RRN flood event resulted in a maximum total velocity of 3.5 ft/s in the same location (Figure 31). Both the No Action and Proposed Alternative show increased velocities relative to the existing conditions. Existing condition peak total velocities within and upstream of the Project ROW generally vary between 2 and 2.5 ft/s. Peak total velocities with the Proposed Alternative are between 0.5 and 1 ft/s higher than with existing conditions with velocities converging upstream of the project area. Velocity differences between the two conditions drop below 0.1 ft/s approximately 2.5 miles upstream of the project ROW. Velocities in overbank areas generally remain very near or below 1 ft/s during the 2,500 cfs flow event. Overbank velocities just upstream of the Aqueduct System can reach 1.5 ft/s, but this is limited to a single cross section.

Figure 32 shows the total velocity of both existing conditions and the Proposed Alternative for the 67- to 0.2-percent AEP events ranging between 1.6 and 7 ft/s within and upstream of the project ROW. Total velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events range from 1 to 3 ft/s higher than existing conditions. Based upon velocity threshold data described in Fischenich (2001) these values may induce erosion in the existing overbank vegetation, depending upon the duration of flow and nature, density, and distribution of the vegetation. Figure 33 shows the channel velocity of both existing and proposed conditions for the 67- to 0.2-percent AEP events. Channel velocities for the Proposed Alternative for the same events can be as much as 5 ft/s higher than the existing conditions with channel velocities exceeding 10 ft/s for less frequent events (i.e., 1-percent AEP). Considering the alluvial silt composition of the Maple River, these velocity values will be sufficiently higher than threshold values (Fischenich, 2001) to cause some degree of bed degradation and channel bank erosion. Total and channel velocity differences between existing conditions and the Proposed Alternative converge to within 0.5 ft/s of the existing conditions approximately 3 miles upstream of the project ROW.

Channel shear stress profiles for all return period flow events are provided in Figure 34. During the 2,500 cfs flow event the peak channel shear stress values are approximately 0.5 psf higher for the Proposed Alternative than for existing conditions. The larger differences occur within the aqueduct flume and are

not expected to generate any erosion concerns as the flume itself is a concrete structure. Channel shear stress value differences between existing conditions and the Proposed Alternative are generally less than 0.1 psf within the natural channel and extend approximately 4,000 ft upstream of the project ROW. As with the channel velocities, the channel shear stresses may result in increased mobilization potential of the channel bed material or bank vegetation based upon the shear stress threshold data described in Fischenich (2001).

Water surface profiles for existing conditions and the Proposed Alternative are shown in Figure 35. The flow profiles for the Proposed Alternative show water surface profiles lowered relative to existing conditions by approximately 4.5 ft. This is caused by the drawdown effects associated with the spillway operation. Figure 36 shows that the proposed meanders and benching result in water surface elevations that are approximately 1 foot higher than the No Action Alternative just upstream of the Aqueduct Flume for the 2,500 cfs flow event. The water surface elevation difference between the No Action and Proposed Alternative converges to within 0.1 ft approximately 5,000 ft upstream of the project ROW. The water surface elevation differences between existing conditions and the Proposed Alternative converge approximately 30,000 ft upstream of the project ROW for all flow events. These lowered water surface profiles are not expected to introduce any additional potential erosion concerns outside of what is described in the paragraphs above based on review of the velocity potential. The channel is incised, so frequency of floodplain inundation will not be affected upstream of the benching for more frequent events. For higher flow events, the frequency is very low and is not anticipated to result in geomorphological changes.

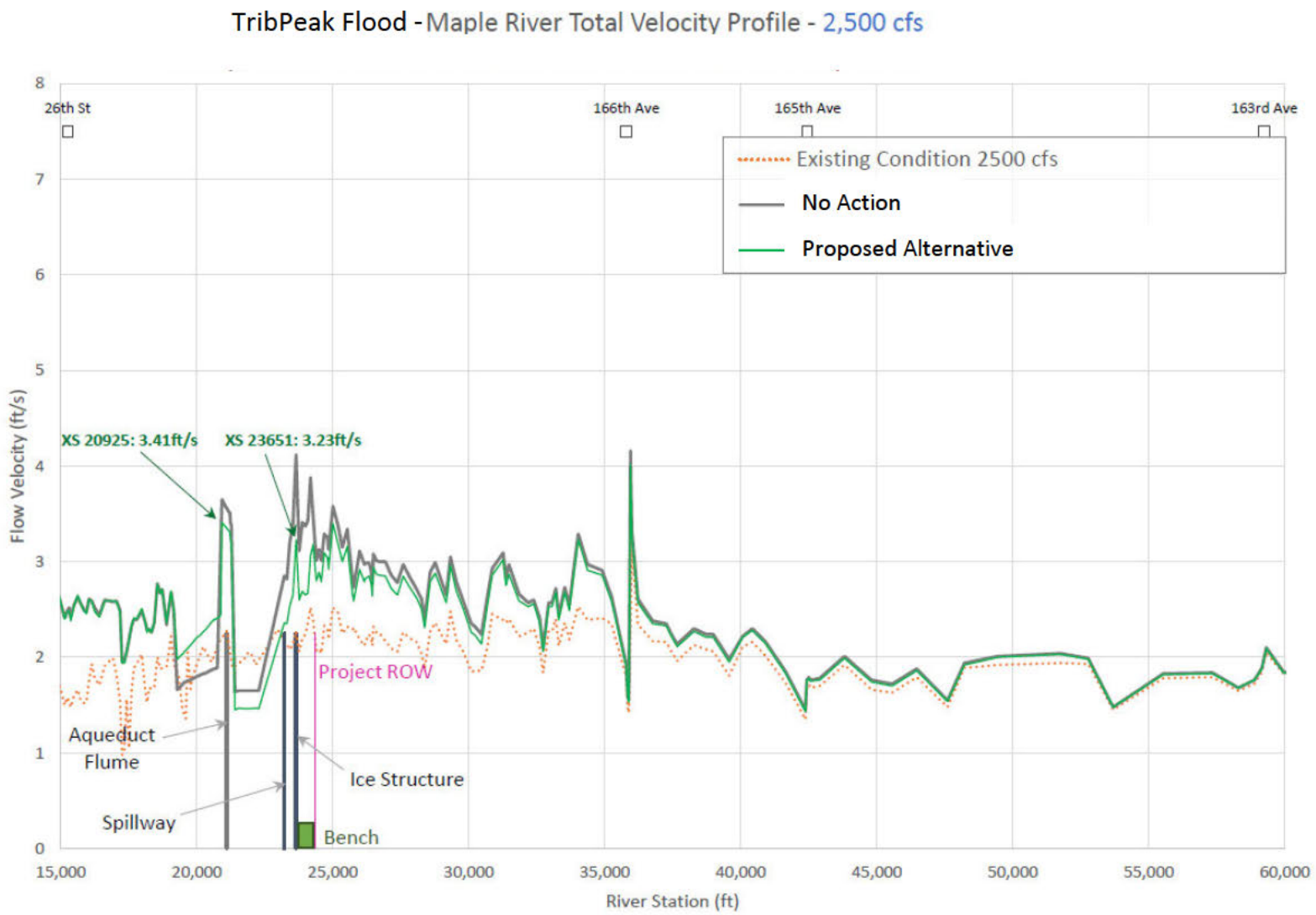

Figure 30. Velocity comparison plot along the Maple River of existing conditions, No Action Alternative, and Proposed Alternative using the TribPeak flow event. Profiles of existing conditions using the full and truncated hydraulic models are included.

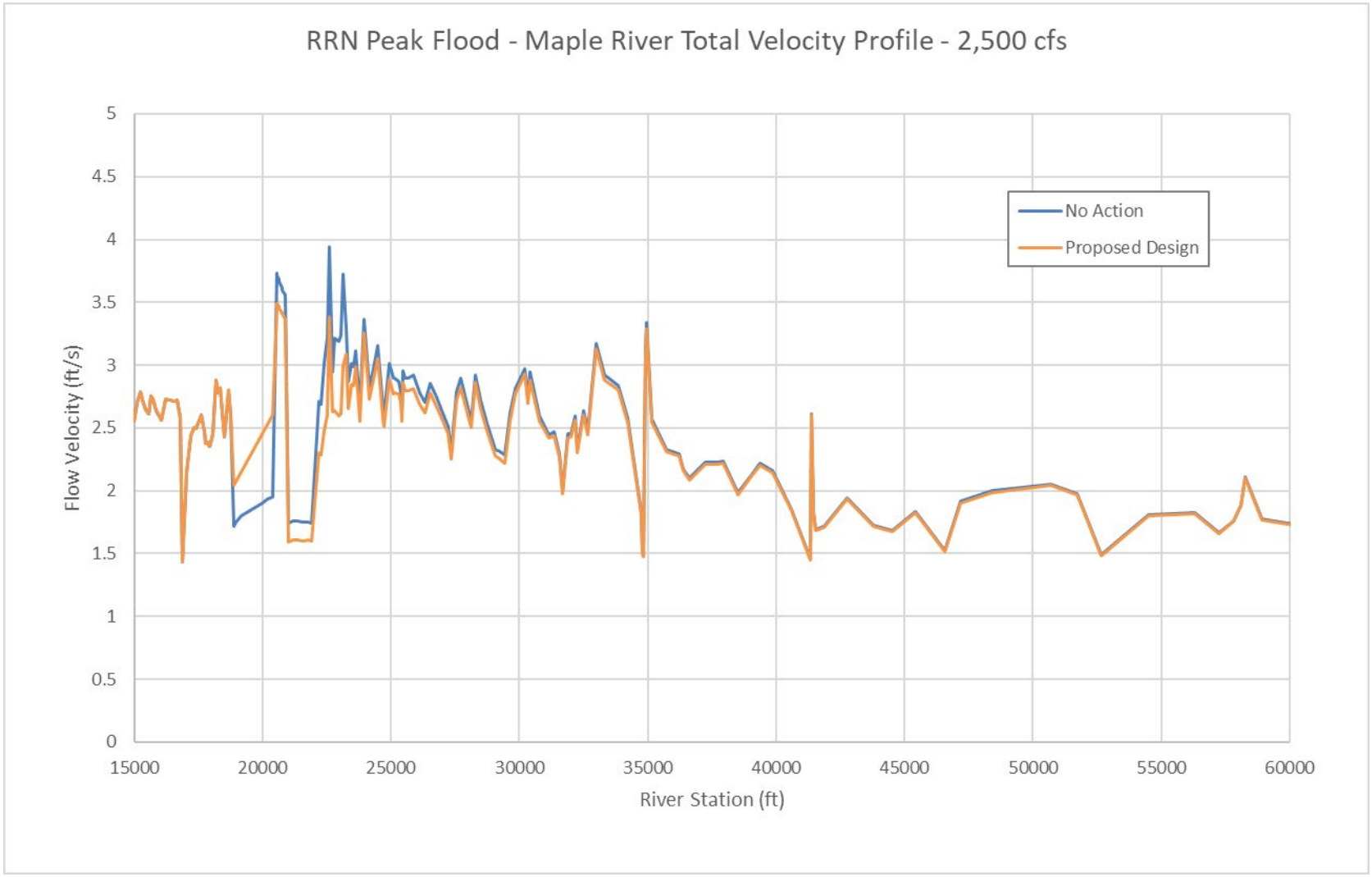

Figure 31. Velocity comparison plot along the Maple River of No Action Alternative and Proposed Alternative using the RRN flow event and a peak inflow of 2,500 cfs

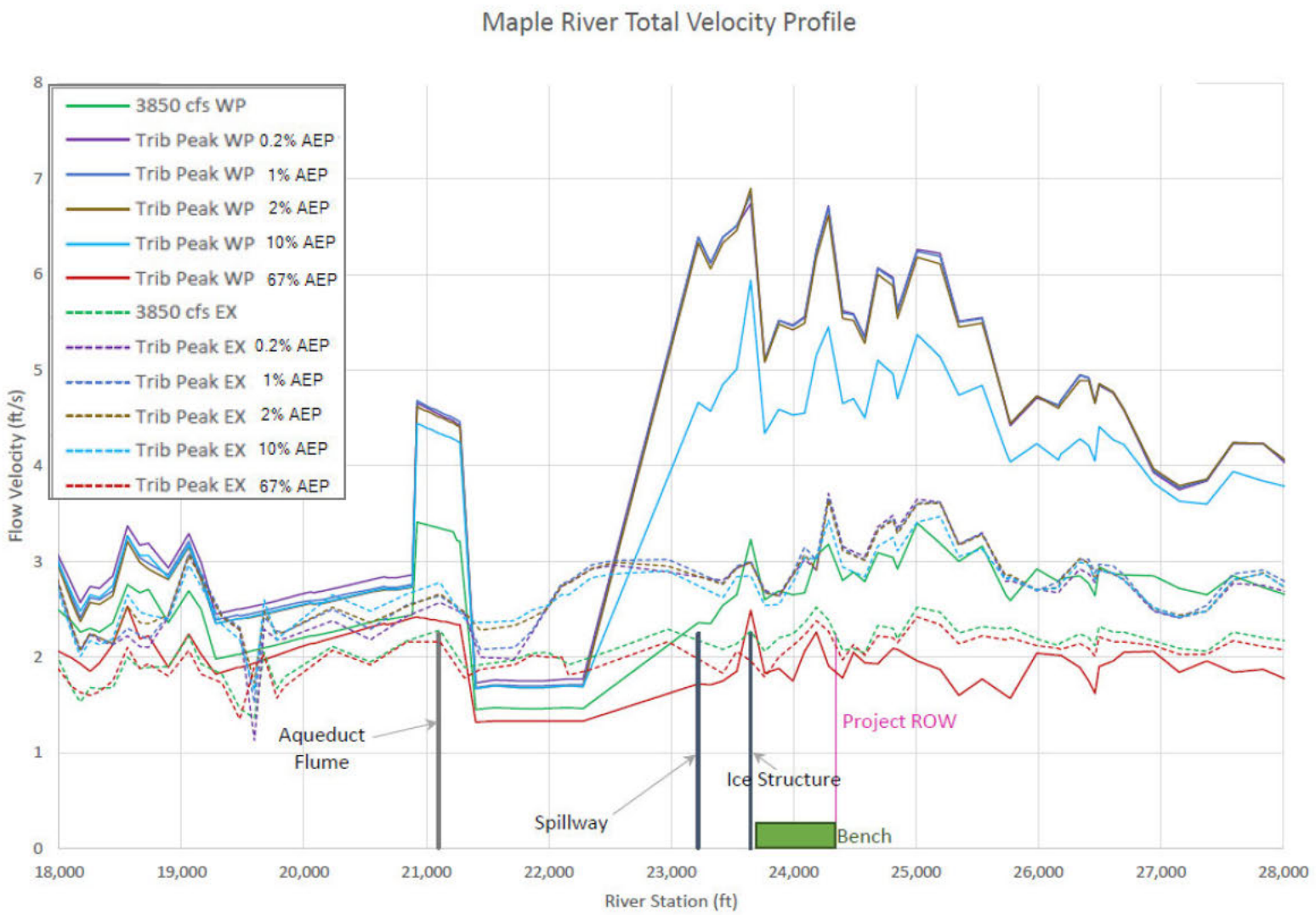

Figure 32. Total velocity profiles along the Maple River of existing conditions and Proposed Alternative for all return-period flow events

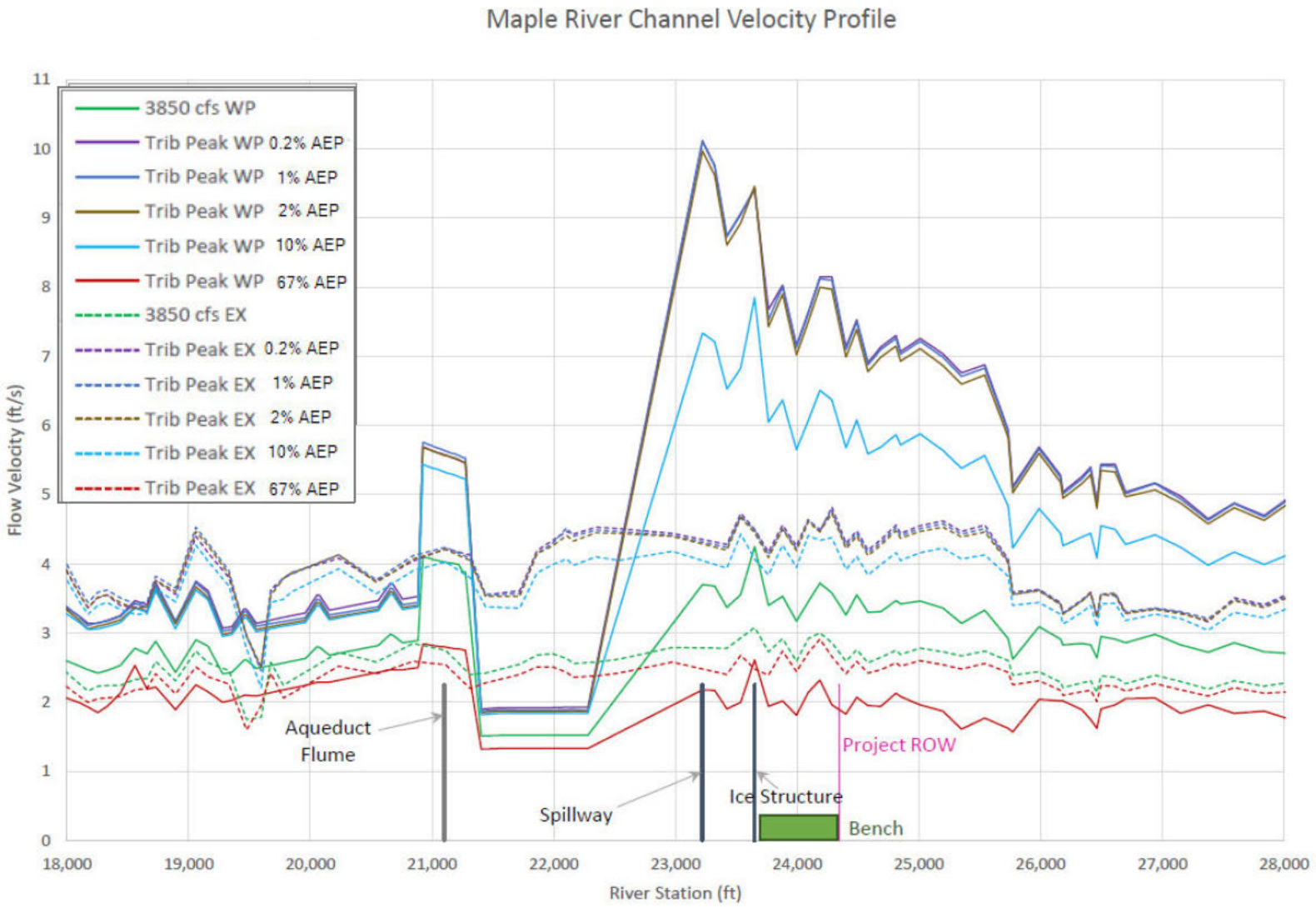

Figure 33. Channel velocity profiles along the Maple River of existing conditions and Proposed Alternative for all return-period flow events

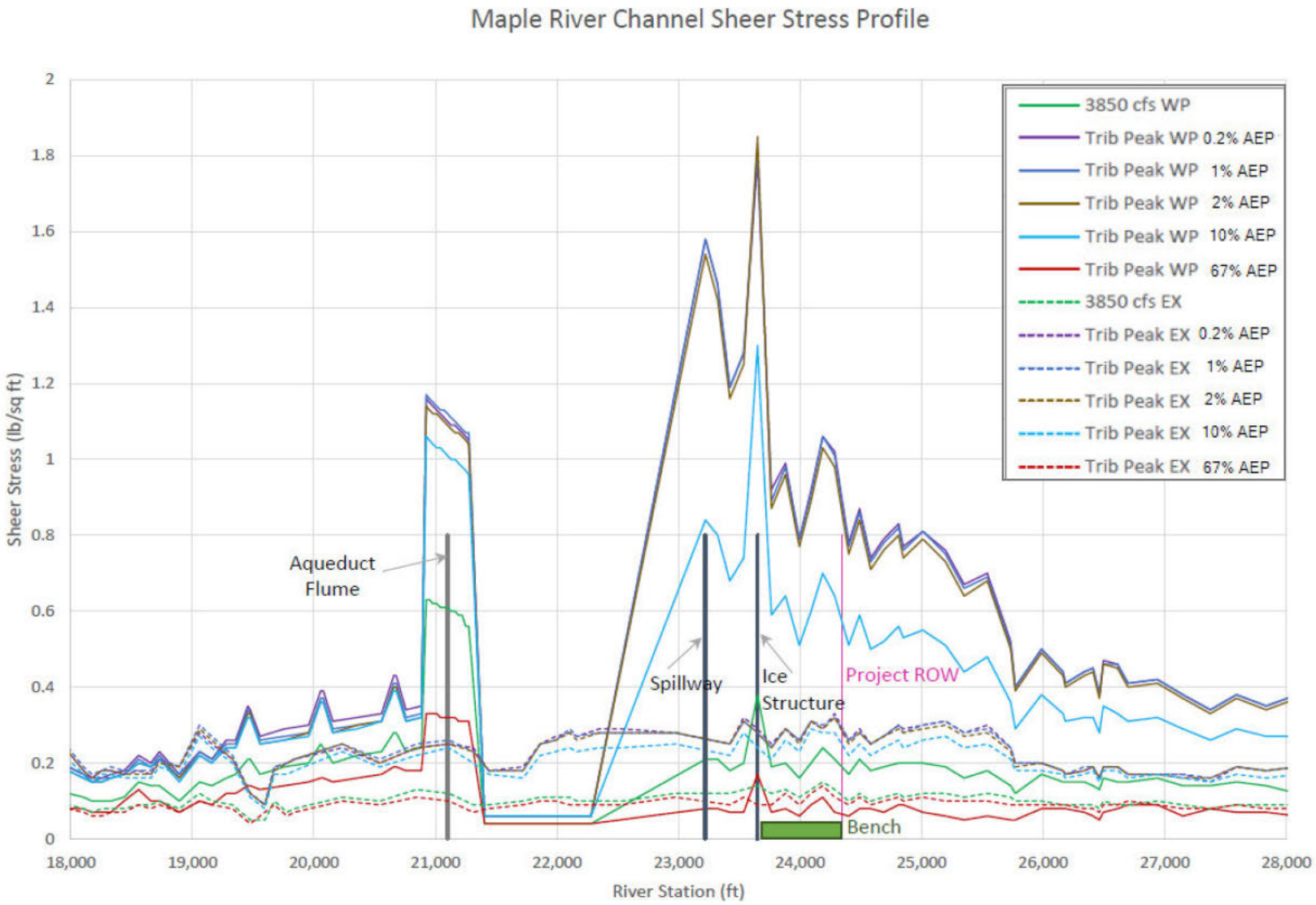

Figure 34. Channel shear stress profile along the Maple River for Proposed Alternative

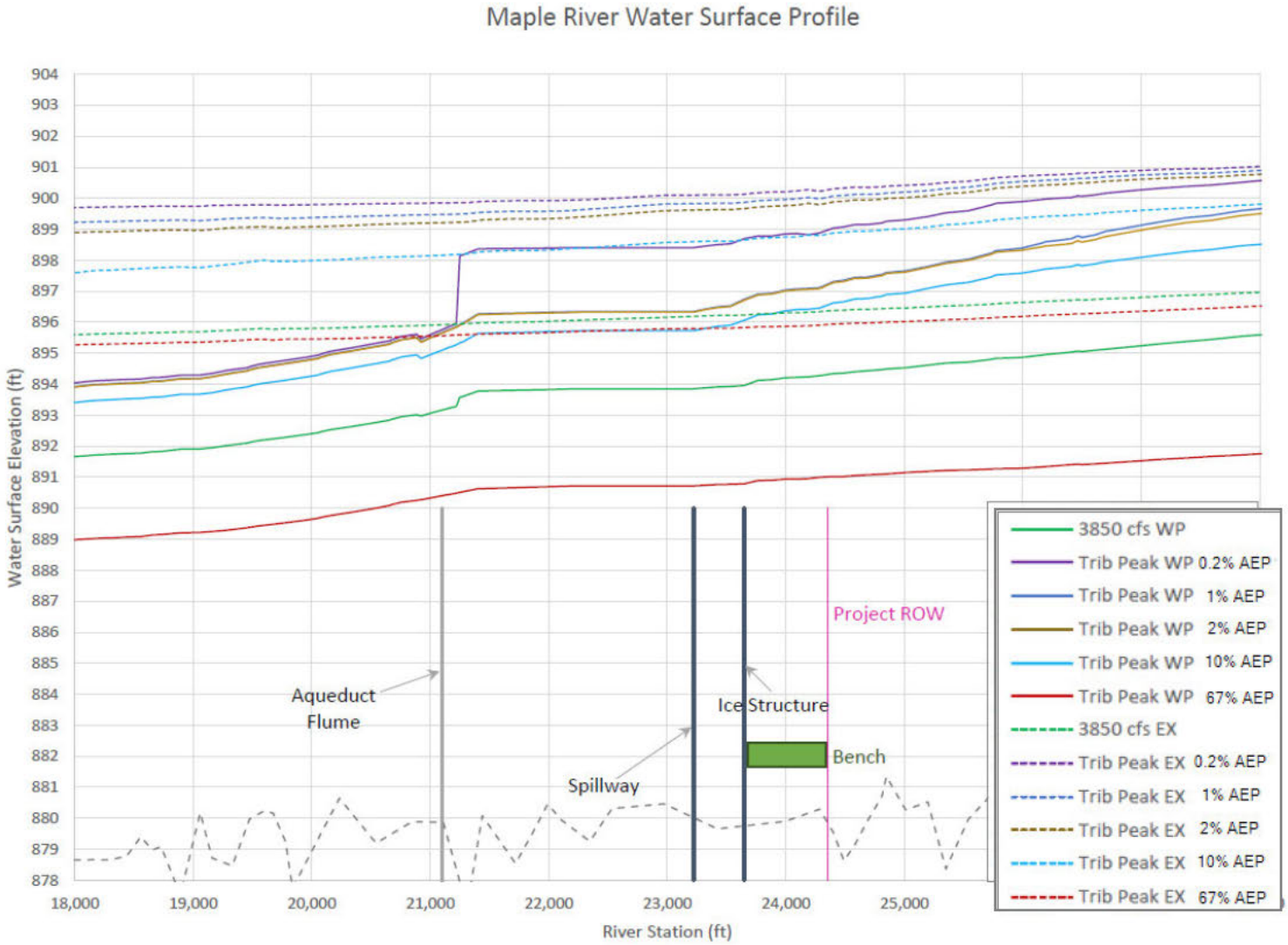

Figure 35. Water surface profiles along the Maple River for the 67- through 0.2-percent AEP flow event for existing conditions and Proposed Alternative

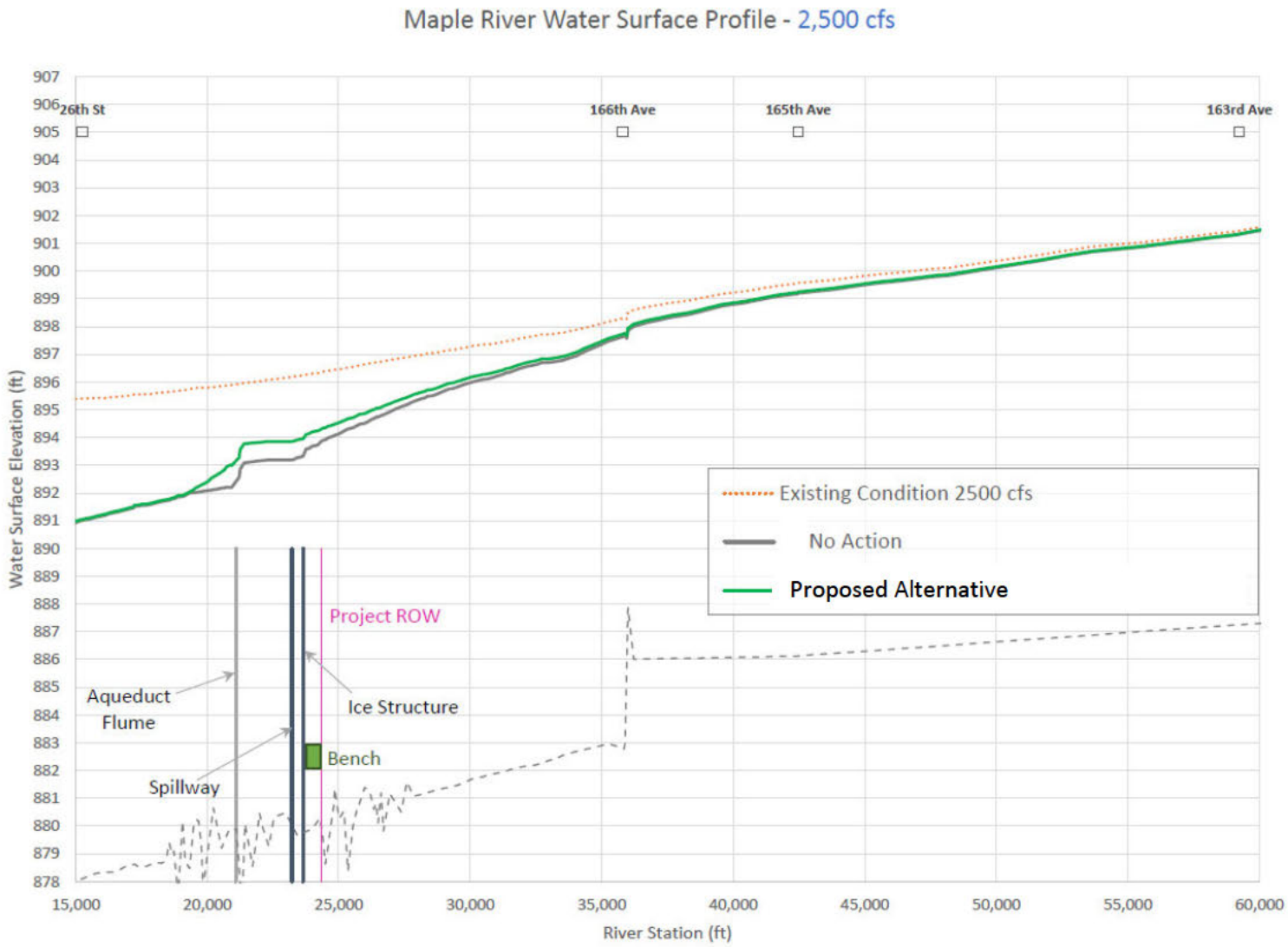

Figure 36. Water surface profile comparison plot along the Maple River of existing conditions, No Action Alternative, and Proposed Alternative. Profiles of existing conditions using the full and truncated hydraulic models are included.

4.4 Rush River

As no design changes occurred since the 2013 SEA, the Rush River designs discussed in this section will be referred to as the Rush River Inlet and are the Proposed Alternative for the Rush River. Peak total velocities show increases with the Proposed Alternative relative to existing conditions just upstream of the project ROW. Peak total velocities within the spillway itself are substantially higher than existing conditions, but erosion concerns are negligible due to the robust nature of the proposed channel and rock design features. The max peak total velocity during the April 5% exceedance event is 4.1 ft/s, an increase of approximately 2.4 ft/s relative to the existing conditions. During the 10-percent AEP flow event peak velocities just upstream of the ROW are 5.5 ft/s, an increase of almost 3.5 ft/s relative to the existing conditions. Peak total velocity increases upstream of the project ROW drop below 1 ft/s upstream of the 167th Ave SE Low Water Crossing and converge with existing conditions velocities as identified in Figure 37. The 1-percent AEP event peak total velocity is 4.8 ft/s which is lower than the 10-percent AEP event. This is due to backwater effects at the confluence of the Rush River Inlet with the Diversion Channel. Based upon velocity threshold data described in Fischenich (2001) these total velocity values could potentially mobilize vegetated portions of the existing channel upstream of the project ROW.

All Rush River Inlet velocities drop to within 0.5 ft/s of the existing conditions just upstream of the 167th Ave SE Low Water Crossing, roughly 1,700 feet upstream of the project ROW (Figure 38). A similar trend is seen in the peak channel velocity data, where Rush River Inlet velocities are higher than existing conditions immediately upstream of the Inlet structure (XS 15,207). The channel velocities are high enough above threshold values (Fischenich, 2001) to potentially mobilize the bed material in ways that could introduce bed degradation and upstream bank instabilities. It is noted that within the Rush River Inlet Structure footprint, the peak total velocities are not expected to generate erosion up through the 1-percent AEP event, as this section is designed with rock revetment (RRVA, 2023b).

Channel shear stress profiles for the 10- through 0.2-percent AEP flow events are provided in Figure 39. Channel shear stress values with the Rush River Inlet conditions can be as much as 0.4 to 0.6 psf higher than for existing conditions. Channel shear stress value differences between existing conditions and Rush River Inlet conditions quickly converge upstream of the 167th Ave SE Low Water Crossing. The shear stress difference is generally less than 0.1 psf within the natural channel and fully converges approximately 10,000 feet upstream of the project ROW.

Due to the increased velocities associated with the Rush River Inlet, peak WSEs drop below the existing conditions for all modeled flow events. The 5-percent April event peak WSE is approximately 4 ft lower than existing conditions and matches existing conditions WSE roughly 6,000 ft upstream of the project ROW at the 166th Ave SE Low Water Crossing. The 10- and 1-percent AEP event peak WSEs are approximately 6 and 2 ft lower than existing conditions, respectively. Both the 10- and 1-percent AEP event WSEs match existing conditions roughly 19,000 ft upstream of the project ROW at the 165th Ave SE Box Culvert Bridge (Figure 40). These lowered water surface profiles are not expected to introduce any potential erosion concerns outside of what is described in the paragraphs above.

Hydraulic modeling indicates that for a single 10-percent AEP Tributary Peak Event, approximately 1 ft of erosion may occur immediately upstream of the Project ROW (RRVA, 2023). Long-term scour modeling found that 10 sequential 10-percent AEP flow events resulted in scour depths reaching approximately 4 feet. This modeling was performed using old bathymetric survey data and would likely be improved with the inclusion of newer data.

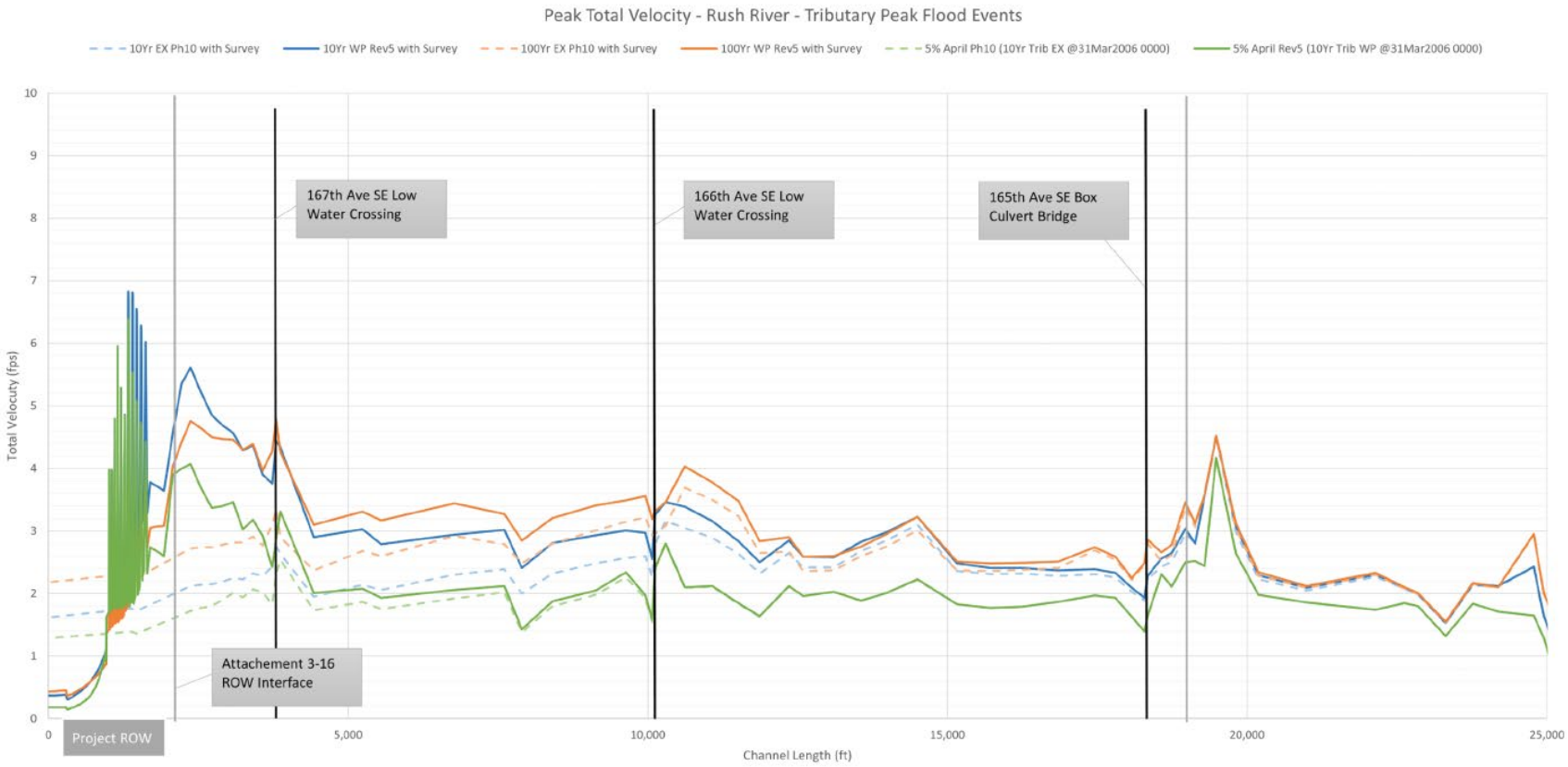

Figure 37. Peak total velocity along the Rush River for existing conditions and Proposed Alternative (With-Project) conditions

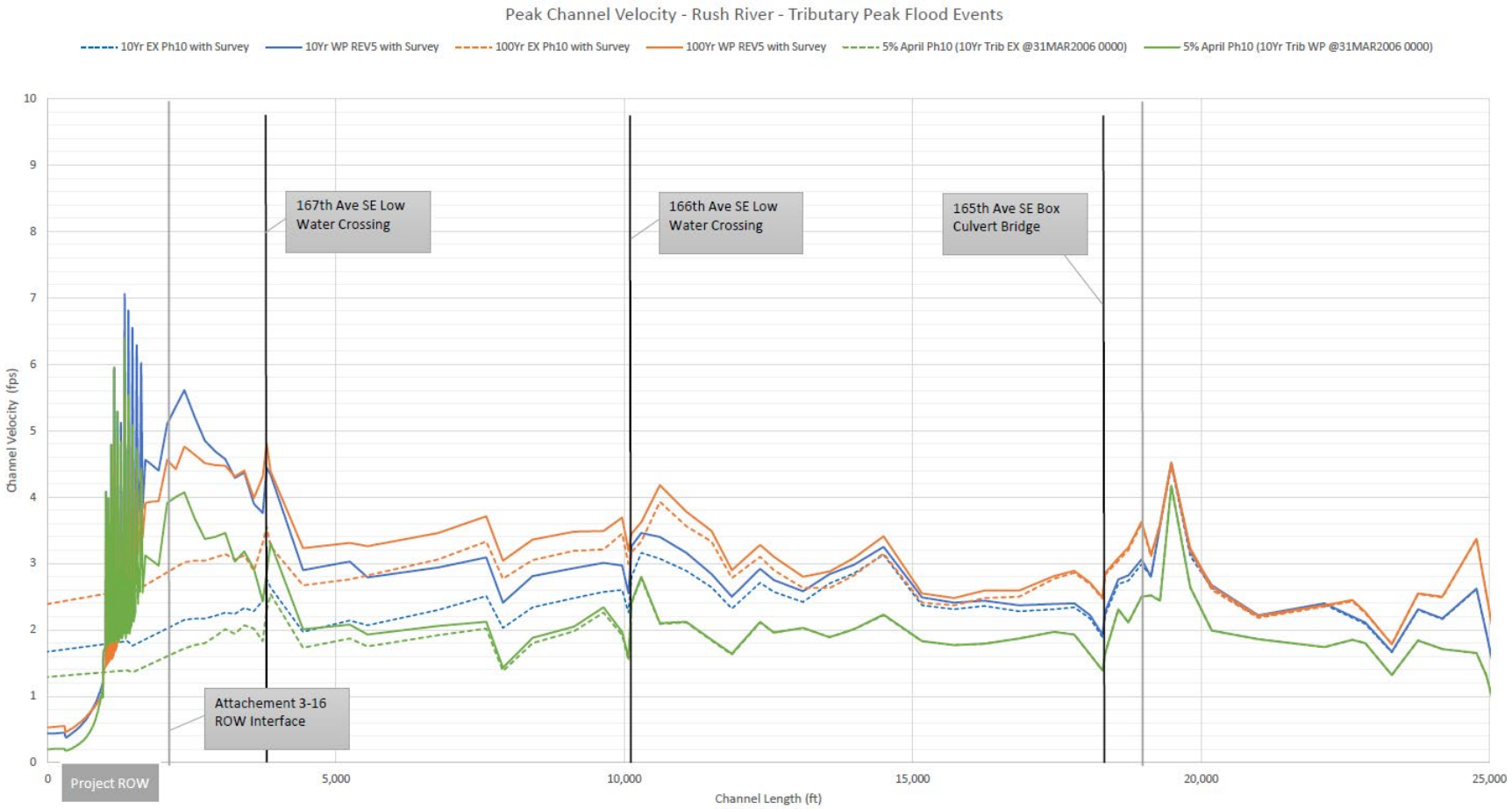

Figure 38. Peak channel velocity profile along the Rush River for existing conditions and Proposed Alternative (With-Project) conditions

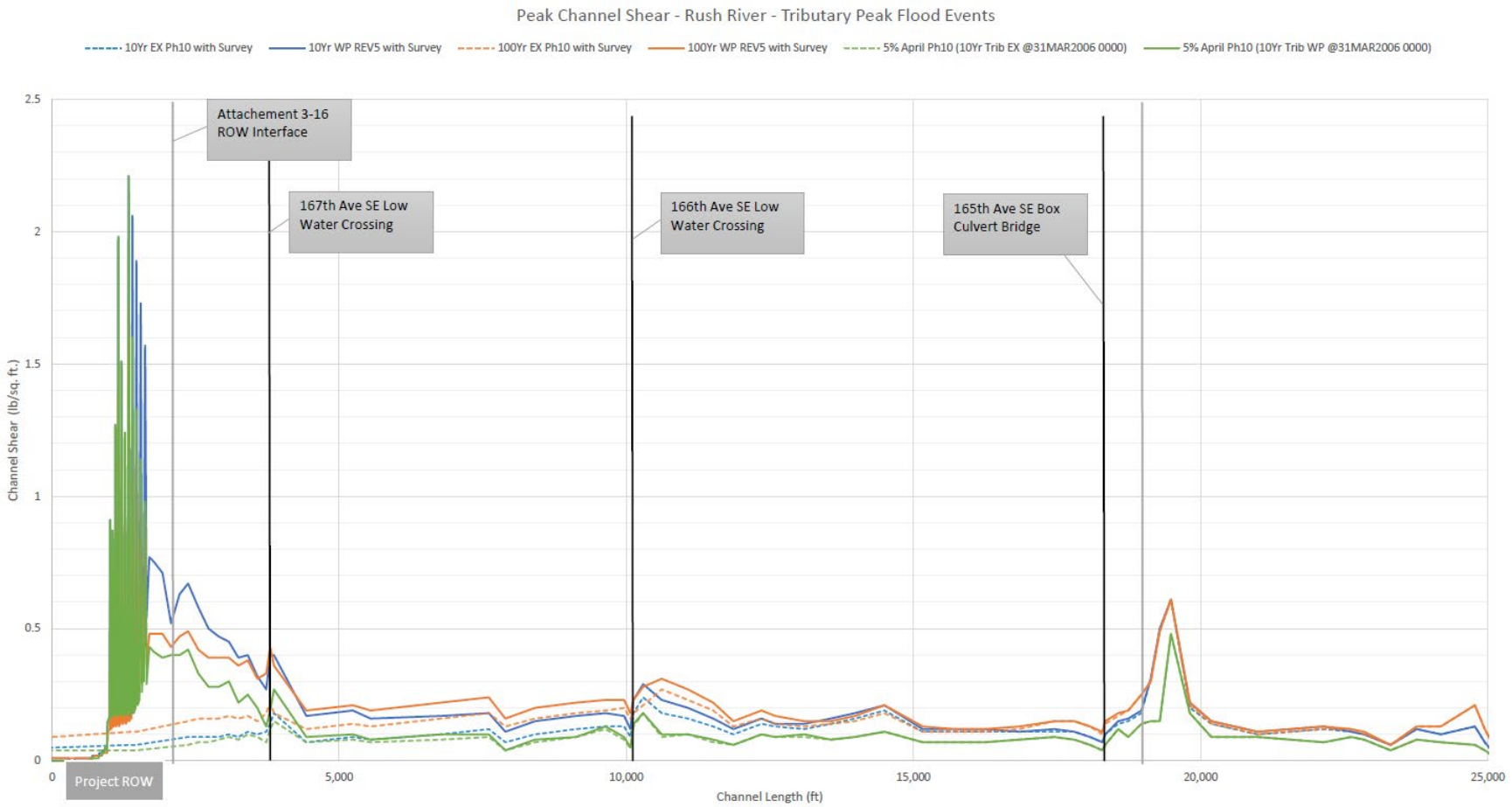

Figure 39. Peak channel shear stress profile along the Rush River for existing conditions and Proposed Alternative (With-Project) conditions

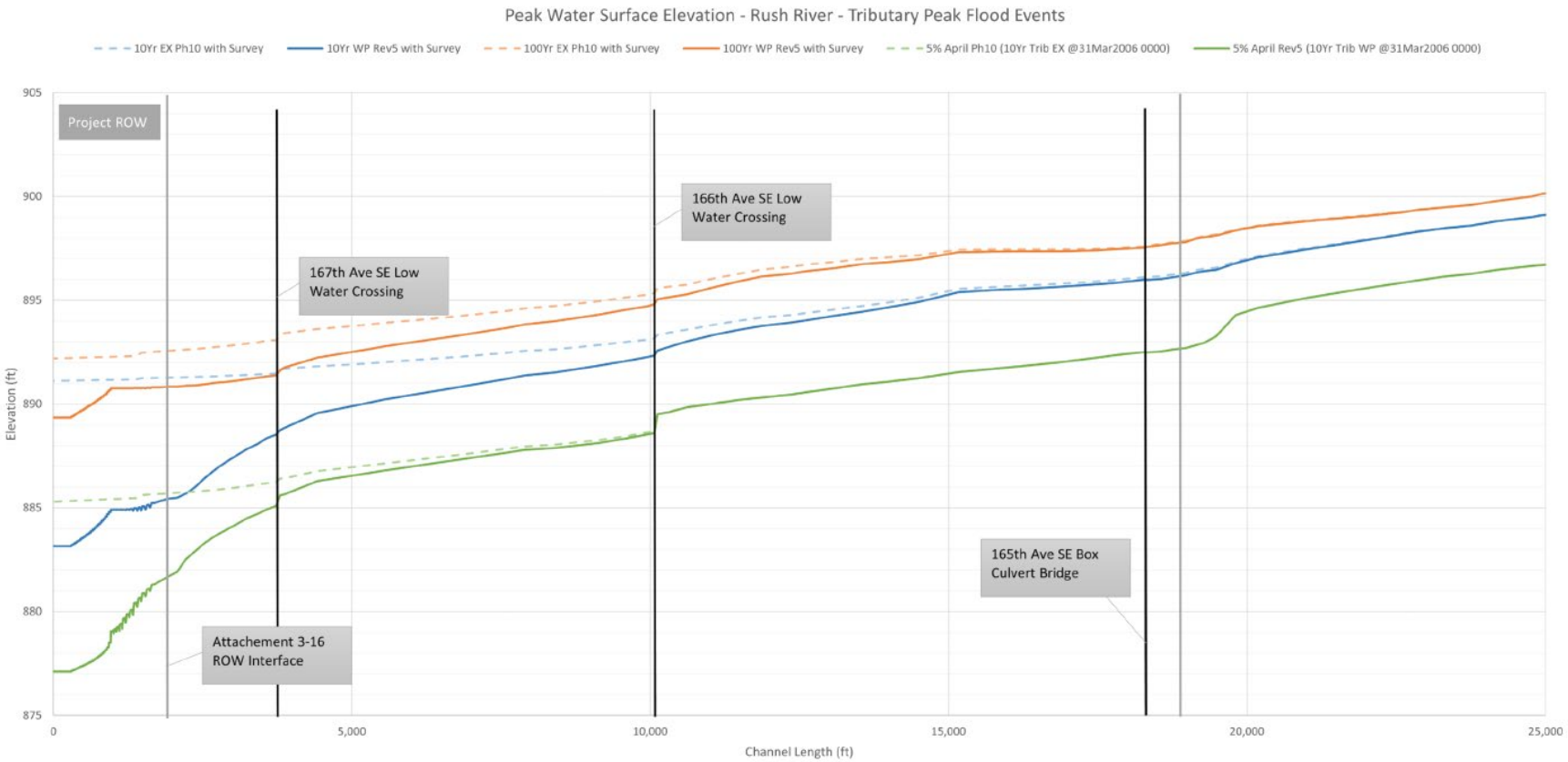

Figure 40. Water surface profiles along the Rush River for existing conditions and Proposed Alternative (With-Project) conditions

5 CONCLUSION

The Proposed Alternatives along the Sheyenne and Maple Rivers lower velocities relative to the No Action Alternatives. However, velocity increases relative to the existing conditions associated with the Sheyenne and Maple River Aqueduct Systems are still present and will require long term monitoring for erosion, especially within the 3-mile reach upstream of the respective project ROWs. Similarly, the Rush River Inlet structure may induce erosion upstream of the structure, but these erosion impacts will likely be limited to the 1,700-foot reach between the project ROW and the 167th Ave SE Low Water Crossing.

6 REFERENCES

Houston-Moore Group (HMG). 2018. *Appendix D Hydrology and Hydraulics – Attachment 1 POR Hydrology Development.*

HMG. 2023. *Sheyenne River Ordinary High Water Mark Evaluation and Determination.*

Metro Flood Diversion Authority (2023). Phase 11.2 FMM Comprehensive Model, May 31, 2023.

Red River Valley Alliance (RRVA). 2023b. *E09-S09 - Rush River Inlet Construction Documents Submittal*, September 2023. United States Army Corps of Engineers (USACE). 2016. *Vegetation Survey and Ordinary High Water Mark Determination for the Maple River, North Dakota*. USACE, Mississippi Valley Division, St. Paul District.

USACE. 2019. *Final Supplemental Environmental Assessment #2: Modifications to the Fargo Moorhead Metropolitan Area Flood Risk Management Project*. USACE, Mississippi Valley Division, St. Paul District.

USACE. 2020a. *Sheyenne River above the Sheyenne Diversion near Horace, ND: Flow Duration Curve Update*.

USACE. 2020b. *Sheyenne River above the Sheyenne Diversion near Horace, ND: Flow Duration Curve Update. Addendum No. 1.*

USACE. 2022. *Flow Duration Curves at Maple River below and near Mapleton, North Dakota*.

USACE. 2023. *Flow Duration Curves on Rush River Just Upstream of FMM Diversion Channel.*

WEST Consultants, Inc. (WEST). 2021. *Geomorphic Monitoring of Rivers Potentially Affected by the Fargo-Moorhead Metro Flood Risk Management Project*. Salem, OR.

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Appendix B
Public Comments

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

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St. Paul District

May 2024

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NORTH Dakota | Game and Fish

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March 8, 2024

District Engineer
St. Paul District, Corps of Engineers,
Attn: Regional Planning and Environment Division North
332 Minnesota St., Suite E1500
St. Paul, MN 55101
[redacted]

RE: Draft Supplemental Environmental Assessment #3

To Whom it Concerns:

The North Dakota Game and Fish Department (Department) appreciates the opportunity to provide comments on the Draft Supplemental Environmental Assessment #3 (DSEA). The Department has worked cooperatively with the Corps of Engineers, Fargo Diversion Authority and other agencies since the inception of the project. We have worked hard to identify potential risks to fish and wildlife resources and continued to work as a team to mitigate any impacts that we identified. We commend the agencies for their work implementing mitigation features but more work is necessary as this project is being designed and constructed.

The Department stated during the writing of the original Environmental Impact Statement that fishing passage is a priority on the Red River of the North, Wild Rice River, Sheyenne River, Maple River, and the Rush River. We also stated we must maintain existing conditions in reference to water velocities for fish passage during all flow scenarios.

The DSEA addresses several concerns regarding inflated velocities in and around the Sheyenne and Maple River aqueducts. Numerous alternative designs were considered for these two structures. But through considerable collaboration and coordination with agencies and landowners the implementation of benching upstream of these two features and stream meanders downstream have at least achieve water velocity modeling that should be adequate to achieve fish passage.

Section 3.1.3 of the DSEA states "The previous NEPA documents described the Rush River Inlet, with its purpose being to convey flow from the Rush River into the Diversion Channel while providing fish passage between the Rush River and the Diversion Channel". However, Section 4.4 of Appendix A - Hydraulics and Hydrology states "Peak total velocities within the

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spillway itself are substantially higher than existing conditions, but erosion concerns are negligible due to the robust nature of the proposed channel and rock design features". Yet, Section 3.3.3 of the DSEA states "No other alternatives were considered for the Rush River". The Department questions how fish passage will be achieved as stated in previous NEPA documents with substantially higher velocities in the spillway, yet no other alternatives were considered?

Thank you for this opportunity and we look forward to developing a solution to our concerns.

Sincerely,

(For) Greg Link
Chief
Conservation & Communication Division

NORTH Dakota | Water Resources
Be Legendary.

March 14, 2024

Eric Swenson
District Engineer; St. Paul District
US Army Corps of Engineers
ATTN: Regional Planning and Environmental Division North
332 Minnesota St., Suite E1500
St. Paul, MN 55101

Dear Mr. Swenson:

This is in response to the Draft Supplemental Environmental Assessment #3 for the Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project.

The proposed project has been reviewed by Department of Water Resources (DWR), and the following comments are provided:

- Project work associated with the Fargo-Moorhead Metropolitan Area Flood Risk Management Project Diversion continues to be reviewed under DWR Construction Permit No. 2626. Associated infrastructure not covered under Construction Permit No. 2626 will need to be reviewed separately by the DWR and may require additional permit(s).

- Work, including riverbank benching, will occur within the Ordinary High Water Mark of the Sheyenne River; therefore, the project will require a Sovereign Land permit from the Department of Water Resources prior to construction.

- There is a FEMA National Flood Insurance Program (NFIP) regulatory floodplain identified or mapped where this proposed project is to take place. Impacted areas are designated to be in NFIP Zone AH. The State of North Dakota has no formal NFIP permitting authority, as all NFIP permitting decisions are considered by impacted NFIP participating communities, which is the community with zoning authority for the area in question. Please work directly with the local floodplain administrator of the zoning authority impacted to achieve NFIP and community compliance.

- Initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code § 61-04-02. Please consult with the DWR Water Appropriation Division if you have any questions at (701) 328-2754 or appropinfo@nd.gov.

Thank you for the opportunity to provide review comments. Should you have further questions, please contact me at 701-328-4813 or acarranza@nd.gov.

Sincerely,

Aaron Carranza
Regulatory Division Director

AC:dm/1570

Ecological and Water Resources
2115 Birchmont Beach Rd NE
Bemidji, MN 56601

March 7, 2024

U.S. Army Corps of Engineers District Engineer, St. Paul District
ATTN: Regional Planning and Environment Division North
332 Minnesota St., Suite E1500
St. Paul, MN 55101

[redacted]

Re: Fargo-Moorhead Metropolitan Area Flood Risk Management Project Draft Supplemental Environmental Assessment #3

Dear District Engineer,

Thank you for the opportunity to review the Fargo-Moorhead Metropolitan Area Flood Risk Management Project Draft Supplemental Environmental Assessment #3 (SEA). The Minnesota Department of Natural Resources (MN DNR) has reviewed the SEA and offers the following comments related to fish passage, stream geomorphic stability, and project design.

Rush River Inlet

The Rush River Inlet hydraulic modelling under With-Project conditions indicates velocities in the channel may cause erosion and channel degradation during high flow events. While the SEA acknowledges this, it assumes that the 167th Ave SE low water crossing will contain any headcutting. As the low water crossing is loose riprap fill, MN DNR cautions that a headcut could undermine the riprap during high flows and continue upstream. The Rush River is channelized throughout much of its length and is susceptible to headcutting, subsequent channel instability, and large-scale bank slumping. The SEA assumes erosion risks are acceptable, however; the MN DNR cautions that erosion may be more significant than anticipated given the channelized and incised character of the Rush River. To help minimize these potential impacts, MN DNR recommends considering methods to further fortify the river channel in the reach with increased velocity.

Proposed alternatives for Sheyenne and Maple River aqueducts

MN DNR agrees that upstream floodplain benching with toe wood sod mats would improve the existing channel habitat and also agrees the proposed channel meanders downstream of the aqueducts are preferrable to a straight channel.

MN DNR concurs that the aqueduct velocity reductions from previous designs will help minimize fish passage concerns; however, MN DNR considers a water velocity of 2.5 feet per second as passable for most fish species in extended flumes. Consequently, the SEA should acknowledge that the aqueducts will still be an impediment to fish passage for some fish species at high flows.

Ice retention structures

The ice retention structures are indicated as a straight line across the channel, with piles extending to 7' above streambed grade. As previously communicated, we continue to have concerns regarding debris accumulation on the pilings that may cause temporary damming and channel erosion. Frequent debris removal at the ice retention structures may be needed during high flows to prevent debris dams and channel erosion. We also recommend an upstream arch design for the ice retention structures to help concentrate higher flows into the middle of the channel.

MN DNR cautions that frozen rivers are popular winter snowmobile routes in the region. Hazard warnings for the ice retention structures should be prioritized to reduce risk of collision by snowmobiles.

Sod mat harvesting for revegetation of benches

MN DNR supports harvesting sod mats with woody growth from excavation areas to use in constructing bankfull benches. MN DNR advises careful removal and stockpiling of harvested sod mats so handling is minimal, as sod mats have a tendency to break apart if handled carelessly or more than twice.

Aqueduct spillway

In Minnesota, MN DNR has observed that rivers with perpendicular inlets into contained channels tend to cause channel bank erosion opposite of spillway inlets. To help minimize this potential MN DNR suggests considering measures to reduce water velocity of the aqueduct spillways flows into the diversion channel.

Thank you for the consideration of these comments. Please contact Owen Baird, Northwest Region Environmental Assessment Ecologist (owen.baird@state.mn.us) with any concerns or questions.

Sincerely,

Nathan Kestner, Regional Manager, Ecological and Water Resources

CC: Owen Baird, MN DNR Ecological and Water Resources
Jason Boyle, MN DNR Ecological and Water Resources
Neil Haugerud, MN DNR Ecological and Water Resources
Nicholas Kludt, MN DNR Fisheries

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Appendix C
Responses to Public Comments

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

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May 2024

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1 OVERVIEW

The Draft Supplemental Environmental Assessment dated February 2024 was made available for public review and comment from February 13, 2024 to March 15, 2024. Comments were received from the North Dakota Game and Fish Department (NDGF), North Dakota Department of Water Resources (NDDWR), and Minnesota Department of Natural Resources (MnDNR). The comments have been paraphrased below along with responses. The full comments received can be seen in their entirety in Appendix B.

2 NORTH DAKOTA GAME AND FISH

Comment 1:

The North Dakota Game and Fish Department questions how fish passage will be achieved through the Rush River Inlet, as stated in previous NEPA documents. Updated modeling has indicated that velocities are substantially higher than existing conditions, yet no other alternatives were considered.

Response 1:

Several alternatives were considered for the Rush River Inlet in previous NEPA documents. The 2011 Final Feasibility Report and Environmental Impact Statement (FEIS) considered alignments that avoided impacts to the Rush River but would result in impacts to other resources. Ultimately an alignment that severed the Rush River via intersection with the Diversion Channel was selected. A variety of structure designs were also considered at the intersection of the Rush River and the Diversion Channel in the FEIS and 2013 Supplemental Environmental Assessment (SEA). A stepped concrete spillway, a vertical drop structure with fishway, and rock arch rapids were all evaluated. The rock arch rapids were selected to help aid in fish passage through the structure. The higher velocities would equally impact the other design alternatives considered and reevaluation of those designs was not warranted. The Rush River Inlet will be monitored for erosion and fish passage. If impacts to erosion and fish passage are higher than anticipated adaptive management will be used to address the impacts.

3 NORTH DAKOTA DEPARTMENT OF WATER RESOURCES

Comment 1:

Infrastructure not covered under Construction Permit No. 2626 will need to be reviewed separately by the NDDWR and may require additional permit(s).

Response 1:

Construction Permit No. 2626 was issued to a non-federal sponsor, the Metro Flood Diversion Authority (MFDA). The MFDA has indicated that it will continue to work with the NDDWR regarding permitting for the Project.

Comment 2:

Work below the Ordinary High Water Mark on the Sheyenne River will require a Sovereign Land permit from NDDWR prior to construction.

Response 2:

The MFDA has indicated that it will continue to work with the NDDWR regarding permitting for the Project.

Comment 3:
Work with the local floodplain administrator of the zoning authority impacted to achieve National Flood Insurance Program and community compliance.
Response 3:
The MFDA will work directly with FEMA as part of the overall approach to obtain NFIP and community compliance for the entire project. The proposed changes in the project description will be included in the submittals to FEMA.

Comment 4:
If surface water or groundwater will be diverted for construction of the project, a water permit will be required.
Response 4:
The MFDA has indicated that it will continue to work with the NDDWR regarding permitting for the Project.

4 MINNESOTA DEPARTMENT OF NATURAL RESOURCES

Comment 1:
The SEA assumes erosion risks at the Rush River Inlet are acceptable. Erosion may be more significant than anticipated given the channelized and incised character of the Rush River. The MnDNR recommends considering methods to further fortify the river channel in the reach with increased velocity.
Response 1:
The area upstream of the Rush River Inlet will be monitored for erosion. Adaptive management measures will be developed with the Geomorphic Monitoring Team to address any higher than anticipated changes to the Rush River channel.

Comment 2:
The MnDNR considers a water velocity of 2.5 feet per second as passable for most fish species in extended flumes. The SEA should acknowledge that the aqueducts will still be an impediment to fish passage for some species at high flows.
Response 2:
Comment noted. The SEA acknowledges that there is an elevated risk that high velocities could be a barrier to fish movement during high flow events.

Comment 3:
The MnDNR has concerns about the design of the ice retention structures. Debris accumulation may cause temporary damming and channel erosion. Frequent debris removal at the ice retention structures may be needed during high flows to prevent debris dams and channel erosion. An upstream arch design is recommended to help concentrate higher flows into the middle of the channel. Hazard warnings should be prioritized to reduce risk of collision by snowmobiles.
Response 3:

The ice retention structures will be located immediately downstream of an equipment pad that is accessed from an all-weather maintenance road. The ice retention structure piles are currently designed to extend several feet above the average ice-freeze elevation of the river to break the large sheets of ice that could travel downstream in the rivers. Cranes and other equipment will be placed at the equipment pads to remove debris and relocate large pieces of ice that are stopped by the ice retention structures to avoid major backwater effects on the rivers.

The current design for the ice retention structures includes placement of the piles to allow kayaks and canoes to traverse the river in the summer months and snowmobiles in the winter months. Signs would be placed upstream of the ice retention structure and near the downstream boundary of the Diversion Channel right of way warning recreationists of the ice retention structure piles.

Comment 4:
The MnDNR advises careful removal and stockpiling of harvested sod mats so handling is minimal, as sod mats have a tendency to break apart if handled carelessly or more than twice.
Response 4:
Comment noted.

Comment 5:
MnDNR has observed that rivers with perpendicular inlets into contained channels tend to cause channel bank erosion opposite of spillway inlets. To help minimize this potential MnDNR suggests considering measures to reduce water velocity of the aqueduct spillways flows into the diversion channel.
Response 5:
Comment noted. The Diversion Channel is being designed and constructed to include erosion protection at drain inlets, spillway inlets, and through bridge and aqueduct crossings. The MFDA will complete annual monitoring to identify changes in the Diversion Channel slopes and sedimentation as compared to as-built conditions. Corrective measures will be completed as necessary.

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Attachment I
Clean Water Act Section 404(b)(1) Evaluation

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

U.S. Army Corps of Engineers

St. Paul District

May 2024

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Attachment I
Clean Water Act Section 404(b)(1) Evaluation

Table of Contents

I. PROJECT DESCRIPTION

A. Background – A Final Feasibility Report and Environmental Impact Statement (FEIS) as well as a Clean Water Act Section 404(b)(1) Evaluation for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project (Project) was completed in July 2011. A Record of Decision for the FEIS was signed April 3, 2012. Detailed engineering and design studies conducted after the completion of the FEIS resulted in several proposed modifications to the Project. An initial round of modifications was addressed in the first Supplemental Environmental Assessment (2013 SEA), with a Finding of No Significant Impact (FONSI) signed September 19, 2013. A supplement to the FEIS Section 404(b)(1) Evaluation was prepared to address the modifications proposed in the 2013 SEA (Section 404(b)(1) Evaluation Supplement #1 or Supplement #1). A second round of modifications was addressed in the second Supplemental Environmental Assessment (2019 SEA), with a FONSI signed February 28, 2019. A supplement to the previous Section 404(b)(1) Evaluations was prepared to address the modifications proposed in the 2019 SEA (Section 404(b)(1) Evaluation Supplement #2 or Supplement #2). The Sheyenne and Maple River Aqueducts were discussed in the FEIS and 2013 SEA.

The Metro Flood Diversion Authority (MFDA) initiated the final design and construction phases for the Diversion Channel features in 2021. Design of the Diversion Channel features was informed through a hydrologic and hydraulic (H&H) model. The initial H&H model results for the final design indicated that during some high flow events, velocities upstream of the Sheyenne River Aqueduct, Maple River Aqueduct, and Rush River Inlet (locations shown in Figure 2 of the 2024 SEA) exceeded levels likely to induce erosion and adversely impact fish passage. USACE and the MFDA developed and evaluated a series of options to reduce velocities at the Maple River Aqueduct and upstream of the Sheyenne River Aqueduct. A range of options were compared to identify a Proposed Alternative for the Sheyenne and Maple Rivers, as discussed in the Supplemental Environmental Assessment #3 to which this Evaluation is attached. Increased velocities on the Rush River are not likely to result in appreciable impacts but will be monitored after construction to verify the magnitude of affects.

B. Location – The area affected by Project construction is located in Cass County, North Dakota and Clay County, Minnesota. The changes to the proposed fill activities covered in this evaluation include areas below the ordinary high water mark (OHWM) of the Sheyenne River, Maple River, and Rush River. Additional information for these changes is provided in Section C of this document.

C. General Description – This supplement addresses the effects that would result from the placement of fill in conjunction with proposed modifications to the Project as described in the 2024 SEA. A general overview of the Project is provided here, along with details of the modifications. The effects associated with the features described here are discussed in detail in Chapter 5 of the FEIS, the 2013 SEA, the 2019 SEA and the 2024 SEA.

The Project is a diversion channel system including but not limited to excavated channels, a gated channel inlet structure, tieback embankments, river structures on the Red and Wild Rice rivers, an upstream flood water staging area, hydraulic structures on tributaries, levees and floodwalls, non-structural features (such as fee acquisitions, relocations, or raising individual structures), recreation features, and environmental mitigation. When operated, the Project would divert a portion of the Red River and Wild Rice River flow upstream of the metro area, pick up flow at the Sheyenne, Maple, Rush, and Lower Rush rivers, and return it to the Red River downstream of the Fargo-Moorhead metro area. The diversion channel system includes a 30 mile long diversion channel extending from the gated inlet structure to its outlet at the Red River near Georgetown, Minnesota.

In order to address higher-than-anticipated velocities in the Sheyenne and Maple Rivers, benching was evaluated as a way to reduce velocities. For the Sheyenne River Proposed Alternative, a series of benches would be constructed along the natural channel from the Equipment Pad upstream to the Cass County Road 16 bridge, as shown on Figures 8 through 12 of the 2024 SEA. In addition, meanders would be constructed within the Downstream Engineered Channel to support riparian habitat. The Sheyenne Aqueduct System would be designed to limit average cross section velocities to not greater than 3.6 feet/second when flow rates in the Sheyenne River upstream of the Diversion Channel are up to 3,850 cfs, as determined by the H&H model.

For the Maple River Proposed Alternative, benches would be added from the Upstream Engineered Channel to the western boundary of the Diversion Channel Right of Way. The placement and width of the benches would be determined using the hydraulic model to limit average cross section velocities in this portion of the river to no more than 3.6 ft/s when the flow in this portion of the river is up to 2,500 cfs. The Downstream Engineered Channel would also include meanders to provide more natural conditions (Figure 13 of the 2024 SEA).

For the Rush River Inlet, hydraulic model analyses were conducted to assist with design and evaluate impacts of the Rush River Inlet. Velocities upstream of the Rush River Inlet appear to be higher than previously anticipated but are not expected to result in unacceptable levels of erosion or fish passage. Monitoring would be used to verify conditions and implement adaptive management, if necessary.

D. Authority and Purpose – The Project was authorized by the Water Resources Reform and Development Act of 2014. The purpose has not changed from what is described in the FEIS.

E. General Description of Dredged or Fill Material

1. General Characteristics of Material – For the Rush River, there would be no change from Supplement #2. For the Sheyenne and Maple Rivers, trees would be added and used for toe wood-sod mats in benching areas.

2. Quantity of Material – No changes were made to the estimated quantities for the Sheyenne River Aqueduct, the Maple River Aqueduct, or the Rush River Inlet. Benching in the areas upstream of the Sheyenne River Aqueduct would result in the removal of approximately 148,000 cubic yards of material, some of which will be above the OHWM, and placement of 1,005 root wads along the river banks. Benching in the areas upstream of the Maple River Aqueduct would result in the removal of approximately 9,500 cubic yards of material, some of which will be above the OHWM, and placement of 100 root wads along the riverbanks.

3. Source of Material – There would be no change from Supplement #2 with the exception of trees used for root wads. Trees would be obtained from the benching areas as well as the Upstream Mitigation Area. In the event a sufficient number of trees are not available there, tree thinning in other locations as a prescriptive measure may be considered to acquire additional trees.

F. Description of the Proposed Discharge Sites

1. Location – The locations of the Project features would not change from Supplement #2, with the exception that there would be benching upstream of the Aqueduct on the Sheyenne River.

2. Size – The size of the discharges in the Sheyenne, Maple, and Rush Rivers have increased from those provided in Supplement #2. Discharges in the Sheyenne River have increased from 8 acres to 13.4 acres due to the addition of river benching and refinements in the work limits. Discharges in the Maple River have increased slightly from 10 acres to 10.2 acres and discharges in the Rush River have increased from 3 acres to 4.1 acres due to refinements in the work limits.

3. Type of Site/Type of Habitat – There would be no change from Supplement #2.

4. Timing and Duration – Construction of the overall Project is underway and is anticipated to be complete in Spring 2027. The work for the Proposed Alternatives would begin in 2024 and would be complete no later than Spring 2027. The majority of the construction of the benches on the Sheyenne River would start in late 2025 and be completed in late 2026.

G. Description of Disposal Method – Soil material removed during bench excavation would be placed on the adjacent upland agricultural fields. Approximately 5,970 linear feet and 600 linear feet of toe wood-sod mats would be placed below the OHWM along the Sheyenne and Maple Rivers, respectively.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. Substrate Elevation and Slope – Banks along the Sheyenne and Maple Rivers would be excavated and graded to a slope of approximately 6 horizontal:1 vertical (6H:1V). These slopes are much more gradual than the steep banks currently found in these areas.

2. Sediment Type – There would be no change from Supplement #2.

3. Dredged/Fill Material Movement – Benching in the areas upstream of the Sheyenne River Aqueduct would result in the removal of approximately 148,000 cubic yards of material. Benching in the areas upstream of the Maple River Aqueduct would result in the removal of approximately 9,500 cubic yards of material. Excavated material would be permanently placed on the adjacent agricultural fields.

4. Actions Taken to Minimize Impacts – There would be no change from Supplement #2.

B. Water Circulation, Fluctuation, and Salinity Determinations

1. General Water Chemistry – There would be no change from Supplement #2.

2. Water Circulation, Fluctuation, and Salinity Determination

a. Current Patterns and Flow – There would be no change from Supplement #2.

b. Velocity – The Sheyenne River Proposed Alternative is designed to reduce stream velocities. The Sheyenne Aqueduct System would be designed to limit average cross section velocities to not greater than 3.6 feet/second when flow rates in the Sheyenne River upstream of the Diversion Channel are up to 3,850 cfs (the 5-percent exceedance April flow), as determined by the H&H model. Peak total velocities for the Sheyenne River Proposed Alternative at 3,850 cfs are between 0.5 and 1 ft/s higher than for existing conditions. The Sheyenne River No Action Alternative peak total velocities for the same event were 1 to 2.5 ft/s higher than existing conditions. The channel velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events (4,500 to 5,200 cfs) may exceed 5 and 6 ft/s. The velocity impacts associated with both the No Action and Proposed Alternative designs extend approximately 8 miles upstream of the project right of way (ROW).

The Maple River Proposed Alternative effectively lowers velocities relative to the No Action Alternative for all modeled flow events. Peak total velocities for the Proposed Alternative during the 5-percent exceedance April flow event (2,500

cfs) are between 0.5 and 1 ft/s higher than for existing conditions and 1 to 2 ft/s higher for the Maple River No Action Alternative. Channel velocities for the Proposed Alternative for the 10- through 0.2-percent AEP events (5,100 to 7,100 cfs) can be as much as 5 ft/s higher than channel velocities under existing conditions. Channel velocities may exceed 10 ft/s for less frequent events (i.e., 1-percent AEP). The velocity impacts associated with both the No Action and Proposed Alternative designs extend approximately 2.5 miles upstream of the Diversion Channel ROW.

The Rush River Proposed Alternative has been shown to have higher than anticipated velocities through recent hydraulic modeling. However, the peak total velocities within the inlet structure footprint are not expected to generate erosion up through the 1-percent AEP event, as this section is designed with rock revetment. For the natural channel upstream of the structure, the max peak total velocity during the April 5-percent exceedance event is 4.1 ft/s. During the 10-percent AEP flow event peak velocities just upstream of the ROW are 5.5 ft/s which is an increase of almost 3.5 ft/s relative to the existing conditions. The Rush River Proposed Alternative total velocities for all modeled events drop to within 0.5 ft/s of existing conditions just upstream of the 167th Ave SE Low Water Crossing roughly 1,700 ft upstream of the Project ROW.

c. Stratification – There would be no change from Supplement #2.

d. Hydrologic Regime – There would be no change from Supplement #2.

e. Normal Water Level Fluctuations – There would be no change from Supplement #2.

f. Salinity – There would be no change from Supplement #2.

3. Actions Taken to Minimize Impact – The Sheyenne and Maple River Proposed Alternatives include riverbank benching which widens the river channel and allows water to spread out over a larger area to reduce velocities which will reduce erosion and allow for fish to pass more freely. The benching areas also include several environmental enhancements such as toe wood-sod mats, root wads, tree planting, and a meandering channel downstream of the aqueduct structures. Erosion and fish passage monitoring will also occur after construction to ensure impacts to those resources are not higher than anticipated. The results of that monitoring will be used to inform adaptive management decisions.

C. Suspended Particulate/Turbidity Determination

1. Suspended Particulates and Turbidity - There would be no change from Supplement #2.

2. Effects on Chemical and Physical Properties of the Water Column – There would be no change from Supplement #2.

3. Actions Taken to Minimize Impacts – There would be no change from Supplement #2.

D. Contaminant Determinations – There would be no change from Supplement #2.

E. Aquatic Ecosystem and Organism Determinations

1. Effects on Plankton – There would be no change from Supplement #2.

2. Effects on Benthos – There would be no change from Supplement #2.

3. Effects on Fish – Benching included in the Sheyenne and Maple River Proposed Alternatives would result in the removal of riverbank to increase cross sectional area, allowing river flows to spread out and reduce velocities during high flows. Reducing velocities would allow fish to move unimpeded, particularly at more frequent flood events (e.g., 50-percent to 5-percent annual exceedance probability). The benching areas would provide areas that fish can effectively use to swim upstream during frequent flood events as velocities in the overbank areas should generally remain at or below 1 ft/sec. The addition of toe wood-sod mats would enhance the benched areas by providing erosion protection, refuge from high velocities during flooding, and aquatic habitat. Velocities upstream of the Rush River Inlet appear to be higher than previously anticipated but are not expected to result in unacceptable levels of fish passage.

4. Effects on Aquatic Food Web – There would be no change from Supplement #2.

5. Effects on Special Aquatic Sites – There would be no change from Supplement #2.

6. Threatened and Endangered Species – The northern long-eared bat (NLEB) is a federally-listed endangered species that has been identified by the USFWS as a species potentially affected by tree removal activities. Due to tree clearing, the Corps determined the proposed project may affect but is not likely to adversely affect NLEB. On March 22, 2024 the USFWS provided concurrence with the USACE determination that the Project may affect but is not likely to adversely affect the NLEB (Attachment II). The monarch butterfly was identified as a candidate species in December of 2020 but it is not yet listed or proposed for listing. Most areas that would be affected by the Proposed Alternatives do not have ideal habitat for the species; however, potential effects to the butterfly would be evaluated and addressed in the future if the butterfly is listed. There would be no change from Supplement #2 for the Dakota skipper and western prairie fringed orchid.

7. Other Wildlife – Wildlife likely to utilize riparian habitat would be adversely affected temporarily during project construction due to noise and construction activity. However, enhancement to the benching areas provided by the toe-wood sod mats and planting of native vegetation would eventually provide the benefits of food, shelter, and a concealed transportation corridor. The Proposed Alternative for the Sheyenne River may have adverse impacts to species that utilize steep banks, typical of the Sheyenne River. Bank swallows are one species in particular. Nesting cavities in vertical sand and dirt banks have been observed on the Sheyenne River. Bank swallows are protected under the Federal Migratory Bird Treaty Act (MBTA). Bank swallows have not been observed at the Maple River and Rush River or within other Project locations.

8. Actions Taken to Minimize Impacts – Standard Best Management Practices (BMPs) will be used to minimize impacts to biota and other resources. These actions are anticipated to ensure compliance with associated laws and regulations. Actions to avoid and minimize impacts to the species will be followed as outlined below.

NLEB: No tree cutting during the active season (April 15 to October 1).

Bald eagles: The MFDA is required to follow the U.S. Fish and Wildlife Service's National Bald Eagle Management Guidelines to minimize the likelihood that the FMM Project will affect any bald eagles nesting in the Fargo/Moorhead Project Area.

Bank swallows: To avoid and minimize impacts to bank swallows, surveys would be conducted prior to and during construction. Bank swallows feed on airborne insects and a mated pair will remain close to the nest throughout the 13-15-day incubation period and 18-21-day nesting period. Once bank swallow nests have been identified at a site, disturbing either the birds or the nests would be avoided. This includes destruction of nests or the collapse of burrows caused by the vibration of heavy machinery. Bank swallows can nest quickly overnight. If detected during construction, work would stop and a 165-foot buffer placed around the nesting site. Once nesting is complete, construction could resume in the area.

F. Proposed Disposal Site Determinations

1. Mixing Zone Determination – There would be no change from Supplement #2.

2. Determination of Compliance with Applicable Water Quality Standards Trees would be obtained from benching areas as well as the Upstream Mitigation Area. In the event a sufficient number of trees are not available there, tree thinning in other locations as a prescriptive measure may be considered to acquire additional trees. All other fill materials used for this project would be obtained from approved quarries in the project area or excavated on-site. It is not anticipated that the proposed project would violate water quality standards for toxicity as all fill material is anticipated to be free of contaminants. The area does not have a history of contamination, and therefore it is unlikely that State water quality standards would be exceeded because of project-related

activities. The North Dakota Department of Environmental Quality (NDDEQ) provided a letter stating a modified Section 401 Water Quality Certification is not required for the modifications discussed in this Evaluation.

3. Potential Effects on Human Use Characteristics

a. Municipal and Private Water Supply – There would be no change from Supplement #2.

b. Recreational and Commercial Fisheries – There would be no change from Supplement #2.

c. Water Related Recreation and Aesthetics – There would be no change from Supplement #2

d. Cultural Resources –The Proposed Alternative at the Sheyenne River crossing may impact historic properties, if any are determined to be present. Based on cultural resources investigations along the Sheyenne River, prehistoric and historic sites are situated along the margins of uplands overlooking the river, and within one-quarter mile of riverbanks. Previous archaeological surveys in proximity to the bank lines, within the diversion channel footprint, identified four sites. Sites 32CS5178, 32CSx362, 32CS5108, and 32CS5180—located north to south along both banks—were all determined to be ineligible and/or isolated finds. To avoid and minimize adverse impacts on historic properties, surveys will be conducted prior to construction, and archaeological monitoring of all ground disturbing activities during construction will take place in the construction zone. There would be no change in impacts to cultural resources for the Maple and Rush Rivers.

G. Mitigation – There would be no change from Supplement #2.

H. Determination of Cumulative Effects on the Aquatic Ecosystem – Aquatic impacts caused by the Project will be mitigated through the Sheyenne River Mitigation Project which includes the removal and alteration of several structures built as part of the Sheyenne River Flood Protection Project. The Sheyenne River Aqueduct lies upstream of the mitigation project. Implementation of the Sheyenne River Proposed Alternative will help to maximize the benefits realized from the mitigation through the environmental enhancement features and benching that allows fish to traverse more freely.

I. Determination of Secondary Effects on the Aquatic Ecosystem – There would be no change from Supplement #2.

III. FINDING OF COMPLIANCE WITH RESTRICTIONS ON DISCHARGE

The proposed fill activities would comply with Section 404(b)(1) guidelines of the Clean Water Act.

The proposed fill activities would comply with Section 307 of the Clean Water Act, and the Endangered Species Act of 1973, as amended. The proposed fill activities, as modified, would not have significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity, and stability and on recreational, aesthetic, and economic values would not occur.

On the basis of this evaluation, the proposed action, including the design modifications, would comply with Section 404(b)(1) guidelines for the discharge of fill material if the guidelines applied to this Project.

2 May 2024
Date

Eric R. Swenson
Colonel, Corps of Engineers
District Commander

US Army Corps of Engineers®
St. Paul District

Attachment II
U.S. Fish and Wildlife Service Correspondence

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

U.S. Army Corps of Engineers

St. Paul District

May 2024

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Assistant Regional Director-Ecological Services
5600 American Blvd. West
Bloomington, MN 55437-1458
Phone: (612) 713-5350 Fax: (612) 713-5292

In Reply Refer To: 03/22/2024 21:17:16 UTC
Project code: 2023-0054375
Project Name: Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Federal Nexus: yes
Federal Action Agency (if applicable): Army Corps of Engineers

Subject: Federal agency coordination under the Endangered Species Act, Section 7 for 'Fargo-Moorhead Metropolitan Area Flood Risk Management Project'

Dear Derek Ingvalson:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on March 22, 2024, for 'Fargo-Moorhead Metropolitan Area Flood Risk Management Project' (here forward, Project). This project has been assigned Project Code 2023-0054375 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (DKey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis completed by the Service, your project has reached the determination of "May Affect, Not Likely to Adversely Affect" the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your

IPaC-assisted determination was incorrect, this letter verifies that consultation on the Action is complete and no further action is necessary unless either of the following occurs:

- new information reveals effects of the action that may affect the northern long-eared bat in a manner or to an extent not previously considered; or,
- the identified action is subsequently modified in a manner that causes an effect to the northern long-eared bat that was not considered when completing the determination key.

15-Day Review Period

As indicated above, the Service will notify you within 15 calendar days if we determine that this proposed Action does not meet the criteria for a "may affect, not likely to adversely affect" (NLAA) determination for the northern long-eared bat. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the identified Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that we did not anticipate when developing the key. In such cases, the identified Ecological Services Field Office may request additional information to verify the effects determination reached through the Northern Long-eared Bat DKey.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Dakota Skipper *Hesperia dacotae* Threatened
- Monarch Butterfly *Danaus plexippus* Candidate
- Western Prairie Fringed Orchid *Platanthera praeclara* Threatened

You may coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the Assistant Regional Director-Ecological Services and reference Project Code 2023-0054375 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Fargo-Moorhead Metropolitan Area Flood Risk Management Project

2. Description

The following description was provided for the project 'Fargo-Moorhead Metropolitan Area Flood Risk Management Project':

> The purpose of the Fargo-Moorhead Metropolitan Area Flood Risk Management Project is to reduce flood risk, flood damages, and flood protection costs related to flooding in the Fargo-Moorhead metropolitan area. The project includes a 20-mile earthen embankment with gated structures on the Red River of the North and the Wild Rice River. The project will operate at approximately a 20-year flood event. During operation the gates on the structures will be lowered, water will pond in an upstream staging area, and will be sent down a 30-miles diversion channel west of the Fargo-Moorhead area. Project construction is anticipated to be largely complete by 2027.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@46.702597850000004,-96.93698335320639,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of “may affect, but not likely to adversely affect” for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. The action area does not overlap with an area for which U.S. Fish and Wildlife Service currently has data to support the presumption that the northern long-eared bat is present. Are you aware of other data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed NLEB acoustic detections. Data on captures, roost tree use, and acoustic detections should post-date the year when white-nose syndrome was detected in the relevant state. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No

3. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer ‘yes’ if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

5. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

6. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes

7. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

8. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

9. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

   If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer “No” below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project’s action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a “no effect” determination for the northern long-eared bat.

   Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer “No” and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

   No

10. [Semantic] Is the action area located within 0.5 miles of a known northern long-eared bat hibernaculum?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

11. Does the action area contain any caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating northern long-eared bats?

    No

12. Does the action area contain or occur within 0.5 miles of (1) talus or (2) anthropogenic or naturally formed rock crevices in rocky outcrops, rock faces or cliffs?

    No

13. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities?
    (If unsure, answer "Yes.")

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats (i.e., live trees and/or snags ≥3 inches (12.7 centimeter) dbh), answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    Yes

14. Will the action cause effects to a bridge?

    Yes

15. Will the proposed action result in the cutting or other means of knocking down, bringing down, or trimming of any trees suitable for northern long-eared bat roosting?

    Note: Suitable northern long-eared bat roost trees are live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

    Yes

PROJECT QUESTIONNAIRE

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

7.4

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

7.4

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

0

Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select 'Yes' if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

7.4

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter '0' if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

7.4

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

No

Will all project activities by completed by April 1, 2024?

No

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Derek Ingvalson
Address: 1020 36th Street
Address Line 2: #100
City: Fargo
State: ND
Zip: 58103
Email derek.s.ingvalson@usace.army.mil
Phone: 6513632180

You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

US Army Corps of Engineers®
St. Paul District

Attachment III
Finding of No Significant Impact

Design Modifications and Additional Analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project

Final Supplemental Environmental Assessment #3

U.S. Army Corps of Engineers

St. Paul District

May 2024

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
332 MINNESOTA STREET, SUITE E1500
ST. PAUL MN 55101-1323

Regional Planning and Environment Division North

FINDING OF NO SIGNIFICANT IMPACT

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

DESIGN MODIFICATIONS AND ADDITIONAL ANALYSIS FOR THE FARGO-MOORHEAD METROPOLITAN AREA FLOOD RISK MANAGEMENT PROJECT

The U.S. Army Corps of Engineers is proposing modifications to and has performed additional analysis for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project, which was previously the subject of a Final Feasibility Report and Environmental Impact Statement. A Record of Decision was signed on April 3, 2012. Supplemental Environmental Assessments dated September 2013 and February 2019 were completed to address modifications to the project. Proposed modifications and additional analysis have revealed changes in impacts from three structures being constructed along the Diversion Channel – the Sheyenne River Aqueduct, the Maple River Aqueduct, and the Rush River Inlet. The previous assessments on these structures were completed on preliminary designs. Detailed design and updated modeling have revealed higher velocities upstream of the structures. To address higher velocities, benching along the Sheyenne and Maple River Aqueducts was evaluated. Increased velocities upstream of the Rush River Inlet are not likely to result in major adverse impacts. Adaptive management will be used to monitor conditions and implement measures as appropriate. The structures are located in Cass County, North Dakota.

This Finding of No Significant Impact is based on the following factors, as discussed in the attached Supplemental Environmental Assessment: the Proposed Alternatives would produce a minor short-term adverse effect on noise levels, air quality, water quality, transportation, aquatic habitat, upland/riparian habitat, wildlife, greenhouse gas emissions, and farmland. The Proposed Alternatives would also have a long-term minor adverse effect on farmland. The Proposed Alternatives would have a long-term positive effect on fish passage, geomorphology, aesthetic values, and aquatic habitat. No additional impacts to wetlands or cultural resources have been identified. Additional tree clearing would occur which may affect but is not likely to adversely affect the northern long-eared bat. The monarch butterfly is a candidate species and potential effects to the butterfly would be evaluated and addressed in the future if the butterfly is listed. The Proposed Alternatives would not result in impacts substantially different in type or magnitude from what was described in the Final Feasibility Report and Environmental Impact Statement and 2013 and 2019 Supplemental Environmental Assessments.

For the reasons stated above, the proposed modifications do not constitute a major Federal action significantly affecting the quality of the environment. Therefore, a supplemental environmental impact statement for the proposed modifications will not be prepared.

5/01/2024

Date

Eric R. Swenson
Colonel, Corps of Engineers
District Engineer